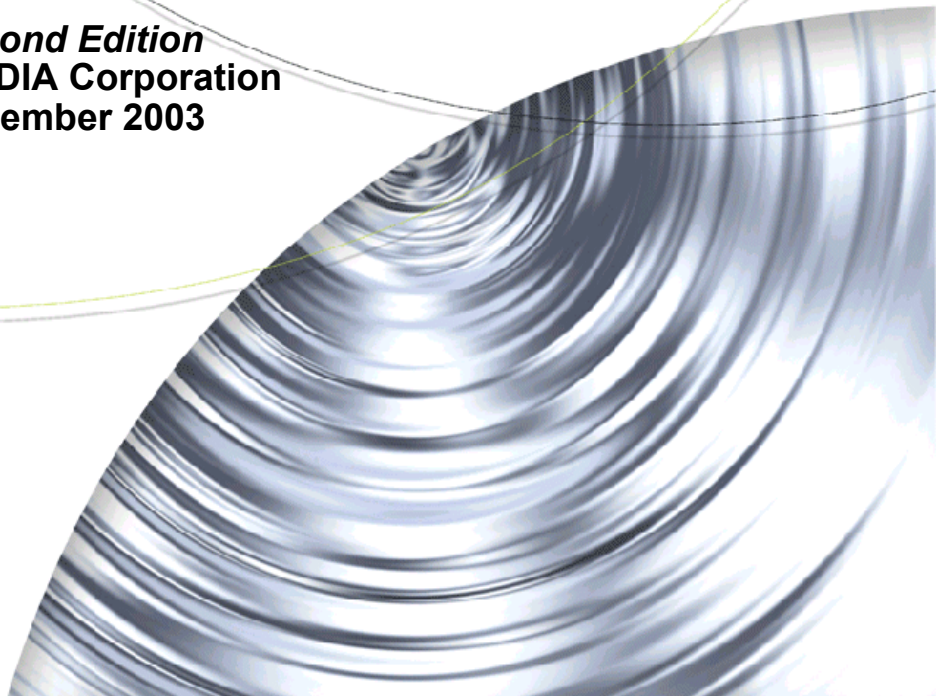# ForceWare Graphics Drivers
User's Guide

Version 53.03 for Windows 2000/XP
Version 53.04 for Windows 9*x*

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INTRODUCTION

This chapter contains the following major sections:

About this Guide

This *user's guide* is addressed to users of NVIDIA® ForceWare™ graphics driver "display properties," which is the NVIDIA Windows® Control Panel-based user interface accessible from the Windows Display Properties **Settings** > **Advanced** option.

This guide focuses on the NVIDIA desktop products, i.e, graphics cards based on **NVIDIA desktop (GeForce series) GPUs (graphics processing units)** listed in Table 2.5, "Supported NVIDIA GPU-Based Products" on page 11.

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

Other Documents

- For details on using the nView™ Desktop Manager application component of the ForceWare graphics drivers, see the following user's guide:

  "*ForceWare Graphics Drivers: nView Desktop Manager 3.0 User's Guide.*"

- If you are primarily using the *display properties* components of the NVIDIA ForceWare graphics drivers based on the NVIDIA **Quadro® GPUs**, see the following user's guide:

  ForceWare Graphics Drivers: Quadro Workstation User's Guide

- The documents titled *NVIDIA Drivers for Windows: Release 50 Notes* describe performance improvements and bug fixes in the ForceWare graphics drivers. These documents enable **add-in-card (AIC)** producers and **original equipment manufacturers (OEMs)** to monitor performance improvements and bug fixes in the driver.

Online Help

You can obtain context help for any of the options on the NVIDIA control-panel based user interface 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 panel (window) you have open, move the "**?**" icon over the option for which you want help, then click your mouse again to display the help.

nView Components: Display Properties and Desktop Manager

The NVIDIA ForceWare graphics driver software includes two user interface-based components: *nView display properties* **and** *nView Desktop Manager*.

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

- **Display properties**, the topic of this *user's guide,* refers to the NVIDIA Windows Control Panel-based user interface, which you can access from the Windows **Display Properties** > **Settings** > **Advanced** option.

Once you click the NVIDIA GPU tab name, a menu appears from which you can configure the advanced display properties of the current release of the NVIDIA ForceWare graphics driver software.

For details on using the NVIDIA menu and its options, see "Using the NVIDIA Graphics Driver Menu" on page 32 and "Using nView Multi-Display Modes" on page 36.

• The primary nView component is the **Desktop Manager**, which is a user-level application utility that focuses on making you more productive when working on your Windows desktop. 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.

Note: As with the *display properties* component, now you can also access the nView Desktop Manager control panel and configure its features from the Windows **Display Properties** > **Settings** > **Advanced** option. nView Desktop Manager has been further enhanced in terms of new features for the Release 50 NVIDIA graphics driver software. For details, the NVIDIA ForceWare Graphics Drivers: *nView Desktop Manager 3.0 User's Guide*.

Key Terms and Concepts

analog display
Analog display refers to your CRT display device, in general. The terms CRT and analog display may be used interchangeably in this guide.

application
An application (or program) can have any number of windows. Some applications have only a single window such as Calculator or Notepad. Other applications can have many windows such as Outlook where you can open several E-mail windows, have your Inbox open, open calendars, etc.

Control Panel
Refers to the Windows Control Panel group, which you can access by clicking **Start** > **Settings** > **Control Panel** from the Windows taskbar.

digital display
A digital display device can be a digital flat panel (DFP) or, for example, a mobile computer (laptop) LVDS internal panel.

desktop

Desktop is the 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 kinds of 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.

Also see the definition of "modal dialog box" and "modeless dialog box" on this page.

dual-card configuration

A setup where two or more display devices (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

Graphics Processing Unit (GPU). NVIDIA graphics chip products are called GPUs. Supported NVIDIA GPUs are listed in "Hardware: Supported NVIDIA Products" on page 11. The graphics card you are using is based on an NVIDIA GPU.

modal dialog box

A dialog box that puts you in the state or "mode" of being able to work only in the dialog box. You cannot move a modal dialog box; it can be removed only by clicking its buttons.

modeless dialog box

A dialog box that resembles a document window without a collapse box. You can move a modeless dialog box, make it inactive and active again, and close it like a document window.

multi-card configuration

A setup where two or more display devices (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 display devices 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 device is connected to the NVIDIA GPU-based graphics card in your computer.

nView Display Mode

nView Span and Clone mode display options are available when you click the nView Display Mode option from the NVIDIA driver menu

window

A window is any independent window on your desktop. Applications such as 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 2.0 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.

New Features in Release 50

This section summarizes the new features and enhancements provided with the NVIDIA Release 50 drivers for Windows.

New Feature Highlights

64-bit Support

Driver Release 50 offers AMD64 and IA64 OS 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.

Graphics Driver Changes — New Features

- **Rotation support** is available for Windows Me/9x operating systems.

- **Custom resolutions** allows the user to construct new modes via the NVIDIA control panel.

- **Screen editing** allows removing infrequently used screens by dragging them from the NVIDIA screen menu to a list. Screens can be restored by simply clicking the **Restore Defaults** option or by dragging them back to the menu.

- **Dynamic EDIDs** allows updates to the master mode list with new modes contained in the connected device's EDID.

- **Support for special panels and display devices**

  - Large panels

  - Wide panels

  - Seamless Span modes are included in the mode list to support T221-style large panels.

  - Interlaced modes for HDTV

  - DVI device hot plugging

- **Frame Lock** functionality **(for Quadro FX series of GPUs)** is available for synchronizing applications across multiple displays.

- **Edge Blending** functionality **(for Quadro FX series of GPUs)** is available for blending the adjacent edges of overlapped displays on projection systems

Video — New Features

Video Mixing Renderer (VMR) Support
VMR support for full screen video and Microsoft's **DirectX Video Acceleration (DXVA)**

PowerMizer — New Features

- Dynamic peak power control
- Thermal Protection version 2.0

User Interface Changes

New Features

- **Dualview support** is available and supported as a single step process from the **nView Display Modes** panel and APIs. Switching in and out of all driver modes is possible with several choices for display device pairs, such as

  - analog display + digital display

  - digital display + analog display

  - TV + digital display

  - and other combinations...

- **Change Resolution** panel

- **Improved Color Correction** panel with enhanced Gamma

- **HDTV** support

Improvements

- Menus for NVIDIA user components

- Easy access to nView Display Mode or Windows Display Properties Settings through the NVIDIA Settings taskbar utility

- Panel access for non-administrator users

- Tool tips for the scroll bar on the NVIDIA menu

- Improved Performance and Quality Settings panel

- Improved TV-Out settings panel

- Improved device selection (display pairs)

- Separate Overlay Controls panel

- Separate Full Screen Video settings panel

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SYSTEM REQUIREMENTS

This chapter contains the following major sections:

- "System Requirements and Support" on page 9
- "Notes on Feature and Configuration Support" on page 14
- "Examples in this Guide" on page 15

System Requirements and Support

This section contains the following topics:

- "Operating Systems" on page 10
- "Minimum Hard Disk Space" on page 10
- "Software: NVIDIA Graphics Driver" on page 11
- "Hardware: Supported NVIDIA Products" on page 11
- "Supported Languages" on page 13

Operating Systems

This release of the NVIDIA ForceWare Graphics Drivers driver is designed for the Microsoft operating systems listed in Table 2.1:

Table 2.1   Operating System Requirements

Operating System	Minimum Requirements
Windows XP Home	
Windows XP Professional	
Windows XP Media Center Edition	
Windows XP Media Center Edition 2004	
Windows Server 2003 x64	
Windows XP AMD64	
Windows 2000	
Windows NT 4.0	Service Pack 4
Windows Me	
Windows 98	Microsoft DirectX$^{™}$ 5
Windows 95	OSR2 (OEM Service Release 2) with USB supplement for AGP support
	Microsoft OPENGL32.DLL
	Microsoft DirectX 5

Note: Windows 95, 98, and Me are collectively called Windows 9x in this guide.

Minimum Hard Disk Space

The minimum hard disk space requirements 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 Disk Space Required
Windows XP	19.2 MB
Windows 2000	19.2 MB
Windows NT	15.2 MB
Windows Me	19.3 MB
Windows 98	19.3 MB
Windows 95	19.3 MB

Table 2.3   Hard Disk Space Requirements — Non-English Languages

Operating System	Minimum Requirements
Windows XP	24.9 MB
Windows 2000	24.9 MB
Windows NT	24.8 MB
Windows Me	24.8 MB
Windows 98	24.8 MB
Windows 95	24.8 MB

Table 2.4   Hard Disk Space Requirements — Full International Package

Operating System	Minimum Requirements
Windows XP	44.1 MB
Windows 2000	44.1 MB
Windows NT	40.0 MB
Windows Me	44.1 MB
Windows 98	44.1 MB
Windows 95	44.1 MB

Software: NVIDIA Graphics Driver

Make sure the current version of the NVIDIA graphics (display) driver software for your Windows operating system has been installed on your computer.

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

Hardware: Supported NVIDIA Products

Table 2.5 lists the NVIDIA products supported by the NVIDIA graphics driver software and the number of displays the GPU-based card supports.

Table 2.5   Supported NVIDIA GPU-Based Products

NVIDIA Desktop Products	NVIDIA Workstation Products	Number of Displays Supported Per Card
nForce™2 S nForce2 ST nForce2 G nForce2		**2**— applies to all GPUs in this category.
nForce 420/420D nForce 220/220D		**1**— applies to all GPUs in this category.

Table 2.5   Supported NVIDIA GPU-Based Products (continued)

NVIDIA Desktop Products	NVIDIA Workstation Products	Number of Displays Supported Per Card
GeForce FX 5950 Ultra		**2** — applies to all GPUs in this category.
GeForce FX 5700 Ultra GeForce FX 5700 GeForce FX Go5700 GeForce FX Go5750	Quadro FX 1100	**2** — applies to all GPUs in this category.
GeForce FX 5900 GeForce FX 5900 Ultra GeForce FX 5950	Quadro FX 3000	**2** — applies to all GPUs in this category.
GeForce FX 5200 Ultra GeForce FX 5200 GeForce FX Go5100 GeForce FX Go5200	Quadro FX 500 Quadro NVS 280 PCI	**2** — applies to all GPUs in this category.
GeForce FX 5600 Ultra GeForce FX 5600 GeForce FX 5600 SE GeForce FX Go5600	Quadro FX Go700	**2** — applies to all GPUs in this category.
GeForce FX 5800 Ultra GeForce FX 5800	Quadro FX 2000 Quadro FX 1000	**2** — applies to all GPUs in this category.
GeForce4 Ti 4800 GeForce4 Ti 4800 SE GeForce4 Ti 4200 GeForce4 4200Go	Quadro4 980 XGL Quadro4 780 XGL Quadro4 Go700	**2** — applies to all GPUs in this category.
GeForce4 Ti 4600 GeForce4 Ti 4400 GeForce4 Ti 4200 GeForce4 440 Go GeForce4 420 Go GeForce4 410 Go	Quadro4 900 XGL Quadro4 750 XGL Quadro4 700 XGL	**2** — applies to all GPUs in this category.
GeForce3 GeForce3 Ti 500 GeForce3 Ti 200	Quadro DCC	**1** — applies to all GPUs in this category.
GeForce4 MX 440 GeForce4 MX 440 SE GeForce4 MX 420 x	Quadro4 580 XGL Quadro NVS 280 Quadro4 380 XGL	**2** — applies to all GPUs in this category.
GeForce4 MX 460 GeForce4 MX 440 GeForce4 MX 440-SE GeForce4 MX 420	Quadro4 550 XGL Quadro NVS 200	**2** — applies to all GPUs in this category.
	Quadro NVS 400	**4** — applies to all GPUs in this category.

Table 2.5   Supported NVIDIA GPU-Based Products (continued)

NVIDIA Desktop Products	NVIDIA Workstation Products	Number of Displays Supported Per Card
GeForce2 Ti GeForce2 Ultra GeForce2 Pro GeForce2 GTS	Quadro2 Pro	**1** — applies to all GPUs in this category.
GeForce2 MX GeForce2 MX400 GeForce2 MX200 GeForce2 MX100 GeForce2 Go	Quadro2 MXR Quadro2 EX Quadro2 Go	**2** — applies to all GPUs in this category
GeForce 256	Quadro	**1** — applies to all GPUs in this category.
NVIDIA RIVA TNT2™ Ultra NVIDIA RIVA TNT2 Pro NVIDIA RIVA TNT2 NVIDIA RIVA TNT2 M64 NVIDIA Vanta™ NVIDIA Vanta LT	---	**1** — applies to all GPUs in this category.
NVIDIA RIVA TNT™	---	**1** — applies to all GPUs in this category.

Supported Languages

The following languages are supported in the NVIDIA panels that are accessible from the Windows **Display Properties** > **Settings** > **Advanced** option.

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)	

Notes on Feature and Configuration Support

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Feature Support

- To access NVIDIA nView Display Mode features, you need
  - a multi-display graphics card based on any of the NVIDIA GPUs that support multiple displays on a single card, as indicated in Table 2.1, *and*
  - at least two display devices connected to the card.

- Other NVIDIA Display Properties features and the nView Desktop Manager are supported by either single-display or multi-display NVIDIA GPU-based cards; i.e., you can connect only one display device and access these features, provided the NVIDIA GPU supports these features.

- The options shown in the NVIDIA properties panels may vary depending on the specific NVIDIA GPU you are using. For example, one or more options that are available for a specific GPU-based card, such as a GeForce4 Ti or GeForce4 MX, may not be available on a GeForce2 Pro or other types of products.

Multi-Display Setup: Tips and Requirements

- When using a multi-display setup under Windows 2000/XP, running Windows in "Dualview" mode is strongly recommended.

- When running Windows with multiple cards (i.e., two or more NVIDIA GPU-based graphics card are installed in your computer), note the following:
  - Using cards based on the same NVIDIA GPU is strongly recommended.
  - The same NVIDIA driver (version) must be installed for each card.
  - For a detailed discussion of using multi-display modes, see "Using nView Multi-Display Modes" on page 36.

Examples in this Guide

- For example purposes, most of the NVIDIA panels shown in this guide feature the NVIDIA GeForce FX 5900 Ultra 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 panels shown in this document apply also to Windows 2000 functionality, *unless noted otherwise*.

- The Windows Me panels shown in this document also apply also to Windows 98/95 functionality, *unless noted otherwise*.

3

NVIDIA DRIVER FEATURE HISTORY

This chapter provides release history of the NVIDIA graphics driver for Windows and summarizes the features and enhancements that have been introduced in each release. It contains these sections:

Driver Release History

Release 10 is the latest NVIDIA graphics driver software for Windows. Table 3.1 contains a summary of previous driver releases and the versions associated with them.

Note: Some versions listed may not have been released outside of NVIDIA.

Table 3.1   NVIDIA Graphics Drivers for Windows

Driver	Name	Versions	Comments
Release 50	ForceWare	50.x–5x.x	Releases ongoing
Release 40	Detonator FX	43.45, 45.23	
Release 40	Detonator 40	40.*xx* – 43.44	Releases ongoing
Release 35		35.*xx* – 36.xx	Releases ongoing
Release 25	Detonator XP	26.00 – 29.42	Releases ongoing
Release 20	Detonator XP v2*x.xx*	21.83 – 23.xx	
Release 10	Detonator 3 v1*x..xx*	10.00 – 17.xx	
Release 6	Detonator 3	6.09 – 8.*xx*	
Release 5	Detonator 2	5.00 – 5.*xx*	
Release 4	Detonator	3.00 – 3.*xx*	
Release 3	Detonator	1.83 – 2.42	
Release 2		1.05 – 1.31	

Release 40: New Features and Enhancement

This section provides a summary of the new features and enhancements provided with the NVIDIA Release 40 drivers for Windows. In addition to overall performance and stability improvements, the following are the specific areas that have undergone significant changes:

- "Enhanced Graphics Driver, DirectX, and Video Capabilities" on page 17
- "NVIDIA Display Properties: New User Interface" on page 19
- "nView Desktop Manager: Enhancements and New Features" on page 20
- "OpenGL Enhancements" on page 21

Enhanced Graphics Driver, DirectX, and Video Capabilities

- "Windows XP SP1" on page 18
- "Temperature Settings" on page 18

Windows XP SP1

- Release 40 supports Windows XP SP1, Windows Media Center Edition, and Windows XP Tablet PC.

- 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.

Temperature Settings

Note: This option is available with GeForce™ FX and later NVIDIA GPUs *and* on certain older NVIDIA GPUs if the option has been enabled in the registry settings of your computer.

Temperature settings let you adjust the temperature of the selected NVIDIA GPU on your computer. See "Temperature Settings" on page 99 for details.

Direct 3D Vertical Sync Options

Vertical Sync Mode options for Direct3D™ specify how Vertical Sync is handled in Direct3D application.

NVRotate

NVRotate™ is a desktop rotation feature that lets you rotate the desktop by 90, 180, or 270 degrees.[1]

For further details, see "Enabling NVRotate" on page 96.

- **Controls:** Desktop rotation is controlled through the NVIDIA Display Properties panel, or integrated seamlessly with Windows XP Tablet PC.

- **Graphics API Support:** NVRotate includes support for windowed and full-screen applications in all rotation modes for Direct3D and OpenGL[®] application.

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

- **Hardware Platforms:** Rotation functionality is supported on desktop, mobile, and Tablet PCs.

DirectX 9 Support

When Microsoft® releases DirectX™ 9 runtime, Release 40 will provide support for DirectX 9, which includes the new vertex shaders, antialiasing modes, and multi-display device support.

Video Enhancements

Changes in the video driver include:

- Flip Sync functionality support

- Support for multiple Macrovision clients

- Simplified Video Mirror feature controls

TV Screen Size Support

Depending on the TV encoder used, Release 40 supports the adjustment of the TV screen up to a DVD-optimal mode. This option is accessible through the NVIDIA display properties control panel.

For further details, see "Device Adjustments: TV Output" on page 69.

Additional Enhancements

- Improved support for wide-aspect ratio screen resolutions.

- Improved memory management support for Dualview.

- Improved memory management support for OpenGL.

NVIDIA Display Properties: New User Interface

New Display Properties Panel

The NVIDIA display properties panels (accessed through the Windows Display Properties Settings **Advanced** option) have been redesigned to improve control over the display adapter settings and make navigation easier.

Some of the new features include the following:

- A menu in the form of a "slider tray" that allows all pages to be available from the top level page.

- Dynamic tracking allows the pages to adapt to the state of the driver, and user interface controls are modified, or even created, accordingly.

- Driver configuration changes are maintained across driver installations.

nView Desktop Manager: Enhancements and New Features

Feature Enhancements

The following features have been enhanced in the new version of NVIDIA nView Desktop Manager:

- **Operating System Support** includes Windows NT® 4.0, Windows 98/Me, and Windows 2000/XP.

- **Profile Feature:** Display Modes are now saved to and loaded from each profile. (This feature is not available in Windows NT 4.0.)

- **Multiple Desktop Support** additions include:

  - Support for multi-display wallpaper selection

  - Graphical display in explorer shell extension

  - Support for icons to represent desktops

  - Support for arbitrary positioning of windows on the desktops

  - Zoom Support includes new "Fixed-Frame zoom" and "Bi-Directional" zoom editing capability

New Features

The following features are new to the current version of the nView™ Desktop Manager:

- **Task Switcher.** When enabled, nView Desktop Manager adds a desktop switcher in addition to the standard application tab switcher. By default, this additional "switch desktop" functionality is accessed through a **Alt-~** keystroke combination which you can change through options in the Desktop Manager Hot Keys panel.

- **Color Keyed Windows** allows the user to color key windows for easy identification when activating them on the desktop.

- **NVKeystone™** allows real-time image correction on portable projectors and heads-up displays.[2] 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.

- **Taskbar and Menu Transparency**

- **New window actions**, such as Collapse

- **New applications settings,** including a full set of application launch and disable settings.

OpenGL Enhancements

OpenGL 1.4 ICD with NVIDIA Extensions

• New extension includes ARB_vertex_program, which co-exists with NV_vertex_program

• Meets new conformance tests

Additional OpenGL Enhancements

• **Multi-Display Improvements**

  New accelerated spanning mode is enabled by default.

• **Reduced Power Consumption:** Release 40 utilizes CPU cycles more efficiently, resulting in reduced power consumption without sacrificing performance.

• **Dynamic AGP/Video Memory Management**

  • Accommodates multiple applications open at the same time

  • Dynamic Memory Resizing

• **Allowance for additional memory tuning**

Release 35: New Features and Enhancements

The Release 35 driver offers new features not found in previous releases of the NVIDIA graphics driver.

• **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.

  For details on using this feature, see .

• 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 display calibration screens and utilities have been designed to improve windows multi-display usability.

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[2] NVKeystone is not supported on graphics cards based on the TNT, TNT2 or Vanta product families.

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.

Release 25: New Features and Enhancements

The Release 25 driver offers new features not found in previous releases of the NVIDIA graphics driver for Windows. These features are:

- **nView,** the next-generation of the former "TwinView" feature, is the latest multi-display technology encompassing driver support, multi-display GPU architecture, and desktop management support.

- **nView Desktop Manager** is a desktop management engine for application window management, extension of application functions, and support of multiple desktops.

    Note: Desktop Manager has been significantly redesigned from its previous TwinView version. nView Desktop Manager is now a separate item on the Windows Control Panel group. You can click this item to access the Desktop Manager configuration tabs and windows.

- **NVIDIA Display Properties** (the topic of this guide) now offers improved features for multi-display functionality, including Clone modes and Horizontal and Vertical Span modes.

- **Dualview support** for Windows 2000

- **Improved DirectX Video Acceleration (DXVA)**

- **Special support for NVIDIA products in the GeForce4 family**:

    - IDCT support for DirectX VA

    - Improved antialiasing compatibility and performance

- **Enhanced 3D Stereo functionality**

    - Support for lenticular lenses on LCDs (Liquid Crystal Displays)

    - 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 offered new features not found in previous releases of the NVIDIA graphics 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 user interface features *and*
  - accelerated Windows XP 3D performance through the NVIDIA XPress Link technology.

Release 10 Enhancements

The Release 10 driver offered new features not found in previous releases of the NVIDIA graphics 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 the following NVIDIA GeForce3 capabilities:
  - Pixel and Vertex Shader support for DirectX 8 and OpenGL.
  - NVIDIA Quincunx™ antialiasing option for enhanced image quality and performance.
- AMD Athlon Processor and Intel Pentium 4 Processor optimizations
- Improved TwinView interface

Release 6 Enhancements

The Release 6 driver offered new features not found in previous releases of the NVIDIA graphics driver for Windows.

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TwinView

TwinView is a Release 6 *and later* feature that supports connecting dual displays using an NVIDIA GPU-based multi-display card.

TwinView includes major features such as the *Virtual Desktop*, *Video Mirror*, and *Desktop Manager*.

TwinView supports a variety of display options, such as digital flat panels, red-green-blue (RGB) displays, TVs, and analog flat panels and display modes; i.e., Standard, Clone, and Span.

Virtual Desktop

Virtual Desktop is a TwinView feature that is useful for flat panels and analog display 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 the following operating systems and modes:

- Windows NT 4.0 and Windows 2000 in TwinView Standard or Clone mode
- Windows 9*x* in TwinView Clone mode

Video Mirror

Video Mirror is a TwinView feature that allows a video or DVD application to mirror its playback in full-screen mode on any one of the connected display devices. In other words, Video Mirror allows video data that's displayed on a hardware overlay to be displayed at full-screen on a secondary display. Currently, Video Mirror functionality is available under

- Windows 2000 in TwinView Clone mode
- Windows 9*x* in TwinView Clone or Span mode
- Windows 95 in TwinView Clone mode

Desktop Manager

See description of "nView Components: Display Properties and Desktop Manager" on page 2

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 GeForce2 MX family and later series of NVIDIA GPUs.

OpenGL

The NVIDIA OpenGL Settings panel contains the following changes:

- Improved full-scene antialiasing 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 panel contains the following changes:

- Improved full-scene antialiasing methods not previously available
- Removed certain obsolete options

Cursor Trails Support

Release 6 for Windows provides support for cursor trails in Windows 9*x*.

Display Properties – Settings – Advanced Tabs

TwinView, Digital Vibrance Control, OpenGL, and Direct3D features have associated NVIDIA-specific tabs from which the above-mentioned features can be configured.

Release 5 Enhancements

The Release 5 driver offered new features that were not found in previous releases of the NVIDIA graphics driver for Windows.

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

- 3D textures (performed in software on all platforms)

- vertex array subranges for optimizing vertex array processing (`glDrawRangeElements()` retains the performance of `glDrawElements()`)

OpenGL Extensions

The OpenGL extensions in Table 3.2 were added or changed in Release 5.

Table 3.2   Openly 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, 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 multi-textured TexCoord2f+Color4ub+Vertex3f.
- Vertex array range extension is fully functional.
- Windows **Display Properties** > **Settings** > **Advanced** tabs enables accelerated full-scene antialiasing (GeForce, GeForce2)
- Multi-display hardware is accelerated on Windows 2000.
- `GL_WGL_swap_interval` extension can change Vsync behavior.
- Vsync is on by default. (Default behavior is selectable from the NVIDIA OpenGL properties tab.)
- Default anisotropic filtering can be triggered by checking the anisotropic filtering box on the NVIDIA OpenGL properties tab.
- 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 antialiasing is enabled (GeForce, 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.)

Display Properties – Settings – Advanced Tabs

NVIDIA now provides tabs (**Display Properties** >**Settings** > **Advanced**) for Windows NT 4.0 and Windows 2000.

4

INSTALLING AND UNINSTALLING THE NVIDIA GRAPHICS DRIVER SOFTWARE

This chapter contains the following major sections:

Before You Begin

In order to access the NVIDIA Display Properties tabs, the latest version of the NVIDIA graphics drivers software for your Windows operating system must be installed on your computer.

- 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 NVIDIA graphics driver software on your computer.

- This chapter discusses the installation process but does not provide step-by-step instructions on how to perform an actual installation.

- For details on configuring and using the nView Desktop Manager application component of the NVIDIA ForceWare graphics driver, see the *NVIDIA ForceWare Graphics Driver: nView Desktop Manager 3.0 User's Guide*.

About the NVIDIA Graphics Driver Installation

NVIDIA graphics driver installation provides both an `.inf` file-based installation method and an InstallShield Wizard-based installation method.

File Locations

- The installation process copies all necessary files for operation into the appropriate directories.

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

- nView Desktop Manager "profile" (`.tvp`) files are saved in the `Windows\nView` directory.

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

- Under Windows Me and Windows XP, the NVIDIA driver is installed in "Dualview" display mode. However, note that the second display is not activated (turned on) by default. You need to enable it. For details on enabling Dualview mode, see "Using nView Multi-Display Modes" on page 36.

- Under Windows 2000, the NVIDIA graphics driver is installed in Span mode.

Preserving Desktop Manager Settings Before Upgrading Your Software

You can preserve your Desktop Manager settings by using profiles when you upgrade your software.

Follow the steps below and/or refer to the *NVIDIA nView Desktop Manager 2.0 User's Guide* for details.

1 Before uninstalling or installing software, save your current nView Desktop Manager settings to a new profile.

For example, name this profile "`My Settings`".

2 Open the `Windows\nView` directory.

You should see your new profile `.tvp` file in this directory; for example, `My Settings.tvp`.

3 You can copy this file to a disk in your A: drive *or* to a different directory on your hard drive.

4 Uninstall the currently installed NVIDIA graphics driver software on your system. See "Uninstalling the NVIDIA Graphics Driver Software" on page 31.

5 Install the new version of the NVIDIA graphics driver software.

6 Copy your profile `.tvp` file back into the `Windows\nView` directory.

7 Start nView Desktop Manager and load your profile.

When you load this profile, all your nView Desktop Manager settings, including Individual Settings you may have set up for applications, are restored.

Uninstalling the NVIDIA Graphics Driver Software

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

To uninstall the NVIDIA graphics driver software, follow these steps:

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

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

Your system now restarts.

Using the NVIDIA Graphics Driver Menu

Once your NVIDIA graphics driver software is installed, you can access the NVIDIA graphics driver features that are available on the NVIDIA driver menu by using the procedures that are explained and illustrated in this section.

1 From your Windows desktop, right click to display the desktop menu and click **Properties** > **Settings (**tab) and then **Advanced**.

You will see the name of your NVIDIA GPU on a tab (Figure 4.1).

Figure 4.1   NVIDIA GPU Tab
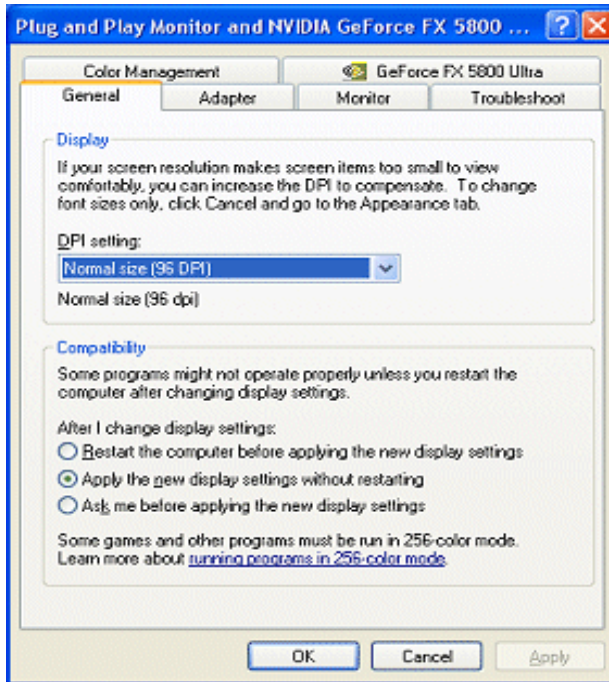
2 Click the NVIDIA GPU tab, which displays the name of the NVIDIA GPU-based graphics card that is installed on your computer.

The NVIDIA menu appears as shown in Figure 4.2.

3 To toggle between hiding and showing the menu, click the green button on the NVIDIA menu.

(Figure 4.2 also shows the GPU panel with a hidden menu.)

4 Click the scroll bar (Figure 4.2) and drag it left or right to view the entire contents of the longer menu names.

Note: You can right-click on the scroll bar to see tool tips (Figure 4.2).

Figure 4.2   NVIDIA Display Properties Menu: Expanded with Scroll Bar and Hidden

Click this **green button** to hide the NVIDIA menu.
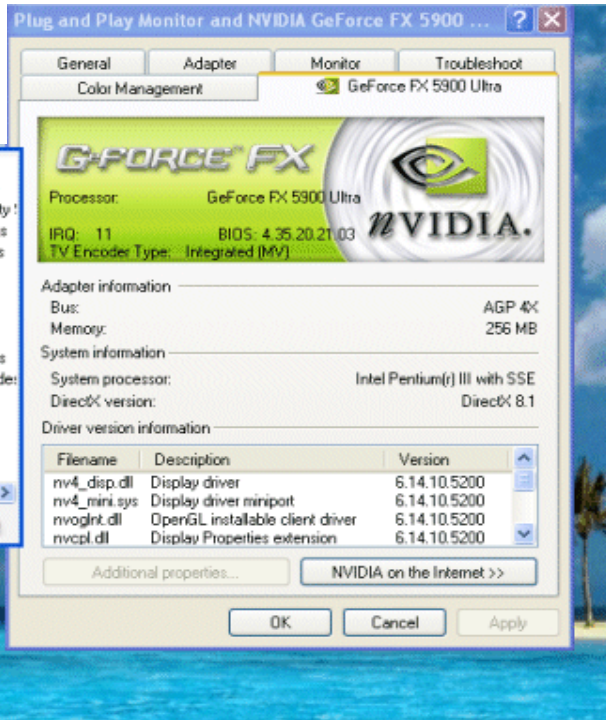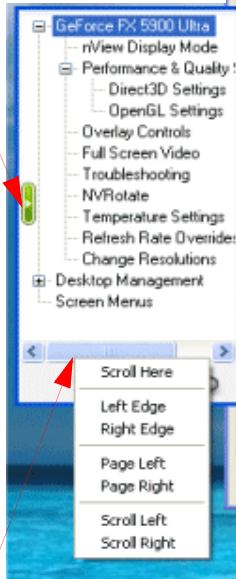
Right click on the scroll bar to view this **tool tip** for using the scroll bar.

Click this **green button** to display the NVIDIA menu.
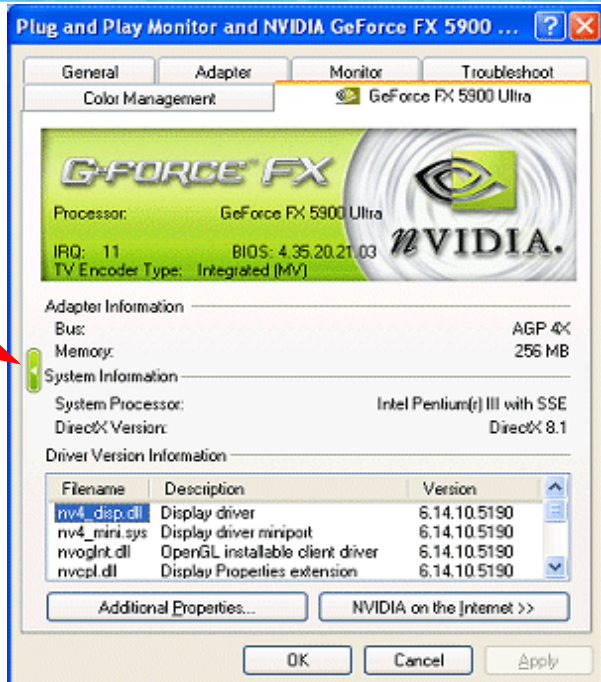
From the NVIDIA menu, you can access all the NVIDIA properties panels where you can configure the following NVIDIA graphics driver features.

• **nView Display Mode**. This option *does not appear* if you have only one display device attached. It appears only when you have more than one display device attached.

• **Performance and Quality Settings**

• **Direct3D Settings**

• **OpenGL Settings**

• **Overlay Controls**

• **Full Screen Video**

• **Troubleshooting**

• **NVRotate**

• **Temperature Settings**. This option is available only with the GeForce FX GPU and only if the feature is enabled on GPUs that are older than the GeForce FX)

• **Refresh Rate Override**

• **Change Resolution**

• **Desktop Manager**. For details on using the Desktop Manager features, see the *nView Desktop Manager User's Guide* for the Release 50 driver.

• **Screen Menus**

To view any of the properties panels, simply click the choice on the menu. Figure 4.3 shows a sample nView Display Modes panel for Windows 2000/XP and Figure 4.4 shows one for Windows Me/9*x*.

NVIDIA Settings Utility

The NVIDIA Settings is a new application that can be used in place of the NVIDIA display properties menu described earlier.

You can access NVIDIA Settings by clicking the NVIDIA Settings icon, which you can optionally add to the Windows taskbar.

This taskbar utility menu items that provide access to the same display settings that the regular NVIDIA menu contains, in additional to direct access to certain application-specific options such as those for nView Desktop Manager, OpenGL and Direct3D customized settings, and others.

For details on enabling the NVIDIA Settings icon, see "Display the NVIDIA Settings Icon in the Taskbar" on page 93.

Figure 4.3   NVIDIA Display Properties: NVIDIA Menu (Windows XP/2000)
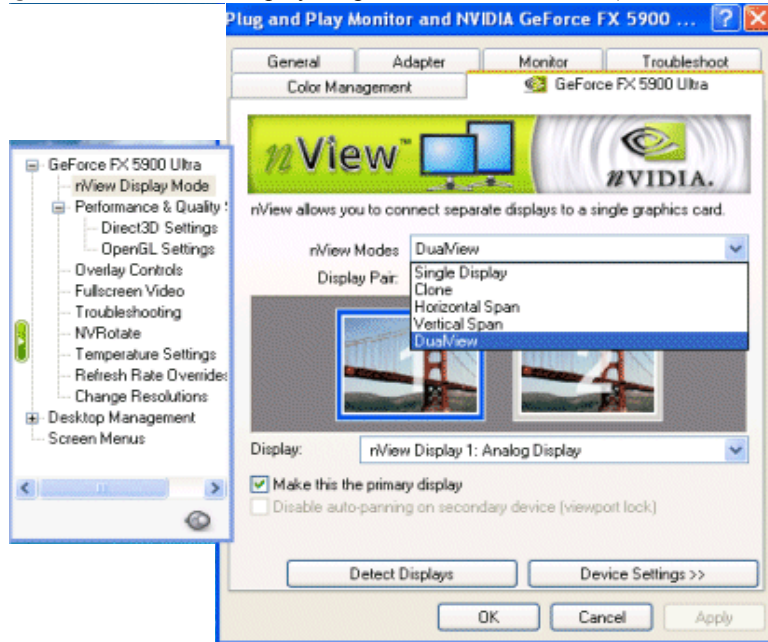
Figure 4.4   NVIDIA Display Properties: NVIDIA Menu (Windows 9*x*

5
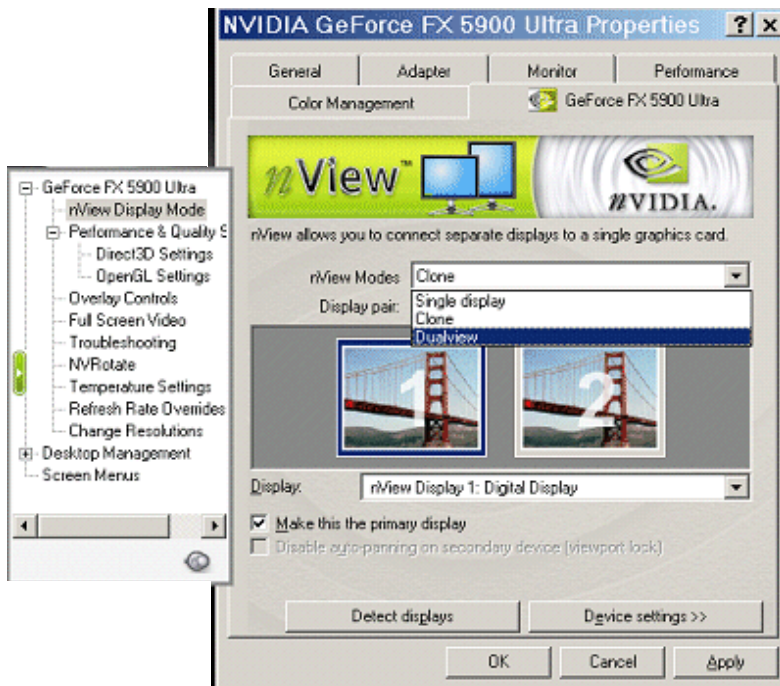
USING NVIEW MULTI-DISPLAY MODES

This chapter contains the following major sections:

nView Multi-Display Applications

For extensive information on nView applications, refer to the Products tab on 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**, where two display devices 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 in mobile PCs.**Virtual Desktop**, 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 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 PC display and one NTSC display. Since nView technology allows decoupling of refresh rates, the PC (editing) display could be a high-resolution RGB display for running the application (Adobe Premiere, for example), while the second display device 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 PC. Simply hook up a large screen television as your second display device and you can watch DVDs -- without buying a dedicated DVD player. *See* "Overlay Controls" on page 86.

Television and Movies: Using the nView Video Mirror feature, you can watch TV and any other video while you work. *See* "Overlay Controls" on page 86.

Using nView Multi-Display Modes

The nView Display Mode panel provides several display modes for your multi-display configuration.

When using NVIDIA products that are multi-display capable, there are three ways to run multi-display configurations **under most operating systems**; Dualview, Span, or Clone mode.

These nView modes are available from the nView Display Mode panel as shown in Figure 5.1.

- **Single display**
- **Dualview**
- **Clone**
- **Horizontal Span**
- **Vertical Span**

Figure 5.1   NVIDIA nView Display Modes
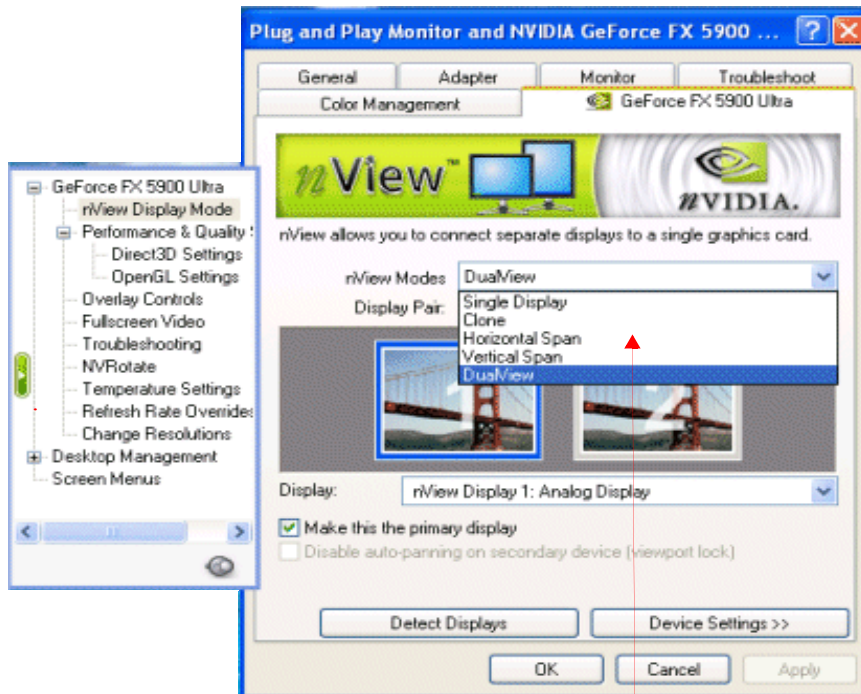
nView display modes

The **display images** display a graphical representation of your nView display configuration.

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

2 Then right click the display image to display a pop-up menu from which you can adjust settings for associated display devices and access the Color Correction tab as shown in Figure 5.2 and Figure 5.2**.**

Figure 5.2   nView Clone Mode Menu: Display 2
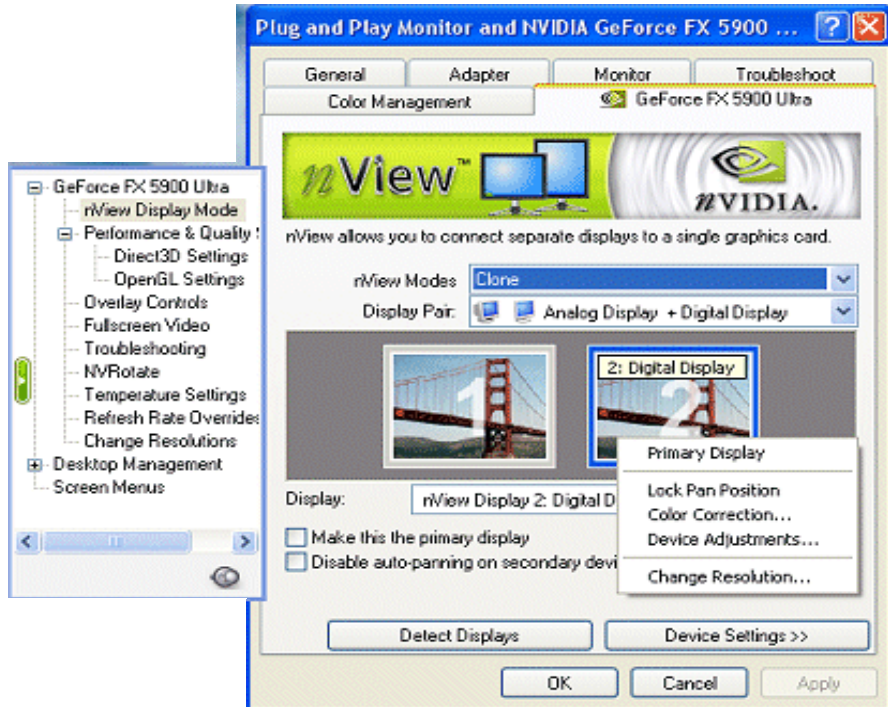
NVIDIA Multi-Display Device Support

The following are sample display device combinations that NVIDIA GPU-based multi-display cards support when used with NVIDIA display properties software:

• Two RGB displays with second RAMDAC (digital-to-analog converter)

• Two analog flat panels

• Two digital flat panels (DFPs)

• One digital flat panel and one analog flat panel

Figure 5.3   nView Clone Mode Menu: Display 1
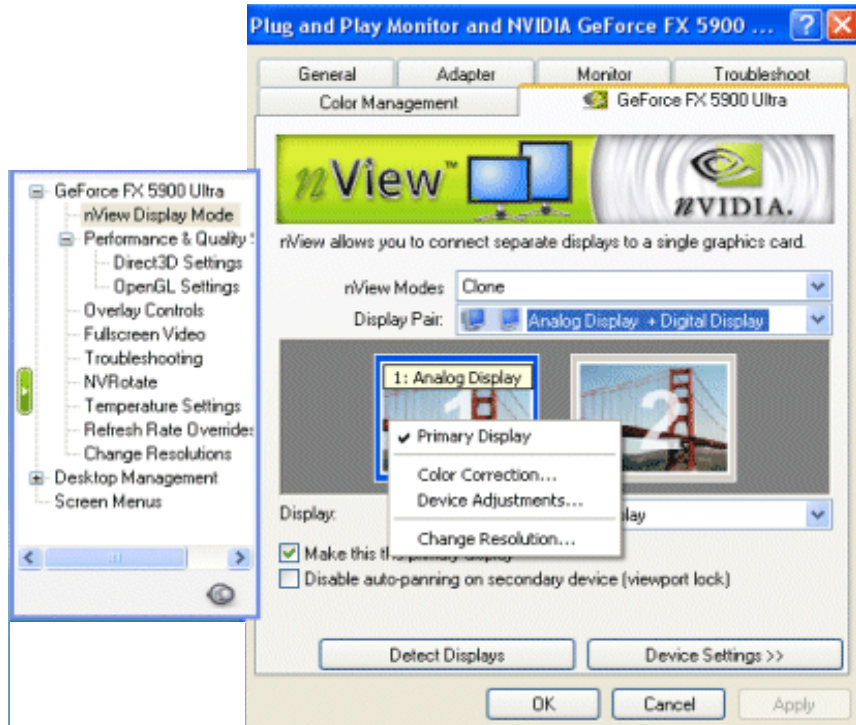
- One digital flat panel and one RGB display
- One RGB display and one TV
- One RGB display and one analog flat panel (with second RAMDAC)
- One analog flat panel and one TV

Note: Actual combinations supported on a given card will vary.

Setting up a multi-display graphics card involves installing the card on a PC, attaching the two display devices to the PC, and installing the current version of the NVIDIA Display Driver software. After rebooting the PC, 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 Mode panel.

2 Then simply 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 attached, your choices are as listed below and shown in Figure 5.4.

Figure 5.4   NVIDIA nView Display Pair Options
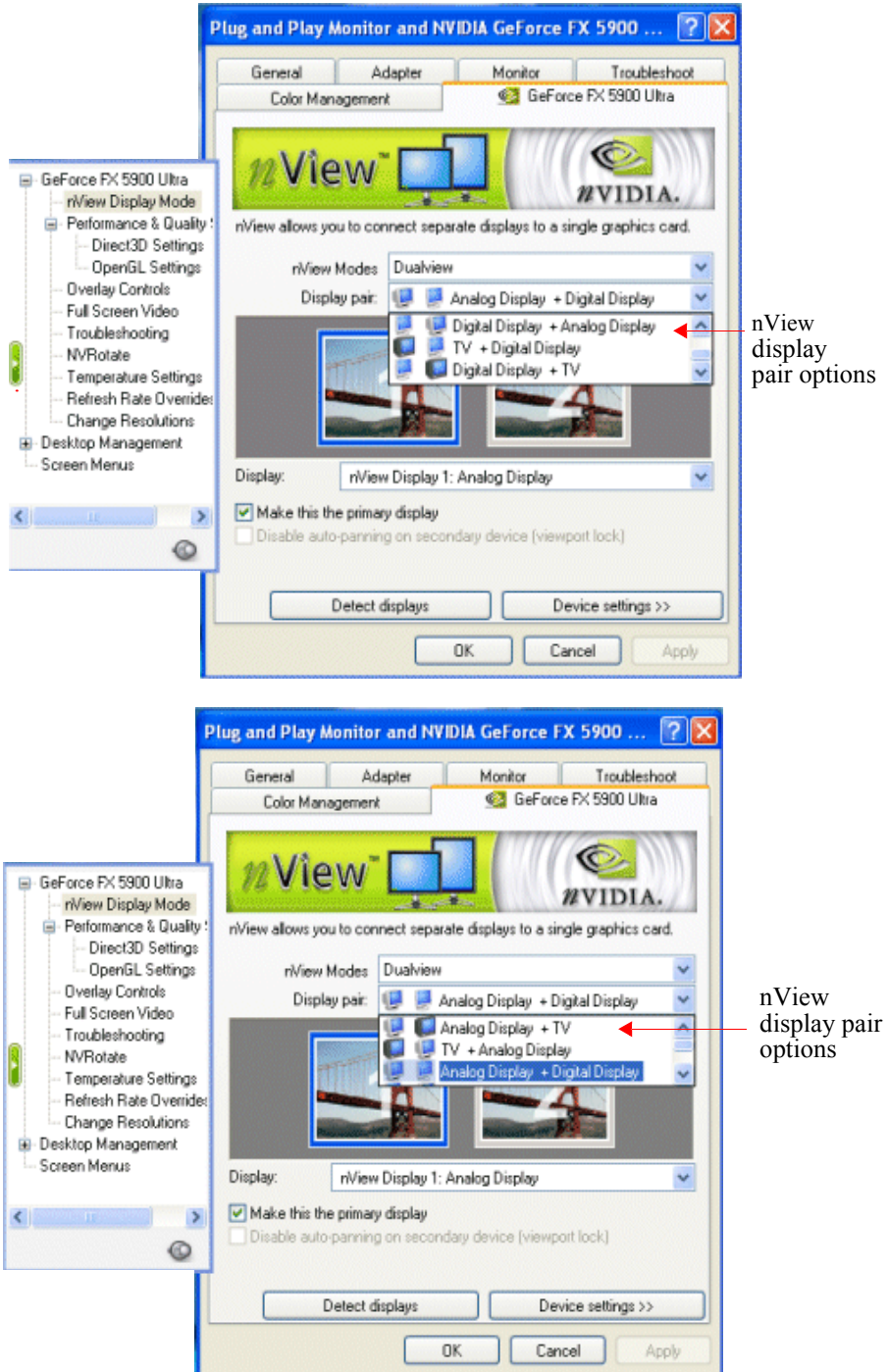
- **Analog display + digital display**
- **Digital display + analog display**
- **TV + digital display**
- **Digital display + TV**
- **Analog display + TV**
- **TV + Analog display**

Note: If the display device appears first in the pair, it is considered the **primary** display device; if it appears second, it is considered the **secondary** display device.

Overview of nView Multi-Display Modes

nView Span Modes

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

nView Span (Horizontal and Vertical) 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. Because of this 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 51.

nView Span 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. For details, see "Full Screen Video" on page 89.

nView Horizontal Span Mode allows you to extend the Windows desktop across two display devices 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 display devices 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.

Note: For compete details on using nView Span modes, see Using nView Span Modes:

nView Clone Mode

nView Clone mode displays the same image on both displays. For example, Clone mode is useful when giving presentations. The presenter may have a small display or other display device 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 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.

In **application zoom mode**, 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. For details, see "Overlay Controls" on page 86.

Note: For complete details on using nView Clone mode, including the virtual desktop *pan and scan* feature, see "Using nView Clone Mode" on page 53.

nView Dualview Mode

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 using an extended desktop (i.e, the Extended desktop option on the Windows Display Settings panel is enabled for the secondary display device), which gives you an extended workspace.

When you start **Windows 9***x* 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 Modes panel, as explained in subsequent sections.

Note: For complete details on using nView Dualview mode, see Using nView Dualview Mode below, including relevant subsections.

Using nView Dualview Mode

Key Features

Dualview support and functionality include the following:

- Support for advanced NVIDIA features such as **Full Screen Video Mirroring** (*see* "Full Screen Video" on page 89) and **Overlay** (see "Overlay Controls" on page 86).

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

- Windows places the taskbar on only one display device *and* replicates (rather than stretches) the background on each display (Figure 5.5 and Figure 5.6.).

- When you maximize an application, it maximizes only to the single display, and so on. Figure 5.5 and Figure 5.6 show examples of Dualview systems where the left and right display devices 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 5.5   Multiple Display Devices in nView Dualview Mode (1)

Display 1: (resolution = 1280 x 768)   **Display 2:** (resolution = 800 x 600)

Taskbar is not stretched across displays.   **Background** <u>is not</u> stretched across displays.
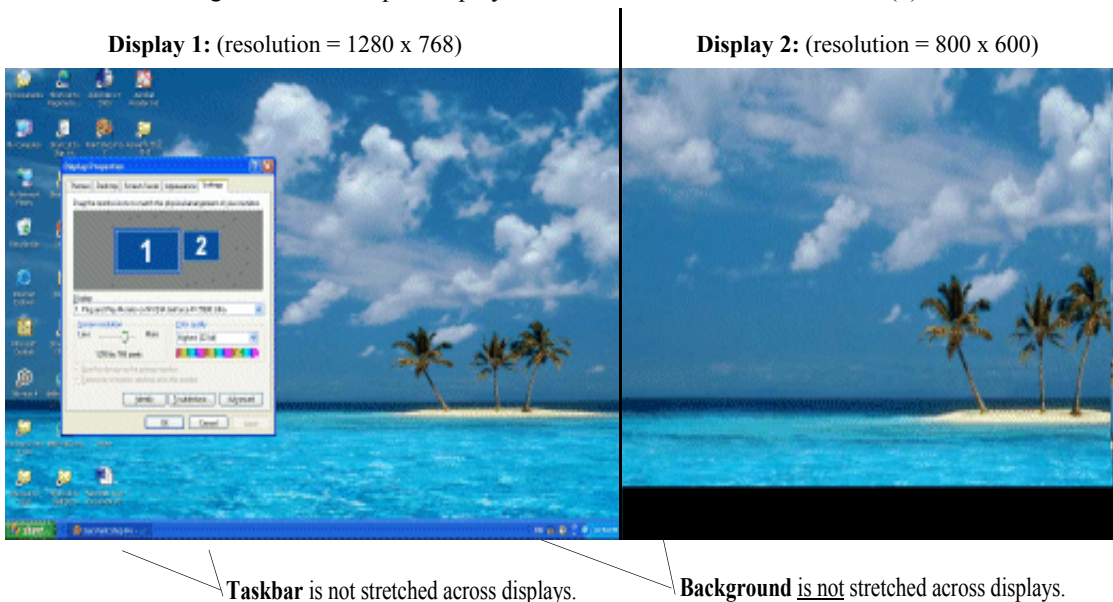
Figure 5.6 Multiple Display Devices in nView Dualview Mode (2)

Display 1: (resolution = 1280 x 768)   **Display 2:** (resolution = 1024 x 768)

Taskbar is *not* stretched across displays.   **Background** is not stretched across displays.
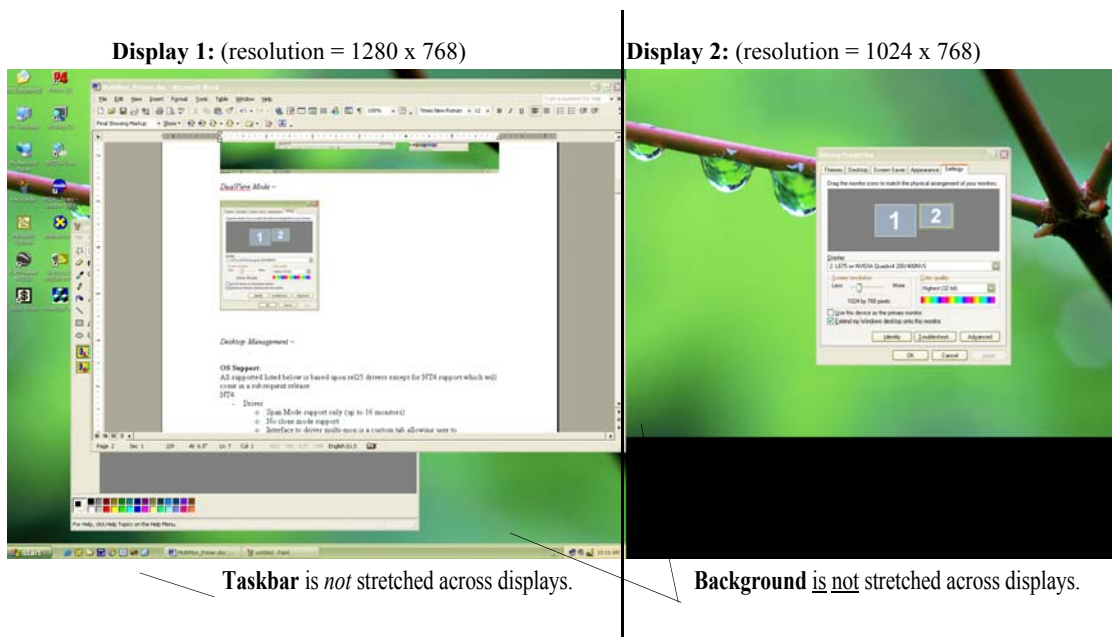
- You can set different color depths per display.

- You can arrange your multi-display desktop to be any shape; it does not have to be limited to "rectangular" as in 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 display devices, as explained earlier in "NVIDIA Multi-Display Device Support" on page 39:

  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.

Installing nView Dualview Mode for the First Time: 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 panel 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 (or dual graphics cards) is properly installed in your computer and securely connected to your display devices.

2 Make sure that the display devices are turned on and the NVIDIA Display Driver software (including the nView Desktop Manager component) has been installed on your computer.

3 After Windows starts up, from your desktop, right click to view the properties menu.

4 Click **Properties** - **Settings** - **Advanced -** the NVIDIA GPU tab - **nView Display Mode** to display the nView Display Mode panel.

5 Click the **nView Modes** list box and select **Install Dualview (Advanced)** as shown in Figure 5.7.

6 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.

After the system starts up, if the NVIDIA nView Desktop Manager Setup Wizard appears, run through the Wizard. (See the *NVIDIA nView Desktop Manager 3.0 User's Guide* for details.)

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

You'll notice that at least two display images appear on the Settings panel now, as shown in Figure 5.8, indicating Dualview mode.

Figure 5.7   nView Display Mode Panel: Installing Dualview in Windows 2000
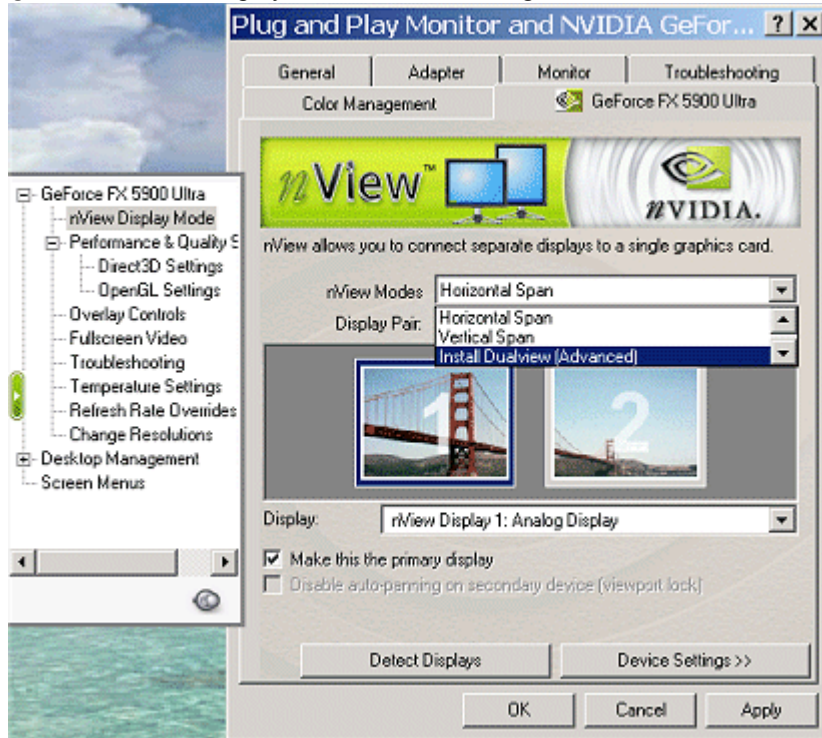
8 Click **Advanced,** the NVIDIA GPU tab, and the **nView Display Mode** menu option.

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

10 Follow the prompts to restart your computer again.

11 When you have returned to your desktop, go to the **nView Display Mode** panel and select **Dualview** from the nView Modes list.

Figure 5.8   Display Properties Settings: Dualview Mode (Windows 2000)
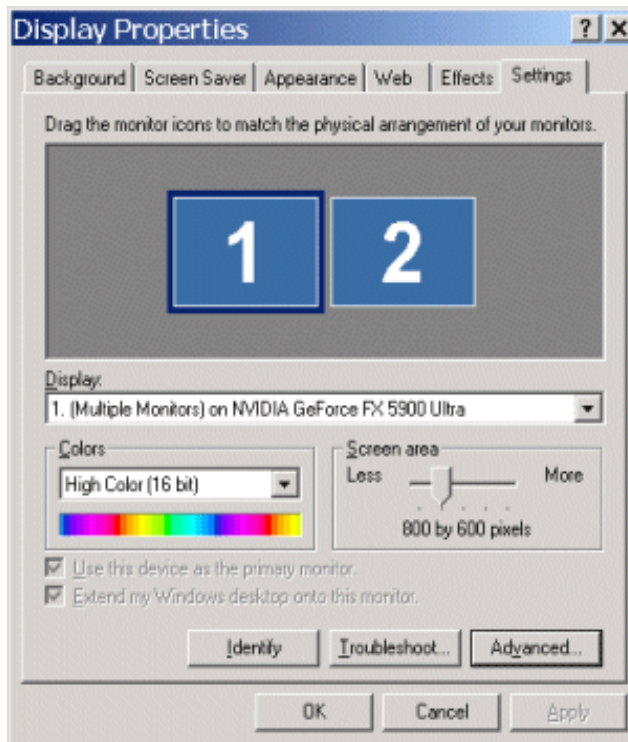
Enabling nView Dualview Mode After Initial Installation: Windows 2000

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 properties menu, then click **Properties** - **Settings** - **Advanced** and then the NVIDIA GPU tab.

2 Click **nView Display Mode** 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 Mode panel 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

nView Horizontal Span, Vertical Span, Clone, and Dualview modes support advanced NVIDIA features such as Video Mirroring. (See "Full Screen Video" on page 89.)

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

nView Span Mode Features (vs. Dualview Mode)

Span mode support and functionality include the following:

• DirectX or OpenGL applications in Span mode 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 device connected to your computer ——— the real "physical" displays are combined together to give you this "logical" display.

  Figure 5.9 shows an example of running Span mode 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 to remember when running nView Span mode 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 Span mode being slightly faster than Dualview mode because Windows only has to manage one display device instead of two.

• Under nView Span mode, 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 5.9. If you maximize an application, the application will be maximized to fill the large "logical" display screen – i.e., both displays.

Figure 5.9   Multiple Displays in nView Horizontal Span Mode

Display 1   **Display 2**

Taskbar is stretched
across displays.

Background is stretched
across displays.
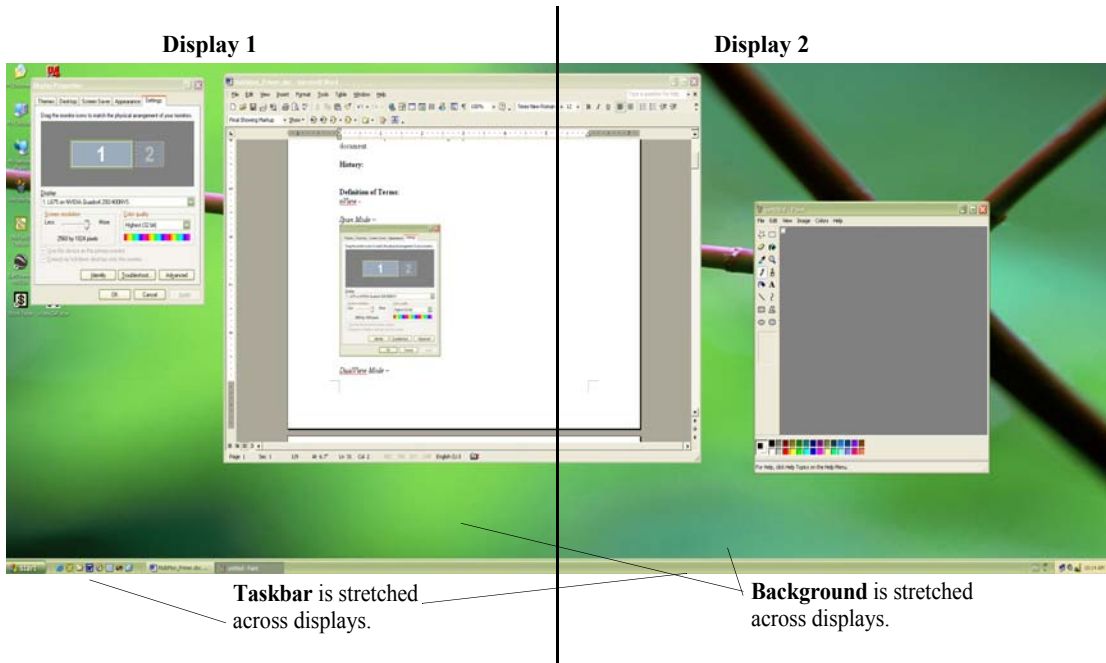
- Using the current NVIDIA Release 50 driver under Windows XP and
  Windows 2000, you can run nView Span mode with more than two displays.
  For example, if are using an NVIDIA GPU-based card to which you have
  connected four displays, you can have two sets of two spanned displays.

Enabling nView Span and 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 properties menu,
then click **Properties** - **Settings** - **Advanced** and then the NVIDIA GPU tab.

2 Click **nView Display Mode** 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 Mode panel 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.

Using Horizontal & Vertical Span Modes

Note: Span modes do not work if you have only one display device attached.

In Span mode, the Windows desktop area is spread across both display devices. 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 mode using one NVIDIA multi-display graphics card [1]. As a result, the 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 5.10) or vertically (Figure 5.11).

To access the nView Span modes, follow these steps:

1 Click the **Horizontal** or **Vertical Span** mode option on the nView Display Mode panel and click **Apply**.

2 Click **OK** and **Yes** when the messages appear.

If you just switched from Standard (Dualview) to one of the Span modes, your secondary display device will be activated. If needed, click **Detect Displays** to enable the display devices.

---

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

Figure 5.10 nView Horizontal Span Mode (Display 1= Analog Display): Windows XP
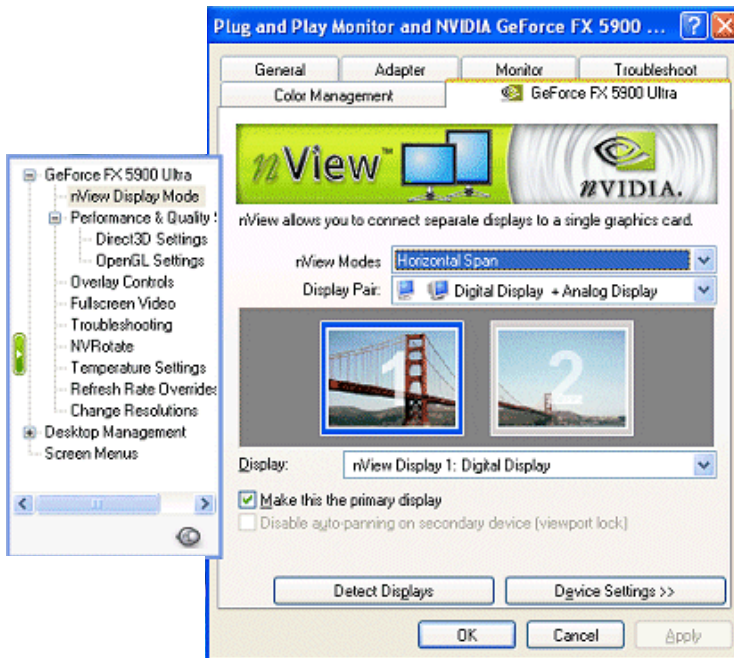
Figure 5.11 nView Horizontal Span (Display 2 = Digital Display) Windows XP
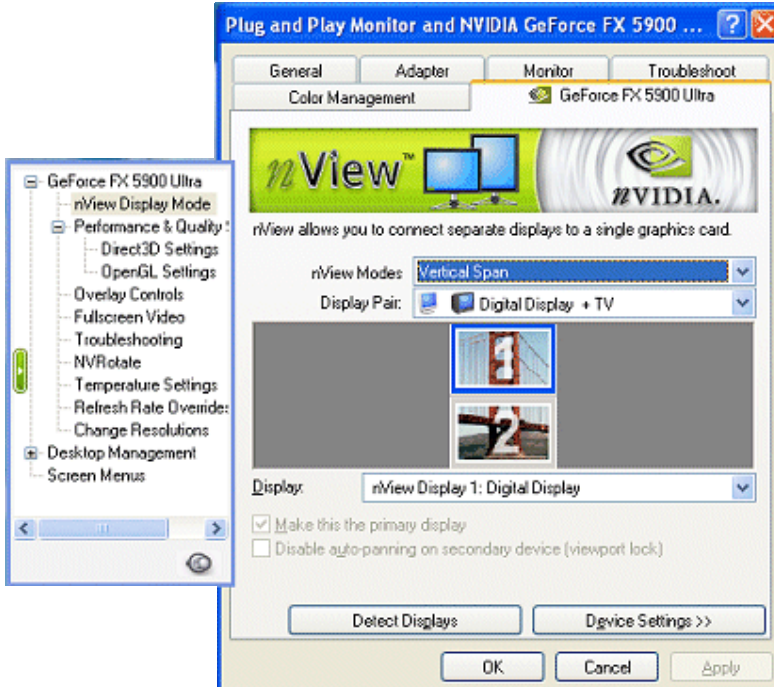
3 Depending on whether you have Horizontal or Vertical Span mode enabled, you can drag your active windows, images, or icons horizontally or vertically to move them to the secondary display.

Using nView Clone Mode

Note: Clone Mode does not work if you have only one display device attached.

In Clone mode, two displays display identical images, which is useful for presentations. A presenter may use the smaller display on the podium, while a projector display reflects the presentation to the audience.

The example in this section starts with the analog display (CRT) as the primary display and TV or digital display as the secondary display.

Enabling nView Clone Mode: Windows XP, Me, and 9*x*

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

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

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

Figure 5.12 shows nView Clone mode using an analog display as a primary device and a digital display as a secondary device.

Figure 5.13 shows nView Clone mode using a TV as a primary device and a digital display as a secondary device.

Enabling nView Clone Mode from Dualview Mode: Windows 2000

Note: Under Windows 2000, switching between nView Span/Clone and Dualview modes requires restarting your computer.

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

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

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 Mode panel and select **Clone** from the nView Modes list, then click **Apply**. To switch back to Dualview mode, you will need to restart your computer, as prompted.

Figure 5.12 nView Clone Mode: Analog Display + Digital Display
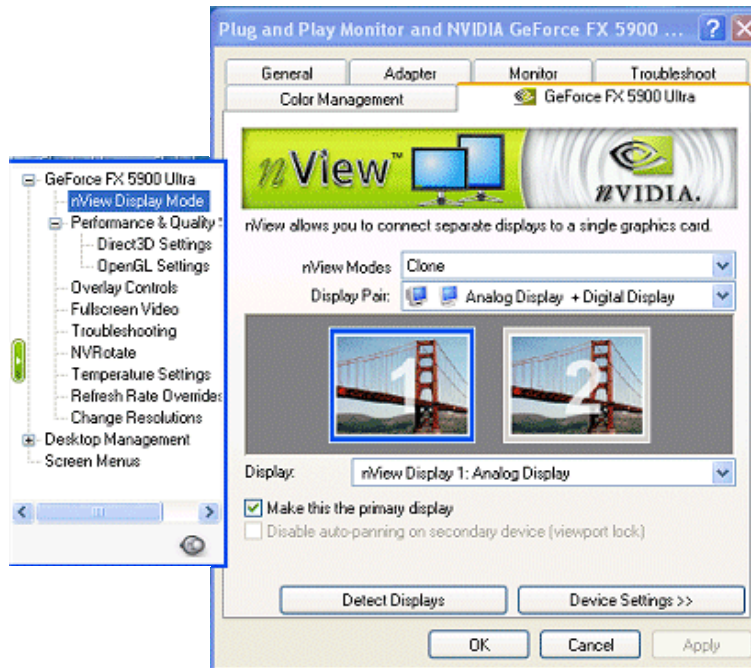
Figure 5.13 nView Clone Mode: TV + Digital Display
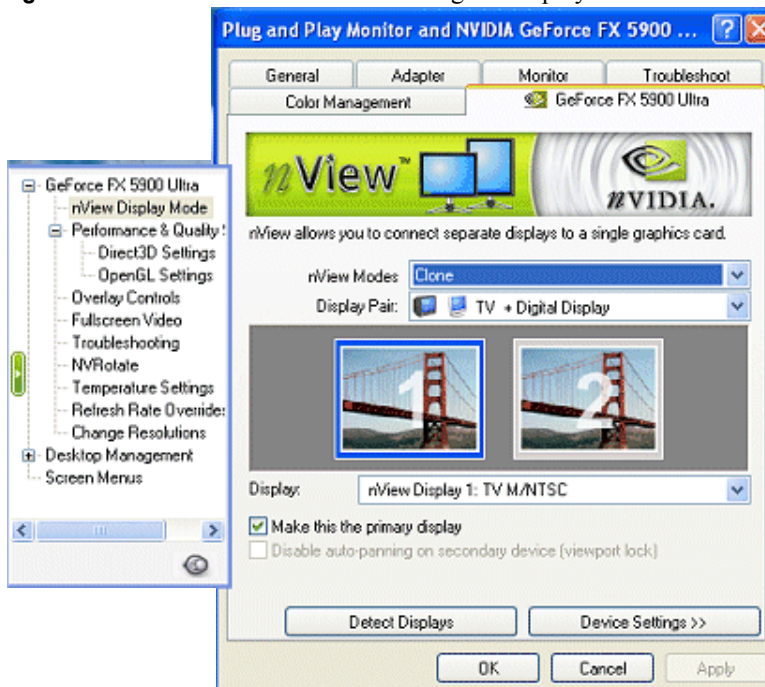
Enabling Virtual Desktop (Clone Mode)

You can use the NVIDIA **Change Resolution** menu option to adjust the **screen resolution** of your primary and/or secondary display device so that the resolution of the secondary device is less than the primary, which allows you to enable **Virtual Desktop**, a useful feature for flat panels and displays with limited 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.

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 Mode panel, *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 moved up and down as you move your cursor across the desktop, 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.

Enabling Virtual Desktop

Follow these steps to enable Virtual Desktop:

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

2 From the NVIDIA menu, click the **nView Display Mode** 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 Mode panel and select **Clone** from the nView Modes list and click **Apply**.

4 From the nView Display Mode panel, right click display image **1** or **2** to display the pop-up menu (pop-up menus for both primary and secondary displays are shown in Figure 5.14) and click **Change Resolution**.

The Change Resolution panel appears, as shown in Figure 5.15.

5 From the **Change Resolution** panel, use the **Screen resolution** slider to set the resolution so that the primary display's resolution is greater than the secondary display's resolution.

Figure 5.14 nView Clone Mode Menus: Display 1 and Display 2
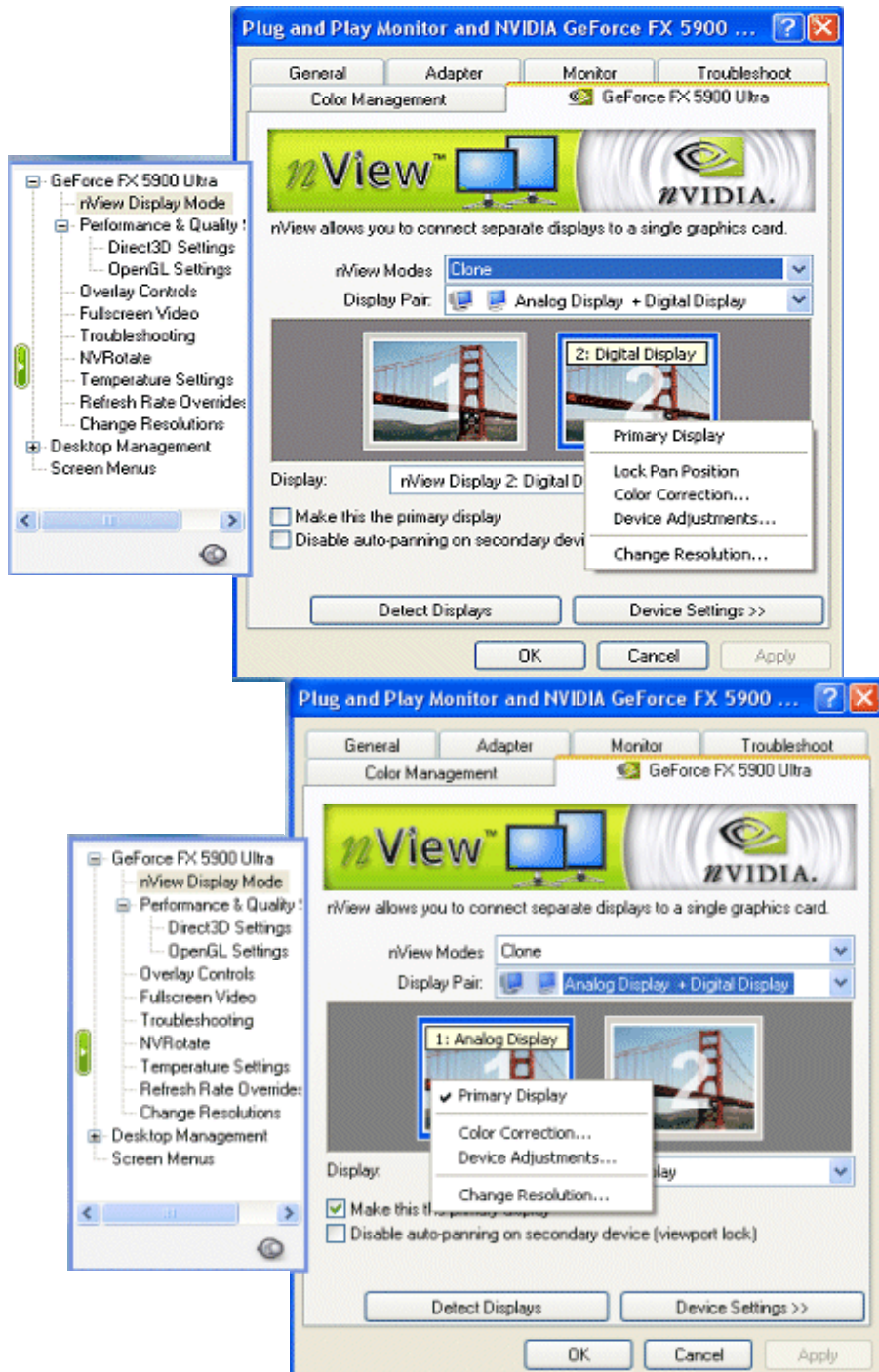
Figure 5.15 nView Clone Mode Device Configuration
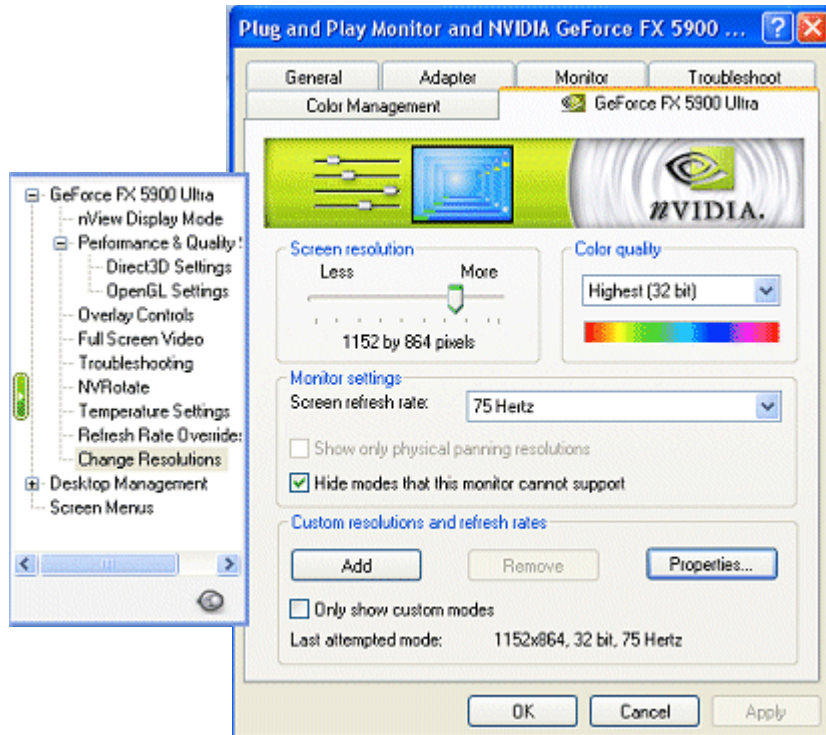
Note: If you set the same screen resolution value for both primary and secondary displays, you cannot pan/scan the desktop area on the secondary display; both displays will remain static.

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

7 Click **Apply** and **OK** close the Change Resolution panel and return to the nView Display Mode panel.

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 (display **2**) 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 can either

- Enable the check box option called Disable auto-panning on secondary device (viewport lock) *or* simply

- Click the **Lock Pan Position** option on the pop-up menu of display image **2**.

The example in Figure 5.16 shows that the **Lock Pan Position** option is checked, which also enables the equivalent check box option **Disable auto-panning on the secondary device (viewport lock)** at the bottom of the nView Display Mode panel.

Figure 5.16 nView Clone Mode with Virtual Desktop Enabled: Disabling Panning

Disabling desktop panning of the secondary display.
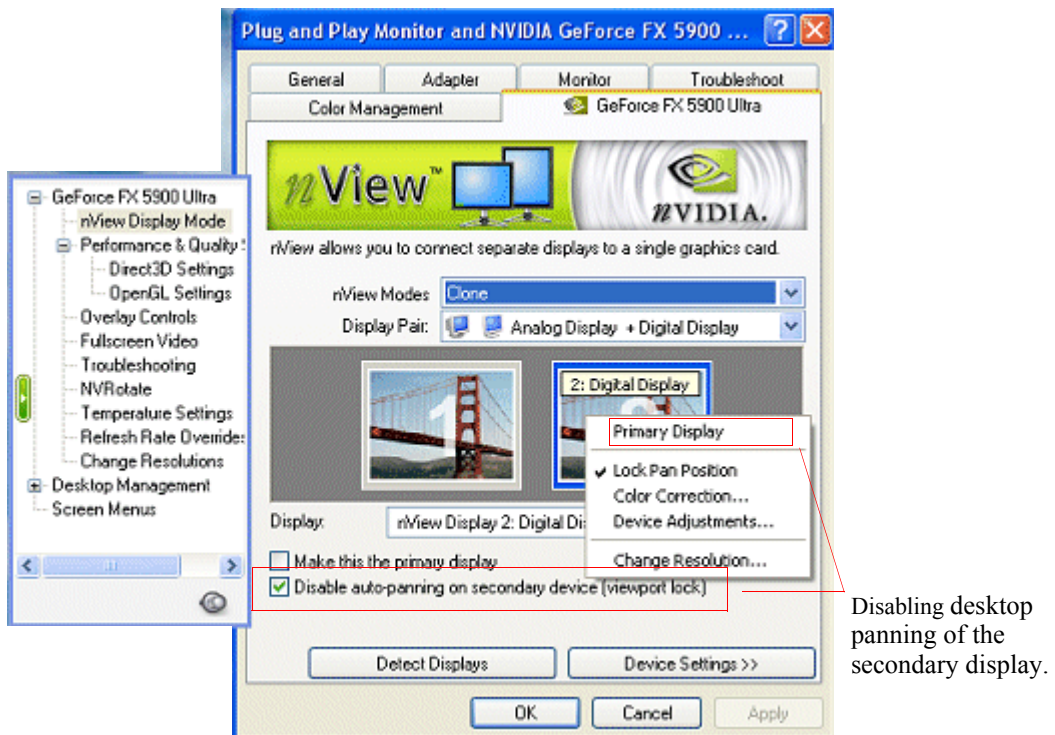
Enabling nView Modes: Windows NT 4.0

For details on enabling nView Multiview and nView Span/Clone modes under Windows NT 4.0, refer to the Application Note titled "*Configuring Multiple Display Devices With Quadro NVS Cards*".

nView Multiview Mode: Windows NT 4.0

Note the following about running nView Multiview mode under Windows NT 4.0:

- Under Windows NT 4.0, nView Multiview mode is only available with the NVIDIA Quadro NVS GPU-based series of graphics cards.

- If you want to enable more than two display devices under Windows NT 4, you must be running in Multiview mode, which supports up to sixteen (16) displays.

- Multiview mode does not support hardware accelerated OpenGL.

nView Span/Clone Modes

Under Windows NT 4.0, Span mode allows you to use up to a maximum of two display devices. If you want to enable more than two display devices under Windows NT 4, you must change modes to nView Multiview mode, which supports up to sixteen (16) displays.

Multi-Display Mode: Arranging Displays on the Windows Display Properties Settings Panel

Note: This section applies only to nView Dualview mode; it does not apply to nView, The examples shown in Figure 5.17 through Figure 5.19 are Windows XP, but the procedure explained below applies to all Windows operating systems.

When using multiple displays, the desktop can be extended horizontally and vertically, as well as at other angles by repositioning the desktop display images in the Windows Display Properties Settings panel. You can drag the images to the positions that represent how you want to move items between your display devices.

- 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 5.17).

Figure 5.17 Display Settings (Horizontal)
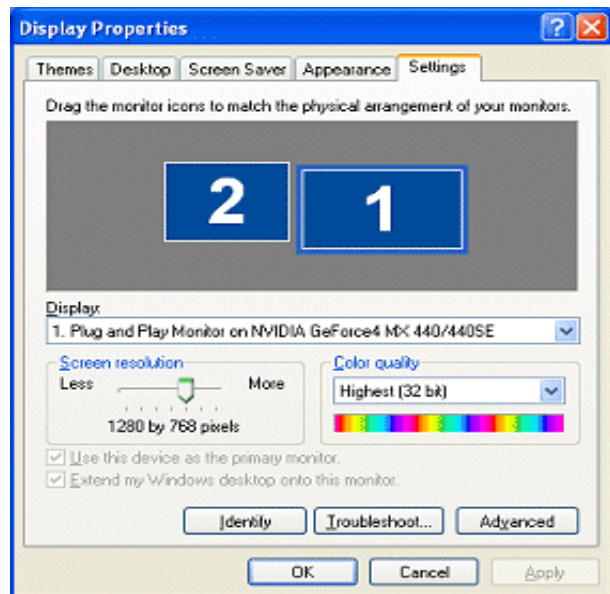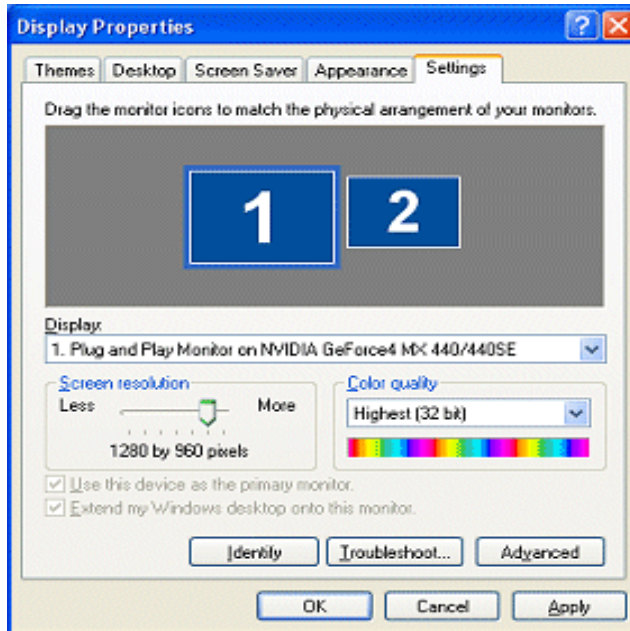
- **To move items between displays by dragging up and down**, position the images one above the other (Figure 5.18).

- **To move items between displays by dragging at an angle**, position the images diagonally (Figure 5.19). 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 5.18 Display Settings (Vertical)
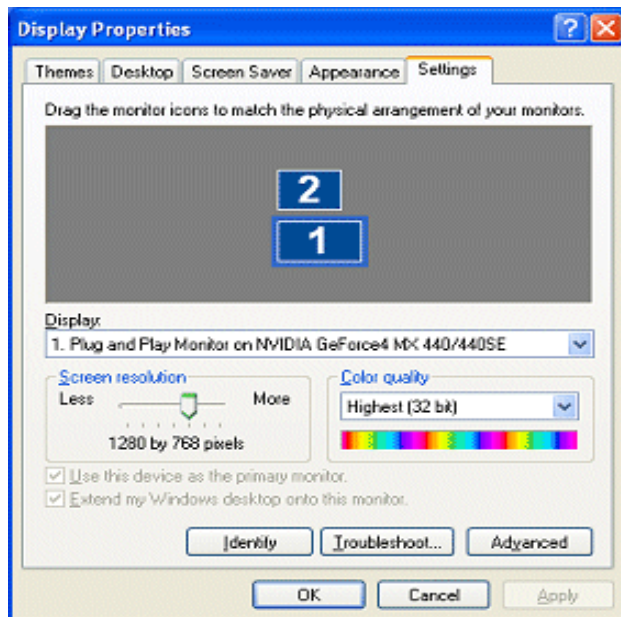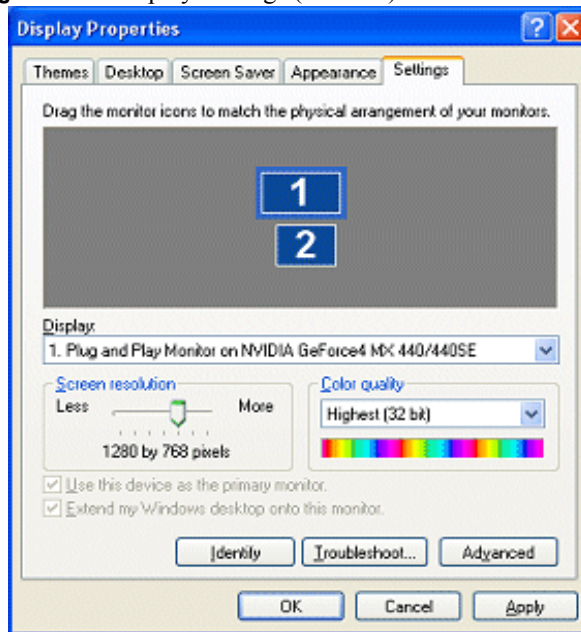
Figure 5.19 Display Settings (Diagonal)

6
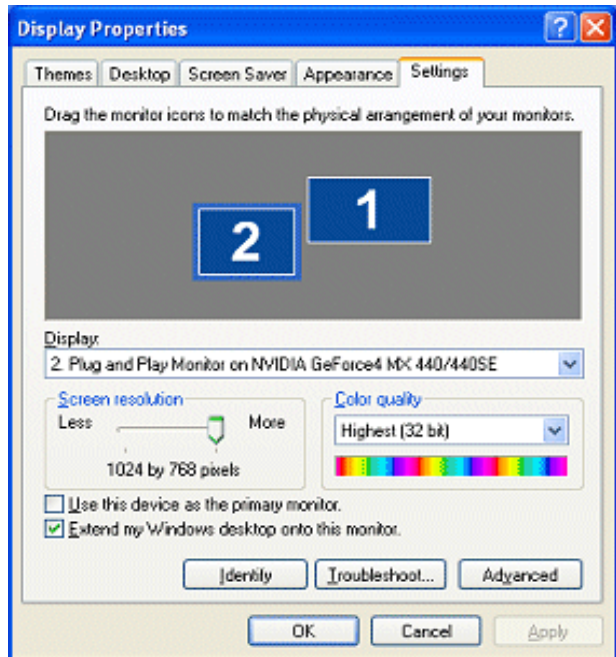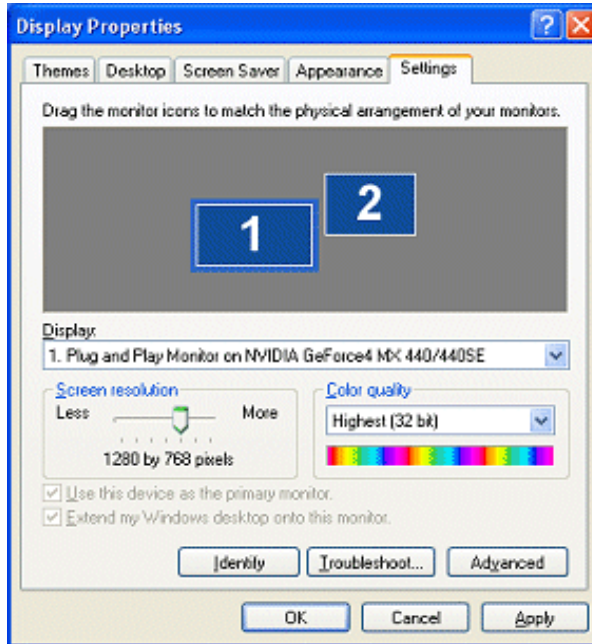
CONFIGURING DISPLAY DEVICES

This chapter contains the following major sections:

Adjusting Analog Display Settings

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

1 From your Windows desktop, right click to open the desktop menu.

2 Click **Properties** > **Settings** > **Advanced**.

3 Click the NVIDIA GPU tab and then the **nView Display Mode** menu option.

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

5 Then right click on that display image and click **Device Adjustments** to open the Device Adjustment window (Figure 6.1), which contains the following two panels. (The Device Adjustments window automatically opens on the Screen Adjustment panel.)

   - **Screen Adjustment**. See "Screen Adjustment" on page 64.

   - **Display Timing**. See "Display Timing" on page 64.

Screen Adjustment

Figure 6.1   Screen Adjustment Settings: Analog Display

The Screen Adjustment panel is shown in Figure 6.1.

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

Display Timing

The Display Timing panel is shown in Figure 6.2. Select the proper timing mode for your analog display device.

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

  Note: Some older analog display devices may not support this feature.

• **General Timing Formula (GTF)** is a standard used by most newer analog display devices.

Figure 6.2   Display Timing Settings: Analog Display
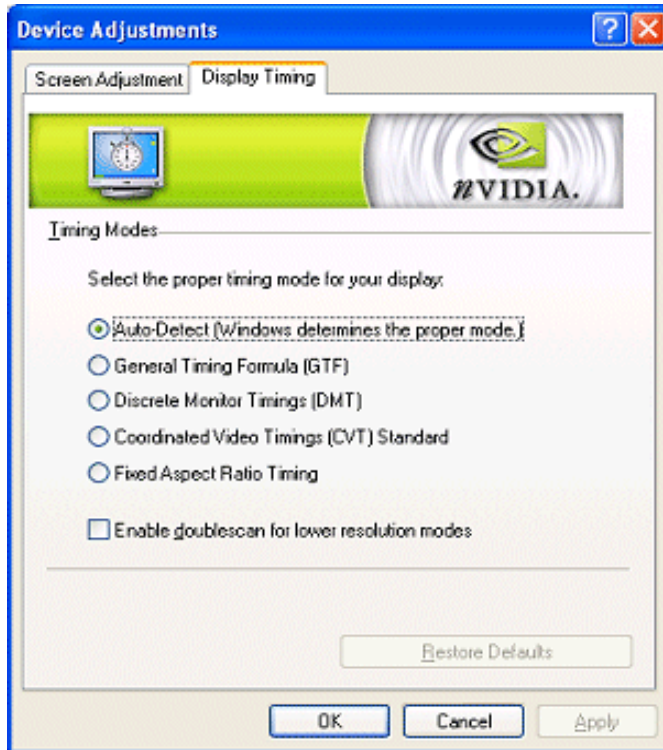
- **Discrete Monitor Timings (DMT)** is an older standard still in use on some analog display devices. Enable this option if your display device requires DMT.

- **Coordinated Video Timings (CVT) Standard** 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 device

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

- **Enable doubelscan for lower resolution modes**. Enabling this option 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 these steps to access the display device's **Device Adjustment** window where you can configure some flat panel display settings.

1 From your Windows desktop, right click to open the desktop menu.

2 Click **Properties** > **Settings** > **Advanced**.

3 Click the NVIDIA GPU tab and then the **nView Display Mode** menu option.

4 Left click on the display image that represents your *digital display* to select it.

5 Then right click on that display image and click **Device Adjustments** to open the **Device Adjustment** window (Figure 6.3) for your digital flat panel.

Figure 6.3   Flat Panel Display Settings: Digital Display
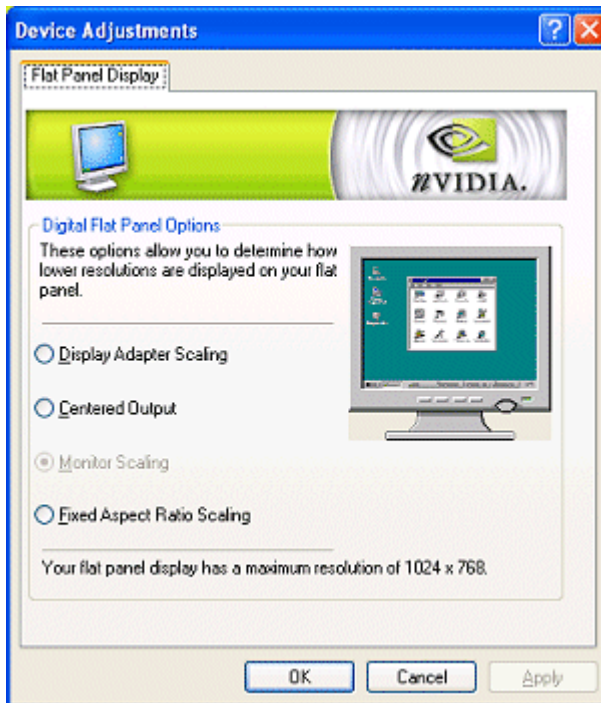
- **Display Adapter Scaling**. Enable this option if you want lower-resolution images scaled to fit the flat panel. For example, if your flat panel has a maximum resolution of 1400x1050, an image with a resolution of 1024x768 will be scaled to appear on the screen at a 1400x1050 resolution.

- **Centered Output**. Enable this option 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.

- Use **Fixed Aspect Ratio Scaling**.

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

    Enable this option 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 1680x1050, an image with a resolution of 1024x768 will be scaled to appear on the screen at a 1400x1050 resolution with black borders.

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

Adjusting TV Settings

If your NVIDIA GPU-based graphics card is connected to a **TV**, follow these steps to access panel where you can choose the correct regional format for TV reception, choose the correct TV connection mode, and configure several TV display settings.

1 From your Windows desktop, right click to open the desktop menu.

2 Click **Properties** > **Settings** > **Advanced**.

3 Click the NVIDIA GPU tab and then the **nView Display Mode** menu option.

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

5 Then right click on that display image and click any of the following options:

- Click **Select TV Format** to open the **TV Settings** window (Figure 6.4). For details on using the options on this panel, see the TV Settings section that follows.

- Click **Device Adjustments** to open the **TV Output** panel where you can configure TV display settings. For details on using the TV display settings, see "Device Adjustments: TV Output" on page 69.

TV Settings

Connection

The Connection list lets you specify the type of video connector based on output signal sent to the TV, including HDTV. The default setting is **Auto-select** (Figure 6.4).

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**.

Signal Format

Click on the list to access a 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.

Figure 6.4   Device Selection with TV Enabled
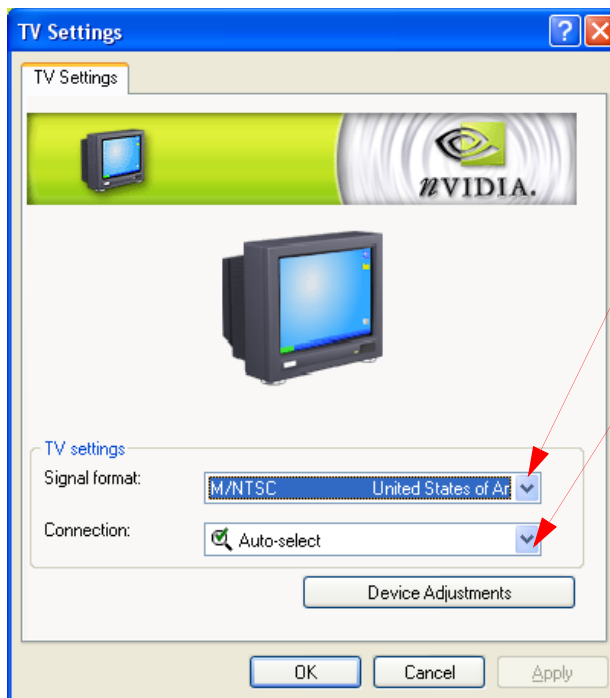
Click the arrow button to display a list of Regional Settings and select a setting.

Click this arrow button display a list of video connector types and select a format.

Device Adjustments: TV Output

You can customize your TV display settings from the TV Output panel shown in Figure 6.5.

Note: Support of TV adjustment features described in this section depend on the following:

- TV encoder on your NVIDIA GPU or the NVIDIA GPU-based graphics card you are using
- NVIDIA GPU family

Certain options on the **TV Output** panel could vary from the example shown in Figure 6.5 below. See Table 6.1 for details.

Figure 6.5 Device Adjustments: **TV Output** Panel
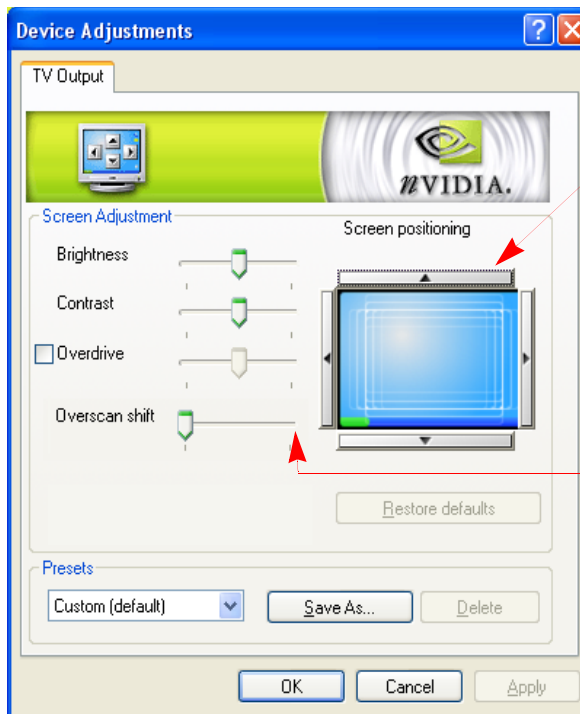
Click any one of these four arrow buttons (top, bottom, left, or right) to adjust the **position** of the desktop on the TV.

Use any of the sliders to adjust options such as Flicker, Brightness, Contrast, Overdrive, and Overscan shift.

Note that the options that are available and visible on your TV output panel depends on the TV encoder on your NVIDIA GPU or GPU-based graphics card.

Adjusting Screen Position

To adjust the desktop position on your TV screen, click the top, bottom, left, or right arrow button.

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. Then you can 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.

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

Enabling this option lets you simultaneously adjust the **Brightness** and **Contrast** slider to remove or reduce edge breaks -- balloon effect of the edges visible based on some content. As Overdrive increases, the Control Panel increases the **Brightness** setting and decreases the **Contrast** setting by a similar amount. Overdrive is 0 to 100%.

To use the Overdrive slider, enable the check box, and click **Apply**. Then use the slider, as needed.

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 is available under these conditions.

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.

TV Adjustment Options Support Based on TV Encoder and NVIDIA GPU

Table 6.1 lists TV encoders and the TV adjustment features they support.

• The first four categories of TV encoders are supported by the *GeForce4 MX series and newer* GPUs.

• The last category of TV encoder supports GPU families that are older than those just mentioned.

Note: Be sure to click **Apply** after you make any changes in order for the changes to take effect.

Table 6.1   TV Encoders and Supported TV Adjustment Features

TV Encoders	Supported TV Adjustment Features						
	Brightness	**Saturation**	**Contrast**	**Overdrive**	**Flicker**	**Screen Positioning**	**Screen Size**
Integrated			x		x	x	x
Chrontel	x	x				x	x
Phillips						x	
Conexant			x		x	x	x
Conexant (with older NVIDIA GPUs)	x	x				x	x

Note: When using the Release 50 NVIDIA graphics driver, 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 GPU class, independent of the TV encoder family:

Note: Any TV encoder that supports both **Contrast** and **Brightness** automatically supports **Overdrive**.

Note: Conexant 875 and Philips 7108 TV encoders support HDTV.

7

ADDITIONAL FEATURES AND ENHANCEMENTS

This chapter explains how to configure the following NVIDIA Display Driver settings:

Adjust Colors: Color Correction Panel

Note: In order to access the Color Correction panel, your "Color" or "Color Quality" setting on the Display Properties Settings panel must be set to (16 bit) or higher. A setting of "256 colors" will not enable the Color Correction panel.

Follow *any one* of these methods to access the Color Correction panel.

To access the Color Correction panel from the nView Display Modes panel:

    a Right click from the Windows desktop to display the desktop menu and then click **Properties** > **Settings** > **Advanced**.

    b Click the NVIDIA GPU tab.

    c From the NVIDIA menu, click **nView Display Modes** to display the nView Display Modes panel.

    d Either right-click one of the display images *or* click the **Device Settings >>** option and then click the **Color Correction** option.

• From the Overlay Controls or Full Screen Video panels, click **Adjust Color** to display the Color Correction panel.

Figure 7.1   Color Correction Settings: nView Display Mode
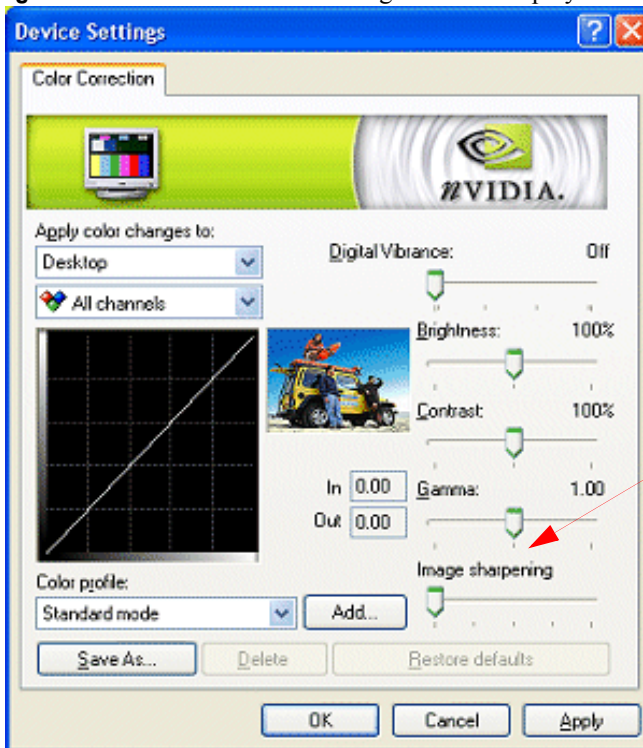
Image Sharpening is a new feature available with GeForce FX and newer GPUs.

Color Correction Options

Digital Vibrance

Digital Vibrance Control (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.

Note: DVC is supported by the GeForce2 MX and later series of NVIDIA GPUs.

Digital Vibrance can be turned off or set to different levels from low to high through the Color Correction panel as shown in Figure 7.1.

Brightness, Contrast, and Gamma

Note: The **Color profile** option on this panel 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 **In**put and **Out**put 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 device. 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 75 and "Color Curve Graph" on page 75.

Apply Color Changes To...

Click to list below the text **Apply color change to. . . . .**

- **All** applies settings to your Windows desktop and to video playback.

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

- **Overlay/VMR** applies these color correction settings to video playback using an overlay.

- **Full Screen Video** applies these color correction settings to full screen video playback.

Color Channels

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.

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.

Note: 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 GPUs.

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 75.)

   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 *not available for use*.

Other Options

• **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.

Performance and Quality Settings

To access the Performance & Quality Settings panel, follow these steps:

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

2 Click **Properties** > **Settings** tab > **Advanced** > **NVIDIA GPU** tab and the
Performance & Quality Settings option from the NVIDIA menu to display
the panel shown in Figure 7.2.

Figure 7.2   Performance and Quality Settings
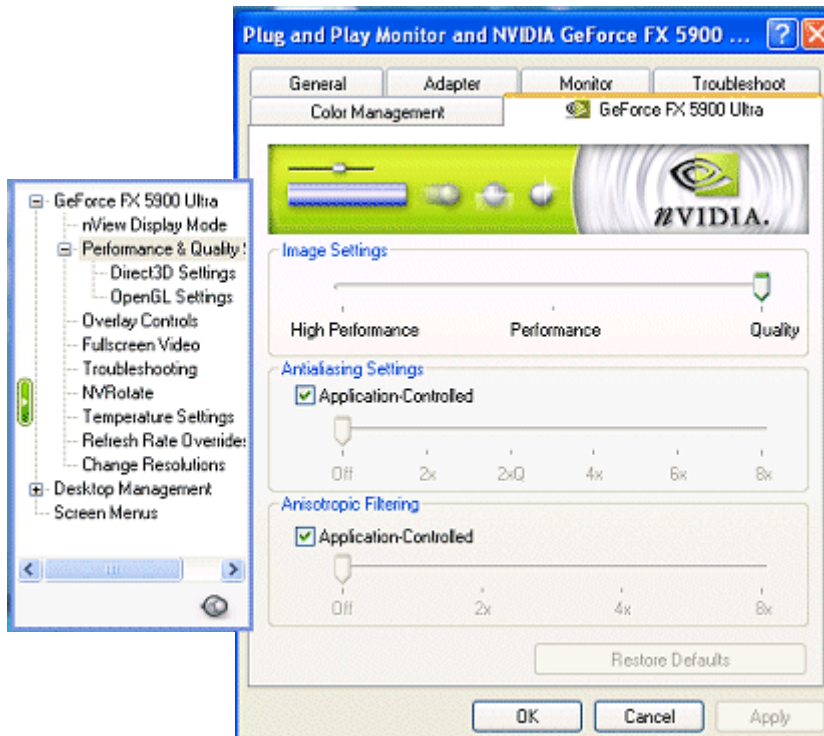
Image Settings

Move the slider to select the performance and quality enhancements settings for
Direct3D and OpenGL applications.

• **High Performance** results in the highest performance for your applications.

• **Performance** results in the best performance for your applications with good
image quality.

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

Note: These settings are not available with Quadro GPUs.

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.

Note: Availability of options described below depends on the NVIDIA GPU you are using.

- **Application-controlled**. If you check (enable) this option, the configurable options are automatically disabled because the application determines the antialiasing settings.

- **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.

- **2xQ** enables the patented Quincunx Antialiasing™ technique available in the GeForce GPU family. Quincunx Antialiasing offers the quality of the slower, 4x antialiasing mode, but at nearly the performance of the faster, 2x mod

- **4x** enables antialiasing using the 4x mode. This mode offers higher image quality at the expense of some performance in 3D applications.

- **4x, 9-tap Gaussian** enables antialiasing using the 4x, 9-tap (Gaussian) mode. This mode offers higher image quality but at the expense of some performance in 3D applications. This option may be discontinued in future driver versions.

- **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.

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.

Anisotropic Filtering

Note: Availability of options described below depend on the NVIDIA GPU you are using.

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 check (enable) this option, the configurable options are automatically disabled because the application determines the antialiasing settings.

  If you don't check the **Application-controlled** option, you can then use the slider by dragging it to set the degree of anisotropic filtering for improved image quality. Enabling this option improves image quality but at the expense of some performance.

- **Off** disables anisotropic filtering.

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

- **2x** results in improved image quality at the cost of performance.

- **4x** results in improved image quality at the cost of performance.

- **8x** results in best image quality.

Direct3D Settings

To access the Direct3D Settings panel (Figure 7.3), follow these steps:

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

2 Click **Properties** > **Settings** tab > **Advanced** > **NVIDIA GPU** tab and the **Direct3D Settings** from the NVIDIA menu.

Figure 7.3   Direct3D Settings Panel
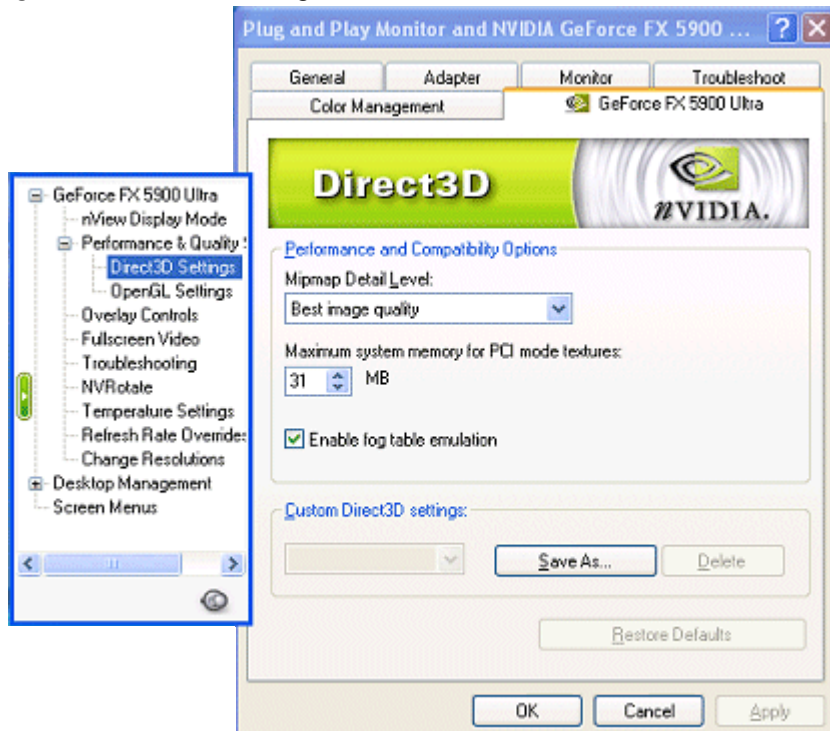
Performance & Compatibility Options

Note: Availability of options described below may depend on the NVIDIA GPU you are using.

Mipmap Detail Level

Allows you to adjust the **LOD (Level of Detail)** bias for mipmaps. A lower bias will provide better image quality, while a higher bias will increase application performance. You can choose from five preset bias values:

- Best image quality
- High image quality
- Blend
- High performance
- Best performance

Enable Fog Table Emulation

This option is used to turn fog table emulation *on* or *off*. Direct3D specifies that a display adapter capable of Direct3D hardware acceleration should be able to implement either vertex fog or table fog.

Note: Some games do not correctly query the Direct3D hardware capabilities and expect table fog support. Enabling this option ensures that such games run properly with your NVIDIA graphics processor.

Custom Direct3D Settings

Click the arrow button to display a list of the custom settings (or "tweaks") you have saved. Selecting an item from the list activates the setting. To apply the setting, click **OK** or **Apply**.

Save As

Saves the current settings (including those set in the More Direct3D dialog box) as a custom "tweak". Saved settings are then added to the adjacent list. Once you have found the optimal settings for a particular Direct3D game, saving the settings as a custom tweak lets you quickly configure Direct3D before starting the game and eliminates the need to set each of the options individually.

Apply

Saves all the changes you have made without closing the dialog box.

Delete

lets you delete the custom setting currently selected in the Custom Direct3D Settings field.

Restore Defaults

Restores any settings you have changed to their default values.

OpenGL Settings

Note: Availability of options described in this section may depend on the NVIDIA GPU you are using.

To access the OpenGL Settings panel, follow these steps:

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

2 Click **Properties** > **Settings** tab > **Advanced** and the NVIDIA GPU tab to display the NVIDIA menu.

3 If the OpenGL Settings options is not readily visible on the menu, click the (+) sign on the left of the "Performance and Quality" option to expand the menu.

4 Click the **OpenGL Settings** option to display the OpenGL Settings panel (Figure 7.4).

Performance and Compatibility Options

Disable support for enhanced CPU instruction sets

Enable this option to disable driver support for enhanced instructions used by certain CPUs. Some CPUs support additional 3D instructions that complement your NVIDIA graphics processor and improve performance in 3D games or applications. This option allows you to disable support for these additional 3D instructions in the drivers. This can be useful for performance comparisons or for troubleshooting.

Enable conformant OpenGL texture clamp behavior

"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.

Figure 7.4 OpenGL Settings: Single-Display Hardware Acceleration
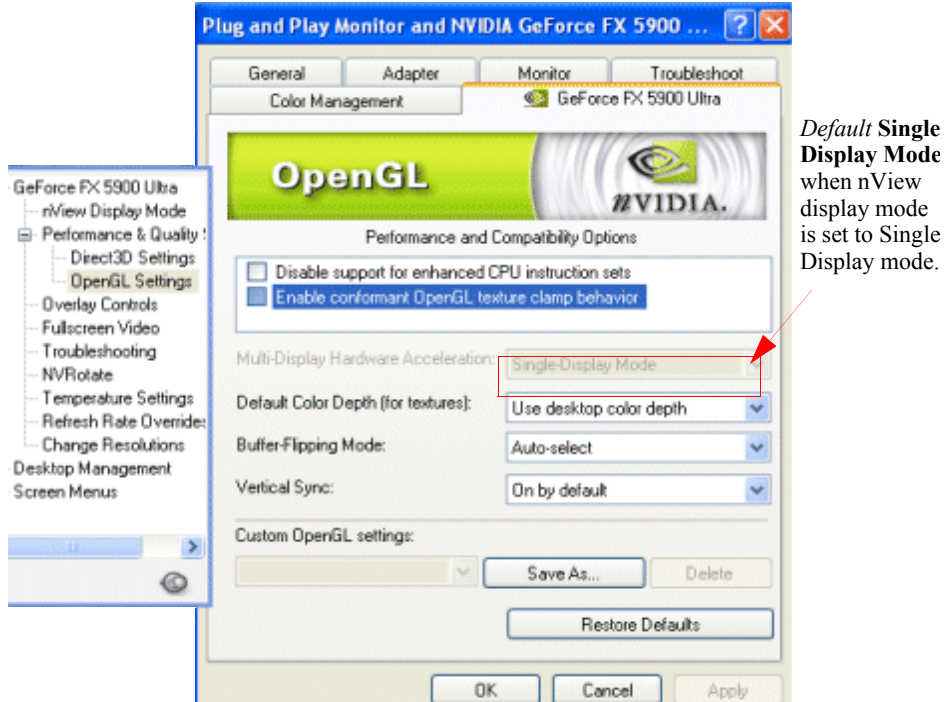
Multi-Display Hardware Acceleration

This option determines advanced rendering options when using multiple displays and/or different classes of NVIDIA GPUs.

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 (Figure 7.4). You can also specify this setting if you have problems with the multi-device modes.

*   **nView Clone/Span Mode:** This is the default setting when your nView display configuration is set to nView Clone mode or nView Span mode. 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-Device" modes described below (Figure 7.5).

Figure 7.5   OpenGL Settings: nView Span/Clone Mode Hardware Acceleration
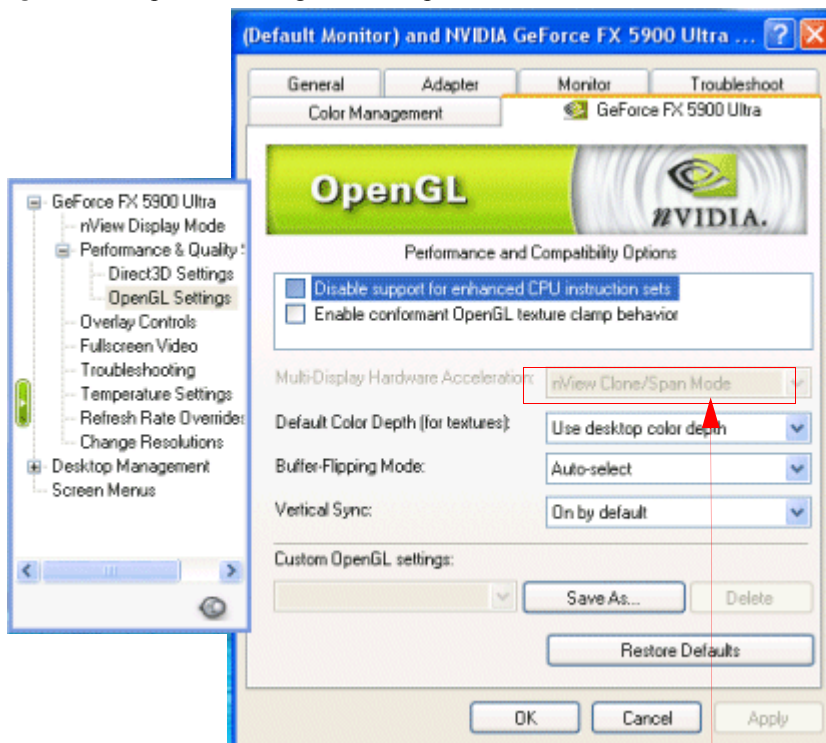
Default **nView Clone/Span Mode** when nView mode is set to Clone, Horizontal Span, or Vertical Span.

- **Multi-Device Compatibility Mode**: This mode is available if you have two or more active display devices when running in nView Dualview mode or if you are using different classes of NVIDIA GPU-based cards (Figure 7.6).

  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-Device Performance Mode:** This mode is available if you have two or more active display devices when running in nView Dualview mode or if you are using different classes of NVIDIA GPU-based cards (Figure 7.6).

  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 display devices may result in minor transient rendering artifacts.

Default Color Depth for Textures

This option 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** options force the use of textures of the specified color depth, regardless of your desktop settings.

Buffer Flipping Mode

Click the "down-arrow" 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.

Figure 7.6   OpenGL Settings: Dualview Mode Hardware Acceleration Options
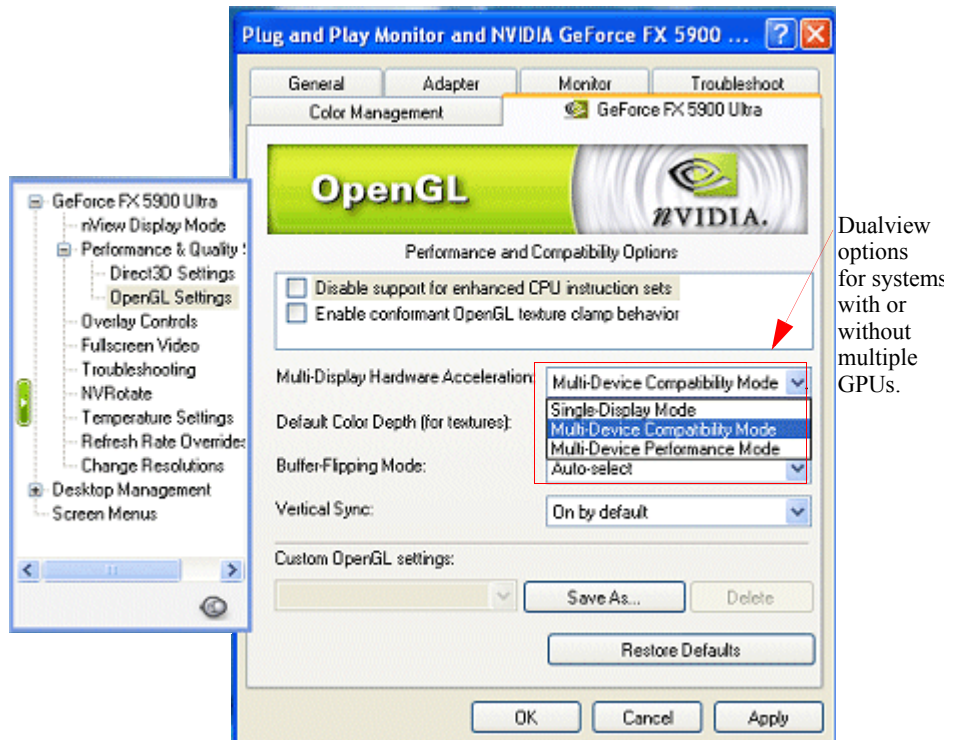
Vertical Sync

Click 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.

Custom OpenGL Settings

This option shows a list of the custom settings (or *tweaks*) you have saved.

Note: This option applies only to Windows XP/2000/NT 4.0.

To activate the setting:

1 Select an item from the list.

2 Click **OK** or **Apply**.

Other Options

Save As

Click **Save As** to save the current settings as a custom *tweaks,* which is then added to the adjacent list. Once you have found the optimal settings for a particular OpenGL application, saving the settings as a custom tweak allows you to quickly configure OpenGL before starting the program and eliminates the need to set each option individually.

Delete

Click **Delete** to delete the custom setting currently selected in the Custom OpenGL settings field.

Restore Defaults

Click **Restore Defaults to** restores all settings to their default values.

Overlay Controls

Use the Overlay Controls panel to adjust the quality of video or DVD playback on your display device. These controls affect videos that are created using the hardware overlay. They 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 and then re-open it.

1 Open the DVD or video application that you want to view.

2 Right click from your desktop to display the properties menu and then click **Properties** > **Settings > Advanced** > the **NVIDIA GPU** tab > **Overlay Controls** option from the NVIDIA menu.

Figure 7.7 shows an Overlay Controls panel for Windows XP/2000 and Figure 7.8 shows one for Windows 9*x*.

Figure 7.7   Overlay Controls Panel: Windows XP/2000
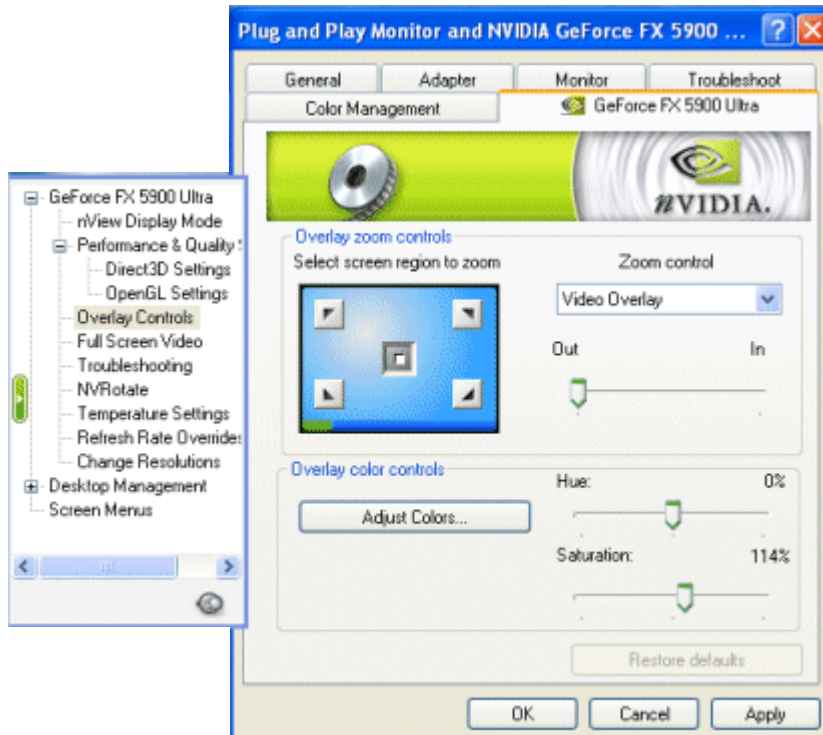
Overlay Zoom Controls

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 "Full Screen Video" on page 89).

  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.

Figure 7.8   Overlay Controls Panel: Windows 9*x*
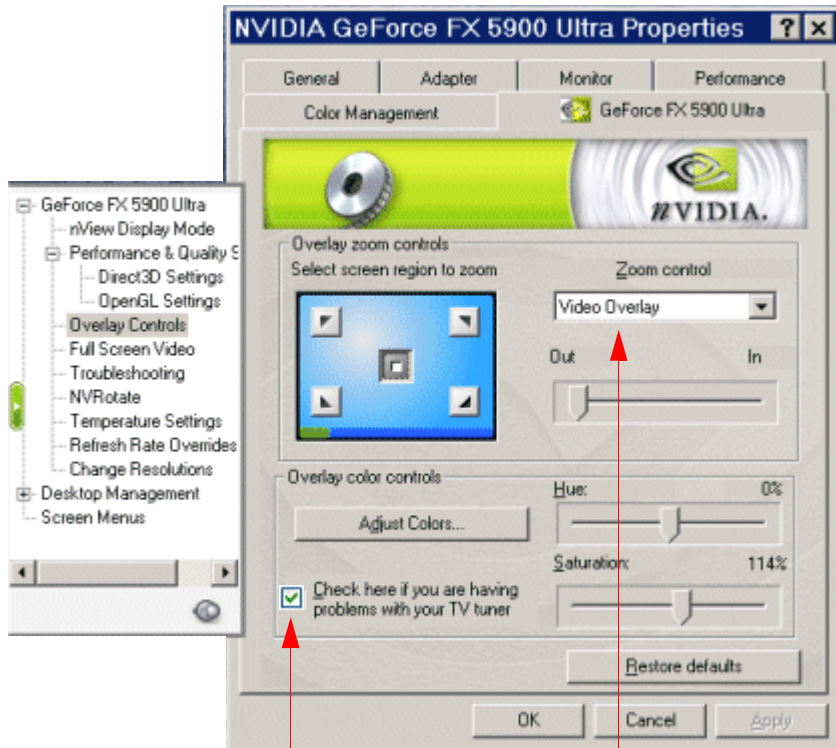
TV Tuner option   **Zoom** control applies to the
                                       display device for **Video Overlay**.

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 "Adjust Colors: Color Correction Panel" on page 72.

Restore Defaults

Click this option restore all color values to the hardware factory settings.

Check Here If You Are Having Problems with Your TV Tuner

Under Windows 9*x, e*nabling this option, as shown in Figure 7.8, forces the overlay software to use busmastering.

Note: It is recommended that you leave this option unchecked unless you experience problems with video playback, such as image corruption or you cannot see a video image.

Full Screen Video

Use the Overlay Controls panel to adjust the quality of video or DVD playback on your display device.

These controls affect videos that are created using the hardware overlay. They 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 and then re-open it.

1 Open the DVD or video application that you want to view.

2 Right click from your desktop to display the properties menu and then click **Properties** > **Settings > Advanced** > the **NVIDIA GPU** tab > **Overlay Controls** option from the NVIDIA menu.

Figure 7.9 through Figure 7.11 show Overlay Controls panels for Windows XP/2000 and Windows 9*x*, highlighting various settings.

Full-Screen Video Options

Note: Video Mirror features are not available under Windows NT 4.0.

The Video Mirror feature is supported by any NVIDIA GPU-based multi-display graphics card.

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

Note: The Video Mirror features are supported only under **nView Clone** and **Dualview modes.** Also note that i**f you have only one display device connected to your computer**, you will not have Video Mirror functionality but will be able to access the other Overlay Control features.

Full-Screen Device

Select the display device on which you want video to be played back in full-screen mode.

Note: After selecting any of these Full Screen Device options, you may need to exit and restart your video application for the settings to take effect.

• **Disable** disables Video Mirror.

• **Primary display/Secondary display** settings are *only* available under nView Clone and Span modes.

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

Figure 7.9   Full Screen Video: Full Screen Device = Auto-Select (Dualview mode)
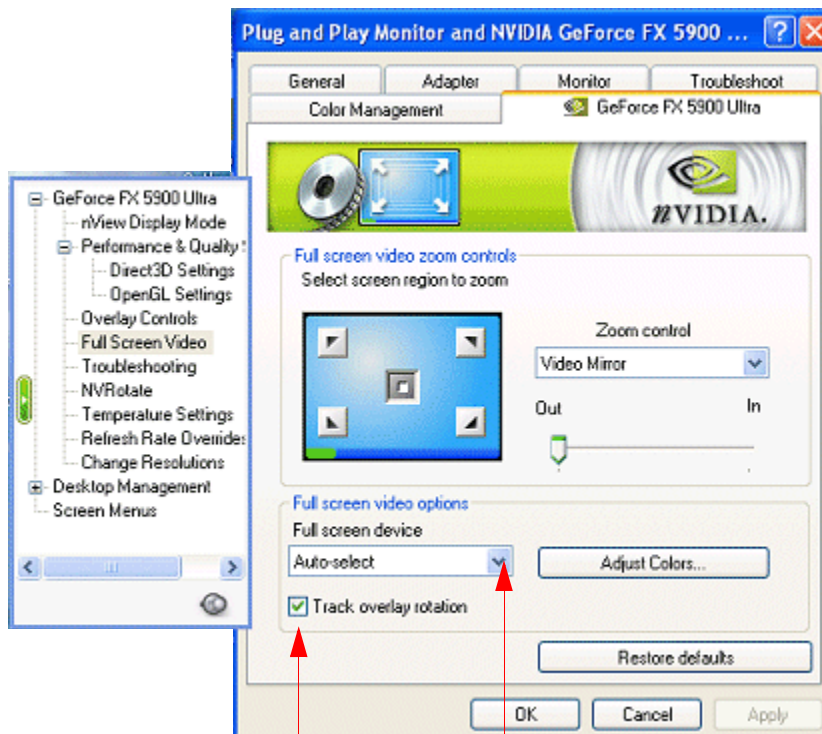
Track overlay rotation is enabled.

Auto-select mode is available in nView Dualview mode.

• **Auto-select** is *only* available under nView Dualview mode. Auto-select enables full-screen device functionality, which creates the full-screen mirror on the display device 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.

Track Overlay Rotation

Enable this option to link the degree of rotation you specified in the NVRotate panel (*see* "NVRotate" on page 96) for the video overlay on the Primary display to the Secondary display. This means that the degree of rotation you choose on the NVRotate panel is reflected on both the Primary and Secondary display devices.

Figure 7.10 Full Screen Video: Full Screen Device = Primary (Secondary) display (Clone/Span mode)
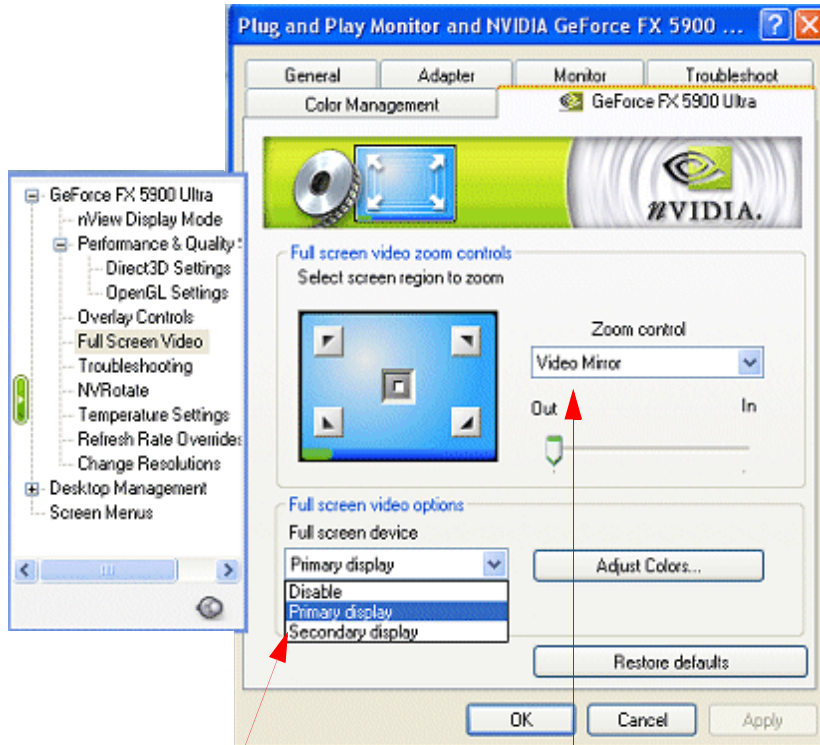
Primary display and **Secondary display** modes are available in nView Clone and nView Horizontal and Vertical Spain modes.

Zoom control applies to the display device for **Video Mirror**.

Adjust Colors

See "Adjust Colors: Color Correction Panel" on page 72.

Full Screen Video 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 Mirror** sets the zoom selection to the full screen device you selected for video mirror rendering on this panel.

• **Both** applies the zoom selection to both the full screen device you previously selected for video mirror rendering *and* the display on which the overlay video is being rendered. (See "Overlay Controls" on page 86.)

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

Figure 7.11   Full Screen Video (Windows 9*x*)
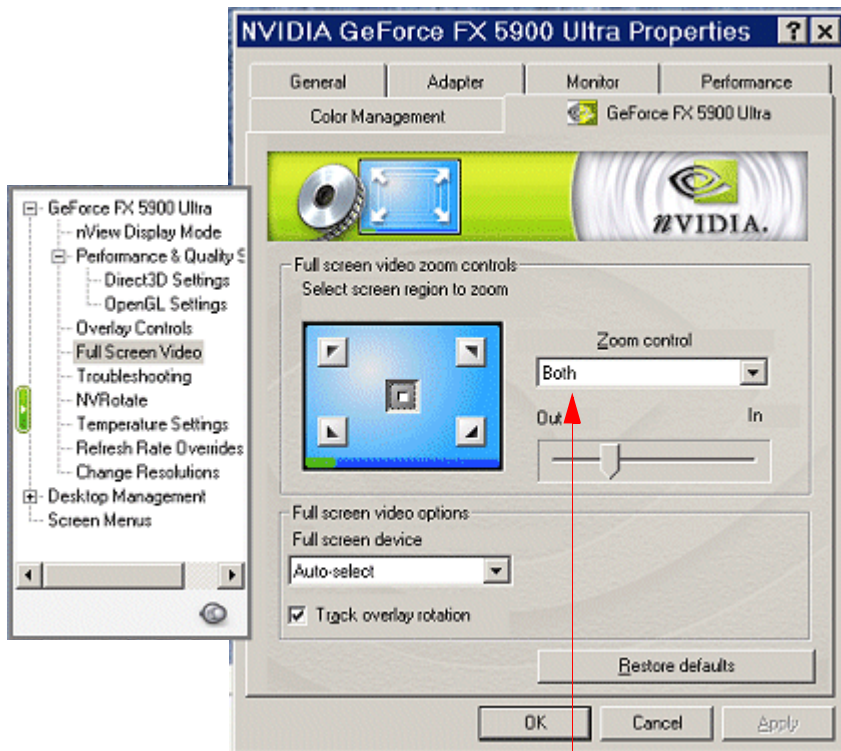
Zoom control is set to **both**--
applies to the display device for
Video Mirror and the display device
for the **Overlay**.

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:** Click this option to restore all color values to the hardware factory settings.Troubleshooting Options

Troubleshooting

To access the Troubleshooting panel. follow these steps:

1 Right click from your desktop to display the properties menu and then click **Properties** > **Settings > Advanced**.

2 Click the **NVIDIA GPU** tab and the **Troubleshooting** option from the NVIDIA menu. Figure 7.12 shows the Troubleshooting panel.

Display the NVIDIA Settings Icon in the Taskbar

Enabling this option adds the NVIDIA Settings icon to the Windows taskbar.

The **NVIDIA Settings** icon lets you apply any of the custom Direct3D, OpenGL or color settings *on the fly* from a convenient pop-up menu. The menu also contains items for restoring default settings and accessing the Display Properties dialog box.

You can access the following settings through the NVIDIA Settings icon:

• **Performance and Quality Settings**

  • Image Settings

  • Antialiasing

  • Anisotropic Filtering

• **Custom OpenGL**

• **Custom Direct3D**

• **Custom Color**

Figure 7.12 Troubleshooting
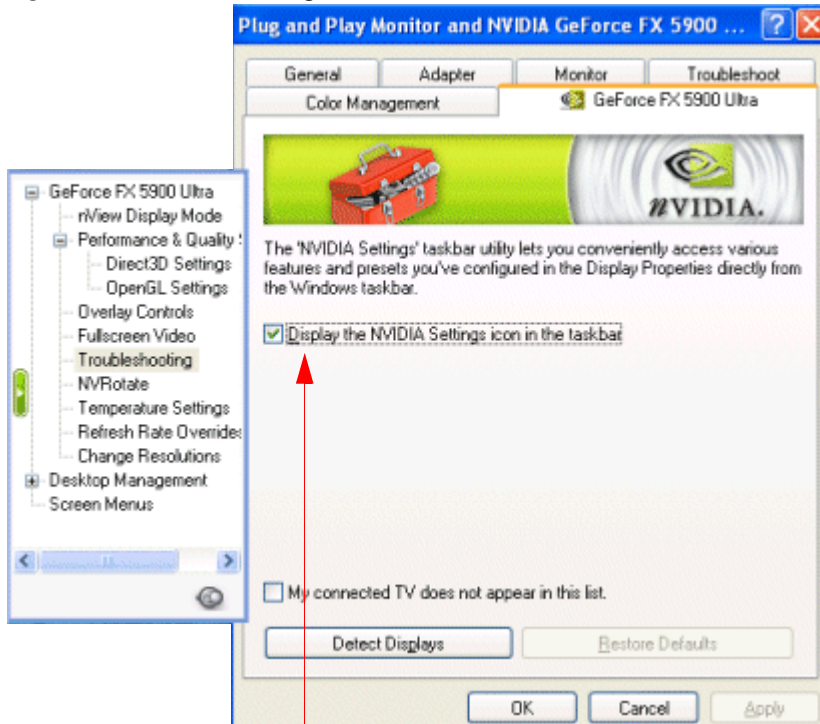
Enable this option to display
the NVIDIA Settings icon in
the Windows taskbar.

- **Rotation (NVRotate)**

- **Desktop Color Correction**

- **Windows Display Properties**

- **nView Desktop Manager**

To use the NVIDIA Settings icon, following these steps:

1 Click the check box **Display the NVIDIA Settings icon in the taskbar** to
   enable the options on the NVIDIA Settings icon.

2 Click **Apply**. The icon is added to the Windows taskbar as shown in Figure
   7.13.

Figure 7.13 NVIDIA Settings Icon on the Windows Taskbar

Windows Taskbar   ⌐NVIDIA Settings icon

3 From the Windows taskbar, simply right click the NVIDIA Settings icon and then select the options you want from the menu that appears (Figure 7.14).

Figure 7.14 NVIDIA Settings Icon
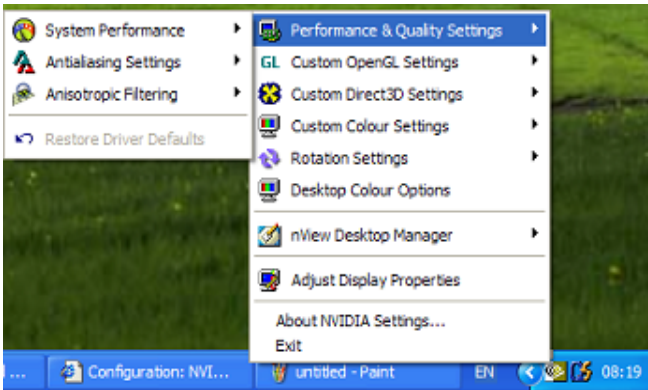
My Connected TV Does Not Appear in This List

Enabling this option forces the detection of a TV connected to the graphics card, even though the control panel does not show that one is currently connected. This is useful in situations where the particular TV model attached does not properly load the signals that allow the graphics card to detect its presence.

1 To enable the TV options, click the check box to check the box and click **Apply**.

2 Restart your computer when prompted. Once you log back in, you can use the TV controls.

Detect Displays.

Click this option to detect all display devices connected to your graphics card.

Note: Use this feature if you have plugged in any display devices after the control panel was opened.

NVRotate

The NVRotate feature lets 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 a GeForce2 or later series NVIDIA desktop GPU.

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** feature that is available on the Full-Screen Video Mirror Controls panel. For details, see "Full Screen Video" on page 89.

Considerations Before You Use NVRotate

• 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 display devices are rotated.

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

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

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

  • Slower GPUs such as GeForce FX Go5200 or GeForce2 Go based products

  • If other demands are placed on the NVIDIA graphics driver, such as moving the application window across the desktop

Enabling NVRotate

To enable NVRotate, follow these steps:

1 From your Windows desktop, right click to display the desktop menu and then click **Properties** > **Settings** > **Advanced**.

2 Click the NVIDIA GPU tab and the **NVRotate** option on the NVIDIA menu to display the NVRotate panel (Figure 7.15).

3 The following desktop rotations options are available:

- **Landscape** is the "default" mode.

- **Portrait** results in a 90 degree rotation.

- **Inverted Landscape** results in a 180 degree rotation.

- **Inverted Portrait** results in a 270 degree rotation.

Restore Default results in the default "Landscape" mode.

Figure 7.15 NVRotate Settings Panel: Landscape Mode
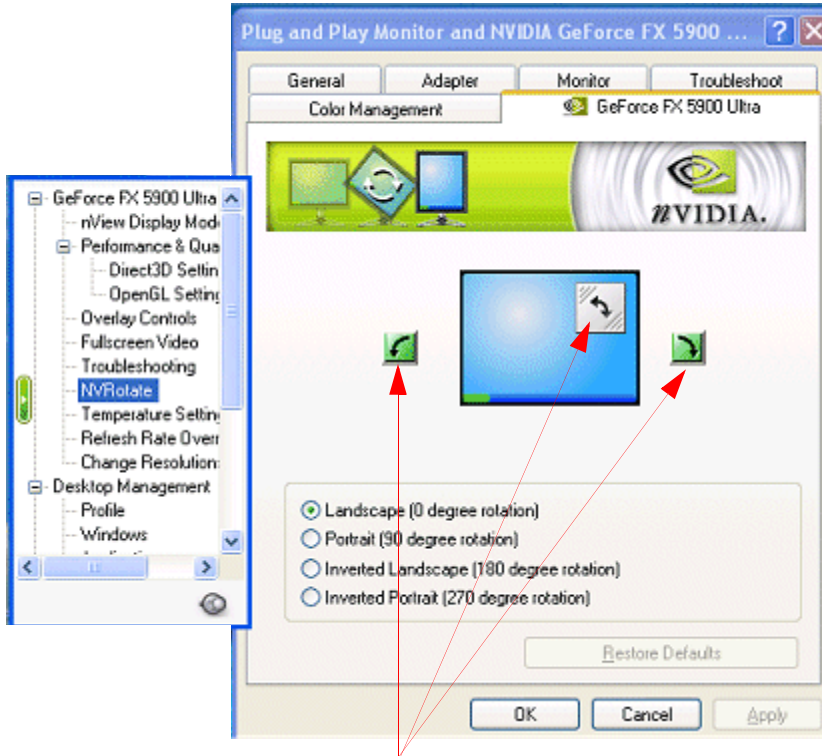
You can choose to click one of these two green arrow buttons to perform rotation actions. Or, you can click the white arrow button and drag it in the direction of the rotation.

4 Click **OK** after selecting any one of the options above for the change to take effect.

Note: You can click one of the two arrow buttons shown on the NVRotate panel (Figure 7.15) to perform the rotation options. *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.

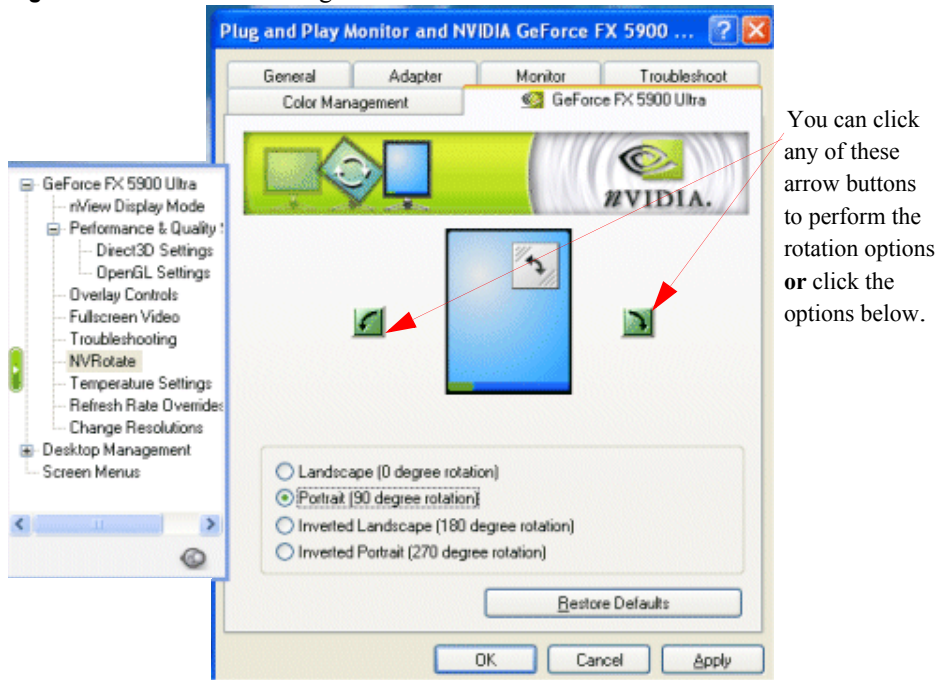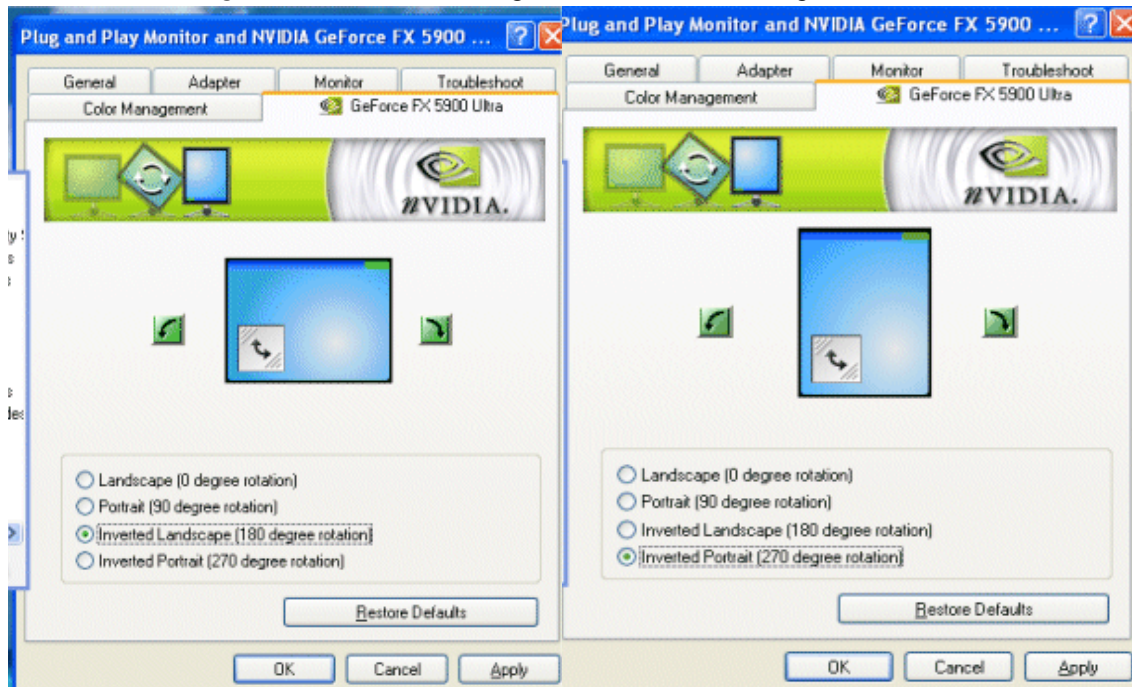**Figure 7.16** NVRotate Settings Panel: Portrait Mode

Figure 7.17 NVRotate Settings Panel: Inverted Landscape & Inverted Portrait Modes

Temperature Settings

Note: This panel 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.:

1 To open the Temperature Settings panel, follow these steps, right click from your desktop to display the properties menu

2 Click **Properties** > **Settings > Advanced** > the **NVIDIA GPU** tab and then the **Temperature Settings** option from the NVIDIA menu.

The Temperature Settings panel appears, as shown in Figure 7.18.

Temperature Level (GPU Core Temperature)

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

Figure 7.18 Temperature Settings
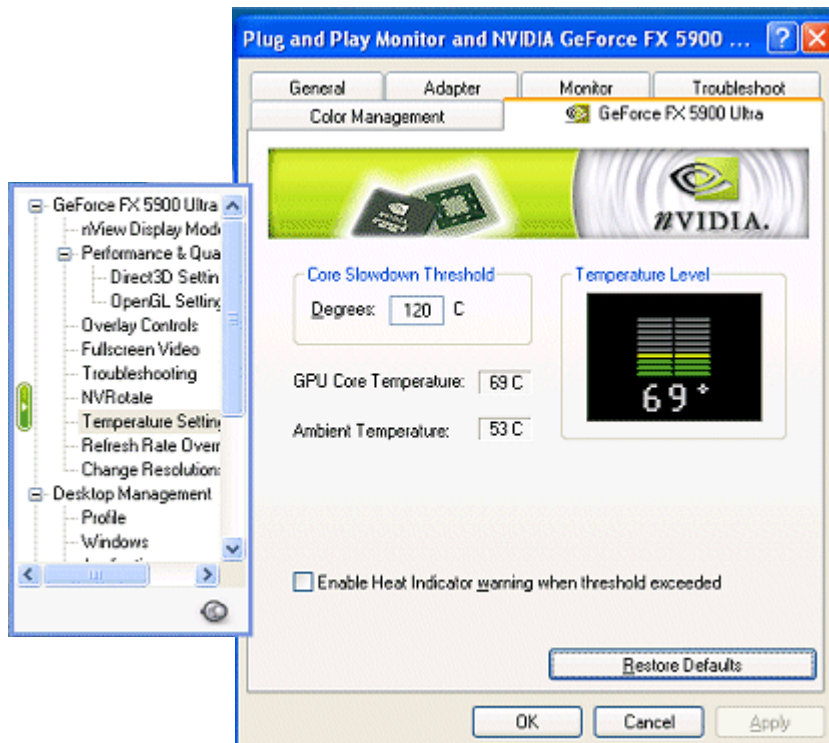
Core Slowdown Threshold

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.

Refresh Rate Overrides

The Refresh Rate Overrides panel lets you select refresh rate overrides to be used in OpenGL, Direct3D, and desktop applications. To access the Refresh Rate Overrides panel (Figure 7.19), follow these steps:

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

2 Click **Properties** > **Settings** tab > **Advanced** > **NVIDIA GPU** tab to open the NVIDIA menu.

3 If you can't see the **Refresh Rate Overrides** option, click the "+" on the left of the **Performance and Quality** option; then click the "+" on the left of the **Direct3D Settings** option to expand the menu.

4 Click the **Refresh Rate Overrides** option to display the panel in Figure 7.19.

Figure 7.19 Refresh Rate Overrides: Applications control refresh rates (enabled)
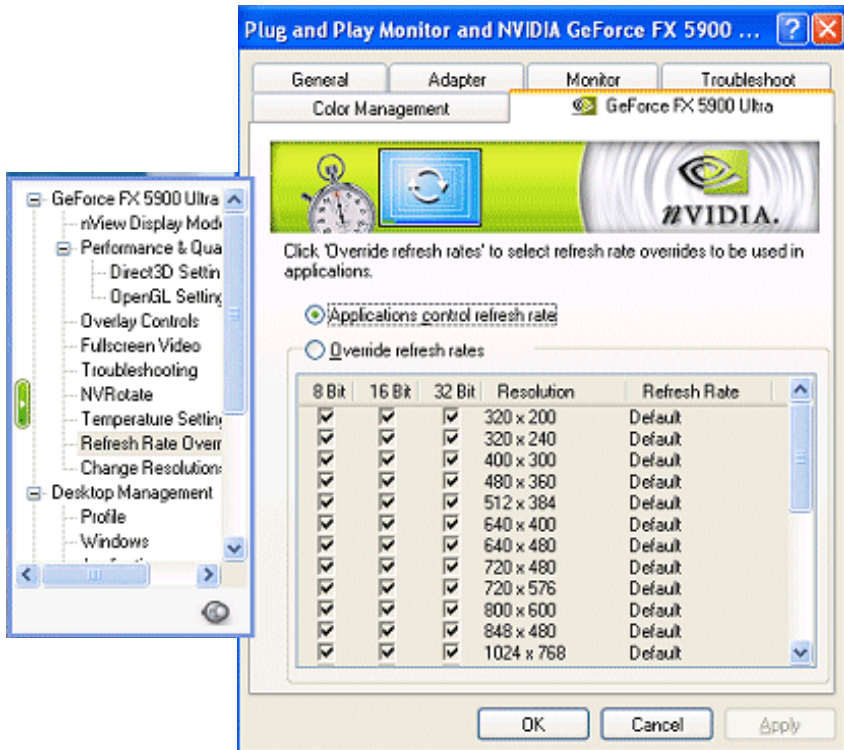
Applications Control Refresh Rates

When enabled, this option allows the application to select its own refresh rate.

Default means that the application's refresh rate is used. Any other value means to set the refresh rate to the value for full-screen applications.

If you want to select refresh rate overrides to be used in applications, click **Override refresh rates**.

Override Refresh Rates

When you click this option, the list box of values becomes enabled so you can select individual refresh rates for each resolution and combination of bit depths, as shown in Figure 7.20.

Figure 7.20 Refresh Rate Overrides: Override Refresh Rates (enabled)
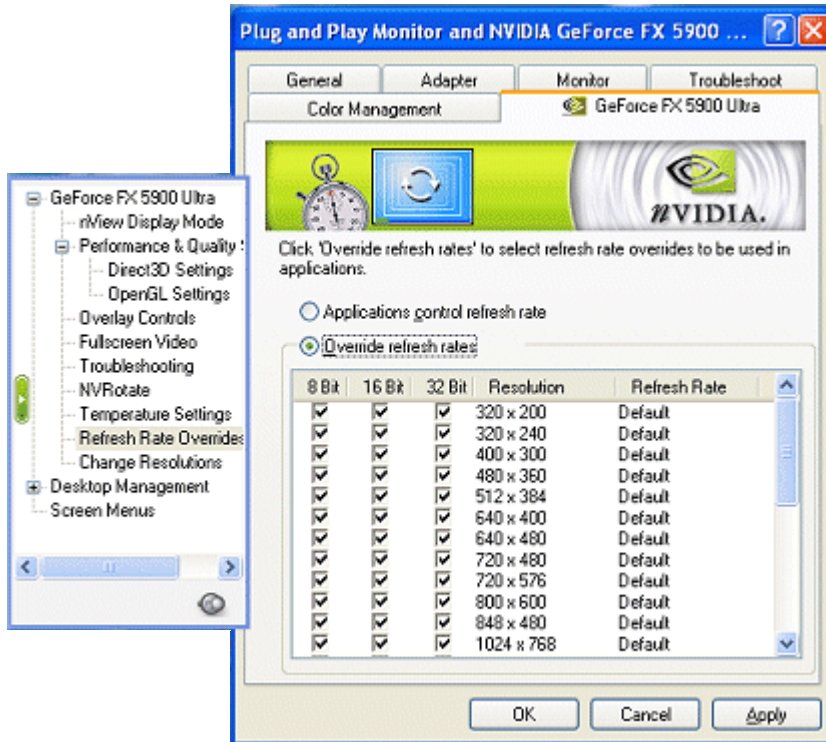
To override a refresh rate, follow these steps:

1 From the Refresh Rate column, click the word **Default** on the line that contains the Resolution for which you want to change the refresh rate. A list box of values appears, as shown in Figure 7.21.

2 From the list, select the refresh rate you want for the associated value in the Resolution column.

3 If you want to eliminate any of the three bit depths in the row, simply click to disable (remove the check mark from) that bit depth.

4 Click **Apply**.

Figure 7.21 Refresh Rates Overrides: Override refresh rates menu
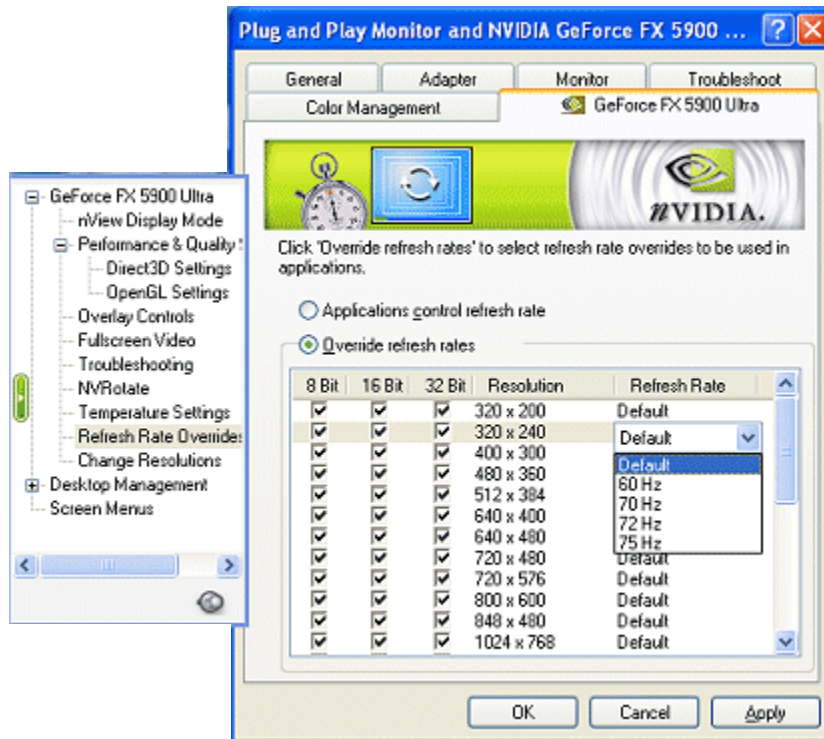
Change Resolution

The Change Resolution panel lets you configure screen resolution, color quality, and screen refresh rates for each of your connected display devices.

To access the Change Resolution panel (Figure 7.22), follow these steps:

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

2 Click **Properties** > **Settings** tab > **Advanced** > **NVIDIA GPU** tab to open the NVIDIA menu.

3 Click the **Change Resolution** option to display the panel in Figure 7.22.

Figure 7.22 Change Resolution Options
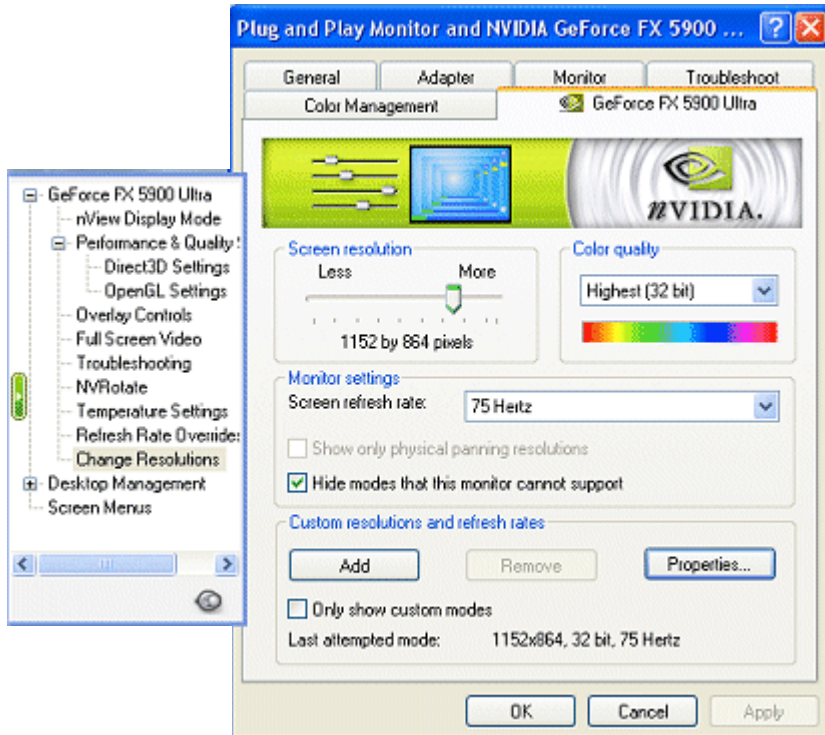
Screen Resolution and Color Quality

• **Screen Resolution** lets you display available screen resolution settings for the display device. 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 device. 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 device. 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.

Custom Resolutions and Refresh Rates

This feature is available only on analog displays.

Add

1 Click **Add** to display the dialog box shown in Figure 7.23.

Figure 7.23 Add Custom Resolution Dialog Box.
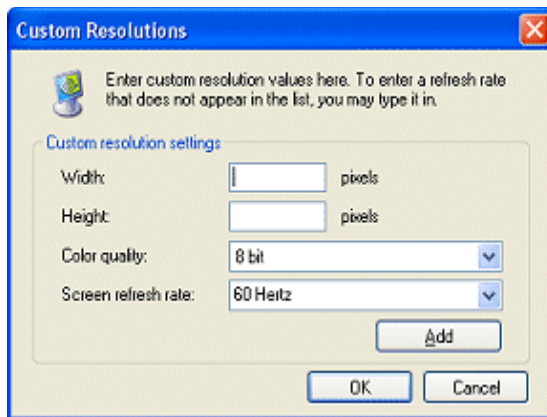
2 Enter requested information in the fields provided.

3 Click **Add** and **OK**.

When you enable the **Only show custom modes option** on the Change Resolution panel, the modes you just added will be available for use.

Remove
Click **Remove** and follow the prompts to remove one or more custom modes.

Properties
Click **Properties** to show all available customized modes for the currently selected screen resolution (Figure 7.23).

Figure 7.24 .Custom Resolution Properties Dialog Box

Only Show Custom Modes

Click **Only show custom modes** to make *only* customized display modes available.

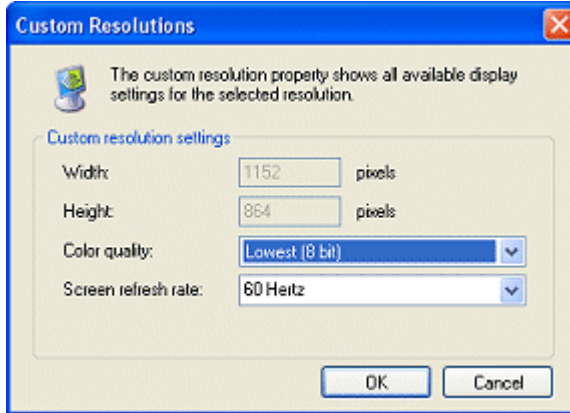**Note:** When you enable this option, the Screen resolution, Color quality, and Screen refresh rate options may become unavailable (greyed out).

Screen Menu Editing

To access and use the Screen Menu editing options (Figure 7.25), follow these steps:

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

2 Click **Properties** > **Settings** tab > **Advanced** > **NVIDIA GPU** tab to open the NVIDIA display properties menu.

3 If necessary, click the "+" sign to expand the NVIDIA menu on the left of the control panel.

4 Click the **Screen Menus** option to select it.

5 To use the screen menu editing feature, check (enable) the **Enable screen menu editing** check box.

6 Remove infrequently used screens by dragging them from the NVIDIA screen menu to the list box shown below the check box.

7 To restore the screen to the menu, drag it back to the menu, or click **Restore Default**.

8 To return to normal navigation mode, click to uncheck the **Enable screen menu editing** check box.

Figure 7.25 Screen Menu Editing Options
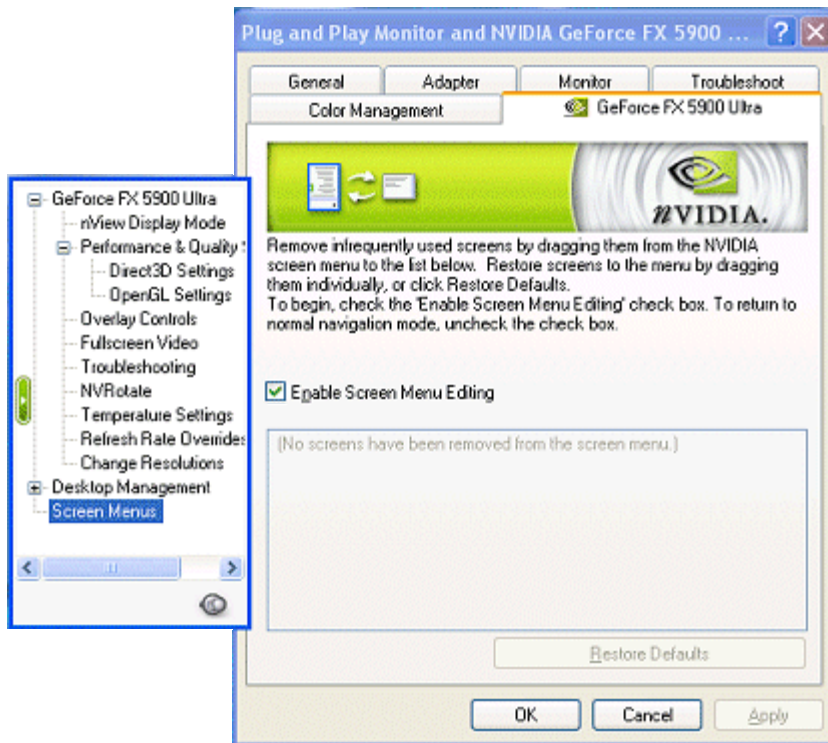
PowerMizer Settings (Mobile computers *only*)

When using a mobile (laptop) computer, the NVIDIA PowerMizer™ panel lets you regulate the power consumption of your GPU.

To access the PowerMizer settings panel on your mobile computer, follow these steps:

1 Right click to display the desktop menu

2 Click **Properties** > **Settings** > **Advanced** > the NVIDIA GPU tab, and then the **PowerMizer** option from the NVIDIA menu.

A PowerMizer panel is shown in Figure 7.26.

PowerMizer Options

Figure 7.26 .PowerMizer Options (for mobile computers)

Current Power Source

Current Battery Charge

Sliders to change AC outlet & Battery consumption levels.

Current Power Level
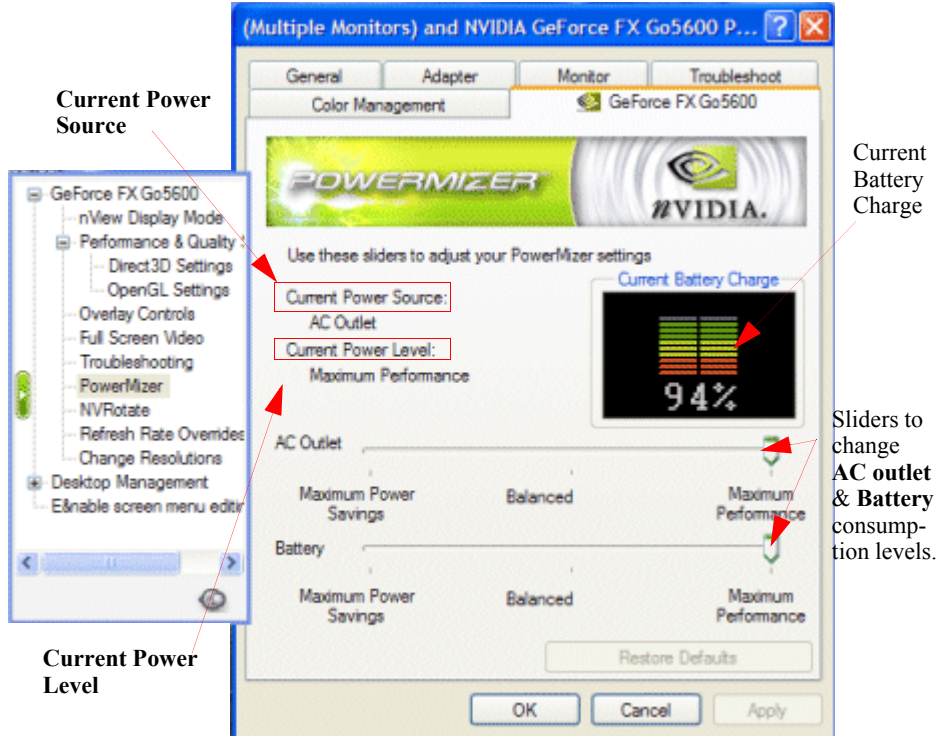
Current Battery Charge

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 7.26) it is AC Outlet.

Current Power Level

Current power level can be one of the following:

- **Maximum Power Savings**

- **Balanced**

- **Maximum Performance** (example setting in Figure 7.26)

AC Outlet

Use the slider to adjust the power consumption from the AC power source relative to performance, by setting Maximum Power Savings Maximum Performance, or Balanced.

Battery

You can either conserve battery life by setting Maximum Power Savings, but at some decrease in performance, use the full graphics performance of your GPU by selecting Maximum Performance, or choose a compromise between the two settings by using Balanced.

A

USING TWO NVIDIA GPU-BASED GRAPHICS CARDS

This appendix contains the following major topics:

- "Before You Begin" on page A-111
- "GeForce FX 5900 Ultra: Installing NVIDIA Display Driver" on page A-112
- "GeForce FX 5900 Ultra: Attaching Secondary Display for nView Dualview Mode" on page A-113
- "GeForce2 MX: Installing NVIDIA Display Driver" on page A-116
- "Attaching Display Devices for GeForce2 MX: nView Dualview Mode" on page A-117
- "Enabling nView Span/Clone Modes: Detaching the Secondary Display Device" on page A-119
- "Viewing Multiple Card Configurations Using the NVIDIA Settings Icon" on page A-120

Before You Begin

This appendix discusses an example of using two *multi-display* NVIDIA GPU-based graphics cards in one computer running Windows XP.

Note: When running Windows with multiple cards (i.e., two or more NVIDIA GPU-based graphics card are installed in your computer), note the following:

  • Using graphics cards based on the same NVIDIA GPU is strongly recommended.

  • The same NVIDIA driver (version) must be installed for each card.

Example Graphics Cards and Setup

The example in this appendix uses the following NVIDIA-based cards and configurations; all steps refer to these products and setup:

• The **GeForce FX 5900 Ultra GPU-based card** is an AGP card connected to a digital display, an analog display, *and* TV for multi-display nView functionality.

• The **GeForce2 MX GPU-based card** is a PCI card connected to two analog displays for multi-display functionality.

  Note: Depending on the number of PCI slots in your computer, you can use several PCI cards. This example uses only one PCI card.

Before Installing the NVIDIA 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 cards are securely seated in their slots.

4 Connect the appropriate display devices to both cards, making sure that their cable connectors are securely attached to the appropriate graphics cards installed in your computer.

5 Turn on your display devices.

GeForce FX 5900 Ultra: Installing NVIDIA 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 Display Driver software 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 card that appears on the Model list and click **Next**.

12 Copying files will take a couple of minutes while you wait.

13 Click all prompts to continue the process.

14 Click **Finish** when that option appears

15 If there is a prompt to restart your computer, click to do so.

16 Respond to the prompts to restart your computer.

GeForce FX 5900 Ultra: Attaching Secondary Display for nView Dualview Mode

1 From your desktop, open the Display Properties Settings panel.

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 GeForce FX 5900 Ultra card. Display **2** (connected to the GeForce2 MX/MX 400) and display **3** (connected to the GeForce FX 5900 Ultra 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 panel, appears briefly on that display device's desktop (Figure A.2).

Figure A.1   Display Properties Settings: 3 Display Devices with 1 Attached
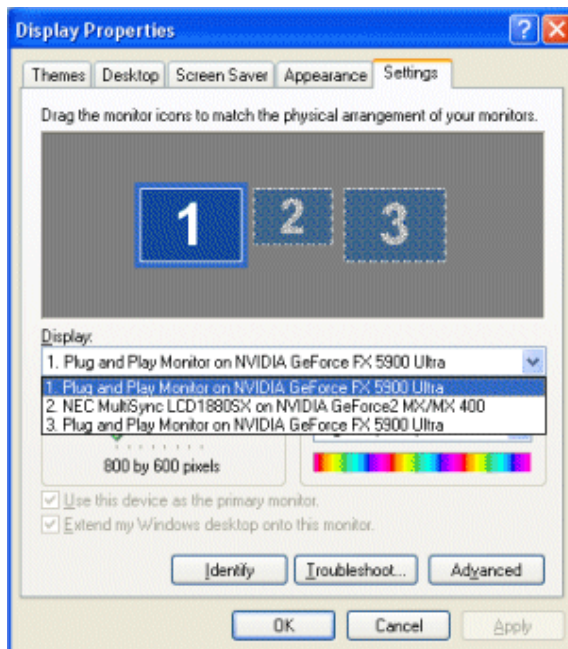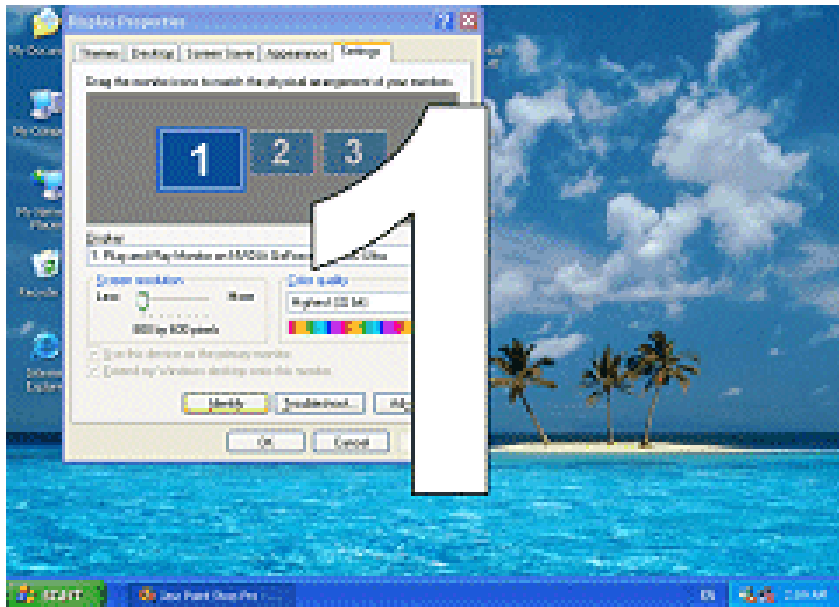
Figure A.2   One Display Device With Identifying Number

4   From the Settings panel, 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 panel, appear briefly on those display devices' desktops (Figure
    A.4).

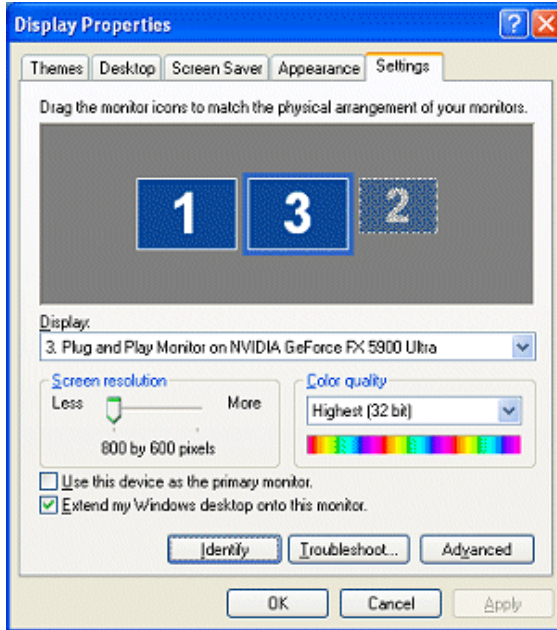**Figure A.3**   Display Properties Settings:3 Display Devices with **2** Attached

Figure A.4   Two Display Devices With Identifying Numbers

GeForce2 MX: Installing NVIDIA Display Driver

1 From the Settings Panel, right click the display image **2** (connected to the GeForce2 MX/MX 400-based 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 card for which you are about to install the NVIDIA driver. In this example, it is GeForce2 MX/MX 400.

9 Click **Have Disk**.

10 Click **Browse** and locate the path containing NVIDIA Display Driver software 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 card (in this example, GeForce2 MX/MX 400).

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 Display Devices for GeForce2 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 GeForce FX 5900 Ultra-based card. Now we will enable display devices 2 and 4 for the GeForce2 MX/MX 400 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.6 and Figure A.7 show the associated Display Properties Settings panel and the resulting desktops on the numbered display devices.

Figure A.5   Display Properties Settings: **4** Display Devices with **2** Attached
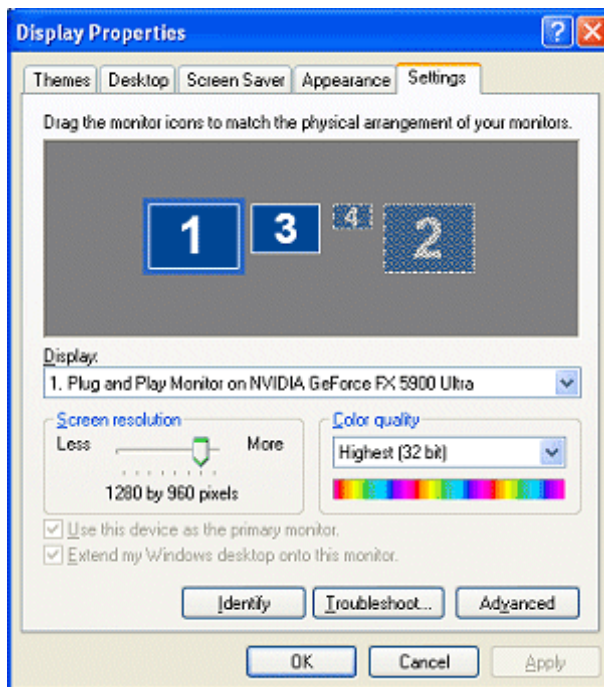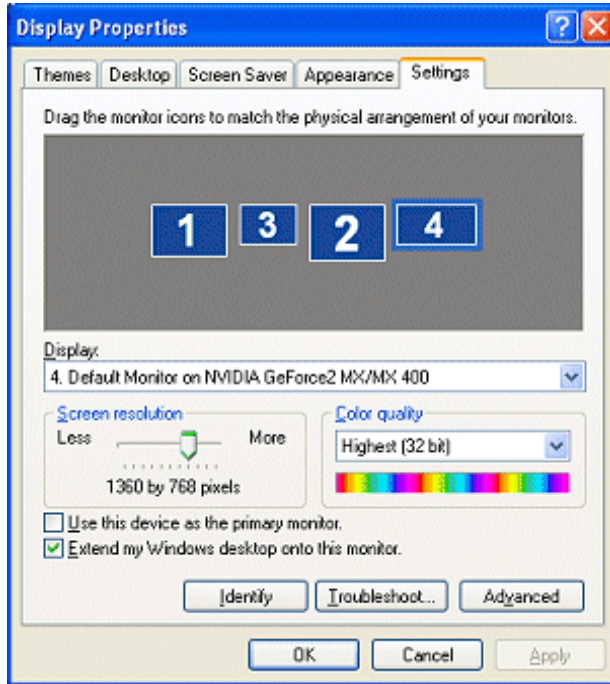
Figure A.6   Display Properties Settings: 4 Attached Display Devices

Figure A.7   Four Display Devices With Identifying Numbers

> **Note:** Attaching all the displays implies that nView Dualview mode is enabled. If you check the nView Display Mode panel for either of the NVIDIA-based cards that are installed, you will see that nView Dualview mode is enabled.

4 From the Settings panel, right click any of the four display images.

5 Click **Properties** and then click the NVIDIA GPU-labeled tab to open the associated GPU panel.

6 Click the **nView Display Mode** menu option. Notice that the nView Modes list is set to **Dualview**.

Enabling nView Span/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-based 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 GeForce2 MX-based card.

2 Click **Properties** and then click the NVIDIA GPU-labeled tab to open the associated GPU (GeForce2 MX) panel.

3 Click the **nView Display Mode** 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 Settings panel and desktop are shown in Figure A.8 and Figure A.9.

Figure A.8   Display Properties Settings: **4** Display Devices with **2** Attached
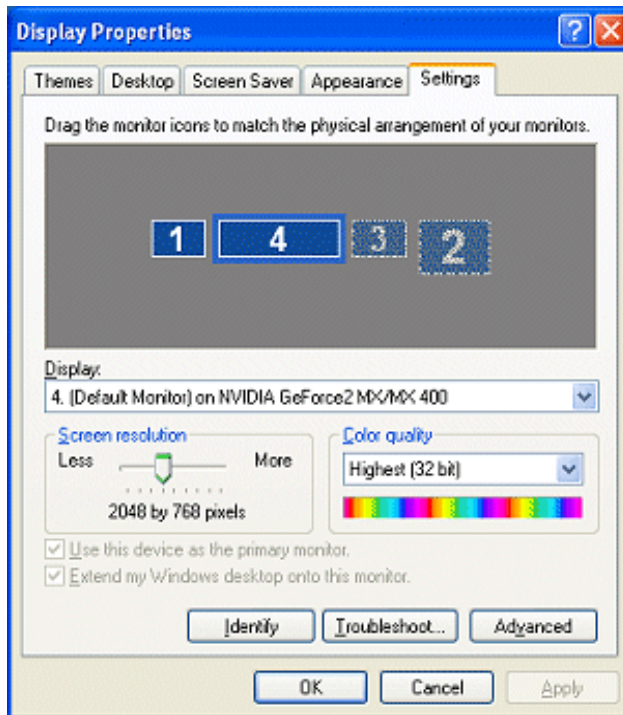
Figure A.9   Two Display Devices With Identifying Numbers

6 You can repeat steps 4 through 9 and chose Vertical Span or Clone mode. The result will be similar to what is shown in Figure A.8 and Figure A.9 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 Card Configurations Using the NVIDIA Settings Icon

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 "Display the NVIDIA Settings Icon in the Taskbar" on page 93.

1 Right click the NVIDIA Settings icon on your Windows task bar. A menu of configuration options appears, as shown in Figure A.10.

Notice that both GeForce FX 5900 Ultra and GeForce2 MX GPU-based cards are shown in the menu.

2 To see the configuration options for each GPU-based card, point to the GPU names on the menu (Figure A.10) and then move the cursor to any of the options that appear on the next menu level.

Figure A.10 NVIDIA Settings Taskbar Menu Displaying GeForce FX 5900 Ultra and GeForce2 MX GPUs

GeForce FX 5900 Ultra = Display 1

GeForce2 MX = Display 2