RADEON™ 9000

User's Guide

P/N 137-40442-10

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Introduction

The RADEON™ 9000 graphics accelerator delivers ground breaking 3D graphics performance.

- Designed and built by ATI Technologies Inc.
- Powered by the RADEON 9000 Visual Processing Unit (VPU).
- Awesome 3D gaming performance.
- Support for OpenGL® applications.
- Support for Direct3D® applications.
- High resolution in 3D up to 2048x1536.
- Best performance for today's and tomorrow's applications.
- Supports TV-Out to connect your PC to your TV or VCR.

Features At A Glance

The RADEON 9000 provides high performance acceleration for today's demanding 3D graphic applications. Its main features includes:

- VIDEO IMMERSION™ which provides industry-leading DVD playback and digital TV decode capability.
- CHARISMA ENGINE™ II performs complex transformation, clipping, and lighting calculations faster than the CPU or 3D graphics chip.
- PIXEL TAPESTRY™ II which can apply 6 textures per pass to a complex 3D gaming scene.
- TV output support.
- TRUFORM™ technology which makes the curved surfaces of 3D objects look smoother and more life-like.
- SMARTSHADER™ technology which can realistically create the visual properties of any material, like glass, metal, wood, and produce 3D depth by rendering the object’s shadows.
- SMOOTHVISION™ which provides users with various degrees of jagged edge removal from 3D images, allowing users to configure their own high quality or high performance gaming experience.

ATI's Catalyst™ Software Suite

Multiple Displays and 3D Gaming Experience

ATI's Catalyst Software Suite provides multiple display functionality, and the advanced graphic features, such as TRUFORM, for the ultimate 3D gaming experience. For help on installing the Catalyst Software Suite, refer to the **Getting Started Guide**.

The Catalyst Software Suite installs the ATI display tabs. These tabs are accessed through the Windows® **Display** Control Panel, through the **Advanced...** button located on the **Settings** tab. For a detailed explanation of each ATI tab, refer to **Catalyst™ Software Suite on page 7**.

Direct3D® and OpenGL®

The Catalyst Software Suite also supports the latest versions of Direct3D® and OpenGL®. Many new 3D game titles, and the latest versions of older titles, will virtually come to life as they utilize their advanced Direct3D® or OpenGL® features. Gamers can tweak their settings for the ultimate experience in 3D image quality or 3D gaming performance.

ATI's Direct3D® and OpenGL® tabs are available through the Windows® **Display** Control Panel, through the **Advanced...** button located on the **Settings** tab.

For a detailed explanation of the Direct3D® and OpenGL® tabs, refer to **Direct3D® Control Panel on page 13**, and **OpenGL® Control Panel on page 18**.

HydraVision™

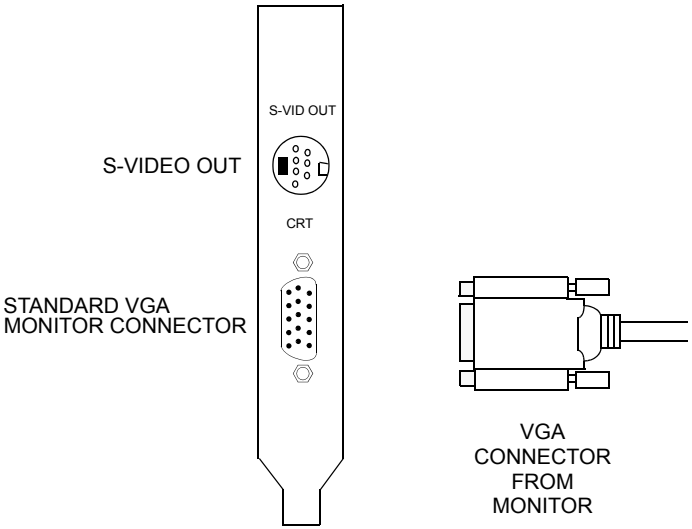
In addition to the multiple display functionality available with ATI's Catalyst Software Suite, you can also use HydraVision for advanced multi-display (CRT + TV) management. For more information on HydraVision, please refer to the **HydraVision User's Guide** PDF located on your ATI Installation CD.

Connecting Your Monitor

The RADEON 9000 provides hardware support for one VGA monitor. A TV can also be used to expand your desktop by using the S-Video out.

Turn off computer before connecting monitor.

Plug the monitor cable into your card then turn on the PC and monitor.



Display Configurations

Your RADEON 9000 card provides support for TV Out. The following table lists the different ways you can connect displays to your card.

Display Configuration	Connector(s) Used	Comments
One CRT display	VGA connector	CRT- cathode ray tube analog display
One TV	S-Video Out	The S-Video Uut can also support a composite connection via the S-Video-to-Composite adapter
CRT display + TV	VGA connector + S-Video Out	

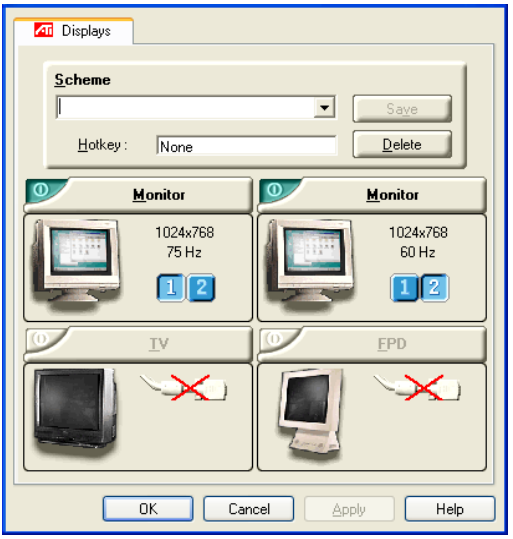
Catalyst™ Software Suite

The following section provides an explanation of each ATI tab available after installing the Catalyst Software Suite.

Features presented in the following pages may not be supported in all operating systems and/or may appear differently.

ATI Displays Tab

Here you enable/disable TV Out. For complete information see How To Enable/Disable The TV Display on page 28.

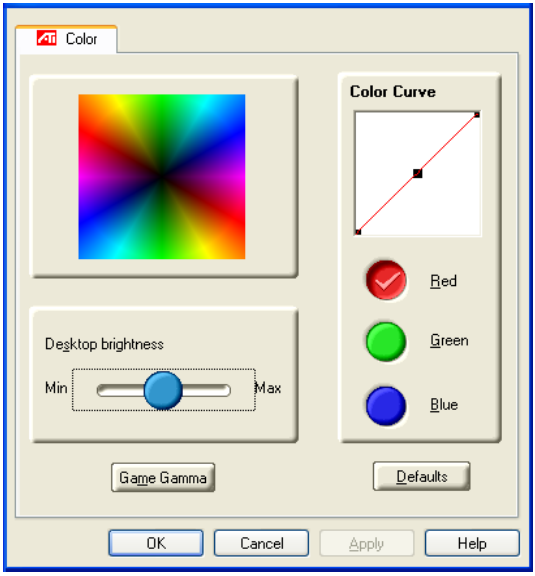


Ratiometric Expansion

Your graphics accelerator card offers ratiometric expansion (or digital panel scaling as it is commonly known). This expands a low resolution image to fill a higher resolution panel.

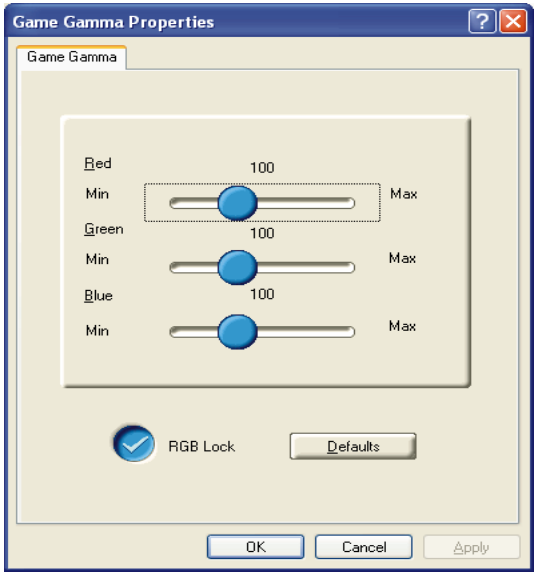
ATI Color Tab

The ATI Color tab is used to adjust the color settings. You can change the red, green and blue display colors. Desktop brightness and Game Gamma (brightness in Direct3D® and OpenGL®) can also be changed.



ATI Color Tab	
Desktop Brightness	This increases or decreases the brightness of your desktop. The higher the gamma value, the higher the brightness of your display.
Color Curve	This adjusts the selected color (red, green or blue check button) by moving the color curve with your mouse.
Game Gamma button	This accesses Game Gamma Properties.
Defaults button	This allows you to reset the desktop brightness and color settings to default values.

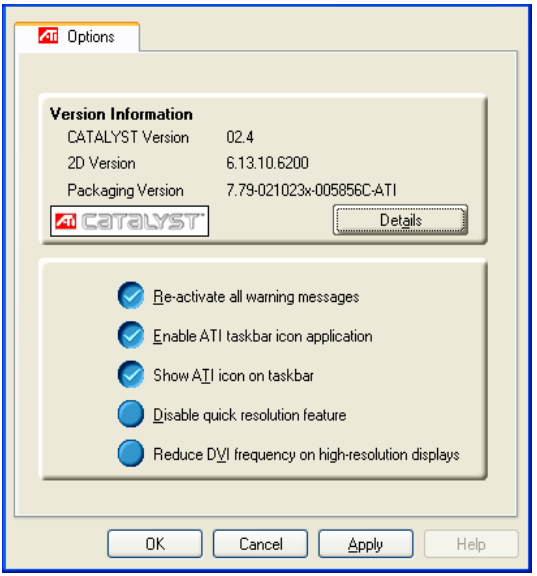
Clicking the **Game Gamma** button accesses the Game Gamma Properties.



Game Gamma Properties	
Red Green Blue sliders	These controls allow you to increase or decrease the color brightness of Direct3D® and OpenGL® games played in fullscreen mode.
RGB Lock	Uncheck this to adjust the RGB sliders individually. Check this to adjust all three sliders at the same time.
Defaults button	This allows you to reset the Game Gamma settings to default values.

ATI Options Tab

The ATI Options tab provides detailed driver information and access to the card's specifications. You can also enable or disable the ATI taskbar icon.



ATI Options Tab	
Version Information	Provides the Catalyst version number, 2D version number and the driver build information.
Details button	Provides access to the Details tab which lists the card's hardware details and driver information.
Reactivate all warning messages	This allows you to reactivate any disabled graphics warning messages.
Enable ATI taskbar icon application	Unchecking this allows you to disable the ATI taskbar applications and removes the ATI icon from your system tray.
Show ATI icon on taskbar	Unchecking this allows you to remove the ATI icon from your system tray without disabling the ATI icon applications.
Disable quick resolution feature	Quick resolution feature is accessible by left-clicking the ATI icon in the system tray. Checking this option disables the feature.

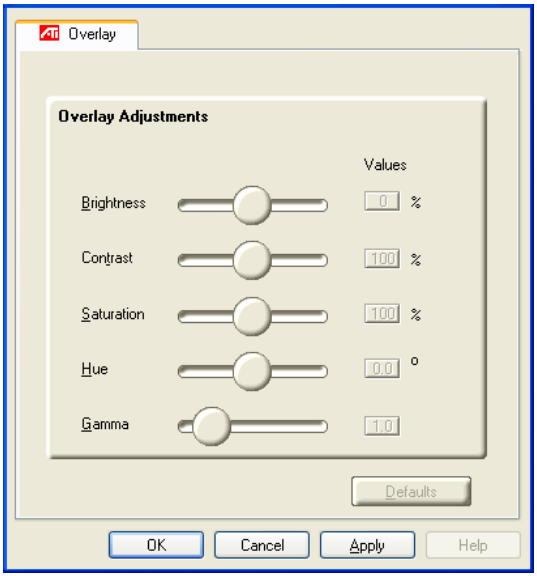
Reduce DVI frequency on high-resolution displays	Fixes display corruption or no displayed image at high resolutions on your DVI-I display. This setting has no effect on cards using a DVI-I-to-VGA adapter.

ATI Overlay Tab

The ATI Overlay tab allows you to configure the brightness, contrast, saturation, hue and gamma properties of your video overlay.

Video Overlay

Video overlay allows for the viewing of full-motion video on your PC. The video overlay controls are automatically activated during playback of any video file type that supports overlay adjustments.



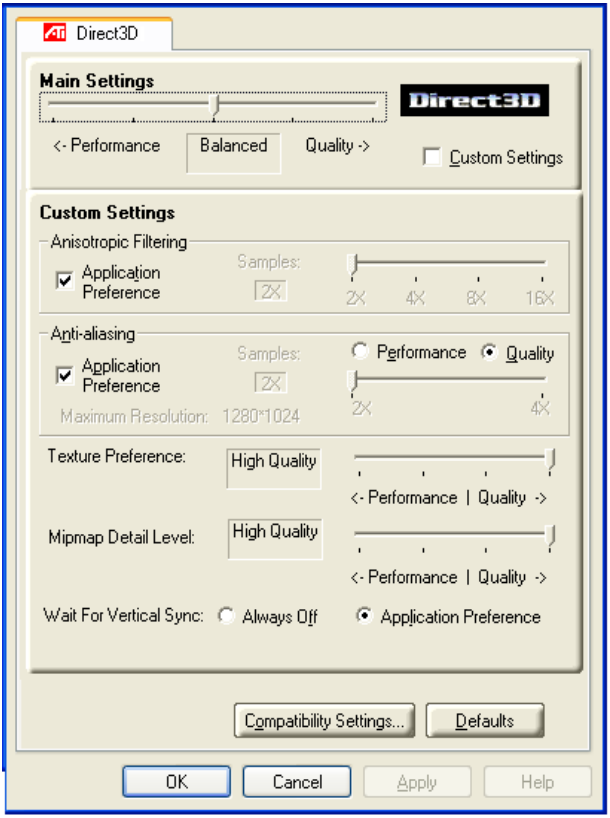
ATI Overlay Tab	
Brightness	Use this slider to adjust the brightness of the video image.
Contrast	Use this slider to adjust the contrast in the video image.
Saturation	Use this slider to adjust the vividness of the color. Sliding it all the way to the left removes all color and produces a black and white picture.
Hue	Use this slider to adjust the pureness or tint of the red, green and blue components of the color.
Gamma	Use this slider to adjust the overall intensity of the video image.
Defaults button	This allows you to reset the Overlay settings to default values.

Direct3D® Control Panel

Using this control panel, you can optimize the display settings for your Direct3D® games.

Main and Custom Settings

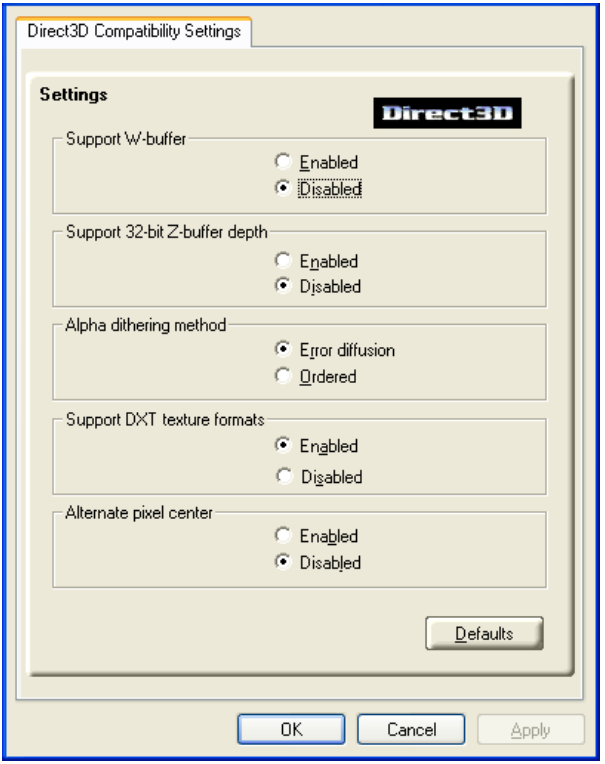
In the **Main Settings** you can maximize overall performance by moving the slider to the left, or you can enhance overall image quality by moving the slider to the right.



Main Settings slider	This allows you to emphasize what kind of application experience you'd like to have. Moving the slider to the left will maximize application performance, while moving the slider to the right will provide excellent 3D image quality. Moving this slider from one position to the next changes the individual Custom Settings sliders found below.
Custom Settings checkbox	When **Custom Settings** is checked, the Main Settings slider is disabled, allowing you to move each individual slider in the Custom Settings section below. Setting the individual sliders gives you complete control over your application experience. Using Custom Settings is recommended for advanced users only.
Anisotropic Filtering checkbox	Anisotropic filtering uses a texture filtering technique that blends multiple texture samples together. Selecting **Application Preference** will result in high quality textures, with a negligible reduction in the application's performance.
Anisotropic Filtering slider	The number of samples taken when anisotropic filtering is performed can vary. By moving this slider to the right, as the number of samples taken increases, the quality of the final image increases significantly. 16X provides extremely detailed, crisp-looking images as a result of the largest number of texture samples possible.
Anti-aliasing checkbox	Anti-aliasing improves image quality by removing jagged edges from 3D images, resulting in smoother, more natural-looking objects. Selecting **Application Preference** will result in high quality images, with a negligible reduction in the application's performance.
Texture Preference slider	Selecting this decides whether your application should use high quality or high performance textures. Moving the slider to the right delivers the highest quality experience. Moving the slider to the left emphasizes a high performance solution while still providing good visuals.

Mipmap Detail Level slider	This will allow you to choose the texture quality of the mipmaps the application will use. Mipmaps are a collection of different sized textures of the same image. As the user moves closer to a 3D object the image quality should increase, requiring a higher quality texture of the same image. The base mipmap is the highest quality texture, and all subsequent mipmaps are smaller sized textures of the same image. Moving the slider to the right selects a higher quality base mipmap, delivering the highest quality application experience. Moving the slider to the left selects a lower quality mipmap, delivering the highest application performance.
Wait for Vertical Sync	Wait for vertical sync will lower the frame rate of full screen games but reduce the image tearing that can occur with the higher frame rate. Selecting **Application Preference** allows the application to decide whether or not it should display its frames at the refresh rate of the monitor. Selecting **Always Off** allows the application to run at its highest possible frame rate, regardless of the monitor's refresh rate which is typically less than the frame rate at which the application will run.
Compatibility Settings button	This button allows you to access advanced settings that can solve compatibility issues for a few specific Direct3D® applications.
Defaults	This button allows you to reset the Direct3D® settings to default values.

Direct3D® Compatibility Settings



Support W-buffer	This will enable W-Buffer support for 3D games. It is recommended to disable this for games that do not support this feature. Certain applications require the increased precision of W-Buffering and will exhibit artifacts unless the W-Buffer is enabled.
Support 32-bit Z-buffer depth	Z-Buffer Bit Depth can be 16 bits, 24 bits, or 32 bits. 16 and 24 are selected by default to achieve optimum performance. Very few applications require a 32 bit Z-Buffer, so in most cases this feature should be disabled.

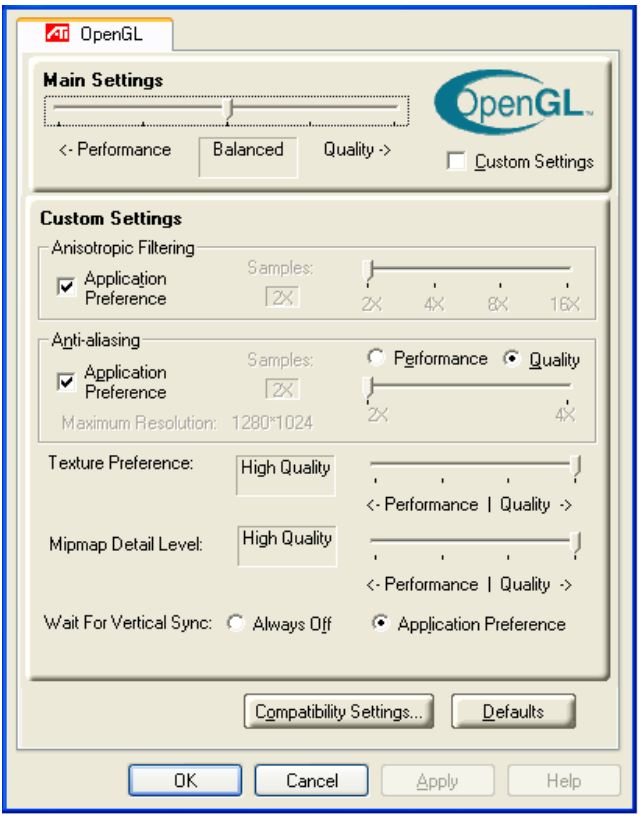
Alpha dithering method	When applications use both dithering and alpha blending, visual artifacts can occur. This option allows you to select how the application should handle both features at the same time. In most cases **Error Diffusion** will handle this situation quite well, but there are a few cases where selecting **Ordered** may be necessary.
Support DTX texture formats	Enabling this allows applications to use this kind of texture format. There are a few applications that can only support a limited number of texture formats. By selecting **Disabled**, the driver will not support DTX texture formats, thus reducing the number of texture formats supported.
Alternate pixel center	This may eliminate problems with some D3D games which display vertical and horizontal lines around textures, or text that appears incorrect. However, this setting should only be used if you are experiencing the symptoms mentioned, as it may cause problems with other games.
Defaults button	This button allows you to reset the Direct3D® Compatibility Settings to default values.

OpenGL® Control Panel

Using this control panel, you can optimize the display settings for your OpenGL® games.

Main and Custom Settings

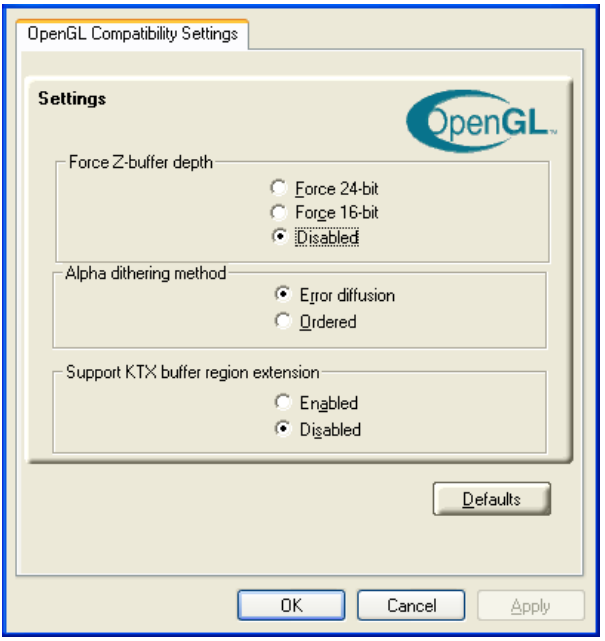
In the **Main Settings** you can maximize overall performance by moving the slider to the left, or you can enhance overall image quality by moving the slider to the right.



Main Settings slider	This allows you to emphasize what kind of application experience you'd like to have. Moving the slider to the left will maximize application performance, while moving the slider to the right will provide excellent 3D image quality. Moving this slider from one position to the next changes the individual Custom Settings sliders found below.
Custom Settings checkbox	When **Custom Settings** is checked, the Main Settings slider is disabled, allowing you to move each individual slider in the Custom Settings section below. Setting the individual sliders gives you complete control over your application experience. Using Custom Settings is recommended for advanced users only.
Anisotropic Filtering checkbox	Anisotropic filtering uses a texture filtering technique that blends multiple texture samples together. Selecting **Application Preference** will result in high quality textures, with a negligible reduction in the application's performance.
Anisotropic Filtering slider	The number of samples taken when anisotropic filtering is performed can vary. By moving this slider to the right, as the number of samples taken increases, the quality of the final image increases significantly. 16X provides extremely detailed, crisp-looking images as a result of the largest number of texture samples possible.
Anti-aliasing	Anti-aliasing improves image quality by removing jagged edges from 3D images, resulting in smoother, more natural-looking objects. Selecting **Application Preference** will result in high quality images, with a negligible reduction in the application's performance.
Texture Preference slider	Selecting this decides whether your application should use high quality or high performance textures. Moving the slider to the right delivers the highest quality experience. Moving the slider to the left emphasizes a high performance solution while still providing good visuals.

Mipmap Detail Level slider	This will allow you to choose the texture quality of the mipmaps the application will use. Mipmaps are a collection of different sized textures of the same image. As the user moves closer to a 3D object the image quality should increase, requiring a higher quality texture of the same image. The base mipmap is the highest quality texture, and all subsequent mipmaps are smaller sized textures of the same image. Moving the slider to the right selects a higher quality base mipmap, delivering the highest quality application experience. Moving the slider to the left selects a lower quality mipmap, delivering the highest application performance.
Wait for Vertical Sync	Wait for vertical sync will lower the frame rate of full screen games but reduce the image tearing that can occur with the higher frame rate. Selecting **Application Preference** allows the application to decide whether or not it should display its frames at the refresh rate of the monitor. Selecting **Always Off** allows the application to run at its highest possible frame rate, regardless of the monitor's refresh rate which is typically less than the frame rate at which the application will run.
Compatibility Settings button	This button allows you to access advanced settings that can solve compatibility issues for a few specific OpenGL® applications.
Defaults	This button allows you to reset the OpenGL® settings to default values.

OpenGL® Compatibility Settings



Force Z-buffer depth	This allows you to explicitly set the Z-Buffer depth. Most applications will work best when **Disabled** is selected.
Alpha dithering method	When applications use both dithering and alpha blending, visual artifacts can occur. This option allows you to select how the application should handle both features at the same time. In most cases **Error Diffusion** will handle this situation quite well, but there are a few cases where selecting **Ordered** may be necessary.
Support KTX buffer region extension	Enabling this feature allows rapid updates of those portions of your screen that have changed. Note that most applications will not be affected by activating this feature.
Defaults button	This button allows you to reset the OpenGL® Compatibility Settings to default values.

SMARTGART™

SMARTGART is a suite of testing and diagnostics tools that perform a variety of bus tests to determine the optimal settings for your ATI graphics accelerator installed in your computer.

SMARTGART automatically configures your graphics device to the optimal settings. SMARTGART *does not* actually disable any AGP functionality in your computer's hardware. It simply instructs the ATI CATALYST driver not to use a specific AGP function if that specific AGP function hasn't passed the SMARTGART diagnostics test.

Changing the AGP settings could result in system instability.

Set AGP Settings

Experienced users can manually change the AGP speed. You will need to reboot your computer for this change to take effect.

The possible AGP speed is dependent on the motherboard chipset and design. Your computer's available AGP speeds are shown in the SMARTGART dialog.

Fast Write

Fast Write allows the CPU to transfer data directly to the graphics accelerator.

By default, this feature is set to ON providing your motherboard's chipset supports Fast Writes.

Some motherboard specifications may claim chipset support for Fast Writes but may not be compatible with many different graphics accelerators.

This setting is disabled for many computers because the motherboard is not capable of supporting this feature.

Retest All

Click this button to retest all graphic bus capabilities. All tests and diagnostics are initiated immediately following a system restart.

*Any settings that have previously been set to **Off** will be turned on, providing the test passes.*

Problems can arise if the user enables a secondary graphics accelerator (in a multiple monitor environment) after the operating system has loaded. The problem exists because the secondary graphics card is enabled after the SMARTGART diagnostic test have been run. To ensure system stability you should restart the computer *after* the secondary graphics accelerator is enabled so that both graphics accelerators can be tested with SMARTGART.

Using TV Out

View your PC's display on a TV

Your RADEON 9000 has TV Out capability. You can attach your card to a TV and monitor at the same time. Or you can connect it to your VCR and record your monitor's display.

TV display is ideal for playing games, giving presentations, watching movies, and browsing the Internet. The following tips will help you get the most out of your TV Out feature.

IMPORTANT INFORMATION for European Customers

Some PC monitors in Europe **cannot** be used simultaneously with TV display. When you enable TV display in Europe, the refresh rate for the monitor and TV is set to 50Hz. Some monitors may not support this refresh rate and could be damaged.

- Please check the documentation supplied with your monitor to see if your monitor supports a refresh rate of 50Hz.
  If your monitor does not support 50 Hz (or if you are not sure), then turn off your monitor before turning on your PC when using your TV as a display.

For information on disabling TV display, see **How To Enable/Disable The TV Display on page 28**.

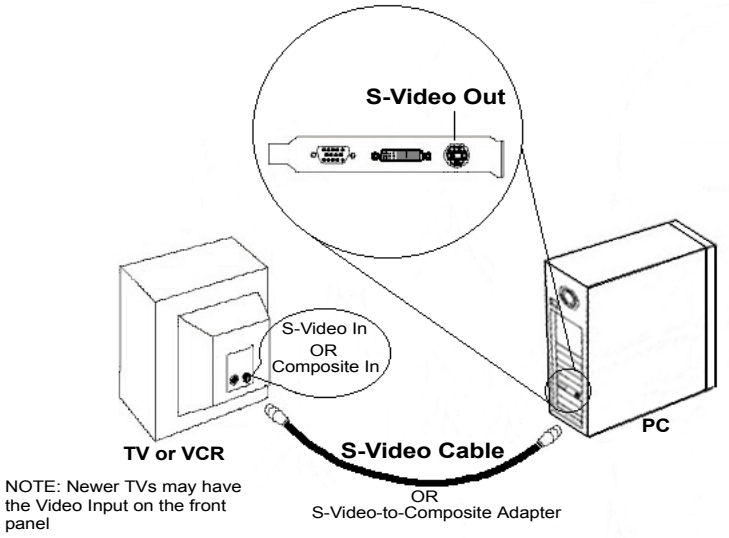
Some TVs in Europe may use a SCART connection. If you use SCART, please read **Using SCART Connectors for European TVs on page 28** before attempting to connect your PC to your European TV.

Connecting to a TV or a VCR

To connect your graphics accelerator card to a TV or a VCR, use a S-Video cable. However, most TVs (and VCRs) have a Composite video input, in which case you can use the supplied S-Video-to-Composite video adapter. If your TV has cable input only, you can connect your card to your TV through your VCR or an RF modulator (available in most electronics stores).

Connecting S-Video Out to a TV or VCR

1. Turn off your PC and your TV (or VCR).
2. Ensure your card was installed correctly as per the Getting Started Guide.
3. Determine if your TV (or VCR) has a S-Video or Composite video connection.
4. Looking at the back of your PC, locate your S-Video Out. Using a S-Video cable or the supplied adapter, attach one end of the cable to your graphics card and the other to your TV (or VCR). Refer to the illustration for further help.
5. Turn on your PC and your TV (or VCR).

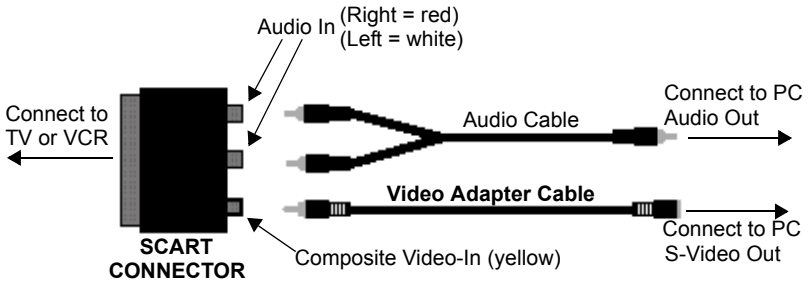


Starting Windows® with TV Display Enabled

The TV screen may become scrambled during the initial Windows® logo display. This is only a temporary effect and your screen will be restored within a few seconds.

During start up, your graphics accelerator card will go through a sequence of mode settings, during which your TV display will remain blank. This process takes only a few seconds and helps program the TV display.

Using SCART Connectors for European TVs



The SCART connector supports only the Composite video format, which means you will have to use the S-Video-to-Composite Video Adapter Cable. The above illustration shows how to connect your PC to a European TV using the SCART. If your European TV **does** support S-Video input, you should use an S-Video cable (available in most consumer electronic stores) rather than the SCART connector.

How To Enable/Disable The TV Display

1. Access the Windows® **Control Panel**. Double-click **Display**.
2. Click on the **Settings** tab and then the **Advanced...** button.
3. Click on the **ATI Displays** tab. Click on the **TV** button.
4. Click the enable/disable button. 
5. Click **OK** or **Apply** to save the changes.

Using and Adjusting TV Out

For information about how to use TV display, right click the **ATI taskbar icon**, point to **Help**, then point to **ATI Television Display**.

Using a Monitor vs. Using the TV Display

Using your TV for your PC's display is ideal for playing games, giving presentations, watching movies, and browsing the Internet. However, the display on your monitor may change or looked squashed. This occurs because the display adjusts to fit the dimensions of your TV. To correct the monitor's display, use the monitor's control buttons to adjust its display size and position.

Some single frequency monitors may not work with TV display enabled. If you experience problems when TV display is enabled, disable TV display to restore your monitor's display.

Adjusting Monitor Display

The size of the display on your monitor may be smaller and not perfectly centered when you have TV display enabled. These effects are caused by the changes required to provide a proper display on the TV.

Use the controls available on the **Adjustments** tab on the **Monitor Properties** page (accessible by clicking on the **Monitor** button on the **ATI Displays** tab) to adjust the display on your monitor only. Click on the **TV** button to adjust the TV display only.

Viewing Text on a TV

A TV is designed primarily to show moving, rather than static, images. The large dot pitch of a TV (which is fine for moving video) will yield poor quality static images such as text.

The small text sizes commonly used for PC desktops can appear blurred or unclear on a TV. You can compensate for this by using larger fonts.

To Use Larger Display Fonts

1. Access the Windows® **Control Panel**. Double-click **Display**.
2. For Windows® XP, click the **Appearance** tab. For Windows® Me and Windows® 2000, click the **Settings** tab, the **Advanced...** button, then the **General** tab.
3. In the **Font Size** box, select the size you want your displayed fonts to be.
4. Click **Apply**. If prompted, click **Yes** to restart your PC.

Reducing Edge Distortion

When using a TV for your PC's display, you may see some edge distortion on the left and right side of your TV screen. This effect depends on your TV and the PC application you are running.

To reduce edge distortion, you can increase the TV display's horizontal size.

To Increase the Horizontal Size

1. Access the Windows® **Control Panel**. Double-click **Display**.
2. Click on the **Settings** tab and then the **Advanced...** button.
3. Click on the **ATI Displays** tab.
4. Click on the **TV** button.
5. Click the **Adjustments** tab.
6. In the **Screen Size** section**,** click on the plus (+) button beside the horizontal arrowheads  to increase the horizontal size of the TV display.

7 Click **OK** or **Apply** to save the changes you have made.

You can also reduce edge distortion by increasing the TV's contrast.

To Increase the TV Contrast

1 Access the Windows® **Control Panel**. Double-click **Display**.

2 Click on the **Settings** tab and then the **Advanced...** button.

3 Click on the **ATI Displays** tab.

4 Click on the **TV** button.

5 Drag the **Contrast** slider to the right to increase the contrast.

6 Click **OK** or **Apply** to save the changes you have made.

Changing Display Configurations

If you move your PC to a place where you are using TV display only, make sure that you have the TV display feature enabled.

You can set your display resolution as high as 1024 x 768. However, higher resolutions will result in a virtual desktop. If a TV is your only display device and a higher mode is selected, the display on your TV will disappear.

Using Games and Applications

Some older games and applications may program your graphics accelerator card directly, to run under a specific display mode. This may cause your TV display to turn off automatically or become scrambled (the PC monitor will not be affected). Your TV display will be restored once you exit the game or if you restart your PC.