

Radeon® 9600 PRO

PC & Mac Edition

User's Guide

P/N 137-40864-10

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CHAPTER 1:

Introduction

The Radeon® 9600 PRO PC & Mac Edition is a graphics accelerator card that delivers maximum programmability and entertainment value to both gamers and developers. It includes flexible dual-display support for multiple combinations of Digital Flat Panel and CRT monitors. Your new graphics card provides:

- Flexible dual-display support enabling many combinations using digital and analog displays.
- OpenGL® acceleration providing superior 3D rendering performance, advanced imaging, and filtering techniques.
- Quartz® Extreme and Core Image.
- Industry leading DVD acceleration for High Bitrate, low CPU usage, and playback of the latest movies at any resolution.

The Radeon® 9600 PRO PC & Mac Edition can also be installed in a Microsoft® Windows® based computer. For more information see the PC Getting Started guide that was shipped with your graphics card. A PC-specific version of the User's Guide can be found on the PC installation CD-ROM.

System Requirements

Hardware	<ul style="list-style-type: none">• AGP 4X capable G4 or G5 computer.• Minimum 512MB of system memory.
Operating System	<ul style="list-style-type: none">• Mac OS® X version 10.3.6 or higher.
Monitor	<ul style="list-style-type: none">• Compatible display devices: DVI or VGA display (using the supplied DVI-to-VGA adapter).• ADC Style Display Panel requires an adapter (sold separately).

External Connections

- One Dual Link DVI output.
- One Single Link DVI output.

Note: Future references to Mac OS® X in this manual are intended to be generic and inclusive of their respective versions of the Macintosh® operating systems.

Related Documentation

The README file summarizes the latest product revisions. Click the README icon on the installation disk to open this file.

Detailed help and feature descriptions are available directly in ATI Displays.

Multimedia Features

Your Radeon® 9600 PRO PC & Mac Edition turns your Mac computer into a 3D and 2D graphics powerhouse. Use your new graphics accelerator card to:

- Enjoy true-color 32-bit 2D or 3D graphics up to 2560 x 1600.
- Watch full screen, full motion, DVD quality video using the Apple® DVD Player or QuickTime® playback acceleration.
- Output your Mac's display to digital flat panels and digital projectors.
- Output to analog displays and projectors.

The following information describes these features in more detail and suggests ways you can optimize your machine to get the most out of your card.

Viewing 3D Graphics

Radeon® 9600 PRO PC & Mac Edition's 3D acceleration features support the following advanced 3D graphics capabilities:

- 4 pixel pipeline architecture.
- 128 bit memory interface.
- Hardware accelerated vertex and pixel shaders.
- 1.6 Gigapixels per second fill rate.
- transform rate of 200 million vertices per second.
- 8.6 GB/sec memory bandwidth.

In addition, the Radeon® 9600 PRO PC & Mac Edition offers the following graphics technologies:

SmoothVision™ 2.1 is an antialiasing solution that raises the bar for image quality using programmable multi-sampling methods to post-process graphics before they are displayed.

SmartShader™ 2.0 contains advanced vertex and pixel-shading capabilities. A shader is a small program that runs on the GPU and describes how an image should be rendered. Vertex shaders manipulate the individual polygons that make up 3D objects, and pixel shaders operate on the individual pixels that fill in these polygons to create a visible image. SmartShader™ 2.0 is designed to alleviate the resource constraints of earlier shader hardware, paving the way for more complex, detailed, and realistic shader effects in applications requiring high-performance 3D rendering.

HyperZ™ III makes Z-buffer bandwidth usage more efficient by decreasing the amount of information sent to the frame buffer at higher resolutions.

Radeon® 9600 PRO PC & Mac Edition only displays 3D graphics in thousands and millions of colors. If you set your display to 256 colors, this will affect Finder™, OpenGL®, Quartz® Extreme, and QuickTime® acceleration.

TV Out Support

The Radeon® 9600 PRO PC & Mac Edition supports TV Out by using the optional Apple® G5 DVI-I to Video Adapter. For more information see your local Apple® reseller.

CHAPTER 2:

ATI Displays Control Panel

Introduction

The ATI Displays control panel provides access to the advanced features of that the Radeon® 9600 PRO PC & Mac Edition has to offer.

Open the ATI Displays control panel

1 Open the **Apple® System Preferences**.

2 Click the **ATI Displays** icon.

or

1 Click the **Hard Disk** icon.

2 Open **Applications** folder.

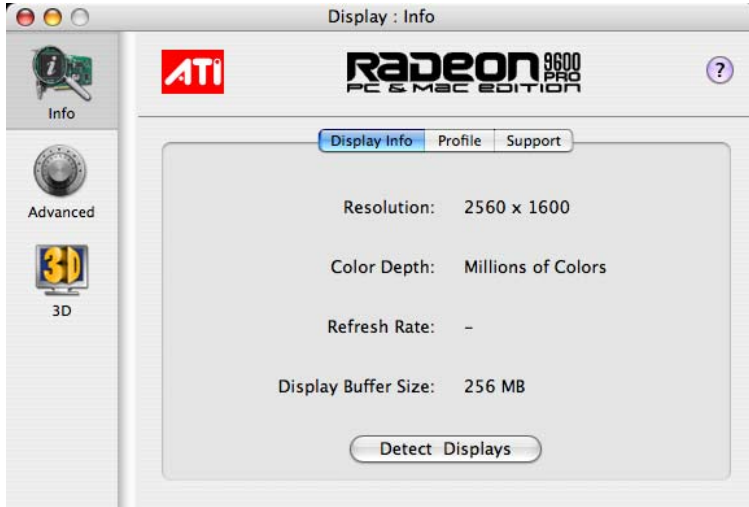
3 Open **Utilities** folder.

4 Open **ATI Utilities** folder.

5 Open **ATI Displays**.

For detailed instructions on how to set up and use these features, refer to the built-in help feature, which can be accessed through the ATI Displays control panel.

ATI Displays Control Panel



Display Info dialog shows the current display settings for the display.

Detect Displays button detects all connected displays. This feature is useful when a second VGA monitor is connected to your graphics adapter. Detect Displays removes the need to restart your computer.

Note: Your display will momentarily go blank when all devices are being detected.

The **Profile** dialog presents information on the specific Radeon® graphics card and video driver installed in your computer. Even if ATI Displays cannot identify your ATI product it will still provide display configuration, driver version and other related information. A warning dialog will display if no ATI product is installed in your computer.

The **Support** dialog provides an internet link to ATI Technologies' web site.

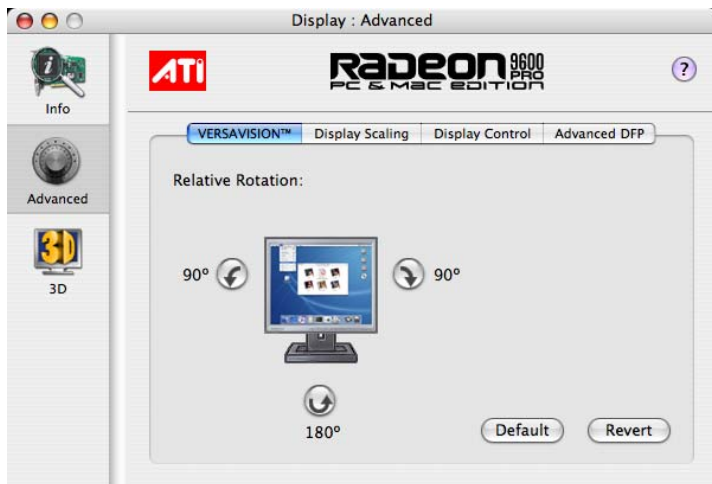
Click **Create Apple® System Profiler Report** to generate a detailed report of the computer's installed hardware and software.

Advanced Display Options

Advanced Display Options adds even more functionality, giving you complete control over your display.

To access the Advanced features open the ATI Displays control panel and click the **ADVANCED** button.

VersaVision™ Tab



Use the **VersaVision™** tab to rotate your display while maintaining the full feature set of other ATI 2D and 3D technologies. ATI's hardware accelerated display rotation and scaling technology provides rotation left or right by 90 degrees or turn it upside down to a full 180 degree rotation.

Use **Relative Rotation** to rotate the contents of your display relative to its current position. Hovering the mouse cursor over a direction button will show you a preview of the change. Clicking the desired rotation button will cause the display to refresh and rotate.

Full 3D support is maintained regardless of rotation selected.

Use the **Default** button to reset Relative Rotation and return your display to its normal orientation.

Use the **Revert** button to undo all changes and reset the desktop to the original state or last known good setting.

Display Scaling

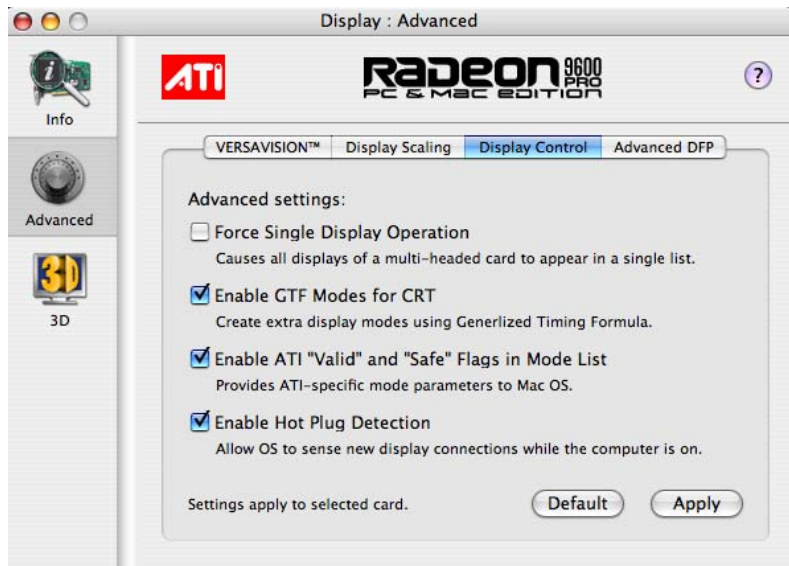
Use this option to control the display output size without affecting the desktop resolution of your display.



If the computer desktop, toolbar or dock exceeds the physical size of your display select **Standard Underscan (87%)** in the **Desktop Size** drop down menu.

You can also create a unique desktop size by selecting **Custom** and adjusting the slider to the desired setting.

Display Control Tab



Force Single Display Operation, when using a dual display video card, causes all display modes to appear as a single list of supported resolutions in the Apple® Displays Properties.

Only one display is on when this feature is enabled. The default setting is Disabled.

Enable GTF Modes for CRT provides a list of all available modes for your monitor based on the Generalized Timing Formula standard. This feature is enabled by default.

Enable ATI "Valid" and "Safe" flags in mode list, when enabled, lets the video card to determine which video modes are valid and safe.

Enable Hot Plug Detection lets the operating system automatically detect when a display is connected to the computer and activates the "Detect Displays" button. This removes the need to restart the computer after attaching a secondary display.

Default button undoes all changes and sets everything to the factory default settings.

Apply button causes all the selected options to be enabled at one time.

Advanced DFP Tab

The features on this tab are intended to support Digital Flat Panels (DFP) only.



Enable ATI Hardware Scaler on non-Apple panels can be used with flat panels with fixed resolutions. Use this feature to change video modes using the ATI Scaler.

Enable frequency reduction on high resolution displays may correct problems concerning jitter or dot crawl.

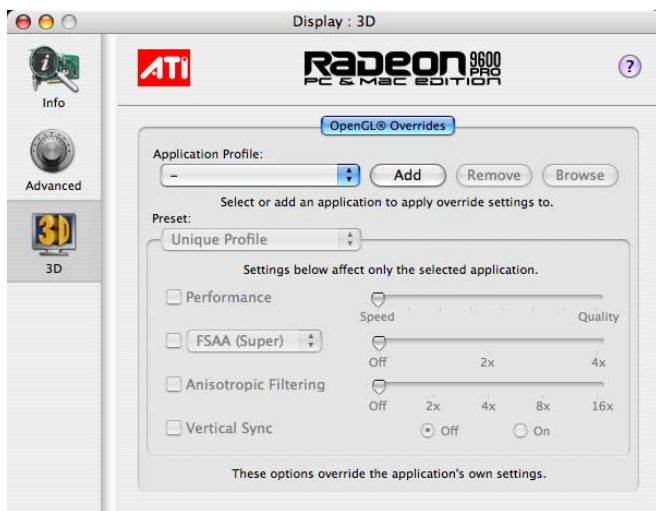
Enable Alternate DVI TMDS Receiver Mode corrects problems such as noise or blank screens on some flat panels.

Default button undoes all changes and sets everything back to the original factory settings.

Apply button enables all the selected options at one time.

3D OpenGL® Overrides

ATI Displays can override key 3D graphics options for OpenGL® based games and applications. Create a profile, a group of settings, that can be applied on a per program basis. Use OpenGL® Overrides to turn on OpenGL® functionality when it is not supported by a specific application or turn off functionality where it is enabled by an application.



Add an Application Profile

To add an application to the Application Profile list:

- 1 Click the 3D icon in ATI Displays.
- 2 Click **Add**.
- 3 Browse to the desired application.
- 4 Click **Choose**.

Select or Create a Preset

ATI Displays includes a number of predefined OpenGL® presets that can be applied to any application. You can also create your own unique preset.

To select a Preset:

- 1 Click the 3D icon in ATI Displays.
- 2 Select the desired preset from the Preset drop-down menu.

To create a new preset:

- 1 Click the 3D icon in ATI Displays.
- 2 Click Preset drop-down menu and select **New Preset**.
- 3 Enter a name for the preset.

- 4 Configure the preset by making adjustments to the Performance, FSAA, Anisotropic Filtering, and Vertical Sync sliders.

Note: The preset selections and adjustments are saved automatically as they are made.

Enabling Mac2TV™

The Mac2TV™ options are available when a TV is detected by the graphics card. Mac2TV™ is only supported using the single link DVI output via an Apple® DVI-to-Video adapter.

Set Up Tab



Video Output shows whether a TV or VCR has been detected. Select Always Connected to over-ride this feature and force TV detection. Video Output will display Device Detected (Off) or Device Detected (On) depending on whether TV mode is selected. This feature is only supported by graphics cards with a native TV Out port. The Radeon® 9600 PRO PC & Mac Edition has this feature greyed out as it is always supported when Mac2TV™ is enabled.

Use **Output Standard** to select and restrict the TV standard for your country. The default setting is NTSC/PAL which provides support for both standards.

Black & White, when enabled, forces Black & White output. The video card produces greys instead of colors in the output signal producing sharper images and text.

Extra Set up: Hard Sync to TV, when enabled, removes a black line that may appear at the bottom of the screen of high end TV equipment. This process slightly alters the color across the screen. This color alteration may or may not be visible.

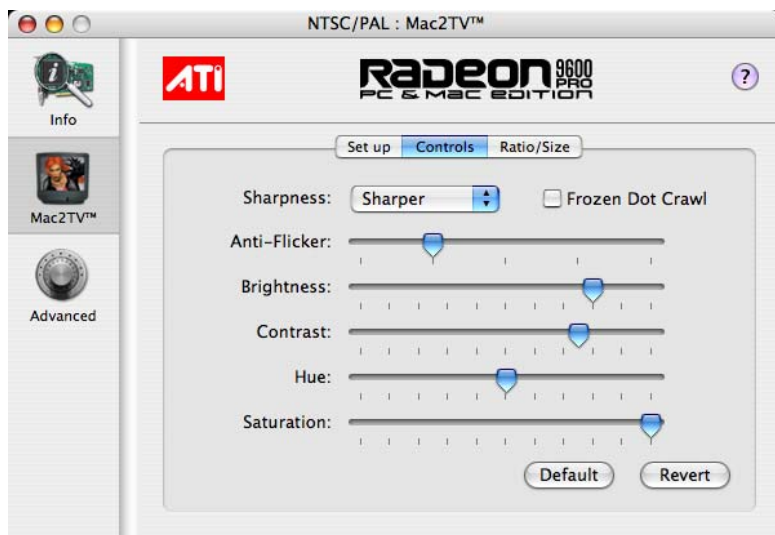
Unless you notice a black line on your TV screen, it is recommended to leave Hard Sync to TV disabled.

Optimizing Mac2TV™

You can optimize your TV display using the video out preferences. Viewing images on your TV can be improved by changing the contrast, brightness, or size of your display.

To set the video out preferences, click the Mac2TV™ icon on the ATI Displays Control Panel then click the **Controls** tab button.

Controls Tab



Sharpness makes details on the TV screen sharper. Use this setting to make blurry text readable.

Frozen Dot Crawl, when enabled, removes the undesirable characteristic of many Composite televisions that is seen as thin, jagged edges moving around objects on the screen. It is especially useful for viewing pictures or stills. S-Video equipment does not exhibit this effect.

The **Anti-Flicker** slider reduces the amount of display flicker. Display flicker is both a distraction and tiring to your eyes, and is most pronounced when text is being displayed.

The **Brightness** slider is related to the amount of light emitted by your display or reflected from an object.

The **Contrast** slider is a ratio of how far the whitest whites are from the blackest blacks. If the contrast is too high, the image may look stark, like pure white squares on a jet-black background. If the contrast is too low, the image may look gray or washed out.

The **Hue** slider, often used as a synonym for “color”, is the quality that distinguishes among red, green, yellow, and so on. Hue is generally not adjusted. Depending on the TV, however, it may be necessary or desirable to adjust the hue to approximate the monitor’s display.

The **Saturation** slider is the amount of color present that distinguishes pale or washed-out colors from vivid ones. Extreme settings, will produce black & white (greyscale) output.

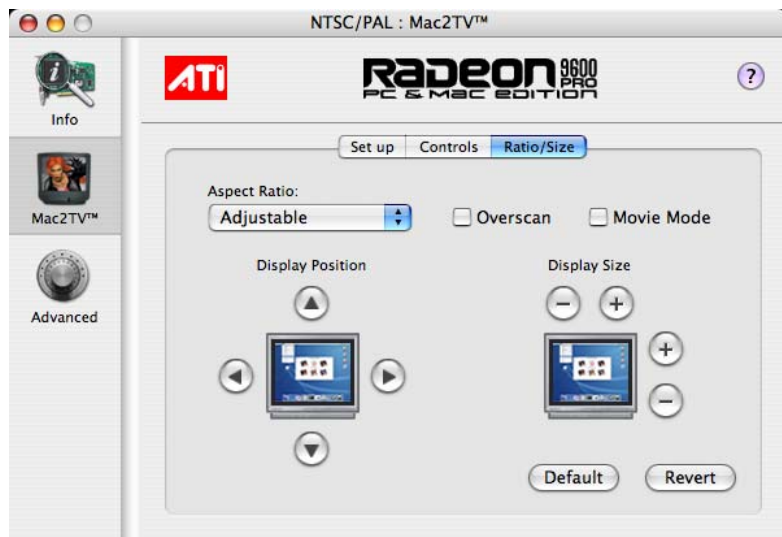
The **Default** button undoes all changes and sets everything to the factory default settings.

The **Revert** button undoes all changes and sets everything to the original state or last known good setting.

Ratio/Size Tab

Use the **Ratio/Size** tab to adjust the Aspect Ratio and change the display size and position.

To set the video out preferences, click the Mac2TV™ icon on the ATI Displays Control Panel then click the **Ratio/Size** tab button.



Use **Aspect Ratio** to select between a fully adjustable display or one locked to a specific aspect ratio. 4:3 Standard, 16.9 Widescreen, and Current screen resolution are all fixed modes.

Overscan increases the vertical and horizontal size to fill your TV.

Use **Movie Mode** for the best results viewing TV or DVDs.

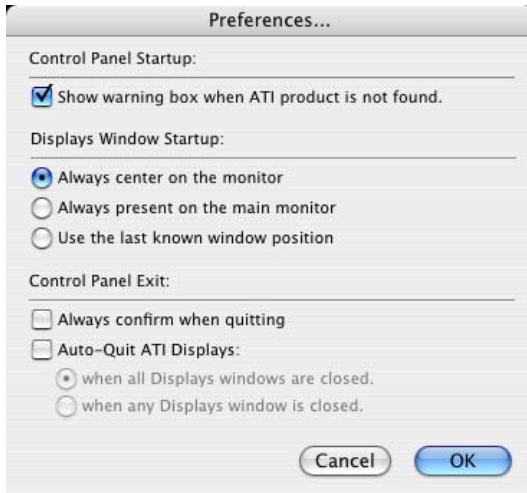
Use **Display Position** to move the TV/VCR image on your display. Use the arrow buttons to locate the image to the desired position.

Use **Display Size** to increase or decrease the size of the TV/VCR image on your display.

The **Default** button undoes all changes and sets everything to the factory default settings.


The **Revert** button undoes all changes and sets everything to the original state or last known good setting.

ATI Displays Preferences



From the ATI Displays drop down menu you can set the Preferences for the ATI Displays control panel. Here you can configure how the ATI Displays control panel starts and exits.

ATI Displays Help

ATI Displays Help is an additional source of information when you are using the ATI Displays control panel. Simply click on the  icon on the ATI Displays control panel.

Using DVD and QuickTime® Playback

Use the Radeon® 9600 PRO PC & Mac Edition's QuickTime® playback acceleration to stretch movies to full screen size without compromising frame rate or image quality. Radeon® 9600 PRO PC & Mac Edition's hardware scaler maintains the original quality of your DVD or QuickTime® movie when scaling to a larger size – even full screen.

When playing movies in thousands or millions of colors, the ATI card utilizes the 3D engine's capabilities to scale and accelerate playback. When scaling video, the Radeon® 9600 PRO PC & Mac Edition uses special hardware techniques (bilinear filtering) to enhance the video quality instead of just repeating pixels.

Using Digital Flat Panel (DVI)

Use Radeon® 9600 PRO PC & Mac Edition's DVI support feature to output your computer's display to your DVI digital flat panel, providing you with:

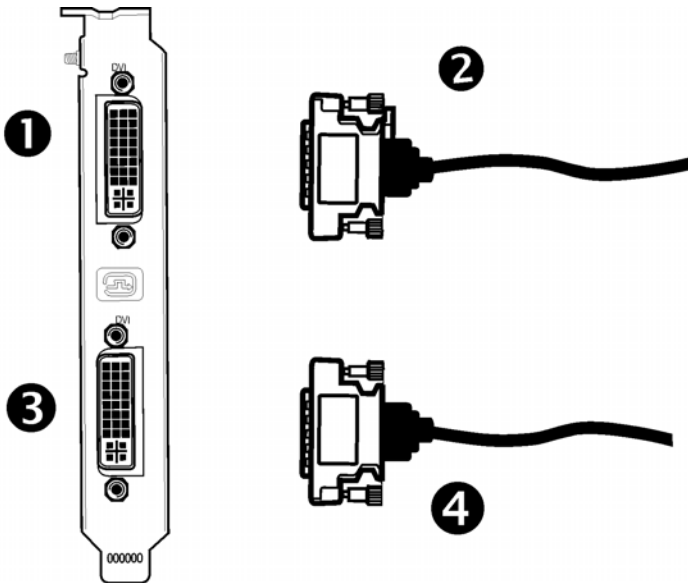
- Crisper, clearer images.
- A true flat screen.
- Virtually no eye strain from prolonged viewing.

Using Radeon® 9600 PRO PC & Mac Edition DVI Connector

Use Radeon® 9600 PRO PC & Mac Edition to connect to a digital flat panel display.

To output your computer's display to a DVI digital flat panel

- 1 Looking at the back of your Mac, locate your ATI Graphics Accelerator.
- 2 Attach one end of your DVI cable to the DVI connector on your Radeon® 9600 PRO PC & Mac Edition and the other end to the DVI connector on your DVI flat panel.



1 Dual Link DVI Monitor Port

-
- | | |
|---|-----------------|
| ② | DVI-I Connector |
|---|-----------------|
-
- | | |
|---|--------------------------------|
| ③ | Single link DVI-I Monitor port |
|---|--------------------------------|
-
- | | |
|---|-----------------|
| ④ | DVI-I Connector |
|---|-----------------|
-

3 Turn on your DVI flat panel and your Mac.

Note: The DVI connector is hot swappable. You no longer need to shut down your computer before attaching a digital flat panel.

A dual-link DVI transmits up to twice the amount of pixel information of single link DVI connection. Use the dual-link DVI connector for extremely high resolution displays such as Apple® 30-inch Cinema HD Displays.

CHAPTER 3:

Specifications

Video Mode Table

The video mode table below lists the color depth capabilities for the supported resolutions on your Radeon® 9600 PRO PC & Mac Edition.

Please consult your monitor's specifications to determine which resolutions are available with your display.

Supported Modes	
Display Resolution	Maximum Refresh
640 x 480	200
720 x 480	200
800 x 600	200
1024 x 768	200
1152 x 864	200
1152 x 870	75
1280 X 960	200
1280 x 1024	200
1600 x 900	200
1600 X 1024	150
1600 X 1200	150
1920 X 1080	150
1920 X 1200	120
1920 X 1440	120
2048 X 1152	120
2048 X 1280	120

Supported Modes	
Display Resolution	Maximum Refresh
2048 X 1536	100

The minimum refresh rate for the above modes is 56Hz.

Digital Flat Panel

Connection Type	Resolution	Example Product
Single-Link (one DVI)	1680 X 1050	Apple 20" Cinema HD
Single-Link (one DVI or ADC)	1920 X1200*	Apple 23" Cinema HD
Dual-Link (one DVI)	2560 X 1600	Apple 30" Cinema HD
Single-Link (one DVI low refresh rate)	3840 X 2400	IBM T221

*Using a reduced blanking interval compatible with Apple®'s Cinema HD ADC Display. This timing is not compatible with VESA's 1920 x 1200 resolution when attached to an ADC connector.

CHAPTER 4:

Reference

Product Registration

To activate Customer Care you must register your product with ATI at: ati.com/online/registration

Customer Care

For detailed instructions on how to use your ATI product, refer to the Online User's Guide included on your ATI installation CD-ROM.

If you require further assistance with your product, the following Customer Care options are available:

Service	Availability	Language	Cost	Access
Online	24/7	English, French, Spanish, Portuguese, German	Complimentary	ati.com
Telephone US & Canada	9:00AM - 7:00PM EST. Monday to Friday.	English	Toll Free	1-877-284-1566
			International and/or local toll charges to Canada will apply.	1-905-882-2626
Telephone Europe and Other Regions	10:30 to 00:00 GMT	English	International and/or local toll charges to Germany will apply	+49-1803-347345
	10:30 to 19:00 GMT	German-French		
	12:00 to 20:30 GMT	Spanish-Portuguese	International and/or local toll charges to Canada will apply	+1-905-882-5549

Service	Availability	Language	Cost	Access
Telephone Latin America / South America	7:00AM to 3:30 PM EST	Spanish, Portuguese	Toll Free	+0800-333-5277 (Argentina)
			Toll Free	+0800-891-9068 (Brazil)
	7:00AM to 7:00PM EST	English	Toll Free	+001800-514- 3276 (Mexico)
			International and/or local toll charges to Canada will apply	+1-905-882-3277 (Other)
Mail	ATI TECHNOLOGIES INC. Attention: Customer Care 1 Commerce Valley Drive East Markham, Ontario Canada L3T 7X6			Complimentary

ATI Customer Care will work to resolve your issue and help you to get your ATI product up and running. If your issue is not resolved, our technicians will determine whether the difficulty you are experiencing is the result of the ATI product, whether your product contains a defect, and whether your product is under warranty.

- ATI Customer Care is unable to assist with refunds, returns, or exchange specific inquiries. If resolving the problem being experienced is critical to your decision to keep the product, it is your responsibility to ensure that you know and are within the period of time your reseller will allow for refunds, returns or exchange.
- ATI is not responsible for any expense incurred accessing Customer Care. It is expected that customers will review the expense associated with the available support options and will choose the method that best meets their needs and budget.
- ATI Customer Care reserves the right to limit support options for products that are not registered or are at End of Life.

CHAPTER 5:

Compliance Information

FCC Compliance Information

This Radeon® product complies with FCC Rules part 15. Operation is subject to the following two conditions

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with manufacturer's instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Re-orient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The use of shielded cables for connection of the monitor to the graphics card is required to ensure compliance with FCC regulations. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Industry Canada Compliance Statement

ICES-003 This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la Classe B est conforme à la norme NMB-003 du Canada.

For further compliance information:

ATI Research Inc.
4 Mount Royal Ave.
Marlborough, MA
01752-1976
USA
508-303-3900

Waste Electrical and Electronic Equipment (WEEE) Directive Compliance

This product was manufactured by ATI Technologies Inc.



Glossary

2D

Acronym for “two dimensional,” a term applied to computer graphics that are “flat.” Typical desktop applications such as word processors, spreadsheet programs, or other programs that manipulate print or simple graphics (such as pictures or line art) are generally considered to be operating within a 2D environment, even when they include simple three dimensional elements, such as buttons.

3D

Acronym for “three dimensional,” referring to computer graphics that appear to have volume and depth. Various modelling processes take the representation of a three dimensional object provided by the computer program and render it by using various lighting components, applying textures, and setting layers of transparency or opacity as required in order to produce a realistic representation of a three-dimensional object on a two-dimensional display.

ADC

Short for “Apple® Display Connector,” a type of video connection found only with certain Apple displays. In addition to carrying the video signal to the monitor, it also carries power, so users can start their whole computer using the power button on the monitor. This type of connector is being phased out in favor of DVI connectors.

Alpha Blending

Alpha blending is used in 3D graphics to create transparent or opaque effects for surfaces such as glass and water. Alpha is a transparency value, so the lower the value, the more transparent the image looks. It is also used in animations to produce such things as fading effects, where one image gradually fades into another.

Anisotropic Filtering

A technique that preserves the surface details of an object as it recedes into the distance by utilizing and blending together the object’s texture maps.

This makes 3D objects appear more realistic as the detail of their surface texture is retained in a smooth, seamless fashion on the sections that move or fade away into the background.

Anti-aliasing

A method that smooths out the jagged edges of a curved object. A black curved line on a white background displayed on a computer screen will have some jaggedness along its edges due to the inherent limitations of using discrete pixels to display the image. Anti-aliasing smooths out this jaggedness by filling in the white spaces between the jagged edges with varying shades of grey.

Aspect Ratio

The proportions of a display are expressed as a ratio of its width and height. Common ratios include 4:3 for TVs and CRTs, 5:4 for LCDs, and 16:9 for widescreen displays.

Back Buffer

A type of offscreen memory used to provide smooth video and 2D graphics acceleration. This technique uses two frame buffers, so the process is often referred to as “double-buffering.” While the contents of one buffer are displayed, a second buffer, called the “back” buffer, holds the frame being worked on. In this way, users will only see complete, smooth frames displayed onscreen.

Bilinear Filtering

This filtering method reduces the blockiness caused when zooming into a 3D surface that is at a right angle to the viewer. A newspaper photo examined closely enough will show that the picture is made up of tiny dots. If the photo was enlarged it would start to look “blocky” and less distinct. This is also a problem for computer-generated images, especially for surface details.

Bit Depth

Refers to the number of data bits required to store color information about a pixel. Larger bit depth means a greater range of color information is capable of being encoded into each pixel. For example, 1 binary bit of

memory can only encode to either “0” or “1.” So a graphical bit depth of 1 means that the display can only show two colors, the black and white of a monochrome display. Four-bit color depth is capable of displaying 16 colors because there are only 16 different combinations of 4 bits (“0000”, “0001”, “0010”... to “1111”). Sixteen-bit color is capable of reproducing 65,536 colors, and 24-bit color can display up to 16,777,216 individual colors.

Bitmap

A bitmap is a graphic or character representation composed of individual pixels, arranged horizontally in rows. A monochrome bitmap uses one bit per pixel (bpp). Color bitmaps may use up to 32bpp, depending on the color depth selected.

Brightness

The amount of white or black that is applied to all colors onscreen. By making the screen “brighter” you are adding more white to it. This should not be confused with luminosity, which measures the actual light level emitted from the computer display.

Buffer

A name referring to portions of on-board video memory. One large buffer is always used to display images to the screen; this is the “display buffer.” The rest of offscreen memory is typically used by applications as back buffers, z-buffers, and texture buffers.

Charisma Engine™ II

Incorporating a programmable Vertex Shader pipeline, Charisma Engine™ II is a transform and lighting engine designed to make 3D characters and transitions even more life-like.

Color Component

Three color components—Red, Green, and Blue—combine in various intensities to determine the color of each pixel on the screen. The values of each color component are graphically represented by a corresponding color curve.

Color Correction

Use Color Correction to correct discrepancies between the real color value and the way a screen displays it. Color discrepancies can be caused by a variety of sources, including the lighting conditions in the work area and gradual shifts in color over time on monitors or flat panel displays.

Color Curve

A color curve represents all possible intensity values (from 0 to 255) for a color component (Red, Green or Blue). For each color curve, the horizontal axis represents the input value (the color value a program wants to display), while the vertical axis represents the output value (the color value that the display driver will write to the screen). A value of 0 (in the lower left corner) represents the complete absence of that particular color, while a value of 255 (in the upper right corner) represents the “full” strength for that color.

CRT

Acronym for “cathode ray tube,” which is the main component of computer monitors and TVs. Color CRTs use three separate electron beams fired through a shadow mask and onto the back of the glass screen. The electron beams activate separate red, green, and blue values in various strengths in order to produce a colored image.

Dithering

A computer graphics technique that takes advantage of the human eye’s tendency to mix two colors that are adjacent to each other to produce smooth boundary transitions. Dithering adds intermediate color values between two or more boundaries, producing smoother, more natural look to 2D images or 3D objects.

Dual-Link DVI

A dual-link DVI transmits up to twice the amount of pixel information of single link DVI connection. Use the dual-link DVI connector for extremely high resolution displays such as Apple® 30-inch Cinema HD Displays.

Dot pitch

Dot pitch specifies the sharpness of a monitor's display. It is measured in millimeters (mm) and is the distance between the individual phosphor sub-pixels in a CRT display or cells of the same color within an LCD display. The smaller the number, the sharper the image. The most common dot pitches for monitors range from .24 mm to .31 mm. Also, if a monitor with a .24 mm dot pitch is set to its highest possible resolution, the pixel size will equal the dot pitch. If the monitor is set to lower resolutions, the pixels will be comprised of multiple dots.

DVI

Acronym for "Digital Video Interface," a standard video connection used on many current computer displays. There are three types of DVI connections: DVI-A (analog), DVI-D (digital), and DVI-I (integrated, capable of either analog or digital). It supports high-bandwidth video signals over 160 Hz, so it is most often used for high-resolution displays.

Flat Shading

A lighting technique that shades each polygon of a 3D object based on where the source of the light is and the angle of the polygon in relation to it. It enables relatively fast rendering of 3D objects, although it can make those objects appear "faceted" as each visible polygon is set to a particular color value, and consequently does not produce as realistic an effect as obtained when using Gouraud shading.

Fog

Term used to describe the blending of an object using a fixed color as objects are made to appear more distant from the viewer.

Frame Buffer

The portion of the memory buffer on the graphics card used to store the image being displayed. All rendering processes have been accomplished by this stage and this buffer contains only a one-to-one relationship of the data to be relayed to the display.

Frames Per Second

In terms of 3D graphics, refers to the rate at which the graphic processor can render new screens per second. Higher rates equals better, more naturalistic performance for such things as games set in a 3D environment. Sometimes abbreviated to “fps.”

Gamma

Sometimes confused with brightness, gamma actually refers to the correction that is applied to any display device in order to produce more gradual increases or decreases in the perceived brightness for that device. A change in gamma produces a non-linear change in the color curve, ensuring that perceived changes in color and intensity are consistently applied.

Gouraud Shading

A shading method used to produce a smooth lighting effect across a 3D object. A specific color is used at each vertex of a triangle or polygon and interpolated across the entire face.

Hue

Refers to a specific color within the visible spectrum of light, defined by its dominant wavelength. A light wave with a central tendency within the range of 565-590 nm is visible as yellow. In the standard RGB color space used by most computer displays, hue refers to a coordinate of the color as described by its red, green, and blue values, minus any additional brightness or saturation values for that color.

HyperZ™

HyperZ™ decreases the amount of information sent to the frame buffer, easing memory bandwidth limitations and allowing for ultra-high resolutions and full-screen 3D acceleration in true color. It uses a Hierarchical Z-buffer visibility algorithm to eliminate blocks of pixels that are hidden behind displayed triangles, Z Compression to compress and speed the resulting visual data and Fast Z-Clear, which updates only those pixels whose values have changed.

Keyframe Interpolation

This feature is also known as “morphing.” In an animation, a start and end point are picked as the key frames. In a 3D rendering, the start point could have a character with a neutral expression, and the end point could have that same character smiling. Additional frames are interpolated (inserted) between the two keyframes in order that “morphs” (transforms) the image so that there is a smooth transition between the key frames.

KTX Buffer Region Extension

This OpenGL® programming term refers to a feature that rapidly updates portions of the display of 3D modelling applications that change very quickly, or have been moved or occluded. It does this by optimizing the storage of buffer regions in the graphics card’s memory buffer. Other applications are typically not adversely affected when this is enabled.

Lighting

In 3D computer graphics, refers to aspects and quality of the virtual light source being used to make an object visible. Lighting can strongly affect the “mood” of a scene. For example, a “harsh” light could be a bare lightbulb that is glaringly bright on the objects closest to it while casting strong shadows in the background. A “softer” light would be more diffuse and not cast shadows, such as you would get outdoors on a typical overcast day.

Mipmapping

The most memory-intensive aspect of 3D graphics are the textures that give an object its realism (like wood, marble, leather, and cloth). Because objects in real life become less detailed as they move farther away from the viewer, 3D programmers simulate this by using less detailed, lower resolution texture maps on distant objects. These texture maps are merely scaled down versions of the main texture map used when the object is up close, and they use less memory.

NTSC

The name for the type of analog television signal used throughout the Americas (except Brazil) and in Japan. It draws a total of 525 vertical interlaced frames of video at a refresh rate of 60 Hz, making it relatively

flicker-free. The acronym refers to the National Television Systems Committee, which devised this color video standard in 1953.

Offscreen Memory

An area of memory used to preload images so that they can be quickly drawn to the screen. Offscreen memory refers to all of the remaining video memory not taken up by the front buffer, which holds the contents of the display screen currently visible.

OpenGL®

Short for “Open Graphics Library,” this is an industry standard for cross-platform 3D graphics development. It consists of a large number of functions that can be called upon in various programs, such as games, CAD, and virtual-reality systems, to produce complex 3D objects from simpler, more “primitive” building blocks. Implementations currently exist under Windows®, Mac OS® X, and various forms of Unix, including Linux®.

PAL

An acronym for “Phase Alternating Line”, the name for a video broadcast standard used in much of Europe (except France), most of Asia, the Middle-East, Africa and Australia. It draws a total of 625 vertical interlaced frames of video at a refresh rate of 25 Hz.

Pipeline

In relation to computer graphic processors, refers to the number of separate arithmetic units available for rendering the output on a display. In general, more pipelines available on a graphical processor means there are more 3D rendering capabilities available, increasing overall 3D performance.

Pixel

All computer images are made up of tiny dots. Each individual dot is called a pixel, a word created from the term “picture element.” A pixel is the smallest indivisible unit of a digital image and can be only a single color. The size of the pixel depends on how the display resolution has been set. The smallest size a pixel can be is determined by the display’s dot pitch, which is measured in millimeters (mm).

Pixel Tapestry™ II

Pixel Tapestry™ II uses four parallel, highly optimized rendering pipelines, each capable of handling two textures simultaneously. It provides advanced texturing, making 3D surfaces look even more detailed and realistic.

Refresh Rate

Also referred to as “vertical refresh rate.” This is the rate at which a monitor or television can redraw the screen from top to bottom. NTSC television systems have a refresh rate of approximately 60 Hz whereas computer displays typically have refresh rates of 75 Hz or more. At refresh rates of 70 Hz and lower, screen flicker is often noticeable.

Rendering

Rendering refers to the final drawing stages where the 2D image that appears on a display is derived from its 3D descriptions. What appears on the display may look three dimensional, but it is really just a 2D grid of pixels designed to appear that way.

Resolution

The resolution of any display is the number of pixels that can be depicted on screen as specified by the number of horizontal rows against the number of vertical columns. The default VGA resolution of many video cards is capable of displaying 640 rows of pixels by 480 columns. The typical resolution of current displays is set to higher values, such as 1024x768 (XGA), 1280x1024 (SXGA), or 1600x1200 (UXGA).

Saturation

Refers to the intensity of a specific hue (color). A highly saturated hue is vivid and intense, whereas a less saturated hue appears more grey. A completely unsaturated color is grey. In terms of the RGB color model, a fully saturated color exists when you have 100% brightness in one of the three channels (say, red) and 0% in the two others (green and blue). Conversely, a fully desaturated color is one where all of the color values are the same. Saturation can therefore be thought of as the relative difference between the values of the channels.

Shadow Mask

In CRT monitors, the shadow mask is a metal plate full of tiny holes that is attached to the inside of the glass screen. It focuses the beams from the electron guns at the back of the CRT. The distance between these holes is called the dot pitch.

SmartShader™

SmartShader™ is ATI's patented shader technology, providing custom transform and lighting effects for vertex shaders, allowing for finer control over the shape and position of 3D objects, as well as pixel shader effects that produce more accurate simulations of natural properties such as hair, metal, glass, and water in a real-time rendering environment. Important visual cues such as reflections, highlights, and shadows from multiple light sources can be rendered more speedily and accurately. It also increases the number of graphical effects that can be created, increasing overall performance while conserving memory bandwidth.

SmoothVision™

SmoothVision™ supports high-quality and high-performance anti-aliasing modes, both of which are required for creating high-quality 3D computer graphics. Both of these modes provide users with the ability to choose between 2x, 3x, 4x, 5x, and 6x sampling, allowing for a total of 10 different anti-aliasing settings, providing incrementally better, more realistic visual displays. The SmoothVision™ technology maintains a high level of performance even when a high anti-aliasing sampling rate is selected.

Specular Highlight

The bright, usually small, intense light reflected from a 3D surface with a high refraction value. From the intensity and spread of this highlight users can differentiate between a "hard," smooth surface, such as metal or porcelain, or a "soft," textured surface, such as fabric or skin.

Texel

Short for "texture element," the 3D equivalent of a pixel, describing the base unit of the surface of a 3D object, such as a sphere; for a 2D object, such as a circle, the base unit is a pixel.

Transition Minimized Differential Signaling (TMDS)

A technology designed to reduce electromagnetic interference (EMI) and improve the digital signal delivered to flat panel displays. Its encoding algorithm converts the original 8-bit graphic data into a more fault-tolerant 10-bit signal, which is then converted back to its original 8-bit form at the display device. The signal is also DC-balanced, allowing for the option of transmitting the signal over fibre-optic cable. DVI connectors can incorporate up to two TMDS links, with each “link” comprised of the number of signals required for standard RGB output. Higher resolutions and refresh rates than standard are possible if multiple TMDS links are available by using multiple DVI connectors.

Trilinear Filtering

A sampling method used to produce realistic-looking 3D objects. Trilinear filtering averages one of the bilinear filter mipmap levels along with the standard mipmap samples.

VersaVision™

An ATI technology enabling accelerated display rotation and scaling. Any desktop can now be rotated 90 degrees left or right, or even 180 degrees, while maintaining the full feature set of other ATI 2D and 3D technologies, such as SmoothVision™. VersaVision™ works with single or multiple displays.

Vertex Shader

Three-dimensional objects displayed on a screen are rendered using polygons, each of which is made up of intersecting triangles. A vertex is a corner of a triangle where it connects to another triangle, and each vertex carries a considerable amount of information describing its coordinates in 3D space, as well as its weight, color, texture coordinates, fog, and point size data. A Vertex Shader is a graphics processing function that manipulates these values, producing such things as more realistic lighting effects, improved complex textures such as hair and fur, and more accurate surface deformations such as waves rippling in a pool or the stretching and wrinkling of a character’s clothes as he or she moves.

VGA Connector

A type of graphics connector, sometimes also called an analog connector. It is the most common type of video connector available, consisting 15-pins set in three rows. The “VGA” is an acronym for “Video Graphics Array,” which is also the name for the video resolution mode of 640x480 pixels, the lowest standard resolution supported by virtually all video cards.

Z-buffer

The portion of video memory that keeps track of which onscreen elements can be viewed and which are hidden behind other objects. In the case of a 3D image, it keeps track of which elements are occluded by the foreground in relation to the user’s perspective, or by another 3D object.

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