Radeon® X850

CrossFire™ Edition

User's Guide

Disclaimer

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Documentation Updates

ATI is constantly improving its product and associated documentation. To maximize the value of your ATI product, you should ensure that you have the latest documentation. ATI's documentation contains helpful installation/configuration tips and other valuable feature information.

(i) IMPORTANT SAFETY INSTRUCTIONS

- **Read Instructions** - All the safety and operating instructions should be read before the product is operated.
- **Retain Instructions** - The safety and operating instructions should be retained for future reference.
- **Heed Warnings** - All warnings on the product and the operating instructions should be adhered to.
- **Compatibility** - This option card is for use only with IBM AT or compatible UL Listed personal computers that have Installation Instructions detailing user installation of card cage accessories.
- **Grounding** - For continued protection against risk of electric shock and fire, this accessory should be installed only in products equipped with a three-wire grounding plug, a plug having a third (grounding) pin. This plug will only fit into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace the obsolete outlet. Do not defeat the safety purpose of the grounding-type plug.
- **Secure Attachment** - All card securement pins shall be completely tightened as to provide continuous bonding between the option card and the PC chassis.
- **Lightning** - For added protection for this product during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet, and disconnect the antenna or cable system. This will prevent damage to the product due to lightning and power-line surges.
- **Power Lines** - An outside antenna system should not be located in the vicinity of overhead power lines or other light or power circuits, or where it can fall into such power lines or circuits.
- **Antenna Installation** - When installing an outside antenna system, extreme care should be taken to keep from touching such power lines or circuits, as contact with them may be fatal.

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CHAPTER 1:

CrossFire™ FAQ

The following is a listing of frequently-asked questions about CrossFire™.

For the latest information, please consult the CrossFire™ Web site at:

ati.com/crossfire

1   What combination of products are required to build a working CrossFire™ system?

Three components are required:
- a CrossFire™ Edition graphics card that works as the Master graphics card.
- a CrossFire™ Ready graphics card from the same brand-family that works as the Slave graphics card.
- a CrossFire™ Ready motherboard (which contains two PCIe™ X16 slots).

More information on the requirements for each of these components can be found within this FAQ.

2   What graphics cards work with CrossFire™?

A CrossFire™ graphics card works with all members of the same brand-family. Thus a Radeon® X850 CrossFire™ Edition can be used as the Master graphics card with any Radeon® X850 product.

3   What motherboards support CrossFire™?

The optimal configuration for a CrossFire™ system is one based on a Radeon® Xpress 200 CrossFire™ Edition motherboard. Motherboards from other manufactures will be certified as CrossFire™ Ready when they become available.

4   Are there specific CMOS motherboard settings for CrossFire™?

On some motherboards, the CMOS may be set by default to support only a single PCI Express® X16 slot. Ensure that both PCIe™ X16 slots are enabled in the CMOS.

5 Which slot does the CrossFire™ Master card go into on the motherboard?

The CrossFire™ Master card must go into the primary PCI Express® slot (slot zero) on the motherboard.

Note: To determine which PCIe™ slot is the primary slot, consult your motherboard manual.

Alternately, to determine whether or not a CrossFire™ Edition card is in the correct slot, connect your display directly to the DVI-I connection on the Master graphics card instead of using the CrossFire™ DMS-59™ connector, with both graphics cards seated in their respective slots on the motherboard. If an image appears on the screen upon boot-up, the card has been placed in the correct slot on the motherboard.

6 Are there any software settings required for CrossFire™ to work?

Yes, there is a setting in the Catalyst™ Control Center that needs to be enabled for CrossFire™ to operate. When all of the hardware and software has been properly set up and installed, the following CrossFire™ aspect appears in Catalyst™ Control Center:

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To access and enable CrossFire™ in Catalyst™ Control Center, do the following:

- Click **CrossFire™** in Advanced View. Then, select **Enable CrossFire™**.

When CrossFire™ is successfully enabled, all display devices except the one used by CrossFire™ will be disabled. Multiple monitors/displays that are disabled when CrossFire™ is enabled reappear after CrossFire™ is disabled.

7   What is the difference between a CrossFire™ Edition graphics card and a standard graphics card from the same family?

CrossFire™ Edition graphics cards include a "compositing engine," a chip that takes the partially rendered image from the Slave graphics card and merges it with the partially rendered image from the Master

graphics card. The result is a complete frame rendered at up to twice the performance of a single graphics card.

8 **How are the graphics cards connected on a CrossFire™ system?**

The two cards are connection by an external cable. The cable is attached from the Slave graphics card's DVI-I connection to the CrossFire™ Edition's DMS-59™ connection, which is used to convey information from the Slave graphics card to the Master graphics card and transmit the combined signal to a display device.

9 **Which games/applications work with CrossFire™?**

CrossFire™ works with all 3D games and applications. If Catalyst™ A.I. is enabled in the Catalyst™ Control Center software, the optimal rendering mode available for the application is automatically selected.

10 **Is a driver profile required to make CrossFire™ work?**

No. CrossFire™ is enabled by default for all 3D games and applications.

11 **What happens if you pair a 12-pipeline CrossFire™ Edition graphics card with a CrossFire™ Ready 16-pipeline graphics card?**

In this scenario both graphics cards will operate as 12-pipeline graphics cards while in CrossFire™ mode.

12 **What happens if the CrossFire™ Edition graphics card and the CrossFire™ Ready graphics card have different clock speeds?**

Both cards will continue to operate at their individual clock speeds; neither card is "stepped down." The compositing engine on the CrossFire™ Edition card merges the resulting images independent of the clock speed on either graphics card.

13 **What are the rendering modes, and what are their specific advantages?**

The following dynamic rendering modes are available:

- SuperTiling - CrossFire™ renders alternate 32x32 pixel squares in a fine-grained checkerboard pattern. This configuration increases image-rendering quality, as each card processes half of the complex 3D objects in the pixel squares.

- Scissor Mode - each graphics card renders up to half of the display, either vertically or horizontally depending on the game or application.

- Alternate Frame Rendering - the two graphics cards are used to render alternate frames of the display. This configuration increases the detail of the 3D objects each card can render, as each card handles half of the total number of frames.

- Super Anti-aliasing - improves image quality by combining the results of full-screen anti-aliasing across two graphics cards in a CrossFire™ configuration. The two graphics cards work on different anti-aliasing patterns within each frame.

The first three features are performance features settings automatically selected by ATI's Catalyst™ Control Center. Super Anti-aliasing is a display quality mode selectable using Catalyst™ Control Center.

14 On what basis are different rendering modes chosen?

When Catalyst™ A.I. is enabled in Catalyst™ Control Center, it determines the optimal rendering mode to use, based on the application or game being used. The default rendering mode is dependant on both the hardware configuration and the application being run; typically it will be either Scissor or SuperTiling mode. If Catalyst™ A.I. is not enabled, any Direct 3D® applications that are running on a system based on graphics cards with 16-pipeline graphics processors will use SuperTiling Mode.

15 What type of performance improvement is expected?

Performance enhancements experienced on a CrossFire™ system depend on the application or game being used. Performance improvements can be increased up to 100%, and the latest graphics-intensive programs will generally see over 80% performance improvement at high resolutions and image-quality modes.

16 How many independent displays can be connected to a CrossFire™ system?

While CrossFire™ is designed for optimal use on a single display, it is possible to drive multiple monitors using a CrossFire™ system when CrossFire™ is not enabled. On a standard CrossFire™ system, it is possible to drive three separate sets of monitors and still have one

of those displays as a dedicated CrossFire™ display. If the motherboard contains an integrated video connection and SurroundView™ is enabled, more displays can be added.

Additional issues are covered in the "Troubleshooting" chapter in the *User's Guide*.

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CHAPTER 2:

Welcome to CrossFire™

ATI's CrossFire™ propels gaming PCs with the ultimate multi-GPU consumer graphics solution.

CrossFire™ Overview

This section provides an overview of the main features and configurations for CrossFire™. These topics will be covered in more detail in other chapters of this manual.

Allowable CrossFire™ System Components

The basic requirements of a CrossFire™ system are a CrossFire™ certified motherboard with two PCI Express® slots, a Radeon® CrossFire™ Edition graphics card (the Master graphics card), and a compatible Radeon® graphics card (the Slave graphics card).

Compatible Slave graphics Cards for the Radeon® X850 CrossFire Edition

- Radeon® X850XT Platinum Edition
- Radeon® X850XT
- Radeon® X850 Pro

For an up-to-date listing of CrossFire™ certified motherboards, see:

ati.com/crossfire.

CrossFire™ Rendering Modes

A CrossFire™ system has four possible display modes:

- SuperTiling
- Scissor Mode

- Alternate Frame Rendering
- Super Anti-aliasing.

The first three are performance-oriented modes, and Super Anti-aliasing is a quality-oriented mode. Each mode uses a different method for dividing the workload required to render a 3D image across multiple GPUs. Only one mode can be in operation at any given time.

The ATI Catalyst™ display driver will automatically select the best of the three performance modes when a 3D application is started, without requiring user intervention. The user can also choose to improve image quality by selecting the new Super Anti-aliasing modes in the Catalyst™ Control Center.

SuperTiling

In this mode, each frame to be rendered is divided into a number of tiles in an alternating checkerboard pattern, so that half of the tiles are assigned to each of the two GPUs. Each tile is kept to a relatively small 32x32 pixel square, so this method does a good job of balancing the workload across each GPU regardless of what is being rendered on the display, doing so without any software overhead.
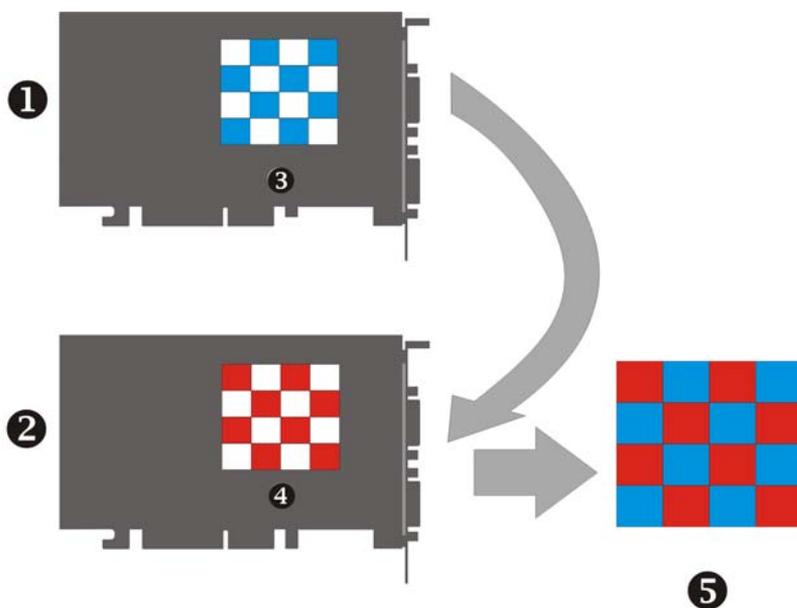
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1	PCI Express® Slave Graphics Card
2	Radeon® X850 CrossFire Edition Master Graphics Card
3	Partial Frame Rendered on PCI Express® Slave Graphics Card
4	Partial Frame Rendered on PCI Express® Master Graphics Card
5	Final Rendered Frame on Display

SuperTiling has the advantage of being able to work with practically any 3D application. However, there are a small number of applications where the SuperTiling workload distribution does not provide optimal performance. For these special cases, Scissor Mode can be used.

Scissor Mode

In this mode, each frame is split into two sections, with each section being processed by one GPU. The split can be either horizontal or vertical, and the split can be even (50/50) or uneven (such as 60/40 or 70/30). The ideal configuration is determined automatically for each application.
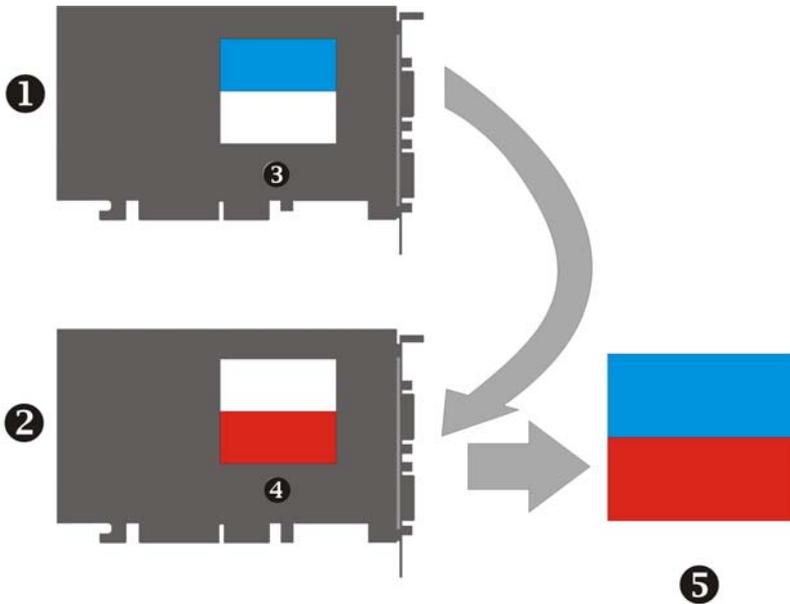
1	PCI Express® Slave Graphics Card
2	Radeon® X850 CrossFire Edition Master Graphics Card
3	Partial Frame Rendered on PCI Express® Slave Graphics Card
4	Partial Frame Rendered on PCI Express® Master Graphics Card
5	Final Rendered Frame on Display

Although Scissor Mode is generally a less efficient means of splitting the workload than using SuperTiling, there are a few cases where it can be more efficient. It is supported by CrossFire™ in order to maximize compatibility and performance.

Alternate Frame Rendering (AFR) Mode

In this mode, all even frames are rendered on one GPU, while all odd frames are rendered on the other. The completed frames from both GPUs are sent to the Compositing Engine on the CrossFire™ Edition card, which then sends them on to the display. By allowing both GPUs to work independently, AFR provides the greatest potential performance

improvements of all the available modes. It is also the only mode that allows the full vertex processing performance of both GPUs to be combined.
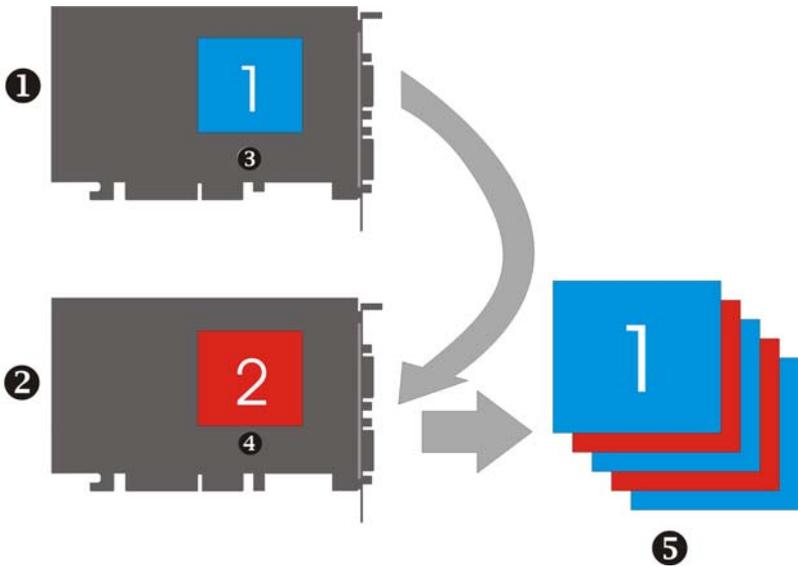
1	PCI Express® Slave Graphics Card
2	Radeon® X850 CrossFire Edition Master Graphics Card
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4	Partial Frame Rendered on PCI Express® Master Graphics Card
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The main limitation of this mode is that it cannot be used in applications where the appearance of the current frame is dependent upon data generated in previous frames, since AFR generates successive frames simultaneously on different GPUs. In these cases, the SuperTiling or Scissor Mode is used instead.

Super Anti-aliasing Mode

Anti-aliasing (AA) is a rendering technique designed to remove jagged edges, shimmering, and pixelation problems that are common in rendered

3D images. Rather than simply determining the color of each pixel on the screen by sampling a single location at the pixel's center, anti-aliasing works by sampling multiple locations within each pixel and blending the results together to determine the final color.

The latest generation of ATI's Radeon® GPUs with SmoothVision™ HD technology uses a method known as Multi-sample Anti-aliasing (MSAA). This method takes samples from 2, 4, or 6 programmable locations within each pixel, and uses gamma correct sample blending for high-quality smoothing of polygon edges. The new CrossFire Super Anti-aliasing mode takes advantage of the programmable sample capability of SmoothVision™ HD to provide higher quality anti-aliasing on CrossFire™ systems.

It works by having each GPU render the same frame with anti-aliasing enabled, but uses different sample locations for each. When both versions of the frame are completed, they are blended in the CrossFire Compositing engine. The resulting image has effectively twice the number of samples, so 4x and 6x Anti-aliasing becomes 8x and 12x Super Anti-aliasing, respectively.
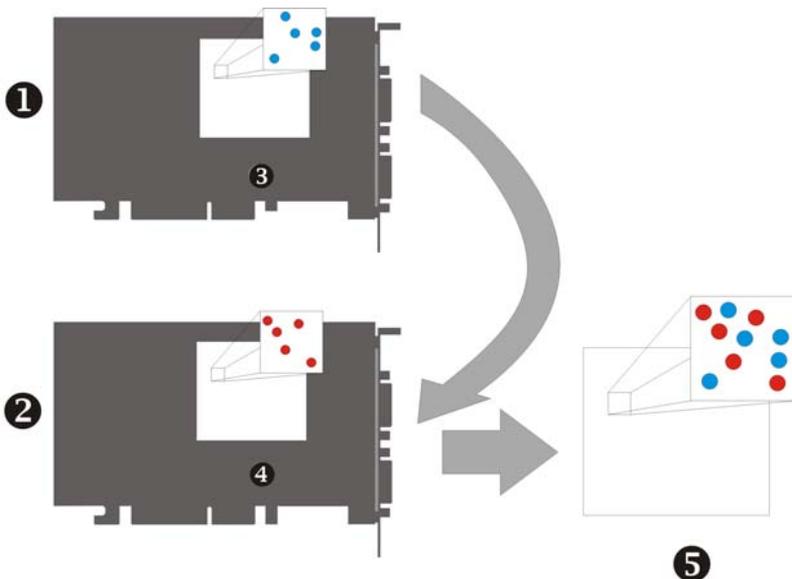
| 1 | PCI Express® Slave Graphics Card |

|	
2	Radeon® X850 CrossFire Edition Master Graphics Card
3	Partial Frame Rendered on PCI Express® Slave Graphics Card
4	Partial Frame Rendered on PCI Express® Master Graphics Card
5	Final Rendered Frame on Display

Some types of textures, especially those with transparent portions, can exhibit aliasing that is not removed by MSAA techniques. Another form of anti-aliasing, known as Super-sample Anti-aliasing (SSAA), can be useful in these cases, because it affects every pixel in an image. Although it normally operates more slowly than MSAA, the power of multiple GPUs can make SSAA practical to use.

SSAA first renders a scene at a higher resolution than that which is output to the display, which is then downsampled to the display's resolution. This approach normally has two main disadvantages: it requires rendering many more pixels than normal, which can have a drastic impact on performance, and that it results in an ordered grid sample pattern, which does a poor job of anti-aliasing some types of jagged edges. CrossFire™'s Super Anti-aliasing overcomes both of these problems. It takes advantage of the second GPU to render the additional pixels required for each frame, so there is little or no performance impact. It can also make use of a more effective sample pattern that does a better job of anti-aliasing near-horizontal and near-vertical edges, resulting in better overall image quality.

Two of the new Super Anti-aliasing modes use a combination of MSAA and SSAA to achieve the ultimate in image quality. They work by not only using different multi-sample locations on each GPU, but also by offsetting the pixel centers slightly. In effect, each GPU renders the image from a different viewpoint, about half a pixel width apart. The new 10x and 14x Super Anti-aliasing modes operate in this manner, combining 2x SSAA with 4x and 6x MSAA, respectively.

Both of these modes work together with SmoothVision™ HD Anisotropic Filtering (AF). This filtering technique produces sharper, clearer textures by blending multiple texture samples (2, 4, 8, or 16) for each pixel. Because Super Anti-aliasing can render each pixel from two slightly different viewpoints and combine them, the texture samples from each viewpoint are combined as well. This means the number of texture samples per pixel is effectively doubled, so up to 32x Anisotropic Filtering can be supported.

The new Super Anti-aliasing modes can be enabled by users through the ATI Catalyst™ Control Center interface.

Note: Super Anti-aliasing is not available when any of the three CrossFire™-specific rendering modes are selected, but regular anti-aliasing values (2x, 4x or 6x) are still available.

CHAPTER 3:

Getting Started

Congratulations on the purchase of your ATI Radeon® X850 CrossFire Edition card. We hope that you will enjoy countless hours of trouble-free computing.

System Requirements

Hardware	• Intel® Pentium® 4 or AMD Athlon®. • 512MB of system memory; 1GB or more for best performance. • A CrossFire™ certified motherboard with two (2) PCI Express® X16 slots and correct PCIe™ chipset driver. Note: The Radeon® X850 CrossFire Edition is a dual-slot solution that may obscure the adjacent slot. (See **ati.com/crossfire** for a list of CrossFire™ certified motherboards.) • Optical drive for installation software (CD-ROM or DVD-ROM drive). • Specialized PCI Express® 500 watt or greater power supply recommended. Consult your computer system manual to ensure the power supply is designed to accommodate a high-end graphics card with a peak dissipation above 75 watts.
Operating System	• Windows® XP with Service Pack 2 (SP2). • Windows® XP Professional x64 Edition.
Monitor	• High-resolution MultiSync or multi-frequency monitors or any other type of VGA monitor. • Digital flat-panel (DFP) displays or digital CRT display.

External Connections

The following connection types are available on the baseplate of your Radeon® X850 CrossFire Edition:

- DVI-I
- DMS-59™

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Before You Begin

Before you begin installing your new graphics card, please do the following.

Record Your Serial and Part Numbers

The serial number and 102 part number printed on the graphics card are required for registration. They are located on a sticker on the back of the card.

| ❶ | Serial number (S/N) |
| ❷ | 102 part number (P/N) |

Write these numbers down before installing your new ATI product.

Uninstall Previous Graphics Card Drivers

To ensure the successful installation of your new Radeon® X850 CrossFire Edition card, you must uninstall the drivers for the existing graphics card before removing it from your computer.

To uninstall previous drivers

With your current graphics card still in your computer:

1   Close all applications that are currently running.

2   Navigate to the **Control Panel** and select **Add/Remove Programs.**

3   Select your current graphics card drivers and select **Add/Remove.**
    The wizard will help you remove your current display drivers.

    Note: If the previously installed graphics card has any additional
    software installed, it should also be removed at this point.

4   Restart your system after the drivers have been removed.

CHAPTER 4:

Installing Hardware

This chapter will guide you through the physical installation of your Radeon® X850 CrossFire Edition graphics card.

The Radeon® X850 CrossFire Edition will always be the Master graphics card due to its on-board compositing engine and the associated DMS-59™ connector. For supported Slave graphics cards, see *Allowable CrossFire™ Display Configurations*.


1   Power Supply

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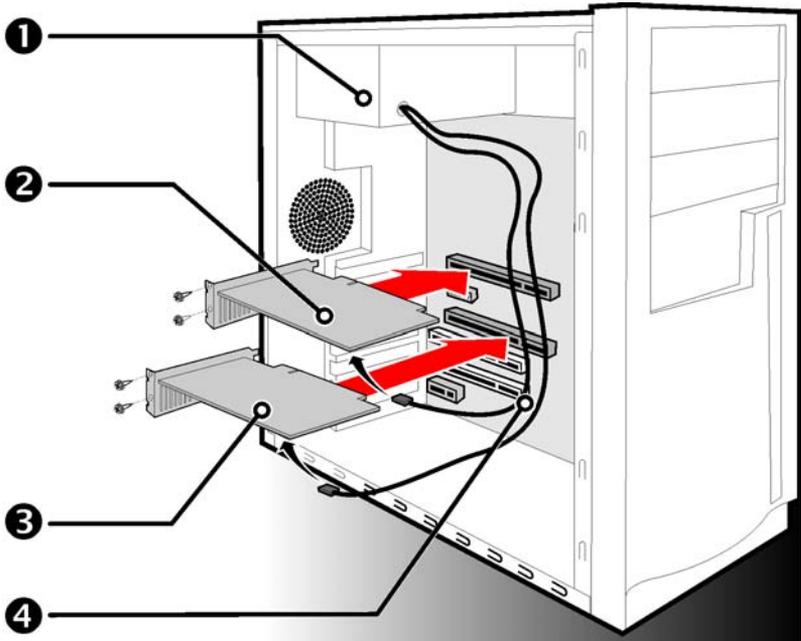
2	Radeon® X850 CrossFire Edition Graphics Card (Master)
3	CrossFire™-Compatible Graphics Card (Slave)
4	Power Cables.

Installing the Radeon® X850 CrossFire Edition Master Graphics Card

The following set of instructions assumes that the PCI Express® Slave graphics card has already been successfully installed in the secondary slot (slot one), and that the primary slot (slot zero) is empty. If you have not already done so, see the user's guide that came with the graphics card for installation instructions.

ⓘ Consult your system builder or OEM to ensure that your system has an adequate power supply. A 500 watt or greater power supply is recommended. PCI Express® compatible system comes with specialized 12V graphics card power connector. Consult your computer system manual to verify that the power supply is designed to accommodate a high-end graphics card with a peak dissipation above 75 watts.

1 Turn off the computer, monitor, and other peripheral devices.

2 Unplug the computer's power cord and disconnect all cables from the back of your computer.

ⓘ **WARNING** - Wait approximately 20 seconds after unplugging the power cord before disconnecting a peripheral or removing a component from the motherboard to avoid possible damage to the motherboard.

3 Remove the computer cover.

If necessary, consult your computer's manual for help in removing the cover.

ⓘ **WARNING** - Discharge your body's static electricity by touching the power supply or the metal surface of the computer chassis. Otherwise, you may damage your system.

4   Unscrew or unfasten and remove any non-CrossFire™ supported graphics card from your computer.

5   Locate the primary (slot 0) PCI Express® slot on the motherboard. If necessary, remove the metal backplate cover from the case housing.

Note: To determine the lowest PCI Express® slot consult your motherboard's manual. For the latest information on the best configuration, consult:

ati.com/crossfire

ⓘ   **Important** - To ensure proper ventilation for your Radeon® X850 CrossFire Edition graphics card, also remove the metal backplate cover to the adjacent PCI Express® slot.

6   Align your CrossFire™ Master card in the slot and press firmly until the card is fully seated.

7   Connect the power cable to the 6-pin Molex power connection on the graphics card.

8   Screw in or fasten the graphics card securely. Make sure the cables are not interfering with anything inside the computer (for example, a cooling fan) and replace the computer cover.

ⓘ   **Important** - Ensure that both cards are properly seated and are not in direct contact with each other to prevent either card from overheating.

9   Reconnect any cables you have disconnected and plug in the computer's power cord.

10 Turn on the monitor, and then your computer.

ⓘ   Your computer will beep, possibly show a warning message on your display, and the boot process will stop if the graphics card is not correctly connected to the power supply.

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CHAPTER 5:

Using Multiple Displays

Connecting devices for CrossFire™

Your Radeon® X850 CrossFire Edition provides hardware support for one DVI-I monitor or one VGA monitor using the supplied DVI-I-to-VGA adapter. It also has a DMS-59™ connector for connection to a supported PCI Express® graphics card for CrossFire™ support. For supported Slave graphics cards see *Allowable CrossFire™ System Components*.

The following illustration shows how to connect your ATI CrossFire™ Edition Master graphics card to your PCI Express® Slave graphics card:
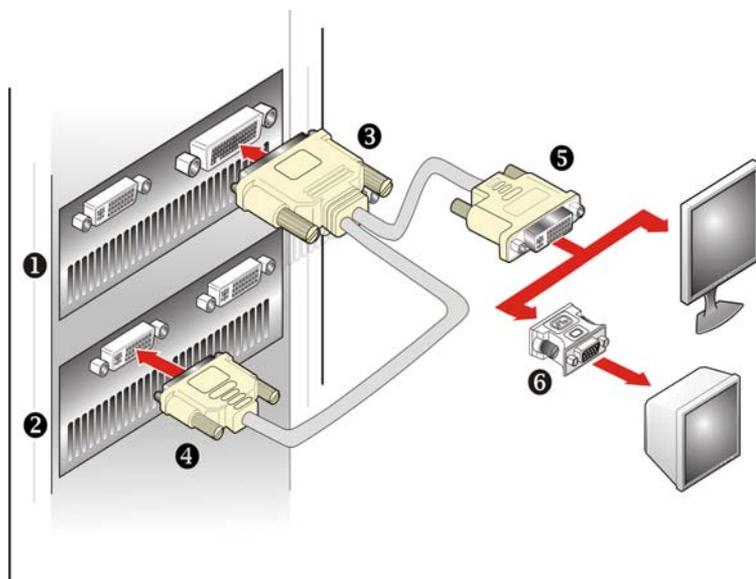
1	CrossFire™ Edition Graphics Card (Master)
2	CrossFire™-Compatible Graphics Card (Slave)

3	DMS-59™ Connection and CrossFire™ Interconnect Cable
4	DVI-I Adapter connects to Slave graphics card
5	DVI-I Adapter connects to display device
6	DVI-I-to-VGA Adapter to CRT Display (optional)

Display Configurations

Display support is only available through the CrossFire™ Interconnect cable when CrossFire™ is active. This arrangement ensures the highest possible performance. When CrossFire™ is active other display devices connected to the other DVI or VGA connections on the Master and Slave graphics cards are rendered inactive.

If additional displays are required when CrossFire™ is active, please use either SurroundView™ (for more information see the SurroundView™ manual) or an additional PCI graphics card.

> ⓘ It is highly recommended that the computer be powered down prior to changing the arrangement of display devices attached to the system.

Connecting Your Monitors for Multiple Display

The Radeon® X850 CrossFire Edition can support up to four displays when CrossFire™ is not enabled and when the Master card is not connected to the Slave graphics card. The illustration below shows possible display connections to the Radeon® X850 CrossFire Edition graphics card.

Display devices can also be added to the Slave graphics card. For specific display support information see the user's guide that came with your Slave graphics card.

Note: While two display connections are displayed below, three is possible by attaching an additional display to the unused DVI connection on the Slave graphics card. Up to five displays can be used if your motherboard contains integrated graphics capabilities in conjunction with SurroundView™.
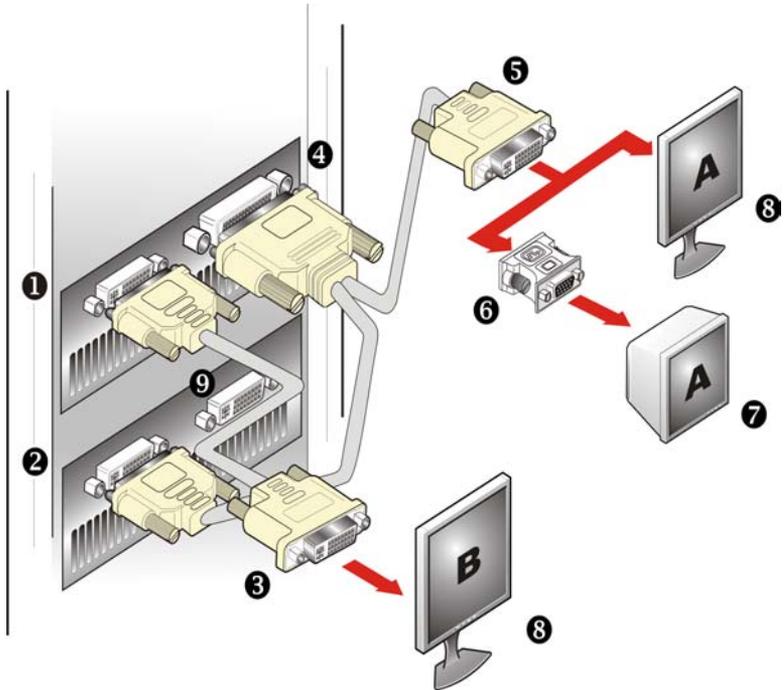
1	CrossFire™ Edition Graphics Card (Master)
2	CrossFire™-Compatible Graphics Card (Slave)
3	DVI-I Connector
4	DMS-59™ CrossFire™ Interconnect Cable
5	DVI-I Connector
6	DVI-I-to-VGA Adapter
7	CRT Display
8	Flat Panel Display
9	DVI-I Connection (can be used to add another display)

The following table shows possible display configurations available when CrossFire™ is *not* enabled.

Connection Type	Display Configuration	Comments
Master Card using DMS-59™ connector and Interconnect cable.	**DFP display**	DFP - digital flat panel display.
	CRT display using DVI-to-VGA adapter	CRT- cathode ray tube analog display. Single TMDS link mode supported with a maximum pixel refresh rate of 166Mhz.
	Digital HDTV display	If the HDTV display supports the connection type, it can be used as a flat panel display using a DVI-I connector.
Master Card using DVI-I connector	**DFP display**	DFP - digital flat panel display.
	Digital HDTV display	If the HDTV display supports the connection type, it can be used as a flat panel display using a DVI-I connector.
	Analog HDTV	If the HDTV display supports the connection type, it can be used as a flat panel display using a smart dongle.
	CRT display using DVI-to-VGA adapter	CRT - cathode ray tube analog display.
Slave Card using TMDS DVI-I connector		Connect interconnect cable from DMS-59™ connection of Master Card.

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Connection Type	Display Configuration	Comments
Slave Card with two DVI-I connectors	DFP display	DFP - digital flat panel display using non-TMDS connector.
	Digital HDTV	If the HDTV display supports the connection type, it can be used as a flat panel display using a DVI-I connector.
	CRT using DVI-I-to VGA adapter	CRT - cathode ray tube analog display.
	Analog HDTV	Not supported using a smart dongle.
Slave Card with one DVI-I and one Honda connector	VIVO	VIVO functionality is not supported on the Slave graphics card.
	Digital HDTV display	If the HDTV display supports the connection type, it can be used as a flat panel display by connecting the Composite Video inputs to the Honda connector.
Slave Card with one DVI-I and one VGA connector	CRT display	

To connect your monitors

1 **Power off** your computer and monitors.

2 **Plug** the monitor cables into their appropriate connectors.

3 **Power on** your monitors first, and then restart your computer.

Enabling Multiple Displays

Use the Displays Manager of the Catalyst™ Control Center to enable multiple displays. The Displays Manager is available in both Standard and Advanced views of the Catalyst™ Control Center.

Enable a secondary display device

• Click the **Wizard** button and follow the instructions to enable Clone Mode.

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> **Note:** A secondary display device can be a flat panel display, CRT monitor, TV, or VCR.

Enable Displays Manager Advanced View

1   Click **View** to switch to Advanced View.

2   From the Tree Menu, click **Displays Manager** to display the settings view**.**

Enable a secondary display device

1   Click **Displays Manager** in Advanced View.

2   Click the number 2 display icon in the right-hand box.

3   Click **Yes** to the **Enable this display** dialog**.**

> • Optionally, right-click the number 2 icon in the right-hand box and click **Enable** in the pop-up menu.

> **Note:** Repeat steps 2 and 3 above for each additional connected device. The number on the display icon will increase as more displays are added.

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CHAPTER 6:

Installing Software

This chapter will guide you through the installation of the drivers and software associated with your Radeon® X850 CrossFire Edition card.

Installing Drivers and Software in Windows®

You will need to install the Radeon® X850 CrossFire Edition drivers and software in the following cases:

- After you have installed the card in your system.
- After you have reinstalled or upgraded your operating system.

This procedure applies to Windows® XP.

Software Installation Prerequisites

To install or remove the drivers, you must have administrator rights or be logged on as a user with administrator rights.

Your operating system must be installed and running before you can install the Radeon® X850 CrossFire Edition drivers. Also, make sure that you have installed Service Pack 2 for Windows® XP.

Make sure your monitor cable is properly attached before you begin.

> **Note:** The installation dialog will display in English if your operating system's language is not supported.

To install ATI drivers and software

> **Note:** Optical drive refers to CD-ROM or DVD-ROM drive.

1 Start your system. When the **Found New Hardware Wizard** appears, click **Cancel**. When the **System Settings Change** window asks you to restart your computer, click **No**.

2 Run the **ATISETUP** utility. The **ATISETUP** utility will start automatically when you insert the ATI Installation CD-ROM into your optical drive after the operating system has started. If your CD-ROM auto-run is not enabled or the **ATISETUP** utility does not start automatically:

   a) Click the **Start** button in the task bar.
   b) Click **Run**.
   c) Select **ATISETUP.EXE** from the root directory of the ATI Installation CD-ROM.
   d) Click **OK**.

3 Click **Install** under Software Install.

4 Click **Next**.

5 Click **Yes** to the license agreement. **ATI Easy Install** will start the **Installation Wizard**.

6 Follow the wizard's on-screen instructions to complete the installation.

> ⓘ The Express installation option is recommended. By selecting this option, the HydraVision™ multi-monitor and desktop management software will automatically be installed, along with the ATI driver. Not all software components are installed using the Express installation. Custom installation allows you to select individual software components for installation.

7 When the Setup Complete message appears, select **Yes, I want to restart my computer now** and click **Finish**.

8 After the system reboots, the **Found New Hardware** message displays **Digital Signature Not Found**. Click **Yes** or **Continue** to complete the driver installation.

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Monitor Configuration

Once the drivers and software have been installed, you can configure your monitor..

> ⓘ **Warning** - Choosing a refresh rate unsupported by your monitor may damage your monitor. Consult your monitor's documentation if necessary.

To configure your primary display

1 Navigate to the **Control Panel** and choose **Display**, or right-click on the desktop and choose **Properties**.

2 Choose the **Settings** tab and select the screen resolution and color depth that best suit your requirements and your monitor's performance.

3 Click **Advanced** and select the **Monitor** tab.

4 Choose a refresh rate from the drop-down list.

5 Click **OK** to return to the desktop.

To set up a multi-monitor display

1 From the **Start** menu click **Control Panel**, then **Display**. Click the **Settings** tab to access the basic multi-monitor configuration settings.

2 Select the **Monitor** icon identified by the number **2**.

3 Click **Extend my Windows desktop onto this monitor**.

4 Set the **Screen Resolution** and **Color Quality** as appropriate for the second monitor. Click **Apply** or **OK** to apply these new values.

   • Refer to your Windows® online help and documentation for further information on using the **Settings** tab.

Note: When you use multiple monitors with your Radeon® X850 CrossFire Edition card, one monitor will always be **Primary**. Any additional monitors will be designated as **Secondary**.

Note: You can also enable multiple monitors using ATI's Catalyst™ Control Center.

Reinstalling Drivers

You can install new drivers or reinstall existing drivers if there was a Windows® conflict.

Reinstall the drivers at any time using the **ATISETUP** utility located on the ATI Installation CD-ROM. The **ATISETUP** utility will start automatically if you insert the ATI Installation CD-ROM into your optical drive after the operating system has started.

To manually reinstall drivers

If your CD-ROM auto-run is not enabled and the **ATISETUP** utility does not start automatically, follow these steps.

1 In the Windows® task bar, click **Start**.

2 From the **Start** menu, select **Run.**

3 Browse to **ATISETUP.EXE** on the root directory of the ATI Installation CD-ROM

4 Click **OK.**

Installing the Catalyst™ Software Suite

ATI's Catalyst™ Software Suite provides software required to enjoy all the features of your ATI graphics card. The Catalyst™ Software Suite has several distinct software elements, including:

- • Driver
- • Catalyst™ Control Center
- • ATI Multimedia Center™
- • HydraVision™ (not included in the *Express* Install)
- • Remote Wonder™ Software.
- • SurroundView™

To install the Catalyst™ software suite

Note: Optical drive refers to a CD-ROM or DVD-ROM drive.

1 Insert the ATI Installation CD-ROM into your optical drive.

If Windows® runs the CD-ROM automatically, proceed to step 6.

2 Click **Start** > **Run**.

3 Type the following: D:\ATISETUP
     (If D is not your optical drive, substitute the correct drive letter.)

4 Click **OK**.

5 Click **Install** under Software Install.

6 Click **Next** and click **Yes** to the license agreement.

7 Click **ATI Easy Install** to begin the Installation Wizard.

8 Follow the Wizard's on-screen instructions then choose either
     Express or **Custom Install**.

     Not all software components are installed using the Express
     installation. Custom installation allows you to select individual
     software components for installation.

ATI Technologies

CHAPTER 7:

Catalyst™ Control Center

The Catalyst™ Control Center is a graphical user application providing access to the display features contained within the installed ATI hardware and software. Use the Catalyst™ Control Center to fine-tune your graphics settings, enable or disable connected display devices, and change the orientation of your desktop. Many of the features show you a preview of the changes before they are applied.

The Catalyst™ Control Center offers you two views of the software:

- Standard View is a simplified view that includes wizards to get the inexperience user up and running.
- Advance View allows the advanced user to access and configure the complete feature set of the software.

The Catalyst™ Control Center can be customized for easy access to the features you use most.

Use the Catalyst™ Control Center to access a comprehensive online help system, or connect to the ATI Web site.

Launching Catalyst™ Control Center

Catalyst™ Control Center can be launched from one of the following access points:

- Windows® Start Menu
- Windows® System Tray
- Desktop Shortcuts
- Predefined Hotkeys
- Via an ATI Multimedia Center™ Application.

Launching Catalyst™ Control Center Using the Start Menu

From the Windows® task bar, click **Start**:

- Click to **All Programs > ATI Catalyst™** Control Center **> ATI Catalyst™** Control Center.

Other Quick Launch Access Points

Launching Catalyst™ Control Center Using the System Tray

1 Right-click the ATI icon in the Windows® System Tray

2 Select Catalyst™ Control Center from the popup menu.

Launching Catalyst™ Control Center Using the Desktop Shortcut

When you first installed Catalyst™ Control Center the setup wizard provided you with the option of placing a shortcut on the desktop.

- Double-click the Catalyst™ Control Center desktop shortcut.

Launching Catalyst™ Control Center Using Hot Keys

- You can press predefined **F7** help key or combination of keys such as **Ctrl**+**Alt**+**C,** or you can define your hot key by using the Hotkey Manager.

Launching Catalyst™ Control Center from ATI Multimedia Center™

You can also access the Catalyst™ Control Center while an ATI Multimedia Center™ application, like TV Player, is running.

- Click the Catalyst™ Control Center icon in the multi-media application's control panel, if available.

ATI Technologies

Catalyst™ Control Center Dialog

Help

Use the Catalyst™ Control Center Help feature to access the comprehensive online help system, generate a Problem Report, and get the installed Catalyst™ Control Center version information.

To access Help

- Click the **Help** button in the Catalyst™ Control Center Dashboard.

or

- Press the F1 key at any time to get specific help on the feature or aspect you are using.

Displays Manager

The Displays Manager aspect is the central location for configuring your display devices and arranging your desktop. Use the Displays Manager

aspect to quickly change your display setup, arrange your desktop in a multi-monitor environment, and enable TV Out.

Those new to the Catalyst™ Control Center may use the Standard View wizard to help you configure your display preferences. Experienced users who prefer to manually configure their desktop setting should use the Advanced View.

Catalyst™ Control Center: Standard View

Catalyst™ Control Center: Advanced View

Video

Use the Video aspect to use preconfigured profiles that best match your viewing environment. Switch to the Advanced view to manually adjust video overlay and choose a preferred viewing mode, such as Widescreen or Fullscreen modes.

To access the Video aspect

• Select **Video** in either Standard or Advanced View.

Display Options

The Display Options aspect gives you additional control to optimize performance of OpenGL® and Direct 3D® applications.

Use 3D Refresh Rate Override to set a refresh rate of your choice when a full-screen application or game has a default refresh rate that is lower than optimal.

Choose one of the Display Detection Options to prevent screen flicker when detecting a display.

If you are using an older TV or one that has non-standard inputs that may not be automatically detected, use **Force TV Detection**. When a TV is detected using this method, it appears in the Displays Manager aspect and can be configured as required. However, some features that rely on automatic detection, such as extended desktop, will not be supported.

To access the Display Options aspect

- Select **Display Options** in Advanced View.

Color

Use the Color aspect to adjust the color settings for your desktop and full-screen games. The Preview effects area shows your changes to gamma, brightness, and contrast in real time.

To access the Color aspect

- Select **Color** in Advanced View.

Monitor Properties

Use the Monitor Properties aspect to configure your Display Data Channel (DDC) monitor's attributes, to display information about the connected monitor, and adjust the output display's position and size.

> **Note:** Catalyst™ Control Center loads aspects dynamically based on what device is attached to the graphics card. If you have a display device other than a standard monitor or flat panel display (such as a HDTV screen) *Digital Panel Properties* will appear in the Graphics Settings listing instead of *Monitor Properties*.

To access the Monitor Properties aspect

- Select **Monitor Properties** in Advanced View.

ATI Technologies

Component Video Properties

The Component Video Properties aspect of the Catalyst™ Control Center adds further support when using the ATI HDTV Component Video Adapter.

Component Video Properties is made up of:

- Formats
- Adjustments
- Advanced

To access the Component Video Properties aspect

- Select **Component Video Properties** in Advanced View.

Digital Panel Properties

Use the Digital Panel Properties aspect to configure the DVI settings and Image Scaling to improve image quality without impacting performance. Use HDTV Support to add EDID information (containing information about the capabilities of the display) about your connected HDTV display to the **Force** button in Displays Manager.

Note: Catalyst™ Control Center loads aspects dynamically based on what device is attached to the graphics card. If you have standard display device such as a CRT monitor or flat panel display *Monitor Properties* will appear instead of *Digital Panel Properties*. The latter is designed for use with such devices as HDTV displays.

Hotkeys Manager

The Hotkeys Manager allows you to create shortcut key combinations to quickly perform tasks such as changing a graphics setting or opening an application. A hot key is a combination of one or more modifier keys, such as Ctrl, Alt, or Shift, and any letter from the alphabet.

To access Hotkeys Manager

- Click **Hotkeys** in the Catalyst™ Control Center.

Profiles Manager

Use profiles to create customized environments for your desktop, video, and 3D applications. Define and save into a profile your own personal video settings that can be quickly activated manually, through a hot key, or by file association.

Note: A profile applies to a specific graphics card. If there is more than one graphics card installed in your computer, you need to select the appropriate card before creating, loading, or activating a profile.

To access the Profiles Manager

- Click the Profiles button in the Catalyst™ Control Center.

Preferences

Use the Preferences page to restore factory defaults, change skins, or enable/disable the System Tray icon.

The Catalyst™ Control Center Preferences page contains the following options:

- Hide Tooltips
- Always on Top
- Enable System Tray menu
- Restore factory defaults
- Show Toolbar Text
- Select a Language
- Select a Skin

To access Preferences

- Click **Preferences** in the Catalyst™ Control Center.

ATI Technologies

CrossFire™

The CrossFire™ aspect requires the following components to be available in order to appear as an option within Catalyst™ Control Center:

- A CrossFire™ Ready motherboard with two PCI Express® X16 slots
- A CrossFire™ Edition Series graphics card
- The Radeon® X850 CrossFire™ Edition can be paired with any standard Radeon® X850-based graphics card, or
- The Radeon® X800 CrossFire™ Edition can be paired with any standard Radeon® X800-based graphics card.
- An interconnect cable, supplied with the CrossFire™ Edition graphics card, connecting the two cards to a single monitor.

It is recommended that Catalyst™ A.I. be enabled in order to automatically select the preferred rendering mode for target applications. For applications that are not identified in Catalyst™ A.I., or when Catalyst™ A.I. is disabled, default CrossFire™ rendering modes are used. In addition, Super Anti-aliasing modes can be directly enabled in Catalyst™ Control Center.

For the latest information, see the CrossFire™ Web page at:

ati.com/crossfire

To access CrossFire™

- Select **CrossFire™** in Advanced View.

Enable CrossFire™

1 Click **CrossFire™** in Advanced View.

2 Click **Enable CrossFire™.**

When CrossFire™ is successfully enabled all display devices, except the one used by CrossFire™, will be disabled.

**Note:** CrossFire™ Higher Quality anti-aliasing can be adjusted in the Catalyst™ Control Center 3D settings aspect.

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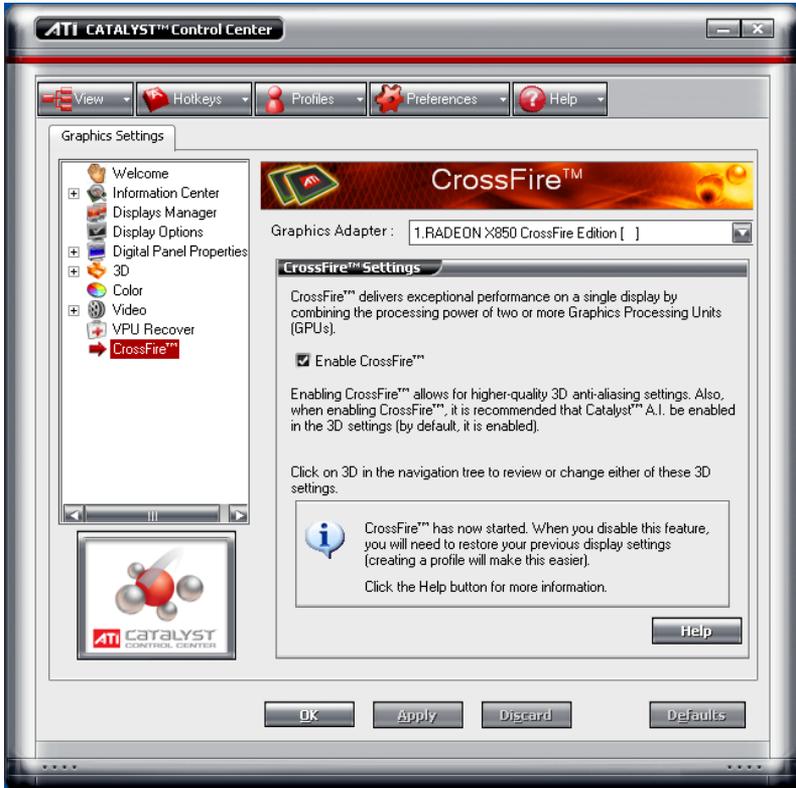
Catalyst™ Control Center: CrossFire™ is Enabled

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CHAPTER 8:

Reference

This chapter provides information on troubleshooting, where to get additional accessories, how to register your product, plus warranty and compliance information.

Troubleshooting

The following troubleshooting tips may help if you experience problems. ATI's documentation contains helpful installation/configuration tips and other valuable feature information. Please contact your dealer for more advanced troubleshooting information.

General Troubleshooting	
Problem	**Possible Solution**
Computer Does Not Boot-Up Properly	• Verify that the installation instructions were properly followed. • Check that the card is properly installed in your system and connected to your monitor. • If you have problems during start-up, restart your computer in **Safe Mode**. While starting Windows® XP, press and hold **F8** until you see the Windows® Advanced Options Menu. Use the arrow keys to select **Safe Mode**, and press **Enter**. • Check the system configuration utility of your operating system for the interrupt assignments. • Contact ATI's Customer Care or your local technical support.

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General Troubleshooting

Problem	Possible Solution
No Display	• Check that the card is seated properly in its expansion slot. • Ensure that the monitor cable is securely fastened to the card. • Make sure that the monitor and computer are plugged in and receiving power. • If necessary, disable any built-in graphics capabilities on your mother board. For more information, consult your computer's manual or manufacturer. (Note: some manufacturers do not allow the built-in graphics to be disabled or to become the secondary display.) • Make sure that you selected the appropriate monitor when you installed your enhanced driver.
Screen Defects Appear	• Check if your monitor supports the resolution, horizontal (kHz) and vertical (Hz) refresh rates as required by the graphics card. • Check your current resolution, refresh rate, and color depth settings in the **Settings** and **Monitor** tabs in your **Display Properties** dialog. **Warning!** Ensure that both video card and monitor support resolution and refresh rates you select. Incompatible resolution/refresh rate selection may result in monitor damage. Refer to your monitor's documentation for recommended resolutions and refresh rates.
Off-Center Screen Image, Odd Colors or No Picture	• Try adjusting the brightness, sharpness, contrast, and color balance controls of your monitor. • Try adjusting the centering and positioning controls of your monitor to position the picture on the screen • Set the monitor's RGB inputs (and sync switches, if this option is available) to 75 Ohms, with the sync set to external. • Digital Flat Panel (DFP) monitor users: refer to your monitor's documentation for the appropriate cable and connector to plug into the DVI-I connector on the graphics card.
Operating System Warns that Video Card Isn't Properly Configured	• Check the driver installation and make sure that all software is correctly loaded corresponding to your operating system and applications. • Re-install the ATI drivers for your Radeon® X850 CrossFire Edition card.

CrossFire™-Specific Troubleshooting	
Problem	**Possible Solution**
CrossFire™ is Not Functioning	In order for CrossFire™ to function the interconnect cable must be correctly connected to both the Master and Slave graphics cards. 1. Connect the DMS-59™ connector of the interconnect cable to the DMS-59™ connection on the Master card. 2. Connect the DVI-I connector of the interconnect cable to the DVI-I connection on the Slave card. 3. Connect the remaining DVI-I connector of the interconnect cable to your monitor. On graphics cards with two DVI-I connectors, only one DVI-I connector on the Slave card supports Transition Minimized Differential Signaling (TMDS) required by CrossFire™. If CrossFire™ does not appear in the Catalyst™ Control Center or is not available, try connecting to the second DVI-I connector on the Slave card.
"Before CrossFire™ can be enabled, you need to close the 3D application or video playback that is currently running."	You will not be able to start CrossFire™ if a 3D application, game, or video playback, such as a DVD movie, is running. Close all open 3D applications, games, and movie player applications then enable CrossFire™.
"The CrossFire™ Edition card must be installed on the 1st boot-up slot on your motherboard."	A message recommending the reversal of graphics card positions appears if the Master graphics card is not installed in the correct PCI Express® slot. Typically, the Master graphics card should be placed in Slot 0 (Slot zero). See your motherboard's manual to determine the correct CrossFire™ placement of Master and Slave graphics cards for your system.
CrossFire Aspect in Catalyst™ Control Center is Not Displayed	CrossFire™ aspect is only available for the Master graphics adapter. Make certain that the motherboard's system BIOS has Dual PCIe™ slots enabled. Also make certain that the master and slave graphics cards are in the correct PCIe™ slot. For more information see your motherboard's manual.

CrossFire™-Specific Troubleshooting	
Problem	**Possible Solution**
"CrossFire™ Is Currently Unavailable."	This error is occurred because CrossFire™ did not correctly detect your graphics hardware or their is a problem with the software. • Check the graphics card are installed correctly. • Check the interconnect cable is installed correctly. • Close all running 3D applications. • Re-install the Catalyst™ Control Center. For information on installing the software see the Getting Started Guide that came with your graphics card.
"The memory sizes for your CrossFire™ Edition and regular card are mismatched."	Graphics card with different amounts of memory can by used with CrossFire™. However, restarting your computer is required. This will cause CrossFire™ to reduce the amount of memory being used on the larger card to match the memory size of the smaller card. Clicking **OK** to the memory mismatch error message will restart your computer. When disabling CrossFire™ you will be given the option to restart your computer to restore the original graphics memory size or continue with the reduced memory size.
Cannot Use ATI Overdrive	ATI Overdrive is not an available feature on CrossFire™ systems.
Screen Rotation Function Does Not Work or is Unavailable	Screen rotation is not an available feature on CrossFire™ systems.
Unable to get CrossFire™ to work on a Windows® XP Professional x64 Edition system.	Ensure that the proper drivers for both graphics cards has been properly installed. If both graphics cards have already inserted onto the motherboard, connect a display to the DVI connection of the CrossFire™ Master graphics card and then install the drivers for both graphics cards.
VIVO on Slave Card Does Not Work	If a VIVO (Video In, Video Out) connection is available on the Slave card, its functionality is not supported in this configuration. If the graphics card is moved into the primary PCI Express® slot, VIVO functionality will return.

HDTV/HDTV Adapter Troubleshooting	
Problem	**Possible Solution**
The colors on my TV display are incorrect	• Ensure that the connections between the Component Video Adapter and your HDTV are correct (Y=Green, Pb=Blue, Pr=Red).
There is no display on my TV	• Your TV will not display anything until Windows starts; this may take several minutes. • Set your TV to YPbPr input. • Ensure that the HDTV Component Video Adapter is properly connected, then restart your computer.
DVDs will not play in 720p or 1080i modes	• Copy-protected DVDs restrict playback to 480i and 480p modes.
I can't see the entire display	• If your component input device supports it, try 720p mode.
The display appears tilted	• Consult your HDTV user's manual.
My CRT display is green	• Your system is in component output mode. Restart your computer with the CRT monitor connected.

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	Access
Online or Mail	24/7	English, French, Spanish, Portuguese, German	**ati.com** or ATI TECHNOLOGIES INC. Attention: Customer Care 1 Commerce Valley Drive East Markham, Ontario Canada L3T 7X6
Telephone US & Canada	9:00AM - 7:00PM EST. Monday to Friday.	English	1-877-284-1566 (toll-free) or 1-905-882-2626 (International and/or local toll charges to Canada will apply).
Telephone Europe and Other Regions	10:30 to 00:00 GMT 10:30 to 19:00 GMT 12:00 to 20:30 GMT	English German-French Spanish-Portuguese	+00800-6677-1111 (toll-free) or +1-905-882-5549 (International and/or local toll charges to Canada will apply)
Telephone Latin America / South America	7:00AM to 3:30 PM EST 7:00AM to 7:00PM EST	Spanish, Portuguese English	+0800-333-5277(Argentina) +0800-891-9068 (Brazil) +001800-514-3276 (Mexico) other: +1-905-882-3277 (International and/or local toll charges to Canada will apply)

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.

Warranty Information

Hardware Warranty Service Statement

ATI Technologies Inc. warrants to the original purchaser of the hardware that the product is in good working condition, according to its specifications at the time of shipment, for a period of three years from the date of original purchase.

Should the product, in ATI's opinion, malfunction within the warranty period, ATI will, at its discretion, repair or replace the product upon receipt with an equivalent. Any replaced parts become the property of ATI. This warranty does not apply to the software component of the installation, usage not in accordance with product specifications and instructions, natural or personal disaster, or unauthorized alterations, repairs, or modifications.

Proof of purchase may be required, if doubt exists regarding warranty eligibility. Late model products are assumed to be under warranty. ATI accepts ordinals, photocopies and faxes as proof of purchase when required

Warranty Service

For warranty service instructions visit:

ati.com/online/warranty or contact one of our Customer Service Representatives using one of the aforementioned means.

- Before shipping any unit for repair, obtain an RMA number for warranty service.
- When shipping your product, pack it securely, show the RMA and serial number of the product on the outside, and ship prepaid and insured.
- ATI will not be held liable for damage or loss to the product in shipment.
- Standard warranty service consists of repair upon receipt.

- ATI reserves the right to replace the product with a serviced product at their sole discretion at any time.
- You are responsible for the cost of shipping the product to ATI. ATI plays the cost of returning the product to you.

Products which are repaired under warranty are guaranteed for the remainder of the original warranty period. Repairing or exchanging a product does not start a new warranty period. If, at the time of repair, a product is already "out of warranty" or within the last 90 days of the warranty period, ATI will guarantee the repair for the full 90 days. All other terms and conditions of the original warranty apply.

Limitations

- This warranty is valid only if the online Product Warranty Registration form at: ati.com/online/registration
  is successfully submitted within 30 days of purchase of said product.
- All warranties for this product, expressed or implied, will expire three (3) years* from date of original purchase.
- All accompanying cables and accessories are warranted for 90 days.
- No warranties for this product, expressed or implied, shall extend to any person who purchases the product in a used condition.
- The liability of ATI in respect of any defective product will be limited to the repair or replacement of such product. ATI may use new or equivalent-to-new replacement parts. Defective product will be sent in for repair or replacement only. ATI makes no other representations or warranties as to fitness for a particular purpose, merchantability or otherwise in respect of the product. No other representations, warranties or conditions, shall be implied by statute or otherwise. In no event shall ATI be responsible or liable for any damages, including but not limited to the loss of revenue or profit, arising:
- From the use of the product, as a result of any event, circumstance, action or abuse beyond the control of ATI; whether such damages be direct, indirect, consequential, special or otherwise and whether such damages are incurred by the person to whom this warranty extends or a third party
- From the loss of use of the product, as a result of any event, circumstance, action or abuse beyond the control of ATI; whether such damages be direct, indirect, consequential, special or otherwise and whether such damages are incurred by the person to whom this warranty extends or a third party.
- Unauthorized repairs to an ATI board level product will void the warranty offered by ATI Technologies. ATI reserves the right to refuse to service any product which has been altered, modified, or repaired by non-ATI service personnel.

Getting Additional Accessories

Additional and replacement cables, installation CD-ROMs, manuals, and other accessories for ATI products can be purchased from the online ATI store at:

ati.com/online/accessories

Compliance Information

This section details the compliance information for this product.

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

ATI Technologies

Waste Electrical and Electronic Equipment (WEEE) Directive Compliance

This product was manufactured by ATI Technologies Inc.

ATI Technologies

CHAPTER 9:

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.

3Dc™

An ATI hardware-based compression technology that reduces the size of 3D texture data, rendering more finely-grained texture surfaces with greater efficiency. It significantly minimizes the memory footprint of normal maps containing information on how light reflects off textured surfaces, allowing game programmers to include more texture and lighting details without affecting performance.

AGP

The Accelerated Graphics Port (AGP) is a slot on the computer motherboard designed specifically for 3D graphics cards. AGP runs 3D

images much more smoothly and quickly than was previously possible with PCI video cards; AGP runs at several times the bus speed of PCI and employs sideband addressing, so multiple data transfers between the graphics processor and the computer can take place concurrently. AGP is currently being phased out in favour of PCI Express® (PCIe™) on PC systems.

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.

Alternate Frame Rendering

A graphical load-balancing scheme where two graphics cards are used to render alternate frames of the display. This configuration increases the detail of the 3D objects each card can render, as each card handles half of the total number of frames. Essentially, each card has more time to render a scene, delivering a noticeable increase in 3D detail. This type of graphical operation is only available in Radeon® CrossFire™ graphics cards running Microsoft® Direct 3D® and OpenGL® games or applications.

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

A group of related features in ATI's Catalyst™ Control Center software. For example, the Color aspect clusters together controls that handles gamma, brightness, contrast, and other features relating directly to the display of color. Similarly, the 3D aspect provides a set of related controls dealing with such features as anti-aliasing, anisotropic filtering, mipmap details levels, and more.

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.

Catalyst™ Control Center

Catalyst™ Control Center is the successor technology to the Catalyst™ software formerly available only through the Windows® Control Panel. It has a new user interface, providing a more interactive means of controlling

such things as 2D and 3D performance while providing immediate feedback using a more intuitive graphical user interface.

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.

Component Video

Typically used on DVD players and HDTV systems, component video is a standard Red/Green/Blue (RGB) color signal for televisions. The signal is split and compressed into separate luminance and color values—luminance ("Y"), red minus luminance (R-Y), and blue minus luminance (B-Y). The value for green is not transmitted. The display device automatically "fills in" the color values that are not red or blue. DVDs are encoded using component video, so display devices will provide enhanced playback when this type of connection is used. A common variant of this format used in North America is YPbPr.

Composite Video

Composite video is a type of analog video signal that combines both brightness and color information into a single signal. It typically uses a single RCA connection for the video channel, and separate RCA connections for the left and right audio channels. The quality of the video signal is reduced by the process of mixing the brightness and multiple color channels together into a single channel. For this reason it is inferior in signal quality than either S-Video or component video. Composite video is the broadcast format for analog television signals worldwide, and connections are typically available on VCRs, DVD players and video games.

Compositing Engine

A chip that is available only on CrossFire™ Edition graphics cards. This chip takes the signals from the GPUs on both the Master graphics card and the Slave graphics card and combines the results according to the selected operating mode. It then sends the final frames out to the display device. It is capable of advanced blending operations without burdening either of the GPUs.

Control Point

A control point is a user-created point on the color curve. Users can change the color of the screen by moving the control points with a mouse.

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.

Dashboard

The dashboard is the part of the Catalyst™ Control Center used to display a graphical representation of the features available in installed ATI hardware and software. The dashboard can be used to access all of the aspects (sets of related graphical features) available on a graphics card. The dashboard offers two views of the software: a Basic view, which is a simplified view that includes wizards, and an Advanced view aimed at more experienced users, providing access to the complete feature set of the software. Users can also create a Custom view.

Direct 3D®

Part of Microsoft®'s DirectX API designed for rendering 3D graphics on Windows® systems. It provides software developers with low-level access to functions on graphics cards, providing the type of performance necessary for intensive 3D applications such as games.

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.

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.

EDTV

Acronym for "Enhanced Definition Television," which produces better television image quality than Standard Definition Television (SDTV). Applicable to the NTSC broadcast format, EDTV displays are capable of depicting the standard 480 horizontal scan lines in a non-interlaced format. Instead it paints all of the scan lines in one pass, which is called progressive scanning, a process which also removes the "jaggies" inherent in the interlaced television signals.

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.

HDTV

Acronym for "High Definition Television," a format that produces much greater picture quality than a standard television, and in a wide-screen format that matches that of a movie theater screen. The two most popular formats are 1080i and 720p, where the number represents how many horizontal scan lines they have, and the following letter represents whether the picture is interlaced, or the product of progressive scanning technology. Interlaced displays paint the odd-numbered scan lines and then the even-numbered lines to produce a picture, whereas progressive scan paints all of the scan lines at once. Both formats use an aspect ratio of 16:9. In contrast, standard North American television signals are displayed using 480 interlaced (480i) scan lines with a more square aspect ratio of 4:3.

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.

HydraVision™

HydraVision™ is ATI's multi-monitor management software, enabling users to manage the display of multiple windows and applications across two adjacent monitors. It also includes a range of productivity features designed to effectively manage applications in this environment.

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.

ATI Overdrive

ATI Overdrive maximizes the performance of the GPU by dynamically altering its speed to an optimal level depending on usage. An on-chip thermal sensor constantly monitors the temperature of the GPU, allowing for maximum clock speed to be maintained while avoiding overheating.

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.

PCI

Acronym for "Peripheral Component Interconnect," which is the specification for a type of computer bus used for attaching computer peripherals to a computer's motherboard. PCI encompasses both integrated motherboard components (such as built-in graphical processors) and peripherals that fit into an expansion card slot, such as a separate graphics card. PCI replaced the older ISA and VESA bus standards, and was itself superseded by the AGP standard for the main graphics card bus.

PCI Express® (PCIe™)

The successor standard to the PCI and AGP bus standards, with a significantly faster serial communications system, further opening up bandwidth for more communications between such peripherals as graphics cards and the computer's CPU. PCIe cards can come in several physical configurations, the fastest currently being X16, which is typically used for graphic cards, and X1, typically used for other peripherals, such as separate multimedia cards.

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).

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.

SCART

SCART is an acronym for "Syndicat des Constructeurs d'Appareils Radiorécepteurs et Téléviseurs". SCART is an 21-pin connector used mainly in Europe for transferring analog audio and video signals between VCRs, DVD players, personal computers, and set-top boxes. It is sometimes referred to as Péritel or the Euroconnector.

Scissor Mode

A graphical load-balancing scheme where two graphics cards are used to render two halves of an image display. One graphics card renders the top half of the screen while the second graphics card renders the bottom half. This configuration offers a form of dynamic load balancing between the two cards as each only needs to render 3D object details on only half of the screen instead of the full screen at any one time. This type of graphical operation is only available in Radeon® CrossFire™ graphics cards running Microsoft® Direct 3D® and OpenGL® games or applications.

SDTV

SDTV is an acronym for "Standard Definition Television" that identifies lower resolution systems when compared to High Definition Television (HDTV) systems. SDTV systems use the same 4:3 aspect ratio and 480 scan lines to produce a picture as regular analog television sets, but digital decoding enhanced of the signal, displaying a sharper and crisper picture.

SDTV broadcasts are either interlaced (480i) or use progressive scan (480p), the latter method providing the best overall image quality.

SECAM

An analog color video signal that originated in France, and is used in many other countries, including (but not limited to) much of Eastern Europe, parts of the Middle East and Asia. Like the PAL video standard, SECAM also draws a total of 625 vertical interlaced frames of video at a refresh rate of 25Hz, but uses a fundamentally different way of encoding its colors. The name is an acronym for "Séquential Couleur avec Mémoire," which is French for "sequential color with memory."

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™ HD

SmartShader™ HD 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™ HD 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.

SmoothVision™ HD

SmoothVision™ HD incorporates improved anti-aliasing, anisotropic filtering and 3Dc™ compression features designed to further enhance image quality. Anti-aliasing performance is improved, providing better overall detail and image quality. The enhanced anisotropic filtering ensures sharper and clearer pictures at higher frame rates, and the new 3Dc™

compression technology makes it possible to display higher polygon counts for 3D rendered objects.

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.

Super Anti-aliasing

A feature that improves image quality by combining the results of full-screen anti-aliasing across two graphics cards in a CrossFire™ configuration. The two graphics cards work on different anti-aliasing patterns within each frame. The results of which are combined by the compositing engine on the CrossFire™ Master graphics card to produce 3D images featuring smoother contours, lines, and shading effects.

SuperTiling

A graphical load-balancing scheme where two graphics cards are used to render alternate small 32x32 pixel squares in a fine-grained checkerboard pattern. This configuration increases image rendering quality, as each card processes half of the complex 3D objects in the pixel squares. SuperTiling is better optimized for most applications than Scissor Mode (where two graphics cards are used to render the top and bottom halves of the screen), since the checkerboard pattern better ensures a more even distribution of what needs to be rendered. This type of graphical operation is only available in Radeon® CrossFire™ graphics cards running Microsoft® Direct 3D® games or applications.

S-Video

Short for "Separate Video," S-Video is a type of analog video interface that produces a higher-quality signal compared to composite video. The signal is split into two separate channels— luminance (Y) and chrominance (C). Sometimes referred to as "Y/C video" or "Y/C", the connectors typically

contain 4-pins within a single connection housing and are commonly found on consumer DVD players, VCRs, game consoles, and related devices.

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.

Texture Mapping

In computer graphics, two-dimensional textured surfaces are referred to as texture maps. Texture mapping is the process by which a two-dimensional surface gets wrapped around a three-dimensional object so that the 3D object takes on the same texture qualities. For example, if you take a 2D textured surface that looks like cloth and wrap it around a 3D sphere, the sphere will now appear to have a cloth-like surface.

Texture Preference

Texture Preference is a feature enabling the user to select the texture quality level for the surface of a 3D object. Selecting the highest quality possible will provide the most realism, although it may also have some impact on the performance of any 3D intensive application.

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.

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.

VPU Recover

A feature designed to significantly reduce the number of system crashes caused by problems occurring with the graphics hardware. If the display driver detects that the graphics processor has hung, VPU Recover will attempt to reset the graphics processor, eliminating the need for a system reboot and allowing users to continue using the computer without interrupting or losing their work.

ATI Technologies

YPbPr

A type of analog composite video signal that splits and compresses the standard Red/Green/Blue (RGB) colors of a television signal into separate luminance and color values. The "Y" stands for the luminance channel, while "Pb" and "Pr" represent the blue and red channels respectively, both of which have the luminance value subtracted from them. It is an equivalent color space to the chrominance-based YCbCr, which is used for digital video.

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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