



## Voodoo5™ 5500 for the PC Reviewer's Guide

### DRAFT - DATED MATERIAL

THE CONTENTS OF THIS REVIEWER'S GUIDE IS INTENDED SOLELY FOR REFERENCE WHEN REVIEWING Rev A VERSIONS OF VOODOO5 5500 REFERENCE BOARDS. THIS INFORMATION WILL BE REGULARLY UPDATED, AND REVIEWERS SHOULD CONTACT THE PERSONS LISTED IN THIS GUIDE FOR UPDATES BEFORE EVALUATING ANY VOODOO5 5500BOARD.

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## Table of Contents

### **Benchmarking the Voodoo5 5500**

**Page 5**

- Cures for common benchmarking and image quality mistakes
- Tips for benchmarking
- Overclocking Guide

### **INTRODUCTION**

**Page 11**

- *Optimized for DVD Acceleration*
- *Scalable Performance*
- *Trend-setting Image quality Features*
- *Texture Compression*
- *Glide 2.x and 3.x Compatibility: The Most Titles*
- *World-class Window's GUI/video Acceleration*

### **SECTION 1: Voodoo5 5500 Board Overview**

**Page 12**

- *General Features*
- *3D Features set*
- *2D Features set*
- *Voodoo5 Video Subsystem*
- *SLI*
- *Texture compression*
- *Fill Rate vs T&L*
- *T-Buffer introduction*
- *Alternative APIs (AI Reyes on Mac, Linux, BeOS and more)*
- *Pricing & Availability*
- *Warranty*
- *Technical Support*
- *Photos, screenshots, White Papers and more*

### **SECTION 2: About the Voodoo5 5500 Board**

**Page 19**

- *Board Layout*
  - *Hardware Configuration & Components*
  - *System Requirements*
- *Display Mode Table*
- *Software Drivers*
- *3dfx Tools Summary*

## **Table of Contents (cont.)**

<b>SECTION 3: About the VSA-100 Chip</b>	<b>Page 22</b>
• <i>Overview</i>	
<b>SECTION 4: Installation and Start-Up</b>	<b>Page 23</b>
• <i>Installing the Board in a PC</i>	
• <i>Start-Up</i>	
<b>SECTION 5: FAQ</b>	<b>Page 27</b>
<b>SECTION 6: Glossary of 3D Terms</b>	<b>Page 31</b>
<b>SECTION 7: Contacts &amp; Press Web site</b>	<b>Page 35</b>
<b>APPENDICIES</b>	
1: Current Benchmarks	<b>Page 36</b>
• <i>3D WinBench 2000</i>	
• <i>3DMark 2000</i>	
• <i>WinBench 2000</i>	
• <i>Game Gauge 2.5</i>	
• <i>Quake III Time Demo</i>	
<i>Expected Performance of Popular Benchmarks</i>	<b>Page 38</b>
• <i>Errata: Known Problems</i>	<b>Page 41</b>
• <i>3dfx Tools User Guide</i>	<b>Page 42</b>
• <i>Other Bundled Software</i>	<b>Page 51</b>

## **The information provided in this document is not for publication.**

### **Benchmarking the Voodoo4/5 series of cards:**

The introduction of real time Full Scene Anti-Aliasing (FSAA) in hardware, made possible by the T-Buffer technology incorporated in the 3dfx Voodoo5 product family brings a new set of challenges for reviewers. For years, frame rates were imperative to games, as manufacturers of 3D accelerators strove to get a frame rate high enough to maintain smooth game play. But as 3D accelerators have continued to dramatically improve fillrates with each subsequent generation, it begs the question, “Why do we need all this fillrate?”

Voodoo5 5500 marks a watershed in PC graphics where the technology emphasis expands from simply achieving incredibly high frame rates to delivering mind-blowing image quality at playable frame rates. Voodoo5 5500 features like FSAA coupled with 32-bit rendering and 2Kx2K textures deliver a new level of realism that greatly enhances game play. Combining extreme improvements in image quality in addition to the pursuit of raw speed is our new charter.

Reviewing a feature which dramatically improves image quality such as the Voodoo5's FSAA is undoubtably complicated. Which is better: an image with jagged edges, crawling textures and popping pixels running at some obscene framerate like 130 fps, or a beautifully rendered, anti-aliased image that appears almost like pre-rendered quality running at a slightly lower frame rate? If the anti-aliased image is of a higher quality at 800x600 than an aliased image at 1024x768, which frame rate is more important: the 800x600 or 1024x768 score? Of course, the answer depends on the game itself. Some “twitch” games (e.g. Quake3) require absolutely immediate response and the highest possible frame rates. Other games, such as flight sims, sports games, role playing games and the like often times become much more immersive and realistic when the visual quality is dramatically improved with FSAA. Since there is no “right” answer to which games should enable FSAA, we provide the user the ability to enable or disable FSAA in the control panel. For fast-paced action games like Quake3 where performance is paramount, turn off FSAA and enable the world's highest fillrates with Voodoo5. And for other games when you want to enjoy the beautiful rendering accomplished with FSAA, turn it on and experience the world's best rendering quality with Voodoo5's FSAA capability.

We believe strongly that FSAA is something that no graphics card should be without. We hope in your review of our product that you will also come to believe this. Those of you that have already seen our FSAA demonstrated understand the superior image quality that 3dfx's hardware FSAA delivers for all games, both old and new, and not just titles that have been written specifically to take advantage of it. We believe that our FSAA is truly the industry's most powerful “out of box” experience ever delivered. Think about it—when the first 3D hardware accelerators became available we wowed consumers with great demos, but the reality was that no games were available to take advantage of the new hardware acceleration. Moving forward we as a 3D industry made incremental improvements to the 3D capabilities: adding higher resolution textures, higher pixel depths, higher triangle rates, hardware T&L, etc. But every time a consumer purchased one of these new boards it was an act of faith – faith that some day in the future that user could actually buy a game that took advantage of some new hardware feature. Well, quite frankly, we believe we have changed the equation with the Voodoo5 family of products. Now, immediately when the user puts his new Voodoo5 into his system he **UPGRADES HIS ENTIRE GAME LIBRARY**. No more waiting for future games to take

advantage of a hardware feature. The same day a user purchases a Voodoo5 is the same day that user can experience the breakthrough FSAA capability in all his titles. This is why we say that Voodoo5 is the most powerful “out of box” experience ever delivered. We hope you agree.

So, the difficult question becomes how to incorporate visual quality (i.e. FSAA) when benchmarking and reviewing 3D boards? We offer the following basic guidelines:

1. First, make sure that when you compare the frame rates achieved by two graphics cards that you have set the cards to achieve similar levels of image quality. A corollary to this rule is if one card delivers image quality that’s far beyond anything that other cards can achieve then it must be considered in a class by itself. Never directly compare benchmarks from two boards when one board’s image quality is substantially better than the other’s.
2. Second, make sure that a board’s FSAA implementation is COMPATIBLE across a variety of titles and APIs. For example, we have noticed a disturbing trend from our competitors whereby drivers are released which perform some form of assisted FSAA but only for certain titles or certain APIs. Make sure to compare FSAA implementation and visual quality across many titles which use different 3D APIs – only this will ensure that you are giving your readers the complete picture.
3. Third, be careful when benchmarking FSAA that it is truly enabled when testing. We have seen drivers, which enable FSAA at some resolutions, but then do not enable FSAA at higher resolutions (presumably because their performance would be so slow!). Sanity check all resolutions by visual inspection to ensure that FSAA is really enabled prior to benchmarking.

**Here are more specific benchmark procedures to consider when testing our boards:**

- 1) Make sure that your competitive benchmarks are truly “apples to apples” comparisons. Voodoo5 5500 offers two levels of FSAA: 2-sample and 4-sample (“2X” and “4X”). Our 2X “jittered” FSAA is equivalent to competitors’ “4-sample” algorithms (see our FSAA white paper for a detailed explanation). Our 4X jittered FSAA has quality beyond anything offered on the market today for the PC. Be sure to compare the speed and quality of Voodoo5 5500’s 2X FSAA with competitors’ standard (likely their only) FSAA. No competing product offers image quality to compare with Voodoo5 5500’s 4X FSAA therefore it should be considered in a class by itself (Read the section describing the use of our “3dfx Tools” FSAA control panel later in this guide to insure that you are always setting the correct level of FSAA for your tests.).
- 2) Because FSAA has previously been unavailable on the PC many titles from top developers have used techniques such as dim lighting, low variation of spatial color and shape, and outright avoidance of finely-detailed objects to minimize aliasing artifacts. The result is that some titles, Quake3 for example, are not dramatically visually improved when FSAA is enabled due to the inherent low contrast artwork. It is therefore imperative to review many titles of different genres and compare their appearance with and without FSAA enabled. Pull out some of your favorite old titles and see how much better they look and how much more fun they are to play with FSAA enabled!
- 3) When running 3D WinBench 2000 DO NOT enable FSAA via the 3dfx Tools. Doing so will override the Direct3D FSAA hint flags that 3D Winbench uses to enable FSAA automatically (WinBench is one of the few number of titles that was actually written to take advantage of FSAA if available). Enable FSAA only via the 3D Winbench 00 performance test’s “Enable AA” menu choice. Enabling FSAA via 3dfx Tools will cause the 3D Winbench 00 image quality tests to fail. This is the expected behavior since the image quality algorithms, not knowing that FSAA is enabled, will misconstrue FSAA to be a form of texture filtering that is considered a “cheat.” We have consulted with Ziff-Davis Benchmark Operations (ZD-Bop), who created 3D Winbench, and we have written confirmation that the correct way to run the image quality and performance tests is to disable FSAA in 3dfx Tools and to enable FSAA only through the performance test’s setup menu.
- 4) Start at 800x600x32bpp. Benchmark our board and our competitors’ with FSAA “OFF” in Direct3D and OpenGL. Generate the FPS scores while also taking great pains to notice image quality of all the boards.
- 5) Now benchmark our board with 2-sample FSAA “ON”, and our competitors with FSAA “ON” in Direct3D and OpenGL. Generate the FPS scores while again, taking great pains to notice the huge image quality improvements.
- 6) Finally, benchmark our board with 4-sample FSAA on (there is no “apples to apples” comparison with the image quality that you will see from our competitors’ products) in Direct3D and OpenGL. Notice the incredible rendering quality of our 4-sample FSAA. Remember that since none of our competitors’ FSAA implementations achieve visual quality levels equal to our 4x FSAA, there is really no way to perform an “apples to

apples' performance comparison of our 4x FSAA to anything our competitors have to offer.

- 7) Increase the resolution to 1024x768 at 32-bit color and repeat steps two through four.
- 8) Because of special algorithms in the Voodoo5 5500, its 16-bit FSAA image quality is very close to our competitors' 32-bit image quality. Run benchmark comparisons at 1024x768 at 16-bit and notice not only the superior performance of Voodoo5 but also the substantial difference in visual quality between our 16-bit FSAA and that offered by the competition. Ours appears smooth with very little artifacts (in fact, sometimes it's hard to tell with our FSAA implementation whether you're running in 16 or 32-bit!) whereas our competitors' offerings look "splotchy" and "dithered."
- 9) Review your benchmark scores and the relative measurements of image quality. For the same level of image quality, say Voodoo5 5500's 2X FSAA versus a competitors' FSAA at 1024x768x32bpp, which card delivers the higher frame rate? Which card, at what settings of resolution and FSAA level, offers the best combination of image quality and frame rate? How did Voodoo5 5500's 16-bit image quality with FSAA enabled compare with competitors' 32-bit image quality with FSAA enabled? How about the frame rate? How did Voodoo5 5500's 32-bit image quality with FSAA enabled compare with competitors' 32-bit quality?
- 10) Finally, turn all the cards to 1600x1200x32 and FSAA "OFF". Benchmark them. How was the score? Did the higher resolution take away *all* the "jaggies" and the crawling textures caused by aliased images? Which resolution plays and looks better? 1600x1200x32 with FSAA "OFF" or 800x600x32 with FSAA "ON"? Which would you play?

It is imperative that you note the differences in visual quality to be sure you are giving a fair comparison. With FSAA, all images are no longer created equal. Remember that the Voodoo5 2x FSAA is visually equivalent to our competitors' "4 sample" FSAA due to Voodoo5's inclusion of special FSAA algorithms and you should benchmark "apples to apples" and compare performance of our 2x FSAA against our competitors' FSAA. Run our 4x FSAA because you'll see the world's finest 3D rendering quality, but don't compare it to any of our competitors' solutions for performance because it is truly in a class by itself in terms of visual quality.

## Cures to Common Benchmarking and Image Quality mistakes

If benchmarking Falcon 4.0, please download the Papadoc benchmark to use in testing. This benchmark can be found <http://www.papdoc.net/>.

### When taking screenshots in Glide/OpenGL always use this hotkey:

Creating Hotkey batch file:

- 1) Create bat file called "go.bat"
- 2) Edit the bat file with the following lines  

```
SET FX_GLIDE_SCREENSHOT_KEY=144
[game executable here]
```
- 3) Start your game and hit the numlock key. It will create TGA image files in the same directory as the executable called glideXXXX.TGA. **Note that every time you quit and restart the game to take more screenshots, the screenshots start over again at glide0000.TGA so they will overwrite the old files that were in there.**

When taking screen shots of Quake 3, be sure that the 8-bit palletized textures are "OFF". Enabling these textures will cause severe color banding.

When using images to compare image quality, you may want to use the highest quality compression to preserve image integrity. We recommend TGA files.

## Benchmarking Tips

- **Disabling V-Sync**

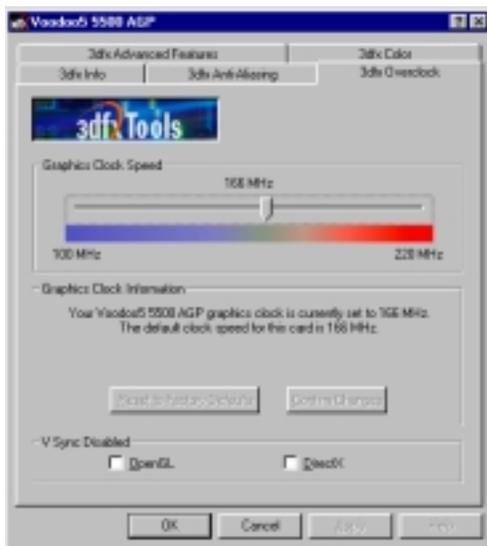
Make sure to disable V-Sync. To disable V-Sync, go to the 3dfx Tools icon in the system tray and double click it. One of the options that pops up will be regarding overclocking. This option will give you a link on where to go to download a V-sync and overclock utility. To receive Microsoft WHQL certification we cannot include a checkbox that allows you to do this in our control panel and we cannot include these utilities in our retail box. We've included these utilities with your eval. board for convenience; end users will have to download the utilities from our website.

To disable V-Sync using the Registry manually, follow these instructions:

- 1) Goto "Start" then "Run". Type in "regedit" and hit "enter".
- 2) Browse to the entry HKEY\_LOCAL\_MACHINE\Software\3dfx Interactive\3dfx Tools\Installed\Tools\{AB040305-8AA1-11D2-8DD1-00104BB5EAD6}
  - a. (It will have two values in that entry, 3dfx Overclocking and Complete Registration)
- 3) Right click on Complete Registration and select modify. Change the value to 1.
- 4) Reboot your machine.
- 5) 3dfx Overclocking and V Sync control panel activated.

- **Overclocking**

Overclocking is not recommended but we know some users will do this. To do this in the registry, download the utility from this link <http://www.3dfxgamers.com/drivers/3dfxtools/>.



**Graphics Clock:** Move the slider right and left to increase and decrease the core and memory clock. Move in small increments!

**Reset to Factory Default:** Resets all boxes and sliders to the original factory settings.

**Confirm Changes:** Click this to enable your changes. A reboot will be needed after clicking this button and clicking the “OK” button.

**V-Sync Disabled:** Check box for OpenGL/Glide and DirectX. Checking either or both of these boxes enabled V-Sync to be unlocked. A reboot is needed after clicking the “Confirm Changes” button and then the “OK” button. If the boxes are checked, removing the check and applying the changes re-enables V-Sync.

\*Make sure to reboot after changing the Graphics clock speed settings or changing any V-Sync settings.

- **OpenGL/Glide\* FSAA On/Off Hotkey**

It's easiest to see the impact of FSAA with a hot-key that enables you to switch between aliased and anti-aliased states. We have a trick for doing this with Glide/OpenGL and D3D titles.

\*\*Note: the technique that we use to enable and disable FSAA with this hot key causes the full FSAA performance hit to be incurred even with FSAA disabled. Do not try to benchmark titles with this hot-key enabled. This utility is simply a convenience to allow easy viewing of the tremendous image quality differences between having FSAA enabled and disabled.

To enable a hotkey for turning FSAA On and Off during a OpenGL or Glide game follow these instructions:

- 1) In the directory where the game is installed, create a new text file and name it whatever you like.
- 2) Right click on the txt file and choose rename.
- 3) Rename the file to “Something.bat” (you choose the something)
- 4) When it asked you if you want to change the type the file type extension, select yes.
- 5) Right click on the file and choose edit.
- 6) In edit mode add the following text
  - a. SET FX\_GLIDE\_AA\_SAMPLE=2 (THIS IS ONLY NECESSARY IF YOU HAVEN'T ENABLED THE 2 SAMPLE AA IN THE ANTI-ALIASING PAGE FROM THE CONTROL PANEL)
  - b. SET FX\_GLIDE\_AA\_TOGGLE\_KEY=144
  - c. “gamenamename.exe”
- 7) Save the file
- 8) Run the bat file.

- 9) Make sure the game is rendering in OpenGL/Glide
- 10) Make sure the num lock key isn't bound to keyboard command in the game
- 11) Hit the num lock key in the game to turn it on and off.

\*Note: Please remember that these instructions will only work with Glide or OpenGL based games. To enable 4 sample AA change the "=2" in the first "SET" statement to "=4" and save the file.

- **DirectX (D3D) FSAA On/Off Hotkey**

1. Set AA Sample setting to 2 or 4 in the control panel.
2. Start regedit and browse to the following location ('device id' is your current video card):

**HKEY\_LOCAL\_MACHINE\System\CurrentControlSet\Services\Class\Display\'device id'\D3D**

3. Create a new key that is **string** and name it **SSTH3\_AAJITTER\_TOGGLE\_KEY**
4. Modify the key and enter the value **65**
5. Close regedit
6. In your game hit CTRL-ALT-A and then release. The game/app will toggle between AA and no AA.

**INTRODUCTION:**

3dfx™ is the industry-leader in 3D entertainment for the PC, and the new VSA-100 accelerator chip, featured on the Voodoo5 5500 products, is the pinnacle of 3D acceleration. The VSA-100 offers blazing 3D/2D/video performance, 1x/2x/4x AGP support, unmatched image quality, and the largest number of compatible gaming titles for the Glide®, Direct3D®, and OpenGL® API's. VSA-100 also provides a unique combination of Voodoo chip-level compatibility, standard-setting image quality features, scalable performance, and unparalleled compatibility with the largest number of advanced 3D API's.

The Voodoo5 5500 of products is an excellent example of the VSA-100's scalability. The Voodoo5 5500 exploits the power of the two VSA-100 chips by coupling them in Scanline Interleave (SLI™) mode and drawing 3D acceleration from both chips simultaneously. The unique scalability of two-chip and four-chip scan-line-interleave (SLI™) configurations delivers industry-leading 3D fill rates that are simply unavailable from other 3D technologies. Multi-chip SLI™ configurations supporting up to 256MB of frame buffer allow the advanced technology of the VSA-100 to manage huge volumes of texture data from even the most demanding 3D applications for stunning visual realism and awesome performance.

Voodoo5 5500 products feature 3dfx's advanced T-Buffer™ technology to provide stunning image quality features like full-scene anti-aliasing, motion blur, and depth-of-field blur. The Voodoo5 5500's VSA-100 chips also support important new image quality features, such as full 32-bit rendering, 32-bit textures, 24-bit floating point depth buffer and 8-bit stencil buffer, and support for texture sizes up to 2Kx2K.

Content developers demand the flexibility and freedom provided by large amounts of texture memory. VSA-100 delivers with multiple forms of 4-bit-per-texel compression, including Microsoft® DirectX 7 format and four proprietary formats with no loss of performance. VSA-100 also supports texture compression through 8-bit palletized textures. VSA-100 supports the greatest range of 3D API's available including Glide 2.x and 3.x, DirectX 7, and OpenGL 1.2. Hundreds of 3D titles optimized for acceleration on Voodoo Graphics, Voodoo Rush, Voodoo Banshee, Voodoo<sup>2</sup>, and Voodoo3 run on VSA-100. No other gaming platform runs more PC and Mac titles combined.

The VSA-100 chip featured on the Voodoo5 5500 is a full 128-bit single-cycle GUI accelerator with 128-bit VGA core. Virtually the entire Windows® Graphics Display Interface (GDI) is implemented in hardware, along with all 256 raster operations (ROPS). VSA-100 is fully compliant with the Microsoft®/Intel® PC99a specification. VSA-100's video architecture is also optimized for software DVD acceleration, including large FIFO's, YUV 4:2:0 planar support with AGP bus-mastering, automatic triple-buffering, 'bob-and-weave' modes and alpha blending for sub-picture support.

## SECTION 1: Voodoo5 5500 Board Overview

### Feature Summary for VSA-100

#### General features

- Fully-integrated 128-bit 3D/2D/Video Accelerator
- Ultimate 3D experience with 366 Million pixels/sec. and 11 Million triangles/sec.
- T-Buffer™ technology:
  - Spatial: full-scene 2 or 4 sample anti-aliasing
  - Focus: depth-of-field blur
  - Motion: motion blur
- 2-way SLI scalability
- 1x/2x/4x AGP with full sideband support
- 32-bit rendering
- Up to 24-bit floating point depth buffer (Z and W)
- 8-bit stencil buffer
- 32-bit textures
- 2Kx2K maximum texture size
- Industry-standard and proprietary texture compression
- [-4k,4k] rendering coordinate range
- Fully software-compatible with 3dfx Voodoo3

#### 3D Feature Set

- Dual pixel pipeline: 2-pixels/clock (single texture) or 2 textures/clock (single pixel)
- Full-scene anti-aliasing in hardware:
  - Single-chip: 2-sample
  - 2-way SLI: 4-sample
- Full hardware setup of triangle parameters
- Supports multi-triangle strips and fans
- Transparency/chroma-key with dedicated color mask
- Alpha blending of source and destination pixels
- Sub-pixel and sub-textel correction to 0.4x0.4 resolution
- Per-pixel atmospheric fog with programmable fog zones
- Dynamic environment mapping
- Perspective-correct true divide-per-pixel 3D texture mapping and Gouraud shading
- Single-cycle bump mapping
- Single-cycle trilinear mip-mapping
- True per-pixel Level of Detail (LOD) MIP-mapping with biasing and clamping
- RGB modulation combines textures and shaded pixels
- Texture compositing for multi-texture special effects
- All DirectX 7 and OpenGL 1.2 texture blends
- Support for 14 different texture map formats
- 8-bit palletized textures with full bilinear filtering
- 4-bit-per-textel texture compression through Microsoft DirectX and 3dfx proprietary algorithms

## 2D Feature Set

- 128-bit VGA core
- 128-bit Windows GUI accelerator
- Acceleration for Bresenham line draw, polygon fill, all Windows 256 ROP's, scissors and rectangle clipping
- SDRAM function support, including color expansion and block-write

## Voodoo5 Video Subsystem

- Planar-to-packed-pixel digital video format conversion (DVD Hardware assist)
- Full VMI 1.4 video port support with CCIR-656 extension
- 350MHz RAMDAC for refresh rates up to 160Hz; up to 2048x1536 at 85Hz display support

## SLI

Scan Line Interleave is a big benefit of the VSA-100's scalable architecture. It allows 3dfx to use multiple graphics chips simultaneously, dramatically increasing fill rates and performance. The VSA-100 supports up to 32 chips being used in SLI. 3dfx has plans to offer 2 and 4 chip (Voodoo5 6000) configurations.

3dfx first introduced SLI with the Voodoo2, used when two video cards were linked together, with one video card rendering the odd lines of a video output, while the other card renders the even lines. With the 3Dfx Voodoo2, the slave 3D card was send its rendered output via a ribbon cable into the master video card where the combined output is then rendered on screen by the master card.

Multiple VSA-100 chips can be mounted on a single card, eliminating the need to use multiple slots for an SLI configuration. The VSA-100 also adds AGP support to SLI, and support for SLI resolutions beyond 1600x1200. The VSA-100 adds the dimension of programmability to SLI, meaning the game developer can break the scene up into anywhere from 1 to 128 lines and assign certain lines to a particular graphics chip to optimize the performance of his game with 3dfx hardware.

## Texture compression

The VSA-100 supports FXT1™, DXTC and Narrow Channel texture compression in hardware.

We are turning on FXT1 compression by default for OpenGL titles when the title specifies that a particular texture be compressed. Please note, we are not compressing ALL textures but only those that the API requests be compressed.

3dfx's open source FXT1™ texture compression technology alleviates the performance bottlenecks associated with the use of many high-resolution textures. The texture compression algorithm reduces the amount of memory required to store each texture, which allows developers to use many more textures at higher resolutions with increased performance. As a result, games and applications utilizing FXT1™ texture compression will run at faster frame rates with significantly enhanced visual quality. Additionally, with the proliferation of 3D content on the Internet, FXT1™ texture compression will help reduce download times for 3D content featuring high-resolution textures.

The FXT1™ texture compression algorithm works by breaking each texture down into multiple 4 x 4 or 4 x 8 texel (texture element) blocks. In contrast to other texture compression schemes, the FXT1™ technology uses 4 different compression algorithms at the block level. For each block, all 4 compression algorithms are applied and the one, which produces the highest quality result, is then used for that block. Since each block can use a different compression algorithm, the overall visual quality of the compressed image is substantially better than other texture compression schemes. The result of the FXT1™ texture compression algorithm is a compressed image, which only requires ½ a byte of memory storage per texel. For example, an uncompressed 32-bit texture image of 256x256 resolution requires 256 Kbytes of memory storage, whereas that same texture compressed with the FXT1™ texture compression requires only 32 Kbytes of memory storage, an effective compression ratio of 8:1.

FXT1™ is currently available to developers registered with the 3dfx Developer Program and can be accessed at [www-dev.3dfx.com/fxt1](http://www-dev.3dfx.com/fxt1).

DXTC is the texture compression supported in Microsoft's DirectX.

Narrow Channel texture compression is a proprietary 3dfx texture compression used in legacy products and by the GLIDE API.

### **Fillrate Vs T&L**

There are several fundamental problems to address with today's 3D accelerators. One issue that will never change is the need for increased fillrate. While there has been a great deal of hype surrounding Transforms and Lighting (T&L), this feature has not yet become a mainstream component of today's games and 3D code. Adding more polygons and triangles causes an increased use of fillrate and while more detail is added to the scene, adding more detail while greatly reducing available fillrate means that each scene is rendered at a slower speed and with an increased amount of aliasing.

### **FSAA: The 3dfx approach to Full Scene Anti-Aliasing**

The anti-aliasing implemented on Voodoo4 and Voodoo5 is a "jittered" subsample approach. Jittered subsamples gives a much higher quality than a regular grid pattern for the subsamples. In general, 2 jittered subsamples is roughly equivalent to 4 unjittered subsamples, as each will produce 2 levels of coverage for nearly horizontal or vertical edges. Four jittered subsamples is roughly equivalent to 16 unjittered subsamples, as each will produce 4 levels of coverage for nearly horizontal or vertical edges. Thus the 4 jittered sample anti-aliasing on Voodoo5 is significantly better in quality than a 4x supersampled (2x in each direction) implementation.



Figure 3 (top): The aliasing in the image to the left shows as both jagged, or stair-stepping, lines and as broken lines. The jagged lines are very noticeable on the edges of the mountains in the upper left area of the scene. The broken lines show in the light poles in the lower right.

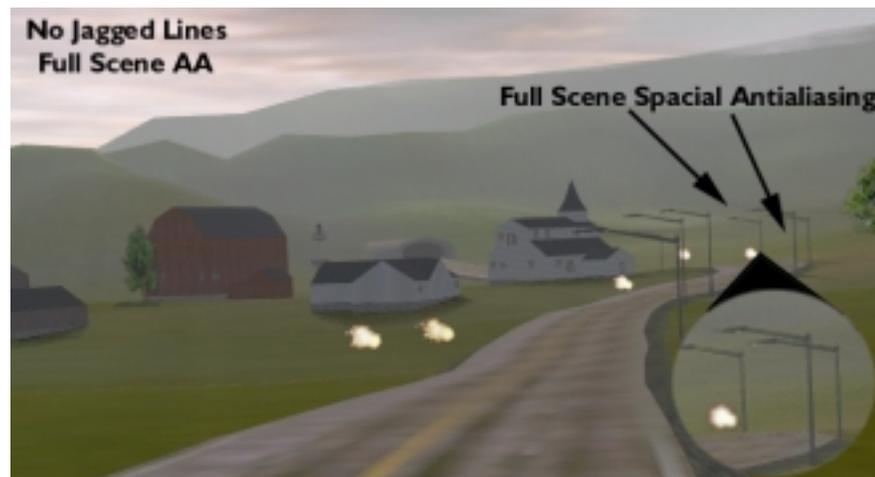


Figure 3 (bottom): Both types of artifacts are dramatically improved with spatial anti-aliasing in the version of the same scene to the right. Screenshots from Barrage 1998 Mango Grits, Inc.

## Introduction to the 3dfx T-buffer

The 3dfx T-Buffer™ technology marks the first time sophisticated, high-end cinematic effects are available in real-time for consumer PCs. Up until now, creating the effects accelerated by the T-Buffer™ technology was reserved for the special effects elite: primarily professionals who could afford the excessive costs associated with developing Hollywood-like digital effects on professional workstations.

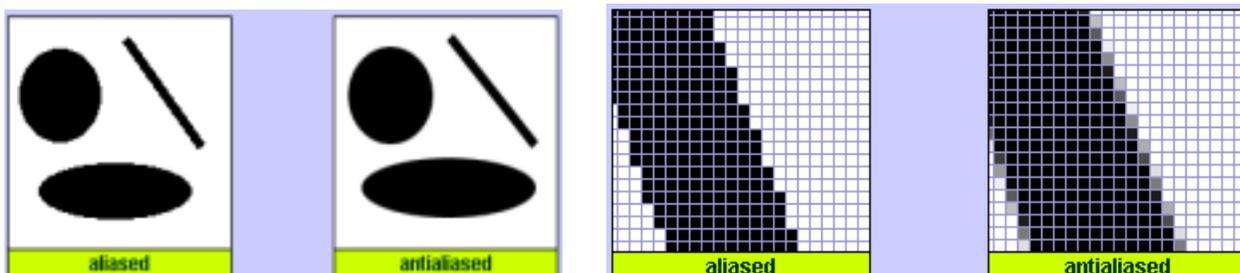
Designed to dramatically raise the level of quality of 3D graphics rendering, the T-Buffer™ technology enables cinematic effects never before available on consumer PCs at real-time frame rates essential to attaining and experiencing true-to-life imagery. Chief among these are real-time Full-Scene Anti-Aliasing (FSAA), which removes the appearance of jagged edges in a rendered scene, and real-time Motion Blur, which dramatically improves the rendered realism for fast-moving objects. The T-Buffer™ technology also allows for the first time acceleration of Depth of Field effects commonly used in professional photography and cinematography.

Spatial Anti-Aliasing, Motion Blur, Depth of Field, and related techniques are key to producing real-life imagery, and can mean the difference between viewer belief and disbelief of an image's realism. To the viewer's eye, the sharp, jagged edges, the absence of blurred images during movement, and the lack of depth reference commonly found in images rendered by today's 3D accelerators are actually indicators of *unrealism* since these artifacts do not occur naturally in real-life, photography, or film. As a result, the human eye registers these poorly rendered scenes as artificial, and the attempt to convey realism is lost. For the first time on consumer PCs and high-end visual simulation systems all of these realistic effects can be accelerated in real-time by the breakthrough

For a detailed explanation on how the T-Buffer works, visit the Virtual Press Room at <http://www.3dfx.com/comp/pressweb/index.html>.

### Full Scene Anti-Aliasing (FSAA)

Long considered the "Holy Grail" of 3D image quality, Full Scene Anti Aliasing has long been the goal of 3D graphics companies, however, until the VSA-100, full scene AA required such a performance hit that it was unplayable in real world applications. As a result, many manufactures would put full scene AA support in their chips and write it in big bold letters on the front of their boxes, but recommend you turn it off to test their cards. Full Scene AA is quite simply the smoothing of rough spatial edges or "jaggies" that always exist in real-time digitally-generated artwork that are created by the intersection of the triangles used to create 3d models (think wire frame). Full Scene AA smoothes those edges and removes triangle edge "jaggies" and eliminates pixel "popping" associated with aliasing. 3dfx is 100% compatible with standard API's and works with all existing games. It allows you to automatically upgrades existing and future games to a new level of image quality.



**Alternative APIs**

3dfx is a strong support of the emerging alternative API's like Linux, BeOS and Macintosh. As such we have open sourced our proprietary API Glide, our 2D and 3D registry specs, as well as all of our driver efforts on the Linux platform. 3dfx is committed to the open source community because it taps into a multitude of hardcore developers who wish to get full access all parts of their video card. More information about Linux, open source code, and 3dfx can be found at this Linux and 3dfx <http://www.linux.3dfx.com>.

**Pricing and Availability**

Voodoo5™ 5500 AGP with 64MB of SDRAM will be available this Spring for the suggested retail price of \$299. The Voodoo5™ 5000 PCI with 32 MB of SDRAM Will be available for a suggested retail price of \$229.

3dfx products can be purchased at leading retailers (Babbage's & Software Etc., Best Buy, CompUSA, Electronics Boutique and Fry's) or leading distributors (D&H, Ingram Micro, Merisel, and Tech Data) and several online resellers.

**Warranty**

Retail versions of the Voodoo5™ 5000 series are covered by a lifetime warranty in the US and a 10 year warranty internationally.

**Technical Support**

For technical support, questions, or additional information during the review process, contact:

PT Barnum, Field Applications Engineer  
972-234-8750, ext. 2226  
[pbarnum@3dfx.com](mailto:pbarnum@3dfx.com)

Brian Burke, Senior Public Relations Manager  
972-234-8750, ext. 2113  
[bburke@3dfx.com](mailto:bburke@3dfx.com)

Bubba Wolford, Senior Public Relations Specialist  
281-578-7782  
[bubba@3dfx.com](mailto:bubba@3dfx.com)

Consumers can access toll free technical support from 3dfx by calling 1-800-234-4334. For 24-hour BBS support dial (214) 437-9615. 3dfx's Technical Support Fax number is: 214-669-1326. Or contact 3dfx at [www.3dfx.com](http://www.3dfx.com)

**Photos, Screen shots, White papers and more.**

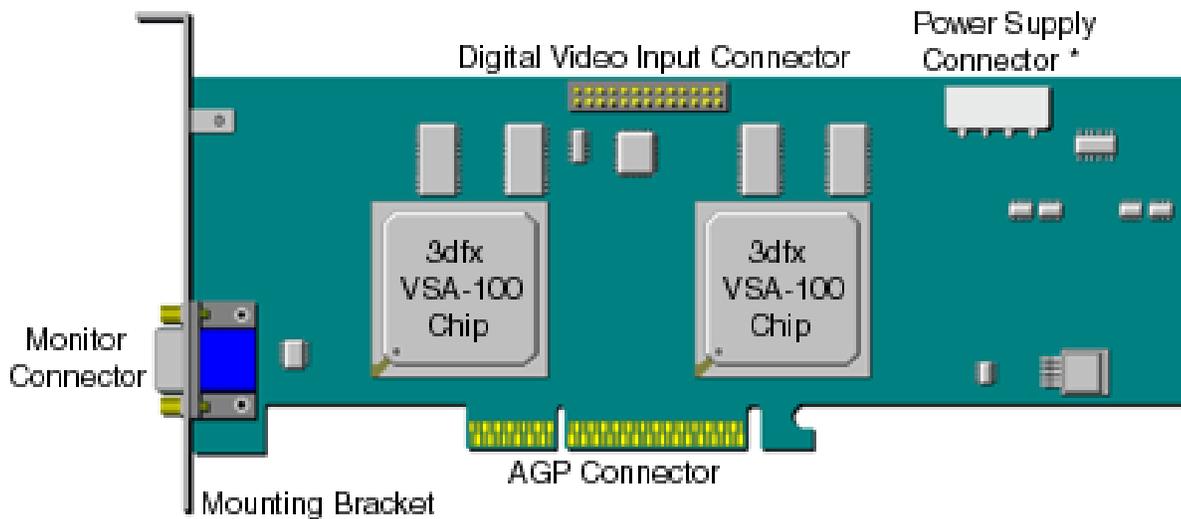
Visit the 3dfx Virtual Press Room at <http://www.3dfx.com/comp/pressweb/index.html>. We provide this as a service for our media partners. In the press room you will provide a number of documents that will help you build background on your stories like news releases, executive backgrounders, white papers, and past Powerpoint presentations on a number of different topics. To add the pop to your story, we provide executive headshots, product images, company logos and screen shots that show the different features of our products.

The site is password protected, so remember to apply for your password before your deadline approaches.

To recommend other resources you would like to see added to the press website, please email [webmaster@3dfx.com](mailto:webmaster@3dfx.com).

## SECTION 2: About the Voodoo5 5000 Board

### Board Layout



### Hardware Components

#### Graphics Subsystem

- Graphics Controller – 166MHz VSA-100 (2x)
- Frame Buffer – 32MB of 1Mx16 SDRAM (5000) or 64MB of 1Mx16 SDRAM (5500)
- RAMDAC – up to 350MHz

#### Bus Interface

- Graphics bus interface – AGP 4X (AGP 2.0) or PCI 2.2

#### I/O Connectors

- Standard Monitor VGA
- CCIR-601 / CCIR 656 Video Input

#### System Requirements

- Windows 95 or Windows 98
- PC with a Pentium, Celeron™, Pentium II, Pentium III or Pentium Pro Processor (Pentium 233 and up recommended), AMD K6-2, K6-3, or Athlon with 3DNow! and a free AGP or PCI slot.
- 32MB of system RAM (64MB recommended)

**Display Mode Table: Driver Modes for Win95, Win98 and Win2000**

- Note: All refresh rates greater than 85Hz will use pre-calculated GTF timings.

Resolution	Aspect Ratio	Refresh Rates (Hz) Vertical Frequency	Color Depth (bpp)	Comments
320x200		70,85	8,16,32	D-Draw, SW D3D only, No Desktop, WHQL Required
320x240		60,72,75,85	8,16,32	D-Draw, SW D3D only, No Desktop, WHQL Required
400x300		60,72,75,85	8,16,32	D-Draw, SW D3D only, No Desktop, WHQL Required
512x384		60,70,75,85	8,16,32	D-Draw, SW D3D, D3D, Glide, OGL No Desktop, WHQL Recommended
640x400		70,85	8,16,32	D-Draw, SW D3D, D3D, Glide, OGL No Desktop, WHQL Requirement
640x480	4:3	60,72,75,85, <b>100,120,140,160</b>	8,16,32	Desktop, D-Draw, (D3D, Glide, OGL) * TV OUT support: NTSC and PAL
720x480		60,72,85	8,16,32	VIDEO ONLY D-Draw only: Video, No Desktop WHQL Requirement
720x576		72,100	8,16,32	VIDEO ONLY: D-Draw only: Video, No Desktop WHQL Requirement MPEG2: PAL
800x600	4:3	56,60,72,75,85, <b>100,120,140,160</b>	8,16,32	Desktop, D-Draw, (D3D, Glide, OGL) * TV OUT support: NTSC and PAL
960x720		60,75,85	8,16	Desktop, D-Draw, (D3D, Glide, OGL) *
1024x768	4:3	60,70,75,85, <b>100,120</b>	8,16,32	Desktop, D-Draw, (D3D, Glide, OGL) *
1152x864	4:3	60,70,75,85, <b>100,120</b>	8,16,32	Desktop, D-Draw, (D3D, Glide, OGL) *
1280x960		60,75,85	8,16	Desktop, D-Draw, (D3D, Glide, OGL) *
1280x1024	5:4	60,75,85, <b>100</b>	8,16,32	Desktop, D-Draw, (D3D, Glide, OGL) *
1600x1024	16:10	<b>60,76,85</b>	8,16,32	Desktop, D-Draw, (D3D, Glide, OGL) *
1600x1200	4:3	60,65,70,75,80,85, <b>100</b>	8,16,32	Desktop, D-Draw, (D3D, Glide, OGL) *
1792x1344	4:3	60,75	8,16,32	Desktop, 2D D-Draw (D3D, Glide, OGL) *
1856x1392	4:3	60,75	8,16,32	Desktop, 2D D-Draw (D3D, Glide, OGL) *
1920x1080	16:9	60,72, <b>75,85</b>	8,16,32	Desktop, 2D D-Draw (D3D, Glide, OGL) *
1920x1200	16:10	<b>60,76,85</b>	8,16,32	Desktop, 2D D-Draw (D3D, Glide, OGL) *
1920x1440	4:3	60,75	8,16,32	Desktop, 2D D-Draw (D3D, Glide, OGL) *
2048x1536	4:3	60,75	8,16,32	Desktop, 2D D-Draw (D3D, Glide, OGL) *

- Note: All refresh rates supported by VSA-100
- Note: Desktop and D-Draw supported at all color depths
- HW accelerated D3D, Glide and OGL supported at 8/16/32-bit color depth at all resolutions (except where lack of memory prohibits the use of such modes)
- Note: All refresh rates in **BOLD** will use pre-calculated GTF timings.

**Extended VGA Modes in BIOS**

<i>Resolution</i>	<i>Vertical Frequency (Hz)</i>	<i>Color Depth</i>	<i>Frame Buffer Alignment</i>
320x200	70	8,16,24	<i>Banked (Windowed) + Linear</i>
320x240	70	8,16,24	<i>Banked + Linear</i>
400x300	70	8,16,24	<i>Banked + Linear</i>
512x384	70	8,16,24	<i>Banked + Linear</i>
640x400	70	8,16,24	<i>Banked + Linear</i>
640x480	70	8,16,24	<i>Banked + Linear</i>
800x600	70	4,8,16,24	<i>Banked + Linear (4bpp banked only)</i>
1024x768	70	8,16,24	<i>Banked + Linear</i>
1280x1024	70	8,16,24	<i>Banked + Linear</i>

**Software Drivers****Drivers included:**

- Voodoo5 Driver Kit
- Voodoo5 DirectX Driver
- Voodoo5 Win9x 2D/3D Display Drivers
- Voodoo5 Glide 2.X Driver
- Voodoo5 Glide 3.X Driver
- 3dfx Tools
- OpenGL ICD
- WDM and Video for Windows drivers for Video Capture
- Voodoo5 Linux driver
- Voodoo5 Apple Macintosh driver
- Voodoo5 Windows 2000 driver

**3dfx Tools Summary**

3dfx Tools make it easy to adjust and control various aspects of the system's display and performance. For a complete overview and guide to the 3dfx Tools available with Voodoo5 5000 and 5500, please refer to Appendix 3.

## SECTION 3: About the VSA-100 Chip

### Overview

At the heart of the new Voodoo5 boards is the highly scalable VSA-100 chip. Debuted at COMDEX in November, VSA-100 is the most advanced graphics processor technology available in PCs today. The T-Buffer technology dramatically improves the rendering capabilities for consumer PCs, bridging the “realism” gap that exists today between motion picture and photographic imagery and computer-generated images. The T-Buffer makes it possible to do real time Full Scene Anti-Aliasing (FSAA), and cinematic effects like motion blur effects, depth of field and soft shadows and reflections.

With 14 million transistors and manufactured in an advanced .25 micron CMOS process, VSA-100 is designed for optimal performance through massive fill-rates on both Pentium II and Pentium III, as well as the AMD-K6<sup>®</sup>-II, K6-III and Athlon processors featuring 3DNow!<sup>™</sup> technology.

The VSA-100 chip featured on the Voodoo5<sup>™</sup> 5000 series is a full 128-bit single-cycle GUI accelerator with 128-bit VGA core. Virtually the entire Windows<sup>®</sup> Graphics Display Interface (GDI) is implemented in hardware, along with all 256 raster operations (ROPS). VSA-100 is fully compliant with the Microsoft<sup>®</sup>/Intel<sup>®</sup> PC99a specification. VSA-100's video architecture is also optimized for software DVD acceleration, including large FIFO's, YUV 4:2:0 planar support with AGP bus-mastering, automatic triple-buffering, 'bob-and-weave' modes and alpha blending for sub-picture support.

VSA-100 provides breakthrough features and performance for the mainstream PC including:

- A Scalable Architecture
- Real-Time Full Scene HW Anti-Aliasing
- T-Buffer<sup>™</sup> Digital Cinematic Effects
  - Motion blur
  - Depth of field
  - Soft Shadows
  - Soft Reflections
- Leadership Fill Rates
- FXT1<sup>™</sup> Texture Compression

## SECTION 4: Installation and Start-Up

### *Installing the Board*

#### Installation Instructions

Follow these simple steps and in just a few minutes you can easily replace your computer's old display card with the powerful new Voodoo5 accelerator card. The Quick Install software on the 3dfx Installation CD will lead you through the installation process in a few simple steps.

#### IMPORTANT NOTES:

- The On-line User's Guide on the 3dfx Installation CD is in HTML format. Your system must have internet/web browser software installed (either Microsoft Internet Explorer or Netscape Navigator) to view the On-line User's Guide.
- The "Hardware Installation" section of the On-line User's Guide has important information that you will need while your computer is shut down and the On-line User's Guide is unavailable to you. It is very important that you print this section so that you can refer to it during the installation.
- A simplified version of the hardware installation instructions is also included in this Quick Install Guide along with some basic troubleshooting information in case you have any difficulty getting your computer restarted after the installation of your new Voodoo5 card.

#### Quick Install Instructions:

1. Before you do anything else, start your computer normally and insert the 3dfx Installation CD into your computer's CD-ROM drive.

If the Quick Install software does not open automatically, simply open Windows Explorer, select your CD-ROM drive, and then double-click on the SETUP.EXE file on the CD.

2. The Quick Install software will perform a simple check of your computer's configuration and then it will open the On-line Quick Install Guide to Page 1.

If you see any error messages instead of the On-line Quick Install Guide, check the Troubleshooting section in the back of this Quick Install Guide for important information.

3. When you have read the instructions on Page 1 of the On-line Quick Install Guide and printed the instructions on the next page that you will need during the hardware installation, then shutdown your system and proceed with the Hardware Installation.

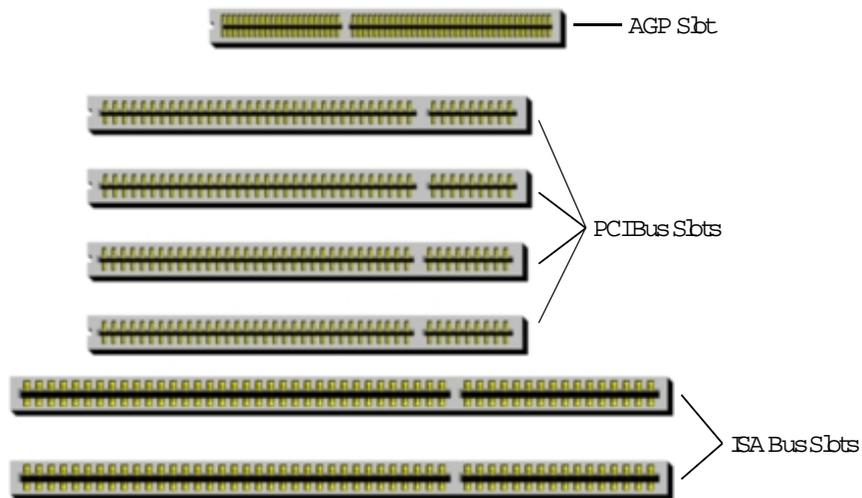
When your system is shutdown, open the computer and replace the old display card with your new 3dfx Voodoo5™ 5500 card.

**NOTE: Be sure to remove the 3dfx Installation CD from your CD-ROM drive when you shutdown the computer and then reinsert it after the system restarts.**

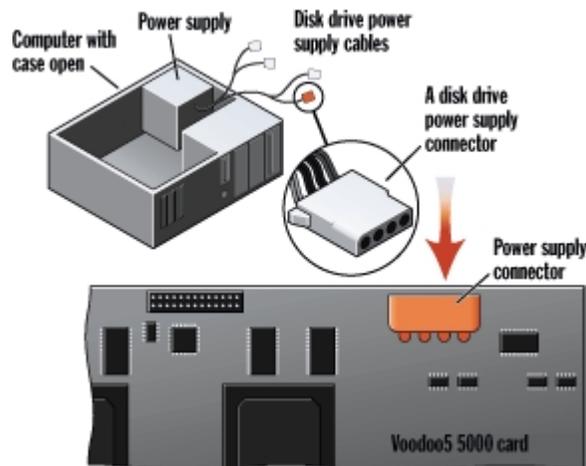
4. Use the following Hardware Installation Instructions to install your new Voodoo5 card.

## Hardware Installation Instructions

- a. Turn off the power and open the computer's case. Refer to the documentation for your computer for detailed instructions on opening your computer's case.
- b. Locate the cable connecting your monitor to the current display card and disconnect it from the card.
- c. Remove the screw securing the mounting bracket of the old card and remove the old card from your computer.
- d. Locate the AGP expansion slot for your new Voodoo5 card and install the Voodoo5 card into the AGP slot.
- e. Connect one of your computer's disk drive power cables to the Power Supply Connector on your new Voodoo5 card (see diagram). Use the included Power Supply Y-cable, if necessary.
- f. Connect your monitor's cable to the Monitor Connector of your Voodoo5 card.
- g. Replace the computer's cover and restart the system.



Overhead view of the expansion slots inside a computer



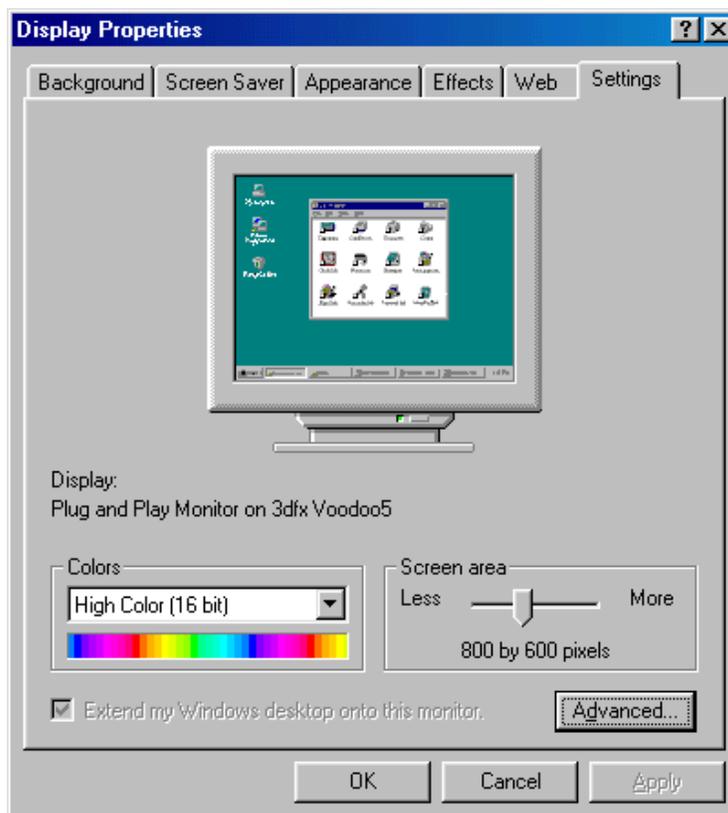
Power Supply Connection Diagram

**NOTE: Be sure to connect your monitor's cable to the Monitor Connector of your new 3dfx Voodoo5™ card.**

5. When you replace the old display card with your new card and restart your computer, Windows will detect the new hardware and prompt you to install the device drivers for it. Place the 3dfx Installation CD in your CD-ROM drive and direct Windows to install the drivers from the CD. Remove the 3dfx Installation CD from your CD-ROM drive and restart the system when you are prompted to do so. Then, after the system has restarted, place the 3dfx Installation CD in your CD-ROM drive again and the Quick Install software will open to the Software Installation page.

Select your software installation options to install 3dfx Tools and other software that may be needed to complete the installation, or to reinstall the Voodoo5™ card's display drivers (if you ever need to). When the installation process is complete, you will be prompted to restart your computer for the changes to take effect. Remove the 3dfx Installation CD from the CD-ROM drive and restart your computer and the installation of your new Voodoo5 accelerator card is complete!

You will probably want to open the "Settings" page of the "Display Properties" dialog box and select new display settings for your new accelerator card. If you chose to install the 3dfx Tools software, then you will also want to open the "Advanced Properties" dialog box and the "3dfx Tools" Control Panel (located in the Windows Control Panel) to select your 3dfx Tools options.



The "Settings" page of the "Display Properties" dialog box

## Troubleshooting Tips

The following troubleshooting tips are general in nature. Be sure to consult the owner's manual for your computer for specific details of your system that may be relevant to these suggestions.

### IMPORTANT NOTES:

Your new Voodoo5™ card requires additional power from your computer's power supply. Be sure to connect one of your computer's disk drive power cables to the Power Supply Connector on your new Voodoo5™ card, using the included Power Supply Y-cable, if necessary.

Your new Voodoo5™ card also requires an interrupt (IRQ). Your computer's BIOS should automatically assign an IRQ to the card at Boot-up. Please refer to the owner's manual for your computer for more information.

If you have trouble restarting your computer after installing your new 3dfx card...

1. Check to be sure that the new card is properly seated in the slot connector.
2. Check all of the cables and cable connections to the computer.
3. Be sure that you have connected one of your computer's disk drive power supply cables to the Power Supply Connector on the Voodoo5 card. Use the included Power Supply Y-cable, if necessary.
4. Verify that there is no other display device in the system or that a built-in display device is completely disabled.
5. Verify that the computer is IBM- and AGP-compatible.
6. Try to boot-up the computer from your Windows Boot Disk (if your system uses Windows) or from a standard DOS boot diskette (if one is available).
7. Check your computer's System Setup options to be sure that the computer does not have any of the following features enabled in CMOS:
  - Video BIOS shadow or cache
  - VGA Palette Snoop or DAC Snoop
  - Hidden Refresh
  - Byte Merge

### ***“Safe Mode” Troubleshooting Tip:***

If your system boots-up normally until it starts to load Windows but fails to work properly after that point, then you may be able to start the system in “Safe Mode” to examine and resolve some common display-related problems. Consult your Windows documentation for information on using the “Safe Mode” option.

## SECTION 5: FAQ

### **Does Voodoo4/5 regain the technology leadership position for 3dfx?**

VSA-100 is a very compelling product line that addresses a multitude of customer needs. There are several technological breakthroughs including breaking the gigapixel barrier, FSAA, T-Buffer™ effects and FXT1™. None of our competitors can match our leadership position.

### **Why have you decided to bring back SLI?**

Performance scalability is a critical component in providing a solution to multiple market segments. SLI effectively addresses the variety of end-user and OEM needs from very high-end game enthusiasts to the cost-sensitive mainstream consumer.

### **How about SLI support for the Mac?**

SLI is applicable to any platform including PCs, Mac and Linux.

### **With the introduction of Voodoo4, will there be any revisions made to Glide?**

No revisions were necessary. Voodoo4 will be compatible with all existing Glide titles.

### **Isn't the Voodoo4/5 board just a stopgap until Rampage, your new architecture and T&L board, which you announced at AEA last week?**

No. VSA-100 is its own product with its own unique feature set. Rampage is a codename for a future, unannounced product.

### **What is Rampage?**

Rampage is a codename for a future product.

### **Will you do a version of Voodoo4/5 that has a tuner like the Voodoo3 3500TV?**

We are not able to disclose at this time future multimedia products which incorporates the VSA-100 graphics design.

### **Will there be a T&L daughter card for Voodoo4/5?**

No. The benefits of T&L do not match the cost and title availability until later down the road.

### **Will the T-buffer effects be in the single chip Voodoo4/5?**

2 sample Full Scene Anti-Aliasing (FSAA) will be available on the Voodoo4 4500.

### **What is the fill rate on the single chip solution? SLI? 4-Way?**

The single chip is 333 Megapixels – the 2-way SLI is 667 Megapixels - the 4-way SLI is 1.33 Gigapixels.

### **Do you expect any supply limitations with Voodoo4/5 like you had with Voodoo3, and especially the 3500TV?**

No.

### **What's a VSA-100 chip?**

The VSA-100 chip is the latest silicon chip that is contained in the Voodoo4 and Voodoo5 product families.

**Can the 2-way SLI product do cinematic effects and full-scene AA at the same time?**

Yes. The Voodoo 5 products are capable of doing any combination of FSAA and T-Buffer.

**Is there a performance penalty associated?**

Because multiple rendering passes are required to do T-Buffer effects and FSAA simultaneously, there is a performance hit that increases as more simultaneous effects are enabled.

**Can the 4-way SLI VSA-100 board do cinematic effects and full scene AA at the same time?**

Yes. It's the same situation as the two-way board but with much higher fillrates.

**Will you be speed grading the Voodoo4/5 chips like you did with Voodoo3?**

We expect good yields at high speeds for VSA-100 therefore we don't have plans to speed-bin the parts.

**Do you have full 4X AGP support in Voodoo4/5? If not, why not?**

We support AGP 4X but we do not support execute mode (i.e. texturing from system memory).

**Does 3dfx support AGP execute mode and side banding?**

We support sidebands but we don't support execute mode. Execute mode has been proven to give minimal performance benefits and we decided it wasn't worth the time, cost, or risk. Show us a single title that demonstrates the benefits of execute mode. Execute mode is a dead technology that is not being embraced by the development community, or even Intel or Microsoft for that matter.

**FSAA doesn't matter at high resolutions – does it?**

You can see from our demos, which are all run at 1024x768 resolution, that FSAA makes a huge difference. The difference is noticeable even at 1600x1200.

**Does your FSAA and T-Buffer technology cause performance hits?**

The real question concerning gamers is whether they can run their favorite titles at real-time frame rates, like 60fps, with features turned on. So, applications will run at real-time frame rates at 32bpp with FSAA turned on and they will run even faster with FSAA turned off.

**Why did you decide to go with the type of SDRAM instead of a higher performing memory type on the board?**

SDR SDRAM is cost-effective, highly available, and presents no technology risks. SLI and SDR SDRAM together give us higher memory bandwidth than any competing product, making SDR SDRAM an easy choice.

**What are the clock speeds?**

166MHz for our Core and memory.

**Are the memory and processor clocks synchronous?**

Yes, there's a single clock memory and core clock.

**What are the minimum system requirements for the single? 2-way? 4-way?**

Any of the Voodoo4 and Voodoo5 products require only a Pentium MMX 200.

**What did you change between Voodoo3 and Voodoo4?**

They are very different parts. Think of all the new features like 4X AGP, full-scene AA, T-Buffer, 32-bit rendering, 32-bit textures, 64MB frame buffer, texture compression, the list goes on. You can get all the details off of our newly revised [Website](#).

**Will Voodoo4/5 support GLIDE?**

Absolutely. The VSA-100 supports Glide 2.X and 3.X.

**Can you overclock Voodoo4? Voodoo5?**

Any component that has a clock, can be overclocked. Overclocking is dangerous to your video board and although we know some computer savy people are going to overclock their video cards, we do not recommend it or warranty cards damaged products due to overclocking. We only guarantee stability at the shipped clock rate.

**Will Voodoo4/5 support 3Dnow?**

Yes.

**Will Voodoo4/5 support Linux?**

Yes.

**Will Voodoo4/5 support BeOS?**

Yes.

**How do higher and lower speed processors affect the Voodoo4/5 cards performance (is it highly scalable across different processor speeds)?**

It is scalable across different processor speeds. Obviously faster processors will allow users to more fully experience the Voodoo4/5 capabilities.

**Will consumers with lower-end systems see a benefit when upgrading to a Voodoo4/5?**

Absolutely. Full-scene anti-aliasing and high fill rates are completely independent of CPU performance, so users who have lower-end systems can still experience an amazing upgraded graphics capability with Voodoo4/5.

**How will you overcome the memory bandwidth problems on the 2-way and 4-way SLI boards?**

There are no memory bandwidth problems with the 2 and 4 way boards. Each chip has its own allocated set of RAM.

**Can I put two 2-way boards in a system? How about two 4-way boards?**

No, not for the consumer market applications. VSA-100's SLI enables multiple chips on a single board to operate in parallel but does not easily provide for multiple boards. Quantum3D's AAlchemy visual simulation products utilize a special bridge and board design to enable multiple VSA-100 boards to operate together. It's a great solution but a bit too expensive for the mainstream consumer market.

**Does the VSA-100 contain any technology carried over from The Voodoo 1-3 series of cards, or was every portion of it built a new from the ground up?**

VSA-100 builds on the Voodoo architecture but represents significant enhancements and refinements. Voodoo 1-3 introduced many innovations to the consumer 3D market that are still valuable today such as per-pixel mipmapping, exponential fog, single-clock single-cycle multitexturing, and a floating-point Z and W buffer. We have retained these functions but of course have upgraded the datapath to 32-bits from 16. The rasterizer was completely re-written from Voodoo3 and is about 20% more efficient. VSA-100 retains the same 2D and video overlay engines as Voodoo3, and the RAMDAC design is basically unchanged. Of course the new functions were built from the ground-up: scan-line interleave, FXT1 and DXTC texture compression, and T-Buffer. For comparison, Voodoo3 used 8.3M transistors while VSA-100 employs roughly 14M.

**Do you have T&L support?**

Voodoo4 and Voodoo5 has software T&L support.

**VSA-100 is at .25 micron –your competitors are at .22 or less –how can you be cost competitive?**

There are several factors involved in cost competitiveness. Process is only part of that equation. A key differentiator for 3dfx is that we optimize our yields and reliability by using ESD layers and implementation of full scan. Our analysis clearly shows that using 6 layers of metal in a .25um process produces a more cost-effective chip than one with the same number of gates and 5 layers of metal in 0.22um or 0.18um.

**Does Voodoo5 support texture compression?**

Yes, Voodoo5 supports for types of texture compression: S3TC, FXT1 3dfx's "narrow channel compression" or NCC, a texture compression format that we've used since the original Voodoo Graphics.

**Does Voodoo5 have any special support for AMD's K6-II, K6-III, Athlon and 3DNow! instructions?**

We have worked diligently with AMD to ensure that our drivers for Voodoo5 and Voodoo5, as well as drivers for Voodoo Banshee, Voodoo2, and Voodoo3 will get the maximum benefit from the 3DNow! instruction set.

**Are you providing optimizations for Pentium III? How about optimizations for Pentium II?**

Collaborating with Intel, we have optimized current and future Voodoo products for the Pentium III processor, enabling consumers to enjoy greater levels of realism in their games and entertainment content. All of the application programming interfaces (APIs) supported by Voodoo4/5 – including Microsoft's Direct X6, Glide from 3dfx and OpenGL from Silicon Graphics – have been optimized for the Pentium III processor. As a result, content developers can incorporate more intricate models and scenes, and apply significantly greater realism to the movements of characters and objects.

As for Pentium II, we introduced a patent with Voodoo Banshee to directly handle out-of-order commands from the Pentium II so that there are no CPU stalls. This hardware optimization results in as much as a 20 percent performance improvement.

## **SECTION 6: Glossary of 3D Terms**

### ***Accelerated Graphics Port (AGP)***

An expansion bus developed by Intel specifically for the video card subsystem. It operates independent of the PCI bus and normally runs at 66MHz (i.e., 1x). Whenever you see multipliers attached to AGP, such as 2x or 4x, they are referring to how much faster the bus will run--2x means 66MHz x 2, or 133MHz.

### ***Alpha Blending***

The process of blending multiple image layers together during 3D rasterization. Used primarily to create visual effects like transparency (water or glass), translucency (artifacts that partially obscure objects, such as smoke, clouds or explosions), "lens flare" and reflections.

### ***Anti-Aliasing***

Techniques for eliminating the stair-step "jaggies" and pixel popping on lines and polygon edges. Anti-aliasing algorithms makes edges smooth and realistic by blending the edges together.

### ***Application Programming Interface (API)***

The software-to-hardware interface that games and applications use to communicate with the underlying hardware.

### ***Bilinear Filtering***

A type of texture filtering that blends 4 neighboring texture map elements ("texels") for a smoother appearance. Bilinear filtering removes the traditional "blocky" look-and-feel of software renderers and older 3D accelerators such as the original Sony PlayStation.

### ***Bump Mapping***

The process of bump mapping gives an object a rough, textured appearance. As light passes over a bump-mapped surface, different shadows and reflections appear across the surface, which shift according to the light's movements and placement. For example, viewing a rug from a distance, the rug looks smooth. But were you to look closely, you would notice ridges and bumps, crevasses and shadows.

### ***CCIR (-601)***

A video format standard used to transmit and receive digital video data. Graphics accelerators typically receive CCIR-601 video through their video input ports.

### ***Chipset***

A generic term for the silicon component(s) of a 3D accelerator. 3dfx chipsets include Voodoo Graphics, Voodoo Rush, Voodoo2, Voodoo Banshee, Voodoo3, and VSA-100.

### ***Depth Of Field***

A technique popularized by Hollywood cinematographers used to direct the viewer's attention towards a specific part of an overall scene by focusing on only a part of the scene while the rest of the scene appears out of focus or "blurred."

**DirectX**

An Application Programming Interface (API) developed by Microsoft that has become one of the most popular and standardized API's used for entertainment applications. DirectX provides interfaces for sound, graphics, and video accelerators. The 3D API that is part of the overall DirectX architecture is known as Direct3D, or sometimes "D3D" for short.

**Double Buffering**

This is a method of using two frame buffers for smooth graphics animation. While the image of the first buffer is being displayed on the monitor, the graphics card can use the second buffer to render the next image. When the next image has been completed, then the monitor switches to use the new image. The result of this technique is smooth 3D animation without "tearing" or other visual artifacts.

**Environment Mapping**

The process of applying a reflection of the surrounding environment to a 3D model. Examples include reflecting clouds off a car's window or reflecting a street scene off a store's display window.

**Frames Per Second (FPS)**

The number of unique images that are created and displayed in one second. Generally speaking, the higher the frames per second metric, the smoother the 3D animation and the more immersive 3D experience. For photo-realistic, smooth rendering, 60 frames per second or higher is targeted.

**Frame Buffer**

The memory used to hold "pixels," which are the individual components which in total compose the overall image. The larger the frame buffer size, the higher the resolution which can be displayed to the monitor.

**Fill Rate**

Fill rate is the number of pixels per second which can be rendered by a 3D accelerator. Generally speaking, cards with higher fill rate performance will generate faster frame rates and a better overall 3D experience.

**FSAA**

FSSA is an acronym for "Full-Scene Anti-Aliasing." See the Full-Scene Anti-Aliasing description below.

**Full-Scene Anti-Aliasing**

Full-scene anti-aliasing is simply applying anti-aliasing techniques to an entire image, as opposed to only performing anti-aliasing on parts of the image. See the description of anti-aliasing above.

**FXT1™**

FXT1 is 3dfx's open source texture compression technology which can reduce texture map sizes through compression by up to 1/8<sup>th</sup> their uncompressed size. The use of compressed textures allows more textures to fit in a given size of memory and allows software developers to use more textures in their 3D applications.

***Glide***

Glide is a 3D API which was originally developed by 3dfx to enable software developers to access specific features found only in 3dfx hardware. Subsequently, Glide has been released to the Open Source community to enable future evolution of the API.

***Gouraud Shading***

Gouraud shading is a method where each pixel's color within a triangle is obtained by linearly interpolating the vertex colors that are located on each corner of the triangle. This allows objects to appear much more realistic due to the appearance of smooth lighting effects.

***MIP map***

A pyramidal organization of gradually smaller, filtered texture maps which are all typically derived from the same high resolution texture map. For example, a typical texture map may be 128x128 texels in size, and its mipmaps would consist of that original texture map image filtered down into 64x64, 32x32, 16x16, 8x8, 4x4, 2x2, and 1x1 mip map images. The smaller versions of the original texture map image are required during rendering to generate the best possible image quality without introducing unnecessary visual artifacts. What size texture is used by the 3D renderer is often known as the texture "Level of Detail," or "LOD" for short, and describes which size of the original texture is being used during rendering.

***Motion Blur***

A 3D rendering technique which attempts to mimic the characteristics of physical camera film by rendering multiple images of a moving object to create "ghosting" or "smearing" effects which appear to the viewer as if the object is moving.

***Multi-Texture***

Multi-texturing is a general 3D method for combining multiple texture maps together on a single polygon to generate various imaging effects. For example, stones on a roadway or grass on a field can be rendered efficiently using two different texture maps combined together to form the final desired image.

***OpenGL***

OpenGL is a 3D graphics API originally developed by Silicon Graphics. OpenGL is now the preferred cross-platform API, with support on a variety of workstations, PCs running Windows or Windows NT, Linux systems, Apple systems, etc.

***PCI***

Peripheral Component Interconnect (PCI) is a bus standard developed by the PCI Special Interest Group. The PCI bus is a 32-bit bus typically running at 33 MHz and is used to connect devices such as disk controllers, LAN chips, and video capture systems.

***SDRAM***

Synchronous Dynamic Access Memory (SDRAM) is a type of memory that incorporates a synchronous clocked, pipelined architecture. SDRAM is now the preferred memory for use as both system memory and graphics memory.

***Scan Line Interleaving***

Scan Line Interleaving, or "SLI" for short, is a method of using multiple graphics chips running simultaneously. The method dramatically increases fill rates and overall performance.

**Soft Shadows**

A 3D rendering technique which gradually fades the intensity of an object's shadow as the shadow is further from the object to create a more realistic shadowing effect.

**Soft Reflections**

A 3D rendering technique which gradually "diffuses" an object's reflection off a shiny surface as the reflection is further from the object to create a more realistic reflection effect.

**T-Buffer™**

The T-Buffer allows several key digital effects for improving photo-realism in real-time 3D graphics rendering. Chief among these are full-scene spatial anti-aliasing, motion blur, depth of field, soft shadows and soft reflections.

**Texture Mapping**

Texture mapping is the process of applying a image bitmap, known as a "texture," to a polygon rendered by a 3D accelerator. The use of texture mapping dramatically improves the photo-realism of a rendered scene.

**Trilinear Filtering**

Trilinear filtering is a type of texture filtering which is higher quality than bilinear filtering. Trilinear filtered selects 2 texture mipmaps, performs bilinear filtering on each mipmap, then blends between the 2 bilinear filtered mipmaps to form a final result.

**Z-Buffering**

A rendering technique used by 3D accelerators to allow calculation of which pixels are visible for a particular scene. For example, in a scene with a horse and a barn, if the software developer specifies that the horse should be in front of the barn, then Z-Buffering in the 3D accelerator ensures that the horse is indeed in front of the barn and not visa-versa.

## **SECTION 7: Contacts**

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**Visit the 3dfx Virtual Press Room at <http://www.3dfx.com/comp/pressweb/index.html>.**

## APPENDIX 1: Current Benchmarks

**Note:** We are currently running and verifying industry-standard benchmarks on the Voodoo4/5 product line. Benchmarks will be available soon at <http://www.3dfx.com>.

### 3D Performance

- **3D Winbench 2000:** The industry-accepted standard for measuring 3D accelerator performance. This benchmark consists of a number of 3D rendering tests including: Z-Buffer accuracy, Anti-Aliasing, Texture Blending, Fog, MIP-Mapping, and Perspective Correction capabilities. For more information, visit <http://www.zdnet.com/zdbop/>

The standard configuration for running 3D Winbench2000 is 1024x768 resolution, 16 bits per pixel color depth, 75Hz refresh rate with double buffering enabled and with VSYNC unlocked in Direct3D.

- **FutureMark's 3DMark 2000:** This benchmark mimics "real world" application performance by measuring a variety of polygon sizes, texture sizes, and single and multiple textures per pixel. The recommended resolution for running 3DMark is 1024x768. For more information, visit [MadOnion](#).

### 2D Performance

- **Winbench2000:** Winbench2000 measures business and high-end graphics. This benchmark can also be run under Windows NT 4.0 to simulate a business desktop environment. For more information, visit <http://www.zdnet.com/zdbop/>.
- **Speedy:** Speedy is a Windows graphics performance benchmark that can be used in a variety of ways to compare the relative performance of different graphics hardware and display driver combinations. Speedy tests a wide range of Windows Graphics Device Interface (GDI) calls and delivers a single SPEEDMARK number for comparison with other systems/devices running Speedy. For more information, visit <http://www.winsite.com/info/pc/win3/util/speedy.zip/>

### Real-World Game Performance

- **Game Gauge 2.5:** Game Gauge is designed to allow the game software itself report the real-world performance based on the actual game data. Game Gauge focuses on frame rate as the ultimate arbiter of a game's performance, returning an average FPS score for each game. This allows a specific 3D card to be evaluated across a spectrum of 3D titles, providing an accurate overall score. For more information, visit <http://www.gamespot.com/downloads/utilities.html#CGW>
- **Quake II:** Time Demo 1 at 1024 x 768 x 32bpp with and without 2 and 4 sample FSAA
- **Quake II:** Time Demo 1 at 1600 x 1200 x 32bpp with and without 2 and 4 sample FSAA

- **Quake III:** Time Demo 1 at 1024 x 768 x 32bpp with and without 2 and 4 sample FSAA
- **Quake III:** Time Demo 1 at 1600 x 1200 x 32bpp with and without 2 and 4 sample FSAA
- **Unreal Tournament:** Time Demo at 1024 x 768 x 32bpp with and without 2 and 4 sample FSAA
- **Unreal Tournament:** Time Demo at 1600 x 1200 x 32bpp with and without 2 and 4 sample FSAA

**Expected Performance to Popular Benchmarks with Voodoo5 5500 AGP.**

These results are provided as a courtesy. There are a number of variables that can effect your results. Please use them to check your results. If a large discrepancy occurs in a similar configuration listed here, please contact PT Barnum at 972-234-8750, ext 2226 or [ptbarnum@3dfx.com](mailto:ptbarnum@3dfx.com) so we can isolate the reason for the discrepancy and ensure both your benchmarks and our benchmarks are accurate.

<b>Results:</b>	<b>V5 5500 FSAA=0</b>	<b>V5 5500 FSAA=2</b>	<b>V5 5500 FSAA=4</b>
Date of test	Sun Apr, 16 2000	Mon Apr, 17 2000	Mon Apr, 17 2000
Product	Voodoo5 5500	Voodoo5 5500	Voodoo5 5500
Chip	FSAA Off	FSAA 2x	FSAA 4x
Graphics Memory	V5 5500 AGP	V5 5500 AGP	V5 5500 AGP
Memory Type	64MB	64MB	64MB
Grx clock speed	SDRAM	SDRAM	SDRAM
Mem clock speed	166	166	166
BIOS Version	1.02 Copyright (C)	1.02 Copyright (C)	1.02 Copyright (C)

**Windows 98 Benchmarks**

*Ziff Davis Benchmarks (Win98)*

3D Winmark 2000 v1.1, 1024x768x16, 75 Hz	89.1	58.6	30.2
3D Winmark 2000 v1.1, 1024x768x32, 75 Hz	68.3	38.3	17
2D Business Graphics Winmark, 1024x768x16, 85 Hz	382	382	382
2D High-End Graphics Winmark, 1024x768x16, 85 Hz	996	994	995
2D Business Graphics Winmark, 1024x768x32, 85 Hz	349	350	350
2D High-End Graphics Winmark, 1024x768x32, 85 Hz	943	945	945

**3DMark 2000 (1024x768, 85Hz, Double Buffer)(Win98)**

1024x768x16bpp,16 bit textures,16 bit Z-buffer(CPU Opt)	4176	3018	1615
1024x768x16bpp,16 bit textures,16 bit Z-buffer(SW T&L)	3713	2918	1617
1024x768x32bpp,32 bit textures,24 bit Z-buffer(CPU Opt)	3437	1919	812
1024x768x32bpp,32 bit textures,24 bit Z-buffer(SW T&L)	3254	1909	819
1024x768x32bpp,32 bit textures,24 bit Z-buffer(HW T&L)			
1024x768x32bpp,32 bit textures,32 bit Z-buffer(CPU Opt)			
1024x768x32bpp,32 bit textures,32 bit Z-buffer(SW T&L)			
1024x768x32bpp,32 bit textures,32 bit Z-buffer(HW T&L)			

**Quake Benchmarks (Win98)**

*Quake 3 1.11 Demo001 (60hz V-Sync Off)*

color depth:16 texture depth:16 geometry detail:medium texture detail:3 filtering:bilinear

	<b>V5 5500 FSAA=Off</b>	<b>V5 5500 FSAA= 2</b>	<b>V5 5500 FSAA =4</b>
640x480	91.8	92	69.4
800x600	92	84.5	46.5
1024x768	88	59.1	29.1
1280x1024	66.8	36.3	17.4
1600x1200	41	24.6	11.3

color depth:32 texture depth:32 geometry detail:high  
texture detail:4 filtering:trilinear

640x480	85.4	79.9	46.2
800x600	85.2	56.7	29.1
1024x768	67.5	37.5	16.7
1280x1024	42.2	21.3	
1600x1200	26.9	12.8	

*Quake 2 Demo1.DM2 (60hz V-Sync Off) 16bpp*

640x480	137.2	136.9	102.1
1024x768	135.3	87.9	43.4
1600x1200	59.5	37.4	17.3

**GameGauge 2.5 Total 1024x768x75hz (vsync off)  
(Win98)**

Game Gauge 2.5 Total (geometric mean)

*Expendable II (Win98)*

	<b>Voodoo5 5500 FSAA Off</b>	<b>Voodoo5 5500 FSAA 2x</b>	<b>Voodoo5 5500 FSAA 4x</b>
1024x768x16bpp	82.01	63.72	31.5
1024x768x32bpp	76.82	43.25	21.51

*NFL Fever 2000 (Win98)*

1024x768x16bpp	58.22	58.71	48.14
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*Panzer Elite (Win98)*

1024x768x16bpp	17.11	16.24	13.13
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*Quake 3 v1.11, (Win98)*

1024x768x16bpp, 16 bit textures	85.6	57.2	28.1
1024x768x32bpp, 32 bit textures	66	36.2	15.3

*Re-Volt (Win98)*

1024x768x16bpp, 16 bit textures	138.8	81.12	39.91
1024x768x32bpp, 32 bit textures	103.9	51.39	22.25

*Unreal Tournament (Win98)*

1024x768x16bpp	55.01	55.05	39.51
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*USAF (Win98)*

1024x768x16bpp	39.12	35.11	26.8
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**The preceding results were gathered on Performance Lab machine, configured as follows:**

**System Specs**

Machine name	P3-866	P3-866	P3-866
CPU Type	P3-866	P3-866	P3-866
Motherboard	Intel Vancouver VC82010A.86A.0	Intel Vancouver VC82010A.86A.0	Intel Vancouver VC82010A.86A.0
Motherboard BIOS	020.P07	020.P07	020.P07
System Memory	128MB RDRAM	128MB RDRAM	128MB RDRAM
System Bus Speed	133 MHz	133 MHz	133 MHz
System AGP Capabilities	4x	4x	4x
Hard Drive Manufacturer	Western Digital WDC	Western Digital WDC	Western Digital WDC
Hard Drive Model Number	AC418000D	AC418000D	AC418000D
Monitor Mfr and Model Number	Viewsonic P815	Viewsonic P815	Viewsonic P815
CD ROM Drive Mfr. and Model Number	Toshiba XM-65	Toshiba XM-65	Toshiba XM-65
Windows 98 OS Version	4.10.2222	4.10.2222	4.10.2222
Windows 98 Driver Name		3dfx32vs.dll 4.12.01.0531	
Windows 98 Driver Version	4.12.01.0531	4.12.01.0531	
Windows 98 OpenGL ICD version	4	4	4
DirectX Version	4.07.00.0716	4.07.00.0716	4.07.00.0716

APPENDIX 2: Errata (PENDING)

**Voodoo5 Known Problems**

Please visit our website at [www.3dfx.com](http://www.3dfx.com) for updates and enhancements to the Voodoo5.

## APPENDIX 3: 3dfx Tools User Guide

### Product Overview

3dfx Tools is designed to give users full flexibility and control over their Voodoo4/5 product. By giving users quick access to all of their video cards standard, as well as 3dfx advanced features not found on other video cards, the 3dfx Tools will allow users to optimize their video card to the fastest performance, while maintaining the highest image quality.

### Product Components

#### 3dfx Tools Advanced Properties

Open the "Display Properties" dialog box, select the "Settings" tab, and then click on the "Advanced..." button to open the "3dfx Voodoo Properties" dialog box. There will be some new tabs for the new pages in this dialog box to support the options of your 3dfx Voodoo card:

- Advanced Features Page** - Select the specific 3D acceleration features required by your 3D software.
- Anti-Aliasing Page** - Select the best combination of processing power and image quality for your specific 3D requirements.
- Color Page** - Adjust the Gamma levels and other display features of your Voodoo card.
- Info Page** - View detailed information about your Voodoo card, its features, driver and BIOS versions, and the 3dfx Tools software.

There will also be a new 3dfx Tools icon in your Windows Control Panel...



The 3dfx Tools Icon

## **Advanced Features Page**

Select the "3dfx Advanced Features" tab to open the "3dfx Advanced Features" page, shown here...



The "3dfx **Advanced Features**" page of the 3dfx Voodoo Properties dialog box

**NOTE: Changing the settings on the "3dfx Advanced Features" page could affect the visual quality or display performance of your Voodoo card with some software. You should only make changes to these settings if you are sure they are necessary for the proper functioning of the software you are using.**

Click on the small "+" to the left of an entry or on the name of the entry to view the option for that item. Click on the name of the option to see its current setting, and then click on the setting shown there to change the value for that option. Various options and settings may be listed depending on your model of the Voodoo card, including:

### Direct3D (D3D) Options

- Alpha-blending
- Video Display
- Anti-Aliasing Configuration

### OpenGL Options (also Glide Options)

- Splash Screen
- Alpha Blending
- Video Display
- MIP Map Dithering
- Triple Buffering
- Rendering Color-depth
- Anti-Aliasing Configuration
- Maximum Buffered Frames

## 3dfx Anti-Aliasing Page

Select the "3dfx Anti-Aliasing" tab to open the "3dfx Anti-Aliasing" page, shown here...



The "3dfx Anti-Aliasing" page of the 3dfx Voodoo Properties dialog box

**NOTE: Anti-Aliasing (AA) options are dependant upon the specific model of the Voodoo card installed in your system, so all of the options shown here may not be available for your card. For example, the Voodoo4 card does not support 4-sample AA.**

- Direct 3D- When selected\*, this option will allow the user to select FSAA options for games that support Direct 3D.
- OpenGL- When selected\*, this option will allow the user to select FSAA options for games that support OpenGL.

\* The "selected" option is the button that has blue/green color in the button. For example: in the above screenshot of our 3dfx Anti-Aliasing properties' page, OpenGL is the "selected" button.

**NOTE: Anti-Aliasing properties can be different for OpenGL and Direct3D.**

**Anti-Aliasing (Voodoo4)** - Two sub-samples are used per pixel to fill-in the jagged edges of lines and smooth the appearance of curves for a more pleasing and realistic visual image. Enable AA to improve image quality. Disable AA to improve 3D performance.

- **Single chip only** - Compatibility mode (for troubleshooting, if necessary).
- **2-sample AA** - High performance hardware mode with 2-sample Anti-Aliasing for improved image quality.

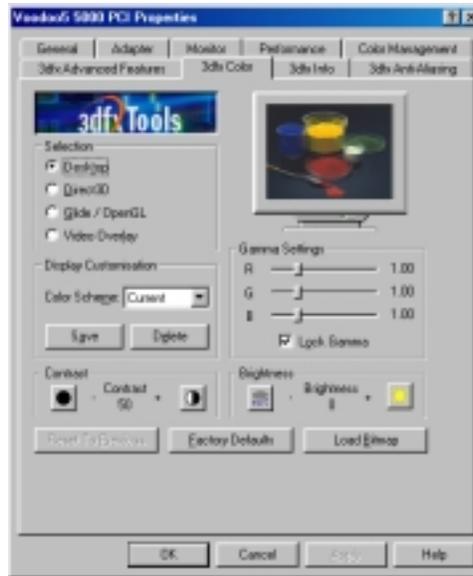
**Anti-Aliasing (Voodoo5)** - Two or four sub-samples are used per pixel to fill-in the jagged edges of lines and smooth the appearance of curves for a more pleasing and realistic visual

image. Enable AA, or increase from 2-sample AA to 4-sample AA, to improve image quality. Disable AA, or reduce from 4-sample AA to 2-sample AA, to improve 3D performance.

- **Single chip only** - Compatibility mode (for troubleshooting, if necessary).
- **Fastest Performance** - Maximum hardware performance with no Anti-Aliasing.
- **2-sample AA** - High performance hardware mode with 2-sample Anti-Aliasing for improved image quality.
- **4-sample AA** - Normal hardware performance with 4-sample Anti-Aliasing for the best image quality.

### **3dfx Color Page**

Select the "3dfx Color" tab to open the "3dfx Color" page, shown here...



The "3dfx **C**olor" page of the 3dfx Voodoo Properties dialog box

**Gamma Settings** - The controls in the "Gamma Settings" group allow you to increase or decrease the color brightness levels of your display. If your display seems too dark or too bright, move the Gamma slider controls to the left to decrease the Gamma levels or to the right to increase the Gamma levels. If you need to adjust the relative color levels for your display, then remove the check from the "Lock Gamma" slider controls to move the Gamma slider controls for each color separately (R = Red, G = Green, B = Blue). The default Gamma Setting is 1.00 for each color.

You can adjust the Gamma settings for your Windows Desktop itself, or you can separately adjust the Gamma settings to use for your Direct3D or Glide/OpenGL applications. Please note that any Gamma adjustments you select for your Direct3D or Glide/OpenGL applications will only be used when such programs are running in full-screen mode. Direct3D or Glide/OpenGL applications running in a window on your Desktop will use your Desktop Gamma settings.

**Selection** - The three options in the "Selection" group allow you to choose which set of the Voodoo card's features you want to change. When the "Desktop" option is selected, you can change the Voodoo card's Gamma Settings for your Windows desktop environment itself. Please note that this option only affects the non-3D functions of Microsoft's DirectX.

**Direct3D** - This option allows you to change the Gamma Settings for your Direct3D applications (when run in full-screen mode).

**Glide / OpenGL** - This option allows you to change the Gamma Settings for your Glide and OpenGL applications (when run in full-screen mode).

**Video Overlay** - Select this option to change the Gamma Settings for your Video Overlay applications.

**Display Customization** - Select this option to customize the display settings.

**Contrast** - This option allows you to change the contrast of the display.

**Brightness** - This option allows you to change the brightness of the display.

**Reset to Previous** - Click this button to undo any changes you have made to the options for the current selection (Desktop, Direct3D, or Glide / OpenGL).

**Factory Defaults** - Click this button to restore the original factory default values for the currently selected option.

**Load Bitmap** - Click this button to select a bitmap from your system to use for the Gamma display.

## 3dfx Info Page

Select the "3dfx Info" tab to open the "3dfx Info" page, shown here...



The "3dfx Info" page of the 3dfx Voodoo Properties dialog box

**NOTE: The version numbers and features shown in the above example would be replaced on your screen with the actual version numbers and features supported by your Voodoo hardware and software**

Click on the small "+" to the left of an entry to view the details for that item. The information available for your VSA-100 card includes:

- Bus Type (AGP or PCI)
- Optional Outputs (DVI or TV Out, if supported by your 3dfx card)
- Total Video Memory
- Graphics Chips (the number of VSA-100 chips on your 3dfx card)
- Graphics Clock Speed
- BIOS Version

Information about the Display Driver that you are currently using is also shown, as well as the 3dfx Tools Version currently installed on your system. Other items listed on this page give you access to information about the current and previous display adapters and monitors you have used with your system.

**Save** - Allows you to save the information on this page in a standard text file (.TXT).

**Print** - Allows you to print the information on this page to your system's default printer, if you have a printer connected to your computer.

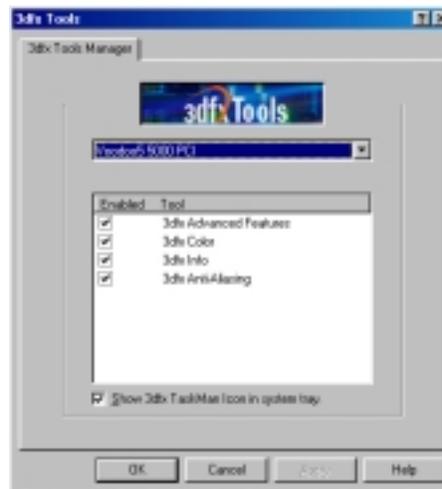
## **3dfx Hub**

Opened by right clicking on the 3dfx Taskman Icon and selecting "3dfx Hub" from the 3dfx Tools TaskMan icon's pop-up menu. Only the 3dfx Tools "Advanced Properties" page are arranged there without the standard "Advanced Properties" pages.

## **3dfx Tools Manager**

Opened by double-clicking on the 3dfx Tools Manager icon in the Windows Control Panel.

To disable any of the 3dfx Tools and remove the corresponding 3dfx Tools page from the "3dfx Voodoo Properties" dialog box (and from the 3dfx Hub), simply right-click on the 3dfx Tools TaskMan icon in the System Tray and select "3dfx Tools Manager" from the pop-up menu. You could also open the Windows "Control Panel" and double-click on the "3dfx Tools manager" icon to open the "3dfx Tools Manager" control panel, shown here...



The "3dfx Tools Manager" control panel

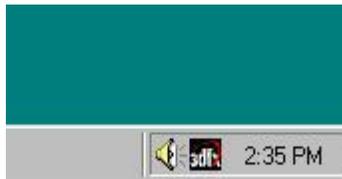
Remove the check from the checkbox beside the option you wish to disable and click on the "Apply" button. To restore that option's page to the "3dfx Voodoo Properties" dialog box (and to the 3dfx Hub) and reactivate the option, simply place a check in the checkbox beside the option you wish to restore and click "Apply".

The checkbox below the list of options places the 3dfx Tools TaskMan icon in the System Tray section of your Windows Toolbar each time your system starts. Remove the check from this box to prevent the TaskMan icon from appearing in the System Tray.

## The 3dfx Tools TaskMan Icon

Located in the System Tray of your Windows Taskbar. Opens each time your system restarts if there is a check in the corresponding checkbox of the 3dfx Tools Manager.

Place the 3dfx Tools TaskMan icon in the System Tray section of your Windows Toolbar each time your system starts by checking the checkbox below the list of options shown in the 3dfx Tools Manager control panel. Remove the check from this box to prevent the TaskMan icon from appearing in the System Tray when your system restarts.



The 3dfx Tools TaskMan icon in the System Tray

Right-click on the 3dfx Tools TaskMan icon in the System Tray of your Windows Taskbar and select one of the 3dfx Tools options from the menu:

- **3dfx Hub** - Opens the 3dfx Hub.
- **Resolutions** - Select a new display resolution or color-depth for your system to use.
- **3dfx Tools Help** - Opens the 3dfx Tools online Help system.
- **Weblinks** - Opens your web browser to [www.3dfx.com](http://www.3dfx.com), [www.3dfxgamers.com](http://www.3dfxgamers.com), or 3dfx overclocking page.\*
- **About** - Shows the 3dfx Tools version and copyright information
- **Exit** - Removes the 3dfx Tools TaskMan icon from the System Tray.

\* This will take you to a webpage that will allow you to download an overclocking utility. This utility will allow you to overclock your Voodoo4/5 board and enable/disable V-sync. If you have downloaded this utility then clicking this link will simply take you back to the overclock page.

You can also double-click on the 3dfx Tools TaskMan icon to open the 3dfx Hub.

## **Other Bundled Software**

### **WinDVD from InterVideo**

WHQL-certified with Voodoo3, InterVideo's WinDVD™ software DVD player includes an advanced intuitive user interface, software video window scaling, software and hardware sub-picture alpha blending, software video signal de-interlacing, and software color and brightness control. WinDVD includes state-of-the-art support for VCD disc and MP3 audio file playback, DVD region control and the most powerful and responsive DVD navigator in the industry. For more information on WinDVD, visit: <http://www.intervideoinc.com>

### **3Deep® and True Internet Color® from E-Color™**

These applications are both designed by E-Color to enhance users experience by correctly calibrating their monitors color, brightness, and contrast. 3Deep corrects lighting, shading and color for all your 2D and 3D games. You get more realistic graphics and better effects. Plus, 3Deep gives you the "see first, shoot first" advantage over your online competitors. True Internet Color delivers color-accurate images to any customer, across any computer setup. No downloads. No plug-ins. Each product is calibrated once during the setup and you are set!

\*Note: WinDVD will only ship with the Voodoo5 5500 in Japan. In all other areas, a coupon will be enclosed in the box for WinDVD. Customers will need to send the coupon in and pay for shipping.