

**The Oxygen™ VX1-16  
Graphics  
Accelerator  
User's Guide**



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# **INTRODUCTION**

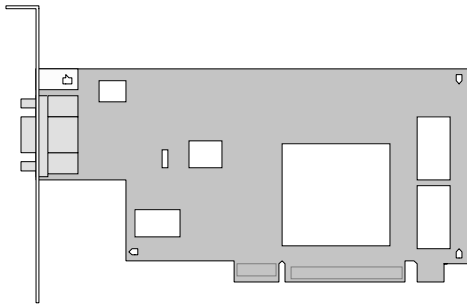
## Introduction

### Welcome to 3Dlabs!

Thank you for selecting a 3Dlabs® Oxygen™ graphics accelerator card!

The Oxygen VX1-16 accelerator uses 3Dlabs' new GLINT® R3 graphics processor to deliver genuine, industrial strength workstation graphics at an affordable price.

The Oxygen VX1-16 benefits from innovative 3Dlabs' technologies, like PowerThreads™ SSE software to distribute OpenGL throughput across multiple processors, and Virtual Textures to shatter the limitations of on-board graphics memory.



Oxygen VX1-16

### Overview

Your Oxygen card has the following features:

- **The GLINT R3 rasterization engine**  
The GLINT R3 rasterization engine accelerates tasks like true-color shading, texture mapping, anti-aliasing, and transparency operations.
- **Virtual Textures**  
Virtual Textures is a hardware-based, full demand-paged virtual texture storage sub-system. With it, your Oxygen card can cache up to 256MB of textures stored in main system memory.
- **PowerThreads SSE geometry processing**  
PowerThreads SSE software distributes OpenGL operations across multiple CPU's (where available) for faster rendering of your files, and leverages the Intel® Pentium® III and Pentium III Xeon™ Streaming SIMD extensions for optimal geometry and lighting performance.
- **16 MB memory**  
16 MB of SDRAM memory supports high-precision, high-performance acceleration.
- **High-precision, high resolution display**  
Your Oxygen card has a 300 MHz RAMDAC enabling flicker-free resolutions up to 2048 x 1536.
- **16, 24, and 32-bit linear Z-buffer**  
The Z-buffer provides the highest level of depth-precision, even at the highest resolutions supported.
- **Full AGP sideband addressing**  
Sideband addressing ensures high-performance 3D acceleration through the advanced features of the AGP bus.
- **Optimized Application Settings**  
Your card comes with preset driver configurations for mainstream Direct3D and OpenGL applications. You can quickly switch between configurations at any time.

### System Requirements

Your system needs the following features in order to support Oxygen VX1-16:

- **Intel or AMD compatible, 166 MHz (minimum) system**
- **Windows® 98, Windows® NT 4.0 SP 4, or Windows® 2000 operating system**
- **64 MB RAM (Random Access Memory)**
- **16 MB minimum available hard drive space**
- **AGP expansion slot**
- **VGA multisync monitor**



## Introduction

### Software Partners

Your Oxygen VX1-16 is compatible with a variety of graphics software packages, several of which are listed below. As testing continues and performance optimizations are made, the results and techniques are posted on the 3Dlabs, as well as the appropriate software partner's, website.

<b>Software Application</b>	<b>Web Site Address</b>
AutoCAD	<a href="http://www.autodesk.com">http://www.autodesk.com</a>
Colorific	<a href="http://www.colorific.com">http://www.colorific.com</a>
3D Studio MAX	<a href="http://www.ktx.com">http://www.ktx.com</a>
Lightscape	<a href="http://www.lightscape.com">http://www.lightscape.com</a>
LightWave 3D	<a href="http://www.newtek.com">http://www.newtek.com</a>
Maya	<a href="http://www.aw.sgi.com">http://www.aw.sgi.com</a>
MicroStation	<a href="http://www.bentley.com">http://www.bentley.com</a>
Pro/ENGINEER	<a href="http://www.ptc.com">http://www.ptc.com</a>
SDRC I-DEAS	<a href="http://www.sdrc.com">http://www.sdrc.com</a>
Softimage   3D	<a href="http://www.softimage.com">http://www.softimage.com</a>
SolidWorks	<a href="http://www.solidworks.com">http://www.solidworks.com</a>
Unigraphics	<a href="http://www.ug.eds.com/ug/">http://www.ug.eds.com/ug/</a>



# **CHAPTER 1 - INSTALLATION**

### Getting Ready

To successfully use your new Oxygen VX1-16 card, you must install the card and the accompanying driver software. Whether you install your new card or the driver first depends on whether a video card is already present in your system.

**If there is a video card in your system:** Uninstall the drivers for the existing card, then install the Oxygen driver. Once the new driver is loaded, remove the old card and install your Oxygen VX1-16 card. The instructions for uninstalling an old driver and installing the new driver begin on page 6.

**If there is not a video card in your system:** Install your new card as described in the Installing Hardware section, below, then install the driver.

---

**Note:** Be sure to register your new card using one of the options described on page 7.

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#### *Before You Start*

Take every possible precaution against static electricity as you prepare to install the card: static can damage components. You should try to work in a static free area (such as on a tile floor rather than carpet). You might even consider wearing special ESD, or at least rubber-soled, shoes.

Save any work in progress and exit any open applications. Always back up your system before you install new hardware or software.

Have a Philips-head screwdriver ready.

## Installation

### Installing Hardware

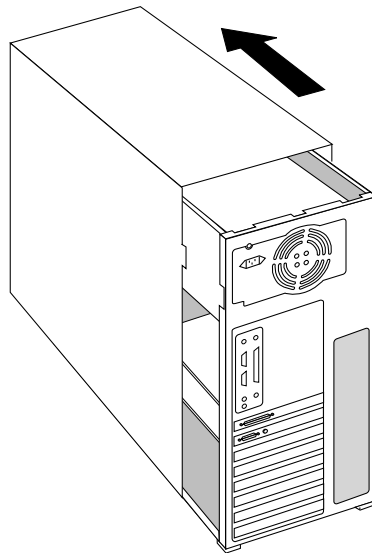
The Oxygen VX1-16 is an AGP form-factor card. Check the documentation for your system for the location of the AGP expansion slot in your system.

#### *To remove an old card from your system*

1. Make sure you have uninstalled any old drivers and installed the Oxygen driver in their place.
2. Turn off and unplug the power source for your system and each of its peripherals.
3. Unplug the monitor cable from the old card.
4. Remove the cover from your system.
5. Remove any screws securing the card to the chassis.
6. Lift the card out of the slot.

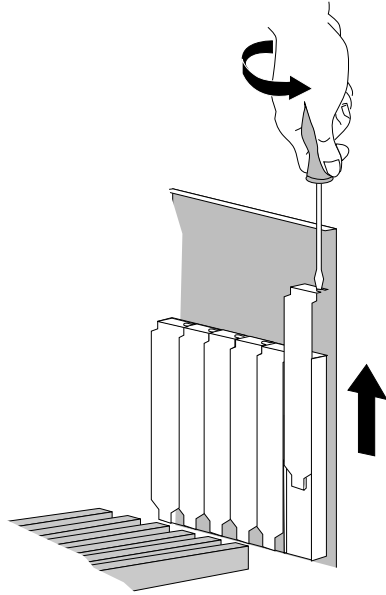
#### *To install your Oxygen card*

1. Turn off and unplug the power source for your system and each of its peripherals, if you have not already done so.
2. Remove the cover from your system so you can access the appropriate expansion slot. See your system documentation for the AGP slot location(s).



## Installation

- Determine which slot you are going to use and remove its slot cover.

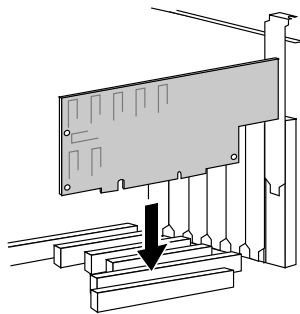


- Remove the card from its anti-static packaging. Write down the serial number for registration and future use.
- Place the card into the expansion slot and seat it firmly.

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**Important!** See your system documentation for instructions on securing the card to the chassis. Loose cards and connections can cause grounding and operating problems.

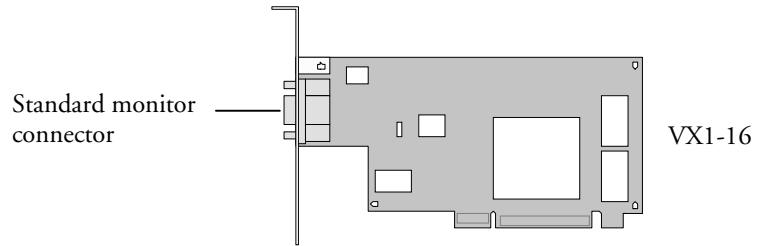
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- Replace the cover on your system.

## Installation

7. Connect the video cable from your monitor to the video connector on the card.



8. Plug in and start up your system, including peripherals, and log on to your operating system.

### Installing Software

The *Oxygen Product CD-ROM for the Oxygen VX1-16* includes Oxygen PowerThreads video driver software, which lets you set image quality and performance preferences for your card.

This section describes the three software installation processes for supported Windows operating systems.

#### *To uninstall an old video driver*

1. If there is an icon for the video card on the taskbar, desktop, or on the Control Panel, select the icon and then check for an uninstall option. If an uninstall option exists, select the option and follow the instructions. (To display the Control Panel, click the Start button, point to Settings, and click Control Panel.)
2. If an uninstall option does not exist, click the Start button, point to Settings, and click Control Panel.
3. Double-click the Add/Remove Programs icon.
4. Click the name of the video card driver you want to remove.
5. Click Add/Remove and follow the instructions.

#### *To install the Oxygen Windows NT driver*

1. Start up Windows. If you are running Windows NT, log onto an account with administrator privileges.
2. Place the Oxygen Product CD-ROM in your CD-ROM drive. When the installation window opens, choose the Oxygen driver installation.
3. Follow the instructions that appear on your screen. (Be sure to read the software license agreement.)
4. Restart your system at the prompt.

#### *To install the Oxygen Windows 98 driver*

1. After installing your Oxygen graphics card, restart your system. Windows 98 automatically detects the new hardware and starts the New Hardware Wizard.
2. In the Add New Hardware Wizard, click Next.
3. Insert the Oxygen Product CD in the CD drive.
4. Confirm that *Specify a Location* is selected, and then type **x:\Win98** (where “x” is the letter of your CD drive).
5. Follow the instructions that appear on your screen. (Be sure to read the software license agreement.)
6. Restart your system at the prompt.



## **Registering Oxygen VX1-16**

When you register your Oxygen card you:

- Activate your warranty
- Receive notification of software updates
- Qualify for technical support

You can complete the registration card and return it to us in the mail, or register on-line once your hardware and software installations are complete. (You must have Internet access to register on-line.)

1. Open your Internet browser.
2. Go to <http://www.3dlabs.com/register>
3. Fill out the registration form that appears on your screen, and click Submit when you are finished.

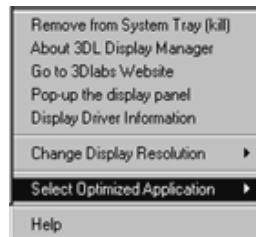
## **CHAPTER 2 - SOFTWARE CONFIGURATION**

### The Oxygen VX1-16 Driver

The Oxygen driver software lets you optimize the working relationship between your card, your system and your applications. The 3Dlabs Display Control Panel allows you to customize and create driver settings. The Taskbar based Configuration Manager provides quick and convenient access to most of the Display Control Panel features, and allows you to quickly switch between alternative driver settings.

### The Task Bar - based Configuration Manager

When you install the Oxygen VX1-16 card and software, the 3Dlabs logo appears in your system tray, also called the task bar. Click the logo with your right mouse button to access the Display Configuration Manager and its shortcuts to these configuration tools:



*Remove from System Tray* lets you delete this task bar utility from your system. You will still be able to access the driver configuration options with the Display Control Panel.

*About 3DL Display Manager* displays version information for this configuration utility.

*Go to 3Dlabs Website* takes you directly to [www.3dlabs.com](http://www.3dlabs.com) through your existing Internet connection.

*Pop up the Display Panel* reaches the 3Dlabs section on the display control panel.

*Display Driver Information* provides quick access to information about your Oxygen card configuration.

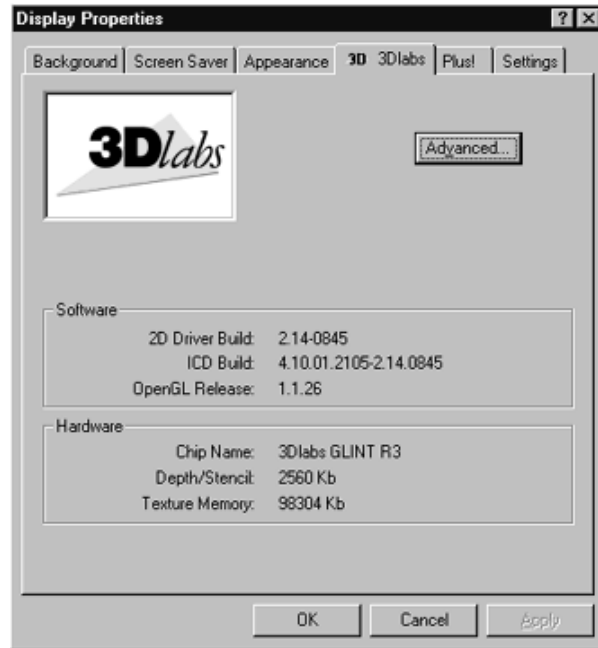
*Change Display Resolution* brings up a pop-up list of supported resolutions. Each resolution has an associated pop-up list of available refresh rates.

*Select Optimized Application* quickly accesses a list of supported applications. Click an application in the list to optimize card settings for your selected option. (The Display Control Panel allows you to create new application settings.)

*Help* provides standard Windows-style help on the driver and its settings.

### The Display Control Panel

When you first click the 3Dlabs tab in the Display Control Panel, this introductory page appears:



It provides software version and basic hardware specifications, and a point-of-entry to the full set of Oxygen driver customization tools. Click the Advanced button for access to these panels:

- Information

- Setup

- Direct3D (Windows 98 only)

- OpenGL Support

- Monitor (Windows NT only)

The following sections describe each in detail.

## Software Configuration

### Information Screen

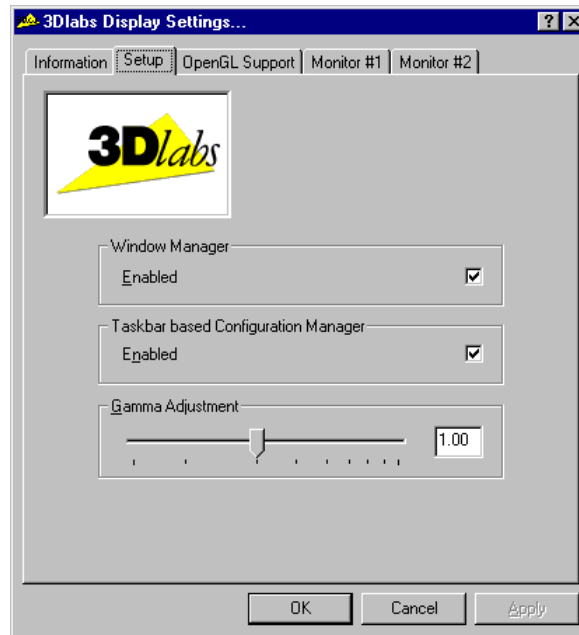
The Information screen provides in-depth information about your selected (or the default) settings, as well as detailed hardware, software, and Direct3D specifications. This information can be especially useful if you should need to contact technical support about your Oxygen card.



## Software Configuration

### Setup Screen

The Setup screen lets you configure settings that are not specifically related to Direct3D or OpenGL.



You can enable (check) and disable (uncheck) the *3Dlabs multi-monitor Windows Manager*, which requires a system restart. This option is only available if there is more than one 3Dlabs display card in the system.

You can enable (check) or disable (uncheck) the *Taskbar based Configuration Manager* with a mouse click. The default setting is enabled. This application provides quick access to the main features of the Control Panel. When the taskbar application is enabled, it appears on the taskbar (system tray) each time the system is started. To remove the application from the taskbar, disable (uncheck) the option and restart the system.

The *Gamma Adjustment* slider on the Setup screen lets you simultaneously adjust RGB color curves and define the color output for your display. You can also enter a precise Gamma value, rather than use the slider, when you know which value is appropriate for your monitor and ambient lighting conditions.

### Direct3D Support Screen

The Direct3D Support screen controls Direct3D application specific driver settings for Oxygen VX1 Windows 98 users, and lets you create your own settings. When the panel first appears, the *Defaults*, *Add New* and *Remove Settings* buttons, as well as the *Advanced Options* section, are hidden. They appear when you click the *Advanced* button.



Click *Driver is optimized for application* to reach a drop down list of Direct3D applications, then select the application you want to use. The rest of your selections on this screen will apply to the specified application. You can also click *Select optimized application* in the Configuration Manager and select your application from that pop-up list.

The *Add New* button lets you create a new setting, with a user specified name. *Remove Setting* will remove user created settings, but will not remove the default settings created at driver installation time. *Default* will restore the factory default settings.

*Texture Origin at Top Left Corner* shifts textures slightly as they are applied to objects, and may result in better image quality with some applications.

*8Bit RGB textures* enables Direct3D support for 8bit textures that do not use a separate “look-up” table to specify color. These can be useful for applications that use the new features of DirectX 6, but older applications can misinterpret these new formats. If you have problems such as incorrect colors or poor quality texturing, try disabling this option.

*Disable 16-bit alpha-luminance* textures enables Direct3D support for monochrome (luminance) textures. These can be useful for applications that use the new features of DirectX 6, but older applications can misinterpret these new formats. If you have problems such as incorrect colors or poor quality texturing, try disabling this option.

*Enable Palettized textures* enables Direct3D support for 8bit textures which use a separate “look-up” table to specify the color. These are useful for graphics cards with a small amount of memory. However, they can be slower than the alternatives available on cards with large amounts of memory.

## Software Configuration

For best performance this option should only be enabled for applications that will not operate correctly otherwise.

*Disable Direct3D Gamma Controls* lets you turn off DirectX gamma control if you experience an extremely dark screen, potentially caused by an application's use of an incorrect default.

*Gamma adjustment for this application* affects the entire screen display. As with the contrast on your television, you can adjust this value if your application causes the display to consistently look too dark or too light.



### OpenGL Support Screen

This screen controls OpenGL-application-specific driver settings and enables you to create your own settings. When the panel initially appears the *New* and *Remove Settings* buttons, as well as the *Advanced Options* section, are hidden. They appear when you click the *Advanced* button at the top of the screen.



Click *Driver is optimized for application* to reach a drop down list of applications, then select the one you want to use. The rest of your actions on this screen will apply to that choice. You can also click *Select optimized application* in the Configuration Manager and select your application from that pop-up list.

Click *New* to add an application to the list and customize its settings. *Remove Setting* will remove a user created setting, but will not remove default settings created at driver installation time.

*Number of DMA Buffers* lets you configure the number of visible 3D windows that can be supported with full speed acceleration. For most applications, 8 buffers is sufficient.

*Size of each DMA buffer* controls the size (in bytes) of the Direct Memory Access (DMA) buffer. DMA is a technique whereby a device can directly read commands from host memory.

*Number of DMA Sub-Buffers* lets you set the number of Direct Memory Access (DMA) buffers allocated for use by OpenGL. (DMA is a technique whereby a device can directly access memory without having to go through the CPU). Each DMA buffer is sub-divided into sub buffers which are used in conjunction with a queued DMA mechanism to reduce latency in the system. The number of sub buffers can be set. Setting it to 2 will disable the queued DMA mechanism.

*Overlay / Alpha Mode* provides additional control of the overlay plane capabilities exported in the OpenGL pixel formats. It is specific to just two applications: *Alpha Only* is required by the Alias / Wavefront application “Maya” where retained alpha planes are required (e.g. the particle system package), and *Overlay Only* is for the Parametric Technology application “Pro/3DPaint”. Selection of the above applications from the application menu cause the correct mode to be set automatically. The *Dynamic* setting should be chosen for all other cases.

## Software Configuration

*Wait for Vblank* lets you determine whether the OpenGL driver will attempt to synchronize screen updates to the vertical blanking interval. Smooth animation of 3D applications can be achieved by rendering (drawing) to an off-screen window/ desktop-sized color buffer and copying or swapping the contents to the displayable front buffer at the completion of each frame.

Visible “tearing” can occur if *Wait for VBlank* is not selected. Disabling this option gives the highest rendering frame rates of double buffered applications. You should disable this option, for instance, when running benchmarks.

Stereo View Support is unavailable on the Oxygen VX1-16 card.

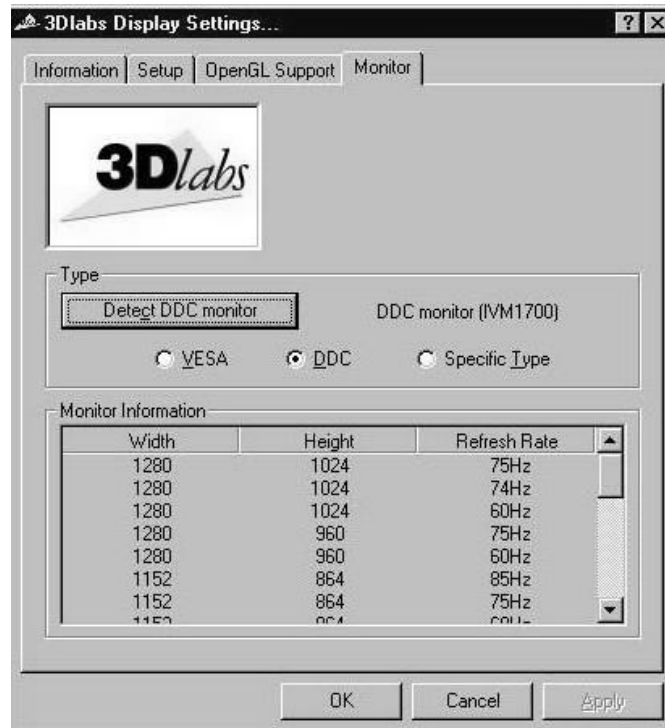
## Software Configuration

### Monitor Screen

This page allows Windows NT users to specify a monitor type and display the available settings, but it does not permit the actual selection of different monitor modes. To select modes, click the Settings tab at the top of the Display Properties panel.

When you open the Display Properties panel and the DDC button is selected, your system automatically checks whether it is connected to a DDC-type monitor. If so, the available modes will be displayed. It is possible, however, for the display settings to fall out of synchronization. This can happen, for example, if you hot-swap monitors. The Detect DDC monitor button lets you manually tell your system to look for the DDC monitor again.

The *Type* section shows which type of monitor was detected when you opened the control panel, and allows you to select a different type if desired. The *Monitor Information* section lists supported monitors. If your monitor is shown in this list, select *Specific Type* in the *Type* section. If your monitor does not appear in the list and is not a DDC-type monitor, select *VESA*.



## **CHAPTER 3 - TROUBLESHOOTING**

### Troubleshooting

If you have trouble using your Oxygen VX1-16 card or a 3D application, you may find the answer to your problem in the following sections. Always start your problem-solving efforts with the simplest solution and work up to the more complex ones.

### Monitors and Display Resolutions

**Question: My monitor is either blank, or the displayed image is distorted, scrambled or smaller than I expected.**

**Solution:** If the monitor is blank, be sure that your system and monitor are plugged in and turned on. Is the monitor's power cord attached securely? Check each component's documentation for the location and use of power connectors and switches.

**Solution:** Make sure that your video cable is connected securely to the monitor *and* to the monitor connector on your Oxygen card. See your monitor documentation and Chapter 1 - Installation, in this document.

**Solution:** Your card might not be seated properly in the AGP slot. Remove and reinstall your card as described in Chapter 1 - Installation. Remember to use the anti-static wrist strap when opening your system and handling the card.

**Solution:** If you have multiple Oxygen cards installed, try connecting the monitor cable to one of the other Oxygen cards and then refer to the section "Error! Reference source not found." on page Error! Bookmark not defined..

**Question: The performance of and/or the available resolutions for my Oxygen card are not what I expected.**

**Solution:** The Oxygen driver may not have installed fully, or a file may have been corrupted. Try installing the driver again.

**Solution:** You may have selected a display setting that is incompatible with accelerated 3D graphics applications. See the Monitor Screen in your 3Dlabs display control panel for a list of compatible resolutions. Monitor screen information appears on page 17 in this guide.

**Solution:** If the performance is different from what you expected, check to see that the correct application or setting has been selected in the Optimized Application Setting in the Taskbar Based Configuration Manager.

**Solution:** If the performance is different from what you expected, check to see that the *Wait for VBlank* setting has been set correctly in the Display Control Panel under Direct3D Support or OpenGL Support.

**Question: When I restart my system, an "Invalid Display Settings" message appears on-screen, followed by "The default display resolution has been temporarily used by the system."**

**Solution:** Within a few seconds, the error messages should be replaced by a window that allows you to set a display resolution. Pick your preferred resolution from the list and you should get the sharp results you expected.

### Systems and Networks

**Question: Since installing the Oxygen card, my system either hangs or crashes to a blue screen when I try to start up, or the system starts up but VGA graphics don't display.**

**Solution:** Try to disable "VGA Palette Snoop." Follow these steps.

1. Remove the Oxygen card and reinstall your old graphics card. See Chapter 1- Installation, for instructions.
2. Restart your system and enter Setup at the on-screen prompt. The key command to enter Setup can differ with each BIOS, so consult your system documentation if you do not see the command displayed as the system boots.
3. Disable VGA Palette Snoop, again consulting your system documentation for its specific location in your BIOS.

## Troubleshooting

4. Choose Exit and Save Settings.
5. Shut down, remove your old graphics card, and reinstall your Oxygen card.
6. Make sure that you are not using an old graphics board driver, and that you have uninstalled any other graphics drivers — particularly those provided by other companies using 3Dlabs chipsets.
7. Please see the Oxygen and Permedia System Integration Guide in the Troubleshooting FAQ section at <http://www.3dlabs.com/support>
8. You may need to update your system BIOS. See your system documentation for system BIOS update information.

**Question: I'm experiencing network problems since I installed my Oxygen card.**

Solution: You may need to reinstall or update your Ethernet driver. See your system or Ethernet adapter documentation for more information.

## Online Information

If you cannot find the problem you are experiencing, or the solution to a problem, listed in this chapter, check the Troubleshooting FAQ list at <http://www.3dlabs.com/support>, or contact your Oxygen card vendor for additional help.

## **APPENDIX A - SPECIFICATIONS**

## Specifications

### Oxygen VX1-16 Specifications

Item	Specification
Card size	NLX shortcard, AGP or PCI, single-slot
Power requirement	10.25 W @ 3v3, 1.0 W @ 5V
Geometry processing	PowerThreads SSE
Rasterizer	GLINT R3 rasterization engine
RAMDAC frequency	300 MHz
Memory	16 MB SDRAM

### Monitor Resolutions

Oxygen VX1-16 is capable of supporting monitor resolutions up to 2048 x 1536, in color depths of 8, 16 and 32 bits, and with refresh rates from 60Hz to 200Hz – *dependent on your system hardware*, operating system, graphics driver version, and your monitor's capabilities.



## **APPENDIX B - SOFTWARE LICENSE**

## **SOFTWARE LICENSE AGREEMENT**

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## **APPENDIX C - REGULATORY STATEMENTS**

## Regulatory Statements

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Sunnyvale, CA 94086  
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Fax 408-530-4701  
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EN 55024:1998, clause 4.2.1  
EN 55024:1998, clause 4.2.2  
EN 55024:1998, clause 4.2.3  
EN 55024:1998, clause 4.2.3.2  
EN 55024:1998, clause 4.2.6  
EN 55022:1994, clause 5  
EN 55022:1994, clause 6  
IEC950:1991, 2<sup>nd</sup> Edition  
EN60950:1992

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San Jose, California, February 2000  
3Dlabs, Inc.

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480 Potrero Avenue  
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Phone 408-530-4700  
Fax 408-530-4701  
United States of America

declare under our sole responsibility that the products

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## **APPENDIX D - GLOSSARY**

## Terms and Definitions

### **AGP**

Advanced Graphics Port. A dedicated graphics bus that transfers data at significantly higher speeds than the PCI bus.

### **Alpha Blending**

This means to create transparent objects by allowing for the blending of pixels to simulate the transparency characteristics of an object. With alpha information, an object can be designed from being totally transparent to opaque.

### **Alpha Buffer**

A portion of the frame buffer used to define the transparency value of a pixel in the frame buffer. This data can be used to blend the frame buffer pixel with the pixel to be drawn to create a composite pixel.

### **Anti-Aliasing**

A technique employed to remove any jagged edges from an object to appear smooth. This is accomplished by gradually modifying the hue and saturation of pixels.

### **API**

Application Programming Interface. The API translates the instructions from the application program into device commands that are specific to the screen's display controller, the graphics board.

### **Atmospheric Effects**

The effect derived from adding one or more layers around an object.

### **Bilinear Sampling**

The process whereby texture mapping is done through filtering.

### **Bit Depth**

Bit depth is another way of expressing the numbers of colors available. A color bit depth of 8 is equivalent to 256 colors, a bit depth of 16 (15 bit of color plus a 1 bit overlay) yields 32768 colors, and a bit depth of 32 (24 bit RGB plus 8 bit of overlays) equals 16.7 million colors. The latter is often referred to as true color.

### **Clipping**

Removal of elements or sections not contained within the active viewing area.

### **CPU (Central Processing Unit)**

The part within a PC that executes programs in main memory.

### **DAC**

Digital to Analog Converter.

### **Depth Cueing**

A technique used to give the illusion of depth. With depth cueing, the part of an object that is farther away is displayed with a lower intensity to give the effect of depth.

### **Digital Flat Panel Display**

A digital, flat-panel display uses a digital (instead of analog) cable connection to transfer data to the display screen. This can eliminate some display artifacts. Flat panel displays occupy less desk space than conventional monitors.



**DirectX**

Microsoft's APIs developed to access various system hardware.

**Direct 3D**

Microsoft's API dedicated to 3D graphics, and a component of DirectX.

**Dithering**

The process of converting an image with a certain bit depth to one with a lower bit depth. Dithering enables the application to convert an image's colors that it cannot display into two or more colors that closely resemble the original. Dithering works because the mind is tricked by the pattern of colors into thinking it's a different color.

**Double Buffering**

With double-buffering, images are rendered in the back buffer and then displayed on the screen once the drawing is completed. This results in the smooth, flicker-free rotation and animation of 3D models and scenes.

**Driver**

A driver is a special interface program that is developed to perform the communication between the application program, the device (i.e., graphics peripheral) and the operating system.

**EVGA**

Extended Video Graphics Array. EVGA runs at 1024 x 768.

**Flat Shading**

The simplest method of shading. Each triangle is assigned one single color, resulting in a faceted appearance of the surface.

**Floating Point**

The portion of the mathematics execution unit of a processor generally associated with multiply and divide operations.

**Frame Buffer**

A 24-bit, true-color frame buffer provides 8 bits for each red, green and blue primary display color. This results in 16.8 million color combinations. A second, or double, buffer enables system to calculate pixels one step ahead of the screen display for smooth, distortion free images.

**Gamma**

A curve representing both the contrast and brightness of an image. Changing the shape of the curve changes the RGB color output. (Not to be confused with GLINT Gamma, the 3Dlabs geometry processing device.)

**Geometry**

The intermediate stage of the 3D pipeline, geometry determines the location of the object and the frame of reference of the viewer in relation to the object.

**Gouraud Shading**

This method of shading, more complex than flat shading, shows subtle color changes across an object. Gouraud Shading is accomplished by adding pixels in a graduated scale of colors.

**Graphics Accelerator Card**

A graphics accelerator performs 3D functions in the hardware, thereby relieving the CPU of repetitive, complex and intensive calls. This results in enhanced performance and speed.

**Heidi**

The API developed by Autodesk to work with its products, such as 3D Studio MAX and AutoCAD.

**MIP-Mapping (for texture processing)**

A feature that delivers photo-realistic images by wrapping 2D bitmaps around 3D objects closely matching the texture to the object. MIP-Mapping allows different versions of a texture to be used for objects of different sizes. It also enables faster performance as textures do not need to be scaled in real time.

**Multiple Resolution Support**

The ability to support multiple resolutions on the screen.

**OpenGL**

The industry standard library of advanced 3D graphics functions developed by Silicon Graphics, Inc.

**Perspective Correction**

A function that allows an object to maintain its 3D textural features as it moves away from the viewer, into the background.

**Pipelining**

A basic hardware tool for accelerating processes.

**Pixel**

The smallest addressable element of a cathode ray tube display. More simply put, the individual dots that make up the screen image.

**Point Sampling**

The basic method of adding texture to an object. Point sampling does not include any filtering of textures.

**RAMDAC**

The final component in the graphics subsystem that translates a digital image into an analog representation.

**Rasterization**

A method to fill in colors for all pixels bound by vertices.

**Rendering**

The final and most rigorous stage in the 3D pipeline where an object undergoes shading, texturing, etc.

**RISC**

Reduced Instruction Set Computing.

**SDRAM**

Synchronous Dynamic Random Access Memory (SDRAM) is a cost-effective solution to improve bandwidth to and from memory, resulting in increased graphics performance.

**SGRAM**

Synchronous Graphics Random Access Memory allows data to be written in a single operation, rather than a (slower) sequence of operations. It also handles background and foreground image fills effectively.

**SDTP**

Super Desktop Publishing. SDTP runs at 1600 x 1200.

**Stencil Buffer**

Similar to stipple masking, the stencil buffer assists with the creation of transparent effects.

**Stipple masking**

A technique that spatially creates transparent effects by rendering an object through various patterns.

**Streaming SIMD**

An instruction set developed by Intel for Pentium III-processor based systems. Streaming SIMD can improve 3D vertice transformation and lighting, among other operations.

**SVGA**

Super Video Graphics Array. SVGA runs at 800 x 600.

**Tessellation**

The initial part of the 3D pipeline where the object is described by a set of triangles.

**Texture Mapping**

A technique that enables 2D graphic images to be “wrapped” around or “pasted” on to a 3D primitive. Perspective correction and lighting calculations allow for added realism.

**Transformation**

The change in rotation, size and perspective of an object in 3D space.

**Transparency**

A function that refers to the rendering of transparent (non-opaque) objects. Transparency is generally accomplished on a polygon rendering system using either screen-door transparency or alpha blending.

**Vectors/second**

Lines drawn per second.

**VGA**

Video Graphics Array. VGA runs at 640 x 480.

**VHR**

Very High Resolution. VHR runs at 1280 x 1024.

**VRAM**

Video Random Access Memory is an expensive, fast type of RAM that is used as display memory on high-end graphics boards.

**VRML**

Virtual Reality Modeling Language.

**Z-Buffer**

Also known as the Depth Buffer, the Z-Buffer is a region of memory containing the depth component of a pixel. Used, for example, to eliminate hidden surfaces from the image.

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