Oxygen 3D Family

OXYGEN™ 102

OXYGEN™ 202

OXYGEN™ 402

Installation and User's Guide

dynamic pictures®

Caution: Changes or modifications to the Oxygen 3D graphics accelerator card not expressly approved by Dynamic Pictures, Inc. void the user's warranty.

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

1) Re-orient or relocate the receiving antenna;
2) increase the separation between the equipment and receiver;
3) connect the equipment into an outlet on a circuit different from that to which the receiver is connected; or
4) consult Dynamic Pictures or an experienced radio/TV technician for assistance.

Compliance with FCC rules requires that a shielded cable be used to connect to other equipment. This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This Class B digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations. Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Dynamic Pictures, Inc. makes no representation that the use of its products in the manner described in this publication will not infringe on existing or future patent rights, nor do descriptions contained n this publication imply the granting of licenses to make, use, or sell equipment or software in accordance with the description.

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Dynamic Pictures® Oxygen™ 3D Family
Has Won the Following Awards

Welcome to Oxygen

Congratulations on selecting a 3D graphics accelerator card from the industry leader, Dynamic Pictures®! Your award-winning Oxygen™ card provides fast, interactive 3D graphics for Intel® and Alpha™ computers.

About This User's Guide

This guide details the installation, software configuration, and capabilities of your new Oxygen graphics accelerator card.

Once you have installed your Oxygen card and driver software, use the *Performance Tuning* section on page 23 to enhance the performance of the 3D graphics applications you use.

Electronic User's Guide

There is an electronic version of the Oxygen documentation that is stored as an Adobe Acrobat file on your Oxygen CD-ROM. The Oxygen.pdf file may be read using the Adobe Acrobat Reader software provided in the Software Gallery on the Oxygen CD-ROM and is found in the following directory on the Oxygen CD-ROM:

<*CDROMDrive*>:\DOC

where *CDROMDrive* is the letter of your computer's CD-ROM drive.

The Oxygen.pdf file is updated periodically. Please visit the Documentation page on our web site at:

http://www.dynamicpictures.com/oxygendoc.html

where you can download the latest version of the Oxygen.pdf.

About Dynamic Pictures

Dynamic Pictures is the industry leader in computer graphics acceleration technology. We design, manufacture, market, and support graphics acceleration hardware and software products for personal computers and desktop workstations. Dynamic Pictures' award-winning 2D and 3D graphics accelerator cards are setting industry standards for uncompromising performance, competitive prices, and outstanding customer support.

Dynamic Pictures also develops premier software technology for OpenGL®, dramatically accelerating applications built on this standard. The integrated technology solutions offered by Dynamic Pictures serve animation, visual computing and CAD/CAM professionals running Intel and Alpha systems. Dynamic Pictures is committed to delivering the fastest, most fully featured 3D graphics technology to the Windows NT® market.

Dynamic Pictures is the industry's only 3D graphics card company that designs and produces graphics chips, cards, and software drivers. Consequently, Dynamic Pictures delivers higher performance and greater compatibility than any other company. To learn more about Dynamic Pictures, get the latest news on the Oxygen product line, register your new Oxygen 3D graphics accelerator card or download software driver updates, visit us on the World Wide Web at:

http://www.dynamicpictures.com

Remember to complete your user registration card. Registration activates your warranty and ensures that you will be advised of future product updates and releases.

NOTE: You can register electronically by selecting "Register Online" on the Oxygen 3D pop-up menu once you have installed your software. For more information, see the *Register Online* section on page 22.

Oxygen 3.0 Release

The Oxygen 3.0 release brings exciting changes and new additions to the Oxygen 3D Family.

PowerThreads™ Technology for Multi-threaded OpenGL

The Oxygen 3.0 release is the fastest Oxygen software technology ever introduced. The addition of PowerThreads technology for multi-threaded OpenGL adds a new boost of power to the unrivaled Oxygen 3D acceleration. For more information, refer to the *PowerThreads Technical Overview* section on page 52.

CD-ROM Media

Dynamic Pictures is pleased to offer Oxygen software on CD-ROM. This new format enables us to provide you with improved installation capabilities. To facilitate periodic updates, drivers can still be downloaded from the Dynamic Pictures web site at:

http://www.dynamicpictures.com/drivers.cgi

Software Gallery

You now have the opportunity to install and review the latest samples, demos or releases from leading 3D software vendors. The *SOFTWARE GALLERY* directory found on your Oxygen CD-ROM highlights the latest achievements in 3D graphics software.

If you are interested in a particular vendor or their products, please visit the Dynamic Pictures web site at:

http://www.dynamicpictures.com/swgallery.html

We know that you will enjoy this valuable bonus. If you have suggestions for the Software Gallery, please let us know in the comments section of your registration card or send us an email to:

marketing@dynamicpictures.com

System Requirements

In order to use your Oxygen card, your computer system must meet certain hardware and software system requirements.

Hardware

- One or more Intel or Alpha processors

- 32 Megabytes (MB) of RAM

- 2 MB of available hard disk space

- PCI bus with at least one *bus-master capable* slot available. If you want to use dual displays, two PCI slots and **two identical Oxygen cards** are required. (See *Appendix C: Using Dual Oxygen Cards* for more details.)

- One or more VGA multisync monitor(s)

Software

- Windows NT® version 4.0 or later installed on your computer;

- Or Windows 95 installed on your computer

NOTE: Oxygen drivers running under Windows 95 display 2D graphics only.

Installation Instructions

This chapter details how to install your Oxygen software drivers and Oxygen card. You must install both the software and the card to experience accelerated graphics.

NOTE: Dynamic Pictures recommends running Windows NT 4.0 or later. This guide assumes that **Windows NT is already installed** on your computer. If not, you must install Windows NT before you install your Oxygen software. For more information about installing Windows NT, please consult your Windows documentation.

If your computer already has a video card installed:
- First, install your software from the Oxygen CD-ROM;
- remove your old card; and
- install your new Oxygen card.

If your system has no other video card:
- First, install your Oxygen card; then
- follow the software installation instructions in the next section.

Dynamic Pictures supports the Oxygen card on multiple system platforms. Platforms may differ in their installation instructions for PCI™ option cards. Consult the hardware installation guide for your workstation or PC if you require additional assistance.

Installing Your Software

Your Oxygen graphics accelerator card includes special software you need to install and configure. These *video drivers* allow your computer to harness the acceleration potential of your Oxygen card. The following section describes the installation process for Windows NT 4.0. If you are running Windows NT 3.51, please refer to *Appendix A: Installing Oxygen on Windows NT 3.51* for installation instructions.

Installing your Oxygen software on Windows NT 4.0

This section describes the installation of the Oxygen software drivers for Windows NT 4.0. If you are running Windows NT version 3.51, refer to page 56. Please ensure that you have closed all Windows applications programs before beginning the Oxygen software installation process.

NOTE: All figures are examples of what you should see on your screen. Slight differences between the figures and your display are common and should not cause concern.

1. Log in to Windows NT 4.0 using any account that has administrator privileges.

2. Insert the Oxygen CD-ROM into the CD-ROM drive on your computer. Double-click on the *My Computer* icon found in the upper left corner of your desktop. The My Computer window appears and should look similar to Figure 1.
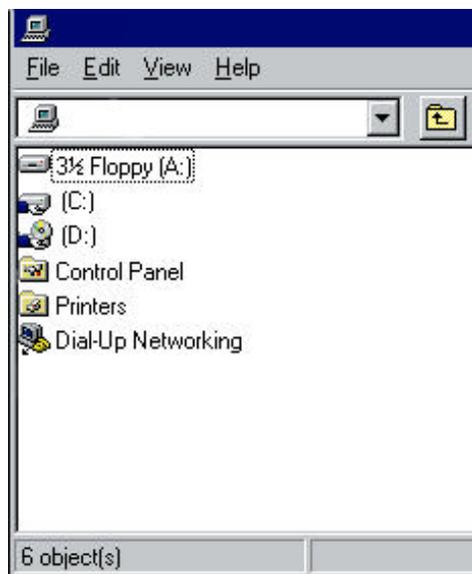
Figure 1: My Computer Window

3. Now select your CD-ROM drive by double clicking on the appropriate icon, usually *D:*. The contents of the CD-ROM are displayed.

4. Double-click on the *DRIVERS* folder. This will display the operating systems and platforms that the drivers support (Figure 2).
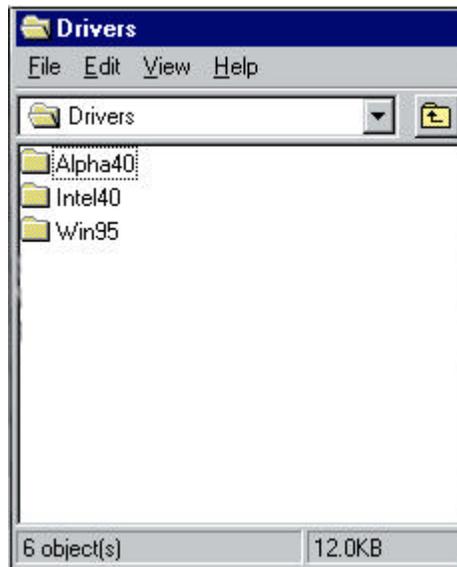
Figure 2: Drivers Folder

5. Choose the correct driver for installation. If you are using a DEC Alpha machine, then double-click on the *ALPHA40* folder. If you are using an Intel system, double-click on the *INTEL40* folder.

6. Double-click on the *DISK1* folder.

7. Now simply double-click the *Setup* icon (Figure 3) to launch the Oxygen 3D Family software installer.
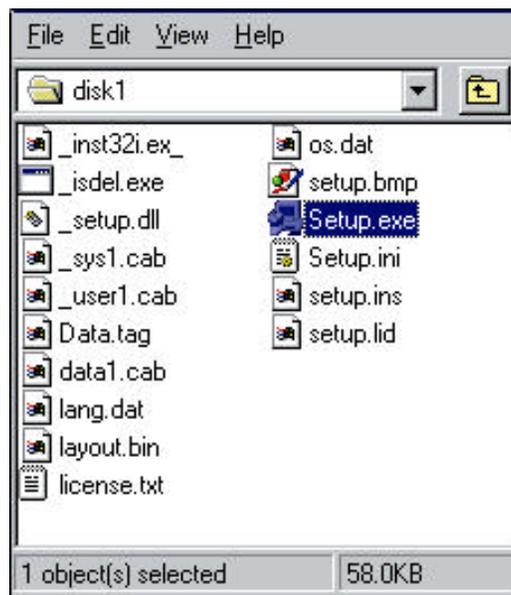
Figure 3: Setup Icon

8. The Setup program will take you through the actions required to install your Oxygen software. If you have exited all other Windows applications, then click the "Next" button in the Welcome window (Figure 4). Otherwise, click the "Cancel" button to exit the Oxygen 3D Family Setup program; close all other Windows applications and resume your Oxygen software installation by repeating steps 1 through 8.

Figure 4: Oxygen 3D Family Setup

9. The Electronic License Agreement should be displayed. Please take a moment to review the Oxygen software use, distribution, and restriction guidelines. You may examine the printed copy of the license agreement found in *Appendix G: Software License Agreement* on page 68 of this manual. In addition, you are bound by license agreements associated with any third-party software products included for distribution on the Oxygen CD-ROM. To accept the terms of the license agreement, click the "Yes" button.

NOTE*:* If you are unwilling to agree to the terms set forth in the license agreement, then click the "No" button to exit the Setup program. Return the card, CD-ROM and all package contents along with your receipt to the place of purchase for a full refund.

10. You must now choose the destination location for your Oxygen software (Figure 5). You may click "Next" to install the software to the default directory which is:

<*SystemDrive*>:\WINNT40\OXYGEN3D

where *SystemDrive* is the letter (e.g., C, D, F, etc.) of the drive where Windows NT is installed.

Figure 5: Installation Directory Window

If you installed Windows NT to a directory other than the default or you want to choose another destination directory for the Oxygen software, then click the "Browse" button and the Choose Folder window will appear. Navigate to the appropriate installation directory, then click the "OK" button. Upon returning to the Destination window, click the "Next" button.

11. The Program Folder is where the Oxygen 3D Family Setup will add the program icons required for your Oxygen card. You may create a new folder such as the default provided, *OXYGEN3D*, or you can choose an existing folder from the scrolling listbox by clicking on the folder to highlight your choice. Once you have identified the Program Folder, click the "Next" button.

12. Setup is now installing the required Oxygen software files onto your Windows NT system.

    NOTE: 3D Studio MAX R1 users must also install the Oxygen Heidi driver. Refer to *Appendix B: Installing Your Heidi Driver* on page 57. 3D Studio MAX R2 users need not install the Heidi driver since 3D Studio MAX R2 supports the OpenGL Oxygen driver that the setup program is currently installing.

13. Once complete, you must restart your computer to activate your new Oxygen software.

    If you have not yet installed your Oxygen card:
    - Select the "No..." radio button (Figure 6);
    - Click "Finish" and shutdown your system.
    - Once you turn your computer's power off, install your Oxygen card and reboot your system.

If you have already installed your new Oxygen card:
- Select the "Yes..." radio button (Figure 6); and
- Click "Finish". Your computer will be restarted and you can begin using your new Oxygen 3D graphics accelerator!

Figure 6: Finish Setup

14. Once your Oxygen hardware and software are installed, refer to the *Performance Tuning* section on page 23 for tips about how to optimize your Oxygen card performance while running your application. It is important to note that not all resolution settings offer accelerated 3D performance. For a list of supported Oxygen resolutions, refer to the *Monitor Resolution Tables* on page 38.

Installing your Oxygen software on Windows 95

Your Oxygen graphics accelerator card also includes video drivers supported under Windows 95.

NOTE: The Windows 95 Oxygen drivers support **2D graphics acceleration only**. They are not intended nor should they be used for 3D graphics acceleration.

1. Log in to your network under Windows 95 using any account that has administrator privileges.

2. Access the Start menu by clicking the "Start" button located in the lower left corner of your desktop. Click the "Control Panel" selection from Settings pop-up menu. The Control Panel window is now displayed.

3. To activate the Display Properties applet, double-click the *Display* icon on the Control Panel.

4. The Display Properties applet contains tabbed dialog boxes that allow you to change the visual properties of your computer display. Click the "Settings" page (Figure 7).
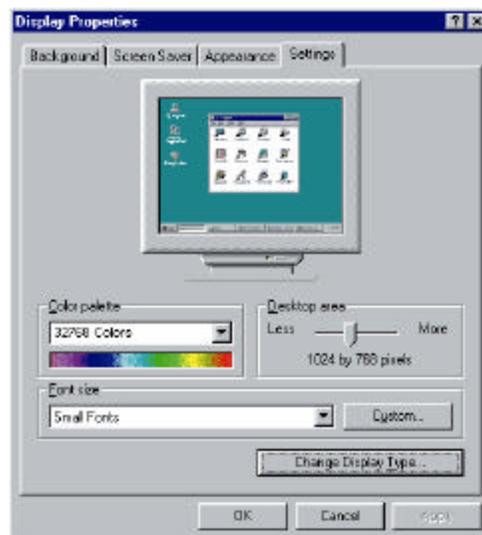
Figure 7: Display Properties - Settings

5. Click the "Change Display Type…" button in the lower right corner of the "Settings" page. The Change Display Type window appears (Figure 8).
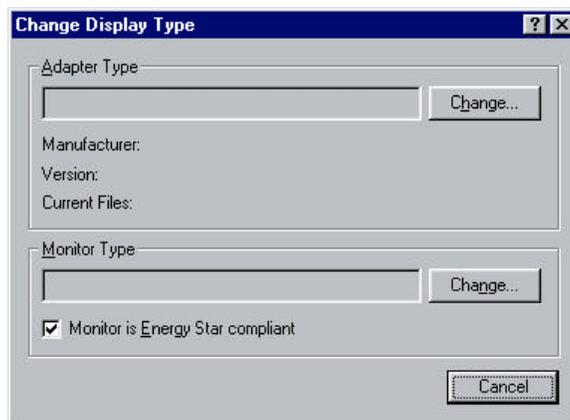
Figure 8: Change Display Type

6. The Change Display Type window shows the graphics adapter and display drivers currently installed in your system. To replace the installed drivers with your new Oxygen drivers, click the "Change…" button under adapter type. The Select Device window appears.

7. The Select Device window allows you to select new display drivers (Figure 9). A standard list of available drivers is displayed here. These standard drivers do not support your Oxygen card. To install your Dynamic Pictures Oxygen driver software from your CD, click the "Have Disk…" button.
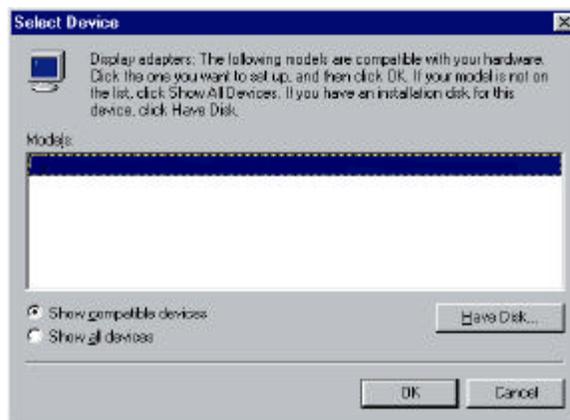
Figure 9: Select Device Window

8. The Install From Disk window appears and allows you to specify the drive from which you wish to install your software. Insert your Oxygen CD-ROM in the drive. Click the "Browse…" button to display the Open window.
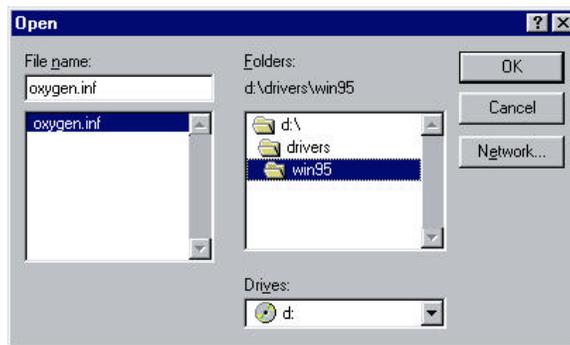
Figure 10: Open Window

9. In the Open window (Figure 10), choose your CD-ROM drive, usually "*D:*\", from the "Drives" listbox at the bottom of the window. Double-click on the *DRIVERS* folder and you will see a list of folders named for the corresponding operating systems that Oxygen supports. Double-click on the *WIN95* folder.

10. Choose the oxygen.inf file and click the "OK" button. The Install From Disk window reappears. In the "Copy manufacturer's files from" box, you should see:

<*CDROMDrive*>:\DRIVERS\WIN95

where *CDROMDrive* is the drive letter (e.g., C, D, F, etc.) of your computer's CD-ROM drive.

11. Click the "OK" button and a new Select Device window should appear with the "Show compatible devices" radio button selected and "Dynamic Pictures Oxygen Rendering Controller" listed. Click the "OK" button.

12. Once your new Oxygen software has been copied to your system, close the Change Display Type window by clicking the "Close" button in the lower right corner.

13. Now accept your changes and activate your new driver by clicking the "Apply" button in the lower right corner of the Display Properties applet.

14. The System Settings Change window appears (Figure 11), instructing you that you must restart your computer for your new driver to take effect.
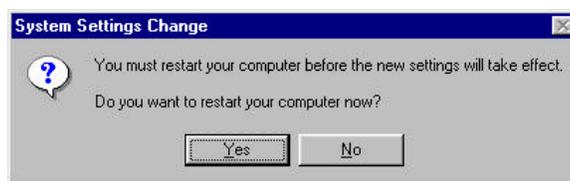
Figure 11: System Settings Change

If you have already installed your new Oxygen card:
- Remove the Oxygen CD-ROM from the drive; and
- Click the "Yes" button to reboot your computer and start using your new Oxygen card.

If you have not installed your new Oxygen card:
- Click the "No" button and close any open applications.
- Remove the Oxygen CD-ROM from the drive; and
- Shutdown your system.
- Once you turn your computer's power off, install your Oxygen card and reboot your system.

NOTE: Please be advised that you have only installed the Oxygen software drivers for Windows 95. If you are running Windows NT and Windows 95 in a dual-boot configuration, you must also install the Oxygen software drivers that support OpenGL under Windows NT. Refer to the *Installing your Oxygen software on Windows NT 4.0* section on page 6 or *Appendix A: Installing Oxygen on Windows NT 3.51* on page 56 for instructions and additional information.

Installing Your Oxygen Card

To install your Oxygen card, you will need a philips-head screwdriver and the anti-static wrist strap included with your Oxygen card. Refer to the Oxygen card layout diagram (Figures 20, 21 & 24) in the *Technology Overview* section on page 46 to identify the parts of your Oxygen card discussed in this section.

It is also recommended that you refer to the printed instructions from your computer manufacturer for specific details on opening the computer and installing cards.

Caution: Static Electricity

To avoid damage to your Oxygen card from static electricity discharge, leave the card in the anti-static bag until you are properly grounded. To be grounded during the hardware installation procedures, use the anti-static wrist strap provided.

To install your Oxygen card:

1. Power off your computer. Make sure you save any work in progress first and properly exit any open applications. It is recommended that you back up your system before installing any new hardware or software.

2. Unplug the power cords from the computer and its peripherals.

3. Remove the computer's cover, following the instructions provided by the computer manufacturer.

4. Attach the anti-static strap to your wrist and clip the other end to a part of conductive metal on your computer's chassis.

5. If you already have a video card in your computer, you will need to remove it before installing your Oxygen card. Unplug the monitor cable from the old card, and then unscrew the card from the chassis. You can now remove the old card from your computer.

6. Install the Oxygen card in an empty PCI slot, following the instructions provided by the computer manufacturer for installing PCI option cards. You should always handle your Oxygen card by its edges.

NOTE: The PCI slot in which you install your Oxygen card must be bus-master capable. Some PCs do not allow PCI bus-master capability from all PCI slots, so be sure to check your motherboard or PC documentation before selecting a slot for your Oxygen card.

7. Make sure you screw the faceplate of the Oxygen card to the system chassis to provide mechanical support and proper grounding. This step is critical to the proper operation of your new card. You may now remove the anti-static wrist strap and save it for future use.

8. Connect the video cable from your monitor to the monitor video connector on your card (Figure 12).
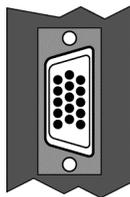
Figure 12: Monitor Video Connector

9. If you have the appropriate stereoscopic viewing hardware and specially configured Oxygen 202 or Oxygen 402, connect the stereo cable to the stereoscopic infrared transmitter and to the stereoscopic viewing connector shown (Figure 13). You can also find more information on stereo viewing in the *Stereo 3D Technical Overview* section on page 54.
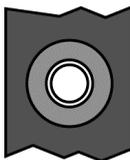
Figure 13: Stereoscopic Viewing Connector

10. Replace the computer's cover; plug in your computer and its peripherals.

11. Power on your system and log in to Windows NT. You are now using your Oxygen graphics accelerator card.

12. Be sure to register your Oxygen card to activate your warranty and to receive notification of future software updates. It is important that you include your Oxygen serial number, which is located either in the upper right corner of the card or on a barcoded sticker on the card's reverse.

13. If you are a user of 3D Studio MAX R1, you will also need to install the Oxygen Heidi driver, as described in *Appendix B: Installing Your Heidi Driver* on page 57.

NOTE: The Oxygen 402 card may consume more than the maximum allowable power for one PCI slot. When installing the Oxygen 402, be sure that at least one PCI, EISA, or ISA slot in your system is left empty. This will guarantee that sufficient power will be available for the Oxygen 402 card. This is not required for users of the Oxygen 102 or Oxygen 202 cards. Refer to *Appendix E: Mechanical and Electrical Specifications* for power consumption details.

Start Menu

This section briefly outlines the purpose of each option on the Oxygen 3D submenu. Although there are many methods of accessing the Oxygen 3D Family utilities, we recommend that you use the Start Menu. Click the "Start" button and then click the Oxygen 3D submenu option under "*Programs*" (Figure 14).
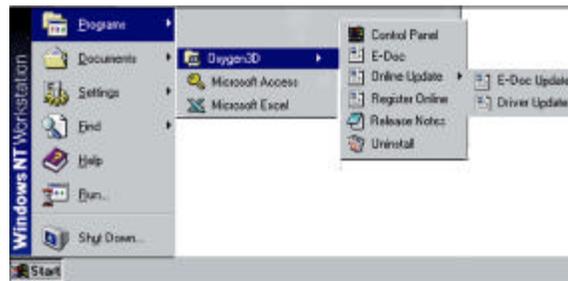
Figure 14: Oxygen 3D Submenu

Control Panel

The Oxygen 3D control panel enables you to choose a variety of performance optimizations. The selections you make will depend on the type of 3D work that you are doing.

E-Doc

Clicking the "*E-Doc*" option opens the *Oxygen Electronic User's Guide* in Adobe Acrobat Reader. If you do not have Adobe Acrobat Reader installed, you may download the software from Adobe's web site at http://www.adobe.com or install Adobe Acrobat Reader from the Software Gallery directory of your Oxygen CD-ROM.

Online Update

Click the "*Driver Update*" option if you want to update your Oxygen 3D driver software. This option launches your web browser and automatically opens the drivers page on the Dynamic Pictures web site. You can download the latest drivers or select "Driver Archives" in order to download older drivers.

Periodically, the Oxygen Electronic User's Guide is updated. Clicking the "*E-Doc Update*" option launches your web browser and opens the documentation page on the Dynamic Pictures web site. From here, you may review or download the latest version of the Oxygen Electronic User's Guide.

Register Online

To facilitate the Oxygen registration process, select "*Register Online*" to launch your web browser. Simply click the "Register" link to the Dynamic Pictures web site. By typing the answers to a few simple questions, you can register your Oxygen card in just seconds!

Release Notes

Click "*Release Notes*" in order to read the latest information available about the release. The Release Notes summarize release enhancements, changes to the Control Panel, and late-breaking technical information about the drivers. It is important to review the Release Notes to ensure that you are aware of details specific to your platform.

Uninstall

The Oxygen uninstall program will seamlessly remove Oxygen 3D software from your computer system.

Performance Tuning

Although you can achieve industry-leading graphics performance using the default settings of your software applications and Oxygen card, you can enhance performance in particular areas through selective allocation of hardware resources and customization of application configuration files.

Hardware Resources Affecting Performance

The combination of your Oxygen 3D accelerator card and the capabilities of the other components in your computer determine the graphics performance of your computer.

Hardware

The speed and configuration of your computer affects the speed of the graphics your Oxygen card displays. Optimal graphics performance is achieved in a system with faster processors, multiple processors, faster memory or larger amounts of memory.

Monitors

The refresh rate of your monitor is the speed with which it redraws graphics on the screen. A monitor with a faster refresh rate appears to flicker less when displaying graphics. Your Oxygen card supports refresh rates from 60Hz to 100Hz.

Dynamic Pictures recommends using a monitor with a vertical refresh rate of at least 75Hz for the best high-resolution graphics appearance. Oxygen 102 delivers optimal performance at a resolution of 1024x768 in 16-bit color mode. With its 16MB or 32MB of memory, Oxygen 202 and Oxygen 402 respectively deliver optimized performance at a resolution of 1280x1024. For additional information about display resolution, please refer to the *Display Resolutions and Settings* section on page 37.

Oxygen Control Panel

The Oxygen 3D control panel is Dynamic Pictures' graphical user interface for viewing and setting options relevant to your Oxygen card. Many graphics applications use the full range of features offered by the Oxygen card. However, certain software applications focus only on one or two areas, and do not utilize other features at all. Given that your Oxygen card has a fixed amount of memory, the Oxygen control panel enables you to manipulate how the graphics memory is allocated for various operations.

The control panel has four pages that enable you to manage resources that affect the performance of your Oxygen card: *Oxygen Status*, *Memory Options, Advanced Options* and *Support Information*.

The Oxygen 3D contol panel opens on the *Oxygen Status* page (Figure 15) which displays the current settings of your installed 3D accelerator card.

Click the *Memory Options* page (Figure 16) to configure the use of your Oxygen card's memory and maximize performance based on your application's specific needs.

Click the *Advanced Options* page (Figure 17) to adjust other graphics and display options for your Oxygen card such as enabling support for a dual display or stereo 3D.

Click the *Support Information* page (Figure 18) to view contact information for the Dynamic Pictures support team. This page also has a test button that will help you verify that your Oxygen hardware and software are properly installed.

Oxygen Status Page
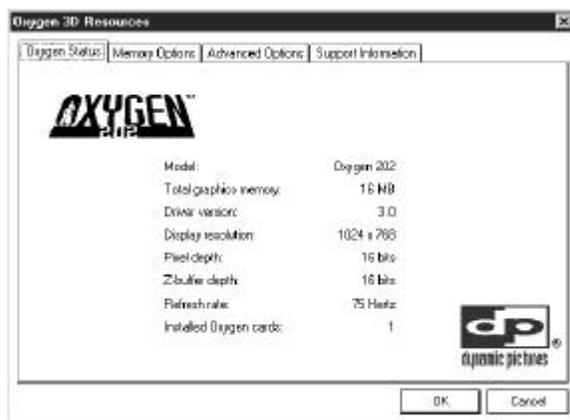
Figure 15: Oxygen Control Panel (Oxygen Status)

At-a-glance, the *Oxygen Status* page (Figure 15) provides current information about your Oxygen card installation and configuration.

Model

Identifies the particular model number of the Oxygen card installed in your system.

Total Graphics Memory

Total amount of memory available on your Oxygen card. Allocation of this memory for texture mapping, z-buffering, etc. is made according to your performance optimization selections.

Driver Version

Refers to version number of the Oxygen software driver that you are currently using. You can download the latest driver releases from our web site.

Display Resolution

Indicates the current resolution being used by your monitor. Not all of the resolution settings supported by your monitor necessarily offer accelerated 3D performance. For a list of resolutions supported by your Oxygen card, refer to the *Monitor Resolution Tables* on page 38.

Pixel Depth

Identifies the number of color planes (known as bits) stacked on top of each other to create a pixel. If the pixel depth is 16-bit, then Oxygen displays five bits each of red, blue and green and a one-bit overlay, for a total of 32,768 colors.

Z-buffer Depth

Specifies the bit depth of the Z-buffer. Oxygen cards support 16-bit and 24-bit Z-buffers. Using a Z-buffer provides added realism to a scene by modifying the positioning and visibility of pixels as a function of distance.

Refresh Rate

The rate at which your monitor repaints the displayed image from the top of the screen to the bottom. Oxygen cards support multiple refresh rates for each resolution, but a refresh rate of at least 75Hz is recommended.

Installed Oxygen Cards

Refers to the number of Oxygen cards installed in your system. Oxygen supports dual displays if you have two identical Oxygen cards installed in your system; however, you must enable dual monitor mode, which is found on the *Advanced Options* page.

Memory Options Page

Figure 16: Oxygen Control Panel (Memory Options)

The *Memory Options* page (Figure 16) shows how much memory is allocated based on the settings you selected in the Display control panel, as well as how much memory is available for texture mapping and other features.

Performance of the Oxygen 102 card is optimized using 1024x768 resolution with 16-bit color, double buffered for many applications. The Oxygen 202 (16MB of memory) is optimized using 1280x1024 with 16-bit color, double buffered. The Oxygen 402 (32MB of memory) performs well using 24-bit, true color displays up to 1280x1024 resolution or 16-bit color, double buffered displays up to 1600x1200.

These settings deliver the best performance and leave the most room to store textures in memory. However, the Oxygen 3D Family memory system is very flexible, and other configurations are available. See the *Display Resolutions and Settings* section on page 37 for details.

Z-Buffer

The Oxygen 3D Family supports 16-bit or 24-bit Z-buffers. The default depth is 16-bit. Dynamic Pictures recommends that you leave this setting unchanged except when you are working with very large models and see undesirable artifacts. Increased Z-buffer precision will allocate up to 24-bits for Z-buffering, although the actual depth will depend on available memory. Selecting *None* will turn off the Z-buffer, and all 3D acceleration. This should be avoided, unless you are working with 2D graphics only and require the additional memory.

Texture Memory

A texel is an individual component of a texture map. Depending on your texture mapping requirements, you can specify the texel bit depth used in texture mapping. For best performance, keep textures stored as 32-bit texels by selecting the *Optimize for performance* option.

If you are using large textures, select the *Optimize for memory utilization* option. This will store textures at the currently selected frame buffer bit depth. Despite a slight performance penalty, this enables a larger dimensioned texture to be stored efficiently.

If you are not using texture mapping, select the *Disable hardware texture mapping* option. This will free memory for other uses by preventing memory allocation for texture mapping.

The Oxygen card can render textures whether or not memory is available on the card, but texturing performance is much higher when using on-card memory. If you are using textures and experience performance degradation, try switching to settings that free up on-card memory (e.g., lower resolution, smaller Z-buffer or fewer colors).

Dynamic Allocation

After memory allocation for the front buffer, back buffer, and Z-buffer is complete, the remaining memory is available for Alpha buffering, stencil buffering or 2D bitmaps by checking the appropriate boxes. You can also increase available memory by disabling double buffering.

To restore the original Memory Options settings, click the "Factory Defaults" button. For additional assistance, click the "Help" button.

Advanced Options Page

Figure 17: Oxygen Control Panel (Advanced Options)

The *Advanced Options* page (Figure 17) enables you to set various application or platform specific parameters that can affect performance. A series of check boxes let you enable or disable certain features.

Adjust for model imprecision

When checked, hardware sub-pixel precision is used to eliminate distortion resulting from 3D model imprecision.

Always draw with anti-aliased lines

When checked, **all** lines will be drawn anti-aliased; otherwise, lines will not be drawn anti-aliased unless specifically requested by the application. Enabling this feature results in smoother lines at a slight performance cost. Recommended for use in applications where text fonts are drawn using OpenGL lines (e.g., some international versions of Pro/ENGINEER). For best performance with most OpenGL and Heidi applications, leave this option unchecked. If you select certain memory options, this alternative is grayed out and unavailable.

Use mip-mapping texture calculations

If checked, mip-mapping will be used for texture calculation when requested by an OpenGL application. If disabled, only the largest map will be used and texture calculations will be done with bi-linear sampling. Mip-mapping is disabled by default for maximum OpenGL application performance. Heidi applications are unaffected.

Sync buffer swap to vertical refresh

If enabled, double buffer swapping occurs during your monitor's vertical blank period. Although there is a slight performance loss, this feature improves the appearance of artifacts by eliminating inter-frame tearing.

Enable dual monitor mode

If two Oxygen 102, two Oxygen 202 or two Oxygen 402 cards are installed in the system, checking this option enables the use of dual displays. The cursor will track from one screen to the next. Disabling this option turns off dual display, even if two cards are present. This option is grayed out if you do not have two Oxygen cards installed.

Use Alpha processor optimizations

If enabled, this feature optimizes operations possible on most Alpha-processor subsystems. If disabled, compatibility with all Alpha systems is ensured.

We recommend enabling this feature in order to maximize performance unless you have a DeskStation Raptor processor. These users may experience boot problems and should leave this feature disabled. If your system does not boot after enabling this feature, reboot and press the <Space Bar> when the system prompts you to enter the "Last known good boot" menu. Select "Last known good boot" option by pressing "L" under Windows NT 4.0 or highlighting that option in the Windows NT 3.51 menu. The option and any other NT registry changes since the last good boot will then be restored back to their previous states. You may also contact your hardware manufacturer for more details.

Enable Back Buffer Copy Mode

This option optimizes performance of Kinetix 3D Studio MAX R2.
Used in conjunction with settings in 3D Studio MAX R2, double buffer
swapping is performed by copying the contents of the back buffer into
the front buffer. The contents of the back buffer will remain
unchanged. If disabled, front and back buffer contents are actually
swapped, which is faster for most applications. Refer to page 34 for
more information about specific settings within 3D Studio MAX R2.

Show stereo modes in display control panel

If checked, you may view and select from the supported stereo 3D
resolutions as shown in the Display Panel. Supported stereo 3D
resolutions are:

Screen Resolution	Color Depth	Vertical Refresh (Hz)
768 x 768	16	105/140
1024 x 768	16	105/120/140
1280 x 512	16	139.32
768 x 768	32	105/140
1024 x 768	32	105/120/140
1280 x 512	32	139.32

Supported stereo 3D resolutions will be shown in the Display Panel in
addition to the non-stereo 3D resolutions. ***If the applications that you
are developing or using are not stereo 3D applications and you
select a stereo 3D resolution, performance will degrade***. This results
from the Oxygen card producing the left and right views required for
stereo 3D and equates to double the number of images in the same
time period. This rapid image production appears as a significant
performance degradation when viewed in an application that does not
support stereo 3D. If you do not wish to view a stereo application in
stereo 3D mode, then deselect the "*Show stereo modes in display control
panel*". For more information about stereo 3D, see the *Stereo 3D
Technical Overview.*

To restore the original Advanced Options settings, click the "Factory
Defaults" button. For additional assistance, click the "Help" button.

Support Information Page

Figure 18: Oxygen Control Panel (Support Information)

The *Support Information* page (Figure 18) contains basic support contact details, as well as an OpenGL system test.

Click the "Test" button to verify that your Oxygen drivers are installed properly. This test will bring up a dialog box stating whether a basic test of OpenGL acceleration passes, indicating successful installation and operation of your Oxygen card.

Oxygen Software Partners

Your Oxygen card has been tested with a variety of graphics software packages. As testing continues and performance optimizations are made, the results and techniques are posted on the Dynamic Pictures web site as well as the web sites of our software partners.

Software Application	Web Site
3D Studio MAX	http://www.ktx.com/
Lightscape	http://www.lightscape.com/
LightWave 3D	http://www.newtek.com/
MicroStation	http://www.bentley.com/
Pro/ENGINEER	http://www.ptc.com/
SDRC I-DEAS	http://www.sdrc.com/
Softimage|3D	http://www.softimage.com/
SolidWorks 97	http://www.solidworks.com/
Unigraphics	http://www.ug.eds.com/ug/

For additional information, visit the partners' page on our web site at: http://www.dynamicpictures.com/swpartners.html

Tuning Your Applications for Optimal Performance

Many graphics applications can be tailored to your needs. These applications perform better if they have information about special hardware on which they run, such as your Oxygen card. This section contains information on several applications that may enable you to realize higher performance. You will also want to consult your software application documentation.

General Tuning Suggestions

To eliminate shape breakup, enable the "*Increased Z-buffer precision*" radio button in the Z-buffer box on the *Memory Options* page of the Oxygen control panel.

To avoid shading problems, check the "*Adjust for model imprecision*" box on the *Advanced Options* page of the Oxygen control panel.

Softimage|3D

You must set the environment variable
`SI_OVERLAY=USE_ONE_BIT` since Oxygen drivers are
optimized for this setting. In this mode, one bit will be used to display
an overlay plane. Softimage may attempt to put more than one bit of
overlays into the overlay plane if the SI_OVERLAY variable is not set.
Setting this variable can be accomplished in the System Control Panel.

On the *Memory Options* page in the Oxygen control panel, enable the
"*Increased Z-buffer precision*" option for Z-buffer (102 users should
enable the *"16-bit Z-buffer"* option); the "*Optimize for performance*"
option for Texture Memory; the "*Alpha buffer*" and "*Stencil buffer*"
options for Dynamic Allocation.

Disable the "*Use mip-mapping for texture calculations*" option on the
Advanced Options page in the Oxygen control panel. Softimage|3D does
not use mip-mapping and this will speed up texture loads.

At 1280x1024 resolution, Oxygen 202 users should use 16-bit color for
optimal performance.

3D Studio MAX R1

3D Studio MAX R1 requires the additional installation of the Dynamic
Pictures Oxygen Heidi driver. For installation and usage instructions,
refer to *Appendix B: Installing Your Heidi Driver* on page 57.

3D Studio MAX R2

When starting 3D Studio MAX, you may specify the default graphics driver
type as OpenGL by including the following line in the *3dsmax.ini* file in the
`[WindowState]` section:

```
GFXType=OpenGL
```

You may have 3D Studio MAX prompt for a choice by specifying "-h" on the
command line used to invoke 3D Studio MAX.

If you are rendering a scene in which the background stays relatively constant and there is little action in the foreground, you might want to alter your application and Oxygen settings.

1) Open the Oxygen 3D control panel *Advanced Options* page and click on the "*Enable back buffer copy mode*" option.

2) In 3D Studio MAX, open the page: File/Preferences/Viewports and click on the "Configure Driver" button. Uncheck the "Redraw Scene On Window Expose" option and make sure that the "Use Incremental Scene Updates (OpenGL Extension)" option is checked.

These optimizations increase performance when swapping the front and back buffers. Only active objects in the scene are re-drawn in the back buffer while static scenery is copied from the previous frame.

Lightscape

Proceed to the *Memory Options* page in the control panel. Since Lightscape provides many opportunities to leverage texture mapping, make sure that you select the "*Optimize for memory utilization*" radio button in the Texture Memory box.

LightWave 3D

For best performance, you must enable OpenGL support in LightWave's Options/Layout View box. Also, select the "*OpenGL Smooth Shaded*" option within LightWave Modeler's Display/Options/Preview Type menu. The software will then use OpenGL hardware acceleration.

If you require full-screen 2D bitmaps in LightWave Modeler, check the "*2D Bitmaps*" option on the *Memory Options* page in the Oxygen control panel.

Due to 3D back buffer and Z-buffer requirements, not all resolutions can satisfy both 2D and 3D requests for LightWave Modeler. Try changing resolutions for optimal performance.

Proceed to the *Memory Options* page in the control panel. Since LightWave is heavily reliant on texture mapping, make sure that you select the "*Optimize for memory utilization*" radio button in the Texture Memory box.

Pro/ENGINEER

Parametric Technology's Pro/ENGINEER CAD software can more fully utilize the capabilities of the Oxygen card if you modify the "config.pro" file with the following lines:

```
SHADE_STRIPS_LONG YES
GRAPHICS OPENGL
```

For additional information regarding Pro/ENGINEER's configuration files, please refer to your Pro/ENGINEER manual.

Unigraphics

Users of Unigraphics should enable the "*Increased Z-buffer precision*" radio button in the Z-buffer box on the *Memory Options* page of the Oxygen control panel.

Display Resolutions and Settings

A monitor that supports 1024x768 resolution at 75 Hz vertical refresh rate is the minimum recommended for use with Oxygen. Choose a resolution, number of colors, and refresh rate that is high enough to meet the needs of your graphics application as well as your personal preference. Performance will vary at certain settings due to the amount of frame buffer memory available.

The following tables detail the 3D display settings supported by your Oxygen card. The first column lists resolution, measured in pixels. The second column contains bit depth information. Bit depth is another way of expressing the number of colors available. A color bit depth of 16 colors (15 bits of color plus a 1-bit overlay) yields 32768 colors, and a bit depth of 32 (24 bits of RGB plus 8-bit overlays) equals 16.7 million colors. The latter is often referred to as "true color". The third column indicates the depth of the Z-buffer. In a few cases, 3D graphics are not accelerated and the graphics are instead drawn in software through the GDI interface. The final column lists the refresh rates supported.

NOTE: Please be aware that when you change resolutions, you should not use the "*Test*" button in the Display Control Panel. Selecting this button may cause a blue screen. If a blue screen occurs, please reboot your system.

Monitor Resolution Tables

Screen Resolution	Color Depth	Z-Buffer Depth	Vertical Refresh (Hz)
800 x 600	16	16 or 24-bit	75
1024 x 768	16	16 or 24-bit	60/70/72/75/85/90/100
1152 x 900	16	16-bit	66/76
640 x 480	32	16-bit	75

Table 1: Oxygen 102 Supported Display Configurations

Screen Resolution	Color Depth	Z-Buffer Depth	Vertical Refresh (Hz)
1024 x 768	16	16 or 24-bit	60/70/72/75/85/90/100
1152 x 900	16	16 or 24-bit	66/76
1280 x 1024	16	16 or 24-bit	60/66/72/75/85/90
1600 x 1200	16	16-bit	60
640 x 480	32	16 or 24-bit	75
800 x 600	32	16 or 24-bit	75
1024 x 768	32	16 or 24-bit	60/70/72/75/85/90/100
1152 x 900	32	16 or 24-bit	66/76
1280 x 1024	32	16 or 24-bit	60/66/72/75

Table 2: Oxygen 202 Supported Display Configurations

Screen Resolution	Color Depth	Z-Buffer Depth	Vertical Refresh (Hz)
1024 x 768	16	16 or 24-bit	60/70/72/75/85/90/100
1152 x 900	16	16 or 24-bit	66/76
1280 x 1024	16	16 or 24-bit	60/66/72/75/85/90/100
1600 x 1200	16	16 or 24-bit	60/65/68/70/72/75/80
640 x 480	32	16 or 24-bit	75
800 x 600	32	16 or 24-bit	75
1024 x 768	32	16 or 24-bit	60/70/72/75/85/90/100
1152 x 900	32	16 or 24-bit	66/76
1280 x 1024	32	16 or 24-bit	60/66/72/75

Table 3: Oxygen 402 Supported Display Configurations

Upgrading Your Oxygen Driver

New drivers for your Oxygen card are posted to the Dynamic Pictures web site. If you need to upgrade your Oxygen driver, follow the directions in this section. If you are installing Dynamic Pictures' driver software for the very first time, follow the directions in the *Installing Your Software* section on page 5.

If you have access to the Internet, you can easily locate and download new Oxygen software drivers from Dynamic Pictures' web site at:

http://www.dynamicpictures.com/drivers.cgi

To download and install updated Oxygen drivers:

1. Point your web browser to the Dynamic Pictures home page, and then select the Software Driver Updates link. From this page, you will be able to download the appropriate Oxygen driver for your hardware platform. The driver file that will be downloaded to your machine is a self-extracting archive.

2. From the Windows NT Explorer, create a new directory on your hard drive for the drivers (e.g., "C:\temp\dpi"). Then move the ".exe" file to this new directory.

3. Double-click on the self-extracting ".exe" file to decompress the driver files into the newly created directory.

4. After carefully reviewing the Release Notes found in the release.txt file, begin the software installation process detailed in the *Installing Your Software* section on page 5 of this manual.

5. Restart your computer. You are now using your new driver.

6. To verify the successful installation of your new drivers, launch the Oxygen Control Panel after restarting. The version number displayed in the control panel should match the version you just installed.

Troubleshooting

If you have trouble installing your Oxygen hardware or software, you may be able to fix it using this section or the information in the Oxygen Release Notes.

Hardware Troubleshooting

Problem: When I restart my system after installing my Oxygen card and software driver, the system hangs or nothing is displayed on my monitor.

Solution: The problem could be one of several things. Here are conditions to check (not an all inclusive list):

- **Monitor:** Confirm that your monitor is connected to the Oxygen card, the monitor is plugged in to a wall socket, and it is powered. Also, verify that your monitor is compatible with the resolution and refresh rate you selected.

- **Oxygen card is loose:** The cables that attach to your Oxygen card could be loose, or the Oxygen card itself might not be seated properly on your motherboard. First, try removing and attaching your monitor cable. If that does not work, power off your computer, remove and reseat your Oxygen card, pressing the card down firmly to ensure a good connection, then screw the bracket on the card to the system chassis. Remember to use the anti-static wrist strap when opening your computer and handling the card.

- **Cable connected to wrong card:** if you have multiple video cards installed in your computer, make sure the monitor cable is connected to the Oxygen card.

- **Bus-master capable slot:** If you still do not see anything on your monitor, your Oxygen card may not be in a bus master-capable slot in your computer. On some PCs, not all slots are bus master-capable slots. Consult your computer or motherboard documentation for more information on your PCI bus and master-capable slots.

- **VGA jumper disabled:** Is the VGA jumper on your Oxygen card set to the factory position, "VGA enabled"? Compare the jumper on your card to the illustration on page 62. Your Oxygen card must have VGA enabled to display VGA mode 2D graphics on your monitor. See *Appendix C: Using Dual Oxygen Cards* for additional details on setting your VGA jumper.

- **Multiple displays:** Not all computers support multiple video cards simultaneously. If you are attempting to use more than one video card and monitor, you may wish to contact your computer or motherboard manufacturer to confirm that this is a supported display configuration.

- **VGA Jumper enabled using two Oxygen cards:** If you are using two identical Oxygen cards to drive two monitors, you must disable VGA on one of the Oxygen cards. Refer to *Appendix C: Using Dual Oxygen Cards* for more information about switching your VGA jumper.

Problem: My monitor is either not displaying anything, or displaying something, but what is displayed is distorted, scrambled or smaller than I expected.

Solution: Your vertical refresh may be set higher than your monitor is capable of displaying. Displaying at a refresh rate that is too high can damage your monitor. Select a lower refresh rate using the Display Control Panel. For more information about your monitor and vertical refresh rates, see the manual that accompanied your monitor.

Problem: After installing an Oxygen 202 or Oxygen 402 card, there are no VGA graphics or the system hangs on boot-up.

Solution: Enter CMOS Setup at boot-up and disable '*VGA Palette Snoop',* if available. To do this, you must reinstall your old graphics card, and during system boot, enter CMOS Setup. (The command to enter setup is usually displayed at system start-up.) Consult your system documentation for changing CMOS settings, then disable '*VGA Palette Snoop'*, if present. Choose Exit and Save CMOS settings.

Alternatively, you may need to update your system to the newest version of your system BIOS. (Oxygen 202 and Oxygen 402 cards require a system BIOS that is compatible with a VGA display device that is behind a PCI-to-PCI bridge.) Consult your hardware system documentation for information on updating your system BIOS to a current version. (If your system is equipped with a Flash BIOS, software updates may be available on the World Wide Web. Check your BIOS manufacturer's web site for an update.)

Problem: After installing an Oxygen 202 or Oxygen 402 card, the system hangs, pauses, or crashes to a Windows "blue screen" during operation.

Solution: Enter CMOS Setup at boot-up and disable '*PCI Bursting'* if available. To do this, during system boot, enter CMOS Setup. (The command to enter setup is usually displayed at system start-up.) Consult your system documentation for changing CMOS settings and disable '*PCI Bursting'*, if present. Choose Exit and Save CMOS settings.

Alternatively, you may need to update your system to the newest version of your system BIOS. Consult your hardware system documentation for information on updating your system BIOS to a current version.

On systems with more than three (3) PCI slots, it may be necessary to move your Oxygen card to the opposite set of three slots. More than three PCI slots implies that your system is bridging a second bus and the system may not support every hierarchy of these bridges. Thus, the Oxygen 202 or Oxygen 402 card must be moved to the proper set of PCI slots.

Problem: After installing the Oxygen card, network problems appeared.

Solution: There may be a conflict between your Ethernet card and your Oxygen card. If your Ethernet adapter is an ISA adapter rather than a PCI adapter, then check system diagnostics for IRQ conflicts. (*The Oxygen 202 card requires two and the Oxygen 402 card requires four of the PCI interrupt lines, which your system may assign to one or more IRQs. Other PCI devices may share these same IRQs.*)

To solve this problem, from the Start Menu, select *Programs* then *Administrative Tools* and run *Windows NT Diagnostics*. Then click the "Resources" tab. Make sure the IRQ button is selected and check for any devices sharing IRQ settings.

If two IRQs conflict, then change the Ethernet IRQ in the Network Control Panel applet. Click on the Adapters tab, then select your network adapter and click "Properties" to change the IRQ setting to an open IRQ number. For additional details, consult your Ethernet adapter documentation or vendor for information on changing IRQ settings or for obtaining a newer Ethernet driver for your adapter.

Problem: After installing an Oxygen 202 card or an Oxygen 402 card, network problems appeared.

Solution: Your Ethernet adapter software driver may be unable to process requests. If using a PCI adapter and your system has more than three (3) PCI slots, you should try changing the relative positions of the Oxygen and Ethernet cards within PCI busses. More than three (3) PCI slots implies that your system is bridging a second bus and the configuration may be incompatible with the Oxygen 202 or Oxygen 402. Updating the Ethernet adpater's driver and/or re-installing the driver software may be required.

Software Troubleshooting

Problem: I installed a new driver (either from the Oxygen CD-ROM or from the Dynamic Pictures web site), and the available resolution(s) or performance is not what I expected.

Solution: You may not have fully installed the Dynamic Pictures driver or an installed driver file may have been corrupted. You can confirm if the driver is installed and its version number by using the Oxygen control panel (Figure 15). It should be the same as the version number of the driver you most recently installed. You can also use the "Test" button on the *Support Information* page in the Oxygen control panel to verify successful installation.

When driver file corruption occurs, it is often a result of a media error or a communications error during the download procedure. Try downloading and/or installing the driver again.

Alternatively, you may have selected a display setting that is incompatible with accelerated 3D graphics. For example, the Oxygen 202 can support a maximum resolution of 1280x1024 when accelerating 3D graphics in true color mode. Selecting a true color resolution higher than this will greatly reduce performance. Refer to the *Monitor Resolutions Tables* on page 38 to select a setting that offers hardware accelerated 3D graphics.

You must restart your system for the new driver to be loaded by the Windows NT operating system.

Problem: After installing my software and Oxygen card, or after selecting a new resolution, when restarting my computer Windows displays the message, "Invalid Display Settings" and "The default display resolution has been temporarily used by the system."

Solution: You should soon see a window that allows you to select a display resolution. Once you have selected your preferred resolution, your Oxygen card should work as expected.

Technical Support

Dynamic Pictures is committed to customer satisfaction. Your Oxygen graphics accelerator card is covered by a three year parts and labor limited warranty. Details of the warranty are described in *Appendix D: Warranty Information* on page 65. For additional information or for technical support, please contact your local Dynamic Pictures Oxygen reseller, or reach us electronically at:

support@dynamicpictures.com

Software driver updates and other new information can be found on the Dynamic Pictures web site at:

http://www.dynamicpictures.com

All software releases undergo extensive quality assurance testing. In addition to OpenGL conformance and Windows compatibility tests, real-world CAD applications, benchmarks, and demo programs are employed to ensure optimized, stable drivers. However, if you encounter what you believe to be a problem with the graphics subsystem, please let us know. You can send electronic mail to the address above.

When reporting problems electronically, please be sure to note the graphics accelerator model, operating system, computer hardware configuration (including memory and CPU), Oxygen driver version, graphics application (including version number), and a detailed description of the problem you are having. Please be sure to include a description of the steps necessary to reproduce the problem.

Technology Overview

NOTE: You need not read this chapter to install and use your Oxygen card and its software.

This chapter describes the award-winning technology upon which the Oxygen 3D graphics architecture is based. Your Oxygen card utilizes the all new Oxygen chip, transforming your computer system into a blazingly fast 3D graphics powerhouse.

Hardware Technical Overview

Oxygen graphics accelerators are PCI cards designed for professional graphics users in application areas such as mechanical CAD, scientific visualization, and animation. The Oxygen card delivers high-end 3D workstation graphics performance and features to PC users running the Windows NT operating system.

The Oxygen 3D Family delivers accelerated 3D graphics, stereoscopic viewing, windowing operations, and video display through the tight integration of high-performance proprietary hardware. Dynamic Pictures Oxygen chip powers this scalable graphics architecture while providing smooth shading, depth-buffering, dithering, anti-aliasing, transparency, alpha blending, stenciling, stippling, accumulation buffering, and texture mapping, coupled with a VGA interface.

Most simply, your Oxygen card works as follows: graphics data comes from the processor and main computer memory, over the PCI bus, to the Oxygen card. These graphics primitives are read, interpreted, and rendered by the Dynamic Pictures Oxygen chip. The geometry, now translated into discrete pixels, is stored in the card's memory until it is passed through a video Digital to Analog Converter (DAC) for display on your monitor.

The Oxygen chip integrates rendering, texturing and plane equation setup calculations–graphics functions other 3D graphics cards divide among several chips. The result with the Oxygen card is increased speed on a smaller card.
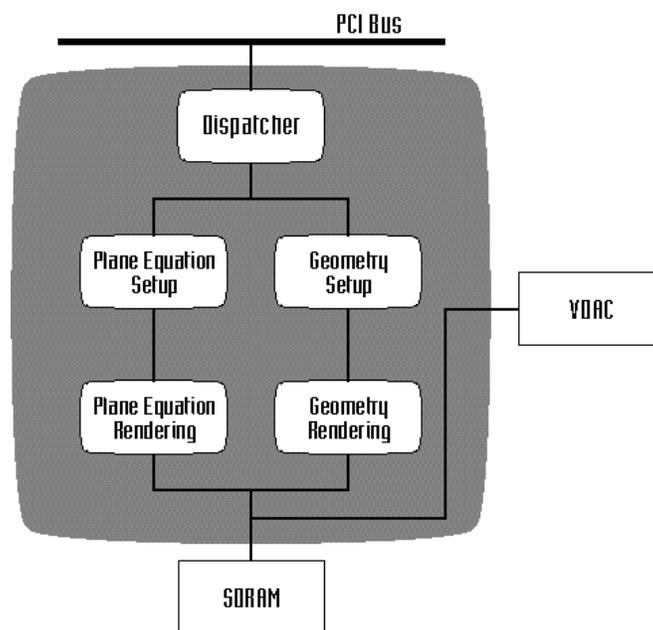
Figure 19: Oxygen Chip Block Diagram

The Oxygen Chip block diagram (Figure 19) shows the components and functions of the Oxygen chip. The *Dispatcher* interfaces with the PCI bus, using a built-in memory FIFO to transfer commands and data from the computer's main memory system to the graphics subsystem for processing.

The data is then split into two paths and processed in parallel, pipelined stages. Attribute information (i.e. color and transparency) is calculated in the *Plane Equation* path. Positional information (i.e. which pixels should be lit) is calculated in the *Geometry* path. Each path does its work in two stages: Setup and Rendering. The Oxygen chip processes three primitives at any given time: one in the dispatcher, one in the setup stage, and one in the rendering stage.

The Oxygen 102 (Figure 20) is equipped with a single Oxygen chip and 8 MB of SDRAM. The Oxygen 202 (Figure 21) features two Oxygen chips operating in parallel, and 16 MB of SDRAM. Finally, the Oxygen 402 (Figure 24) features four Oxygen chips operating in parallel, and 32 MB of SDRAM.

In the case of the Oxygen 102, rendered data from the Oxygen chip is stored in the 8 MB of SDRAM on the card until it is passed through the high-end video DAC (Digital to Analog Converter), which supports color mapping, overlay planes, cursor control, and video clock generation.

Alternatively, the card's VGA chip can drive the video display through a separate port on the video DAC. The VGA chip drives the display during the boot up process and when operating the system in full-screen VGA mode (e.g., when playing a VGA-based video game).

In the case of the Oxygen 202 and Oxygen 402, multiple Oxygen chips operate in parallel, simultaneously rendering to different parts of the frame buffer. Each Oxygen chip has its own dedicated 8MB of SDRAM. The unified memory architecture of the Oxygen 3D Family allows allocation for front buffer, back buffer, Z-buffer, texture memory and overlays depending on the needs of the user and the desired applications. Please refer to the *Oxygen Control Panel* section on page 24 for more details.
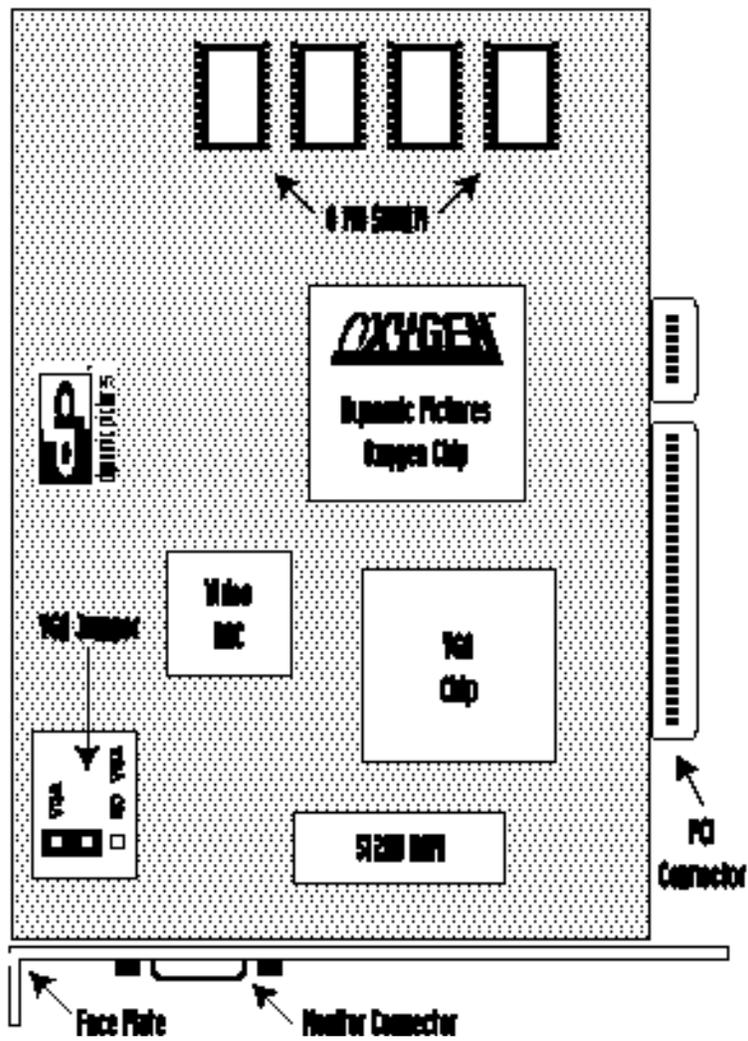
Figure 20: Oxygen 102 3D Graphics Accelerator

Software Technical Overview

The Oxygen graphics accelerator card supports the Windows NT operating system, accelerating 3D applications built on the OpenGL application programming interface (API). OpenGL is the predominant 3D API in the technical computing community.

The software environment for the Oxygen card presents two APIs to the applications programmer – WIN32 and OpenGL. WIN32 is the Windows NT windowing API. Used together, OpenGL and WGL provide a 3D programming interface. The OpenGL API supports the 3D geometry and rendering pipelines, while the WGL API presents interfaces that allow the OpenGL API to interact with the Windows operating system.

Dynamic Pictures' OpenGL implementation is supported through Microsoft's Installable Client Driver mechanism. By default, Microsoft provides a software OpenGL implementation where all graphics primitives are converted to 2D GDI calls. All 2D and 3D OpenGL graphics requests are intercepted by Oxygen software drivers and directed to the Oxygen card for dramatically accelerated performance.

Oxygen also includes support for Heidi, a graphics library used by Kinetix 3D Studio MAX R1 and other Autodesk applications. If you are a 3D Studio MAX R1 user, please refer to *Appendix B: Installing Your Heidi Driver* section on page 57.
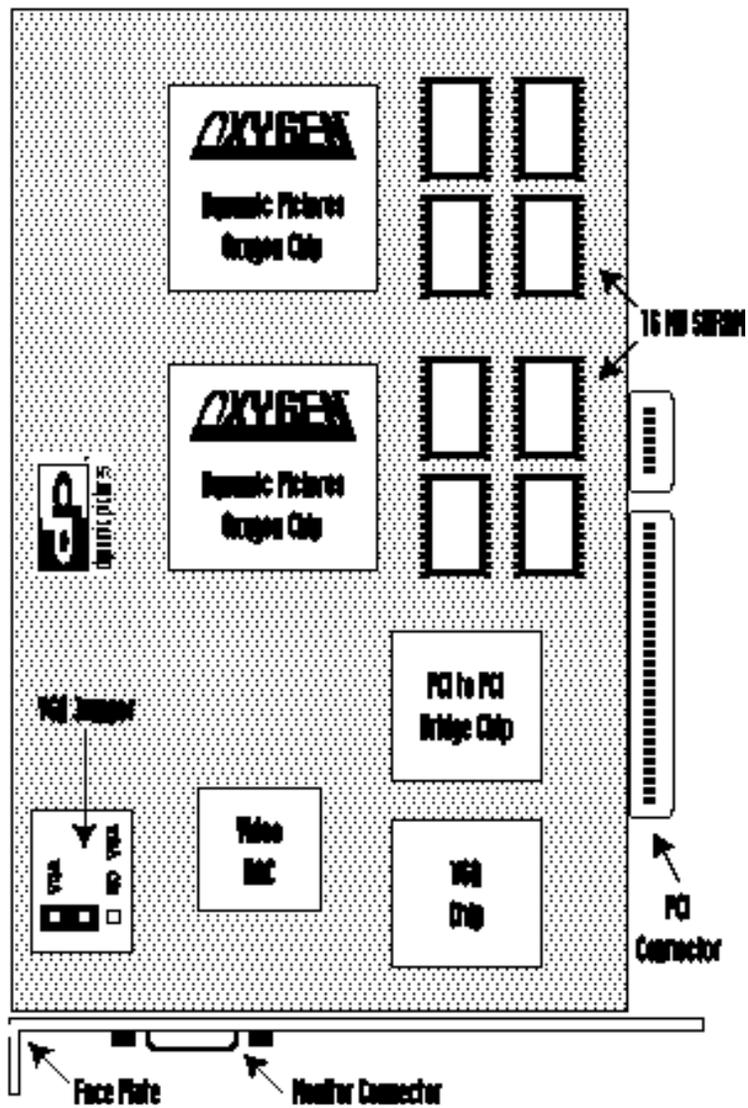
Figure 21: Oxygen 202 3D Graphics Accelerator

PowerThreads™ Technical Overview

In order to provide the fastest 3D graphics performance, it is vital that 3D graphics hardware and software be tightly integrated and *optimized.* Dynamic Pictures, the only 3D graphics card company to design, develop, and manufacture its own graphics chips and accelerator boards, is in the ideal position to leverage this integration from the initial product concept through execution. The result is the new PowerThreads technology for multi-threaded OpenGL.

PowerThreads technology enables users of multi-CPU systems to utilize existing computing resources to accelerate geometry transformation. In a standard dual CPU configuration, the CPU is over-worked while processing all geometry transformation requests for the Oxygen chips (Figure 22). Thus, the graphics card does not benefit from the combined power of both CPUs. However, PowerThreads technology automatically enables the Oxygen 3D Family of cards to take full advantage of the new breed of multi-processor PCs. In its simplest form, PowerThreads-enabled drivers intercept the OpenGL requests and give them to each CPU to process in parallel (Figure 23). Coupled with the multi-chip Oxygen architecture, each host CPU can now simultaneously communicate with multiple Oxygen chips. This new technology increases rendering and texture mapping performance by alleviating bottlenecks in the graphics pipeline.

The PowerThreads architecture is particularly appealing to multi-processor system users who work with 3D graphics applications that are written for only one CPU. Even if an application is not multi-threaded, PowerThreads technology delivers multi-threaded performance. For example, when a quad processor Oxygen 402 card is installed in a dual processor system, PowerThreads technology enables each CPU to concurrently feed data to two Oxygen chips, so all four Oxygen chips render in parallel. The performance gains are independent of the way in which the application is written.

The PowerThreads architecture is designed to leverage integrated hardware and software resources in order for you to rocket along in the bottleneck-free zone!
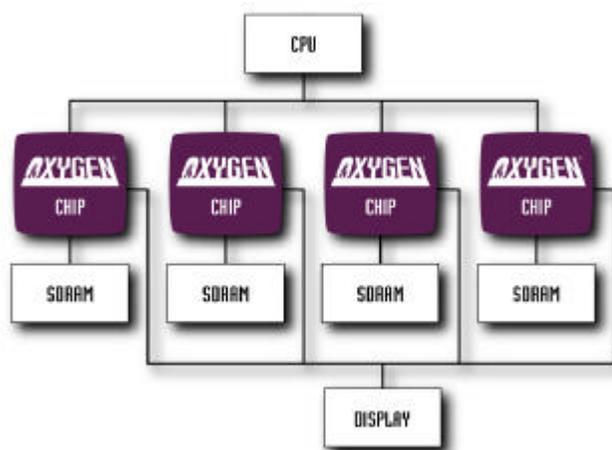
Figure 22: Without PowerThreads technology, a single CPU is burdened with all geometry transformation operations
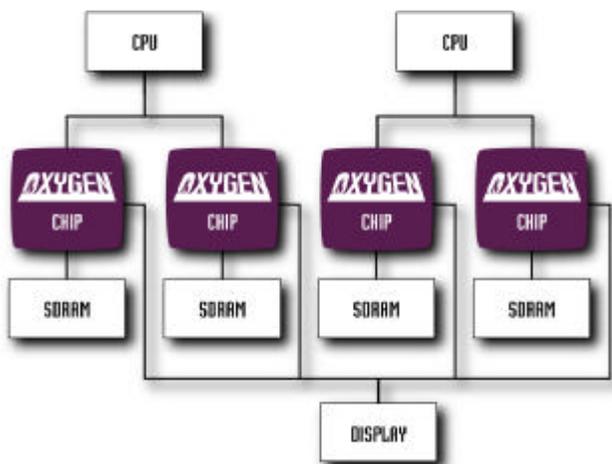
Figure 23: With PowerThreads technology, enabling each CPU to use multiple Oxygen chips for geometry transformation operations maximizes performance

Stereo 3D Technical Overview

Historically stereo has been a very expensive feature offered only on highly specialized virtual reality systems, and high-end SGI UNIX (or equivalent) systems. Now Dynamic Pictures brings stereo 3D to the PC.

High resolution stereo 3D is presented in "stereo pairs", which are the "left eye" and "right eye" frames required to see an image in full stereo 3D. Video output of the two images is double buffered left and right views which must be output at the same refresh rate as the monocular (or normal) image to avoid discernible flicker while operating in stereo 3D mode. This is a significant workload for a graphics card because the output requires twice the number of scan lines displayed in the same time interval. In other words, without employing any additional techniques the board must output 'twice as many pixels, twice as fast."

To generate stereo 3D correctly, an accelerator board should be capable of displaying the stereo pairs in a window. Oxygen is the only graphics card that supports what is called true, full-page flipping, time-multiplexed or field sequential stereo in an NT window. This window is then "decoded" into the independent left and right views by Liquid Crystal Display (LCD) shuttering glasses or similar devices. There are methods of producing stereo that achieve faster frame rates but images are "stretched" and suffer from diminished quality.

The Oxygen 402 3D graphics accelerator card has a connector that enables the card to behave as a stereoscopic viewing system (Figure 24). Any OpenGL application that supports stereo 3D operation can take advantage of this feature today. Viewing of stereo 3D images on the monitor requires your Oxygen 402 card and an infrared emitter with glasses. CrystalEyes® Oxygen™ is a complete solution that combines the power of StereoGraphics' CrystalEyes with the award-winning Dynamic Pictures Oxygen 3D graphics accelerators delivers industry leading, high quality stereo 3D under Windows NT.

For more information regarding stereo 3D options, contact Dynamic Pictures, Inc. at (408) 327-9000. For questions regarding your CrystalEyes eyewear and emitter included with the CrystalEyes Oxygen product, please contact StereoGraphics directly at (415) 459-4500.

Figure 24: Oxygen 402 3D Graphics Accelerator

Appendix A: Installing Oxygen on Windows NT 3.51

Oxygen 3.0 supports the Windows NT 4.0 platform only. Previous versions of the Oxygen driver software supporting Windows NT 3.51 may be found on our web site at: http://www.dynamicpictures.com/drivers.cgi.

Please ensure that you have closed all Windows applications programs before beginning the Oxygen software installation process.

1. Log in to Windows NT 3.51 using any account that has administrator privileges.

2. Using your web browser, go to the Dynamic Pictures web site and download the required self-extracting ".exe" file into a temporary directory (i.e. "TEMP").

3. Download the Windows NT 3.51 Oxygen Driver Installation .pdf file and follow the instructions for completing the driver installation.

Appendix B: Installing Your Heidi Driver

NOTE: This section is for Kinetix 3D Studio MAX R1 users only.

Heidi is an interface layer that allows applications to operate without knowing specific details of the display hardware. Your Oxygen card will accelerate the performance of 3D Studio MAX R1, but only if the Oxygen Heidi driver is installed. The Oxygen Heidi driver software is available for download from our web site at: http://www.dynamicpictures.com/drivers.cgi.

Installing and using your Heidi driver requires two basic steps:

- After you have completed the installation of your Oxygen card and driver software, and also completed the installation of 3D Studio MAX R1, you will need to install the Oxygen Heidi driver.

- When launching 3D Studio MAX R1 for the first time, you will need to instruct the application to use the Oxygen Heidi driver.

Heidi driver files always end with a .HDI extension, and are stored in the *DRIVERS* directory. This directory is located in the 3D Studio MAX R1 top-level directory where the 3D Studio MAX R1 executable program (3DSMAX.EXE) resides. The default location for the Heidi drivers folder is:

<center>*<SystemDrive>*:\3DSMAX\DRIVERS</center>

where *SystemDrive* is the letter (e.g., C, D, E, etc.) of the drive where Windows NT is installed. If you are unsure of where 3D Studio MAX R1 is installed, contact your system administrator.

To install the Oxygen Heidi driver:

Please ensure that you have closed all Windows applications programs before beginning the Oxygen software installation process.

The following steps assume that 3D Studio MAX R1 is installed in C:\3DSMAX, and that you are running a command shell.

1. Using your web browser, go to the Dynamic Pictures web site and download the self-extracting ".exe" file into a temporary directory (i.e. "TEMP").

2. Expand the self-extracting ."*exe*" file by double-clicking on the file icon.

3. Running a command shell from the temporary directory you created, type COPY OXYGEN.HDI C:\3DSMAX\DRIVERS\

Alternatively, if you are running the Windows NT Explorer or the File Manager, drag the file called OXYGEN.HDI from the temporary directory you created to the directory C:\3DSMAX\DRIVERS.

NOTE: Kinetix is no longer supporting 3D Studio MAX R1 running under Windows NT 3.51. You are advised to upgrade to 3D Studio MAX R2.

To select the Oxygen Heidi Driver in 3D Studio MAX R1:

The first time 3D Studio MAX R1 is launched, you will be presented with the Driver Setup dialog box. If you have already been running 3D Studio MAX R1, you may not be presented with this window at start-up, in which case you need to bring up the Driver Setup window from within 3D Studio MAX R1.

1. From the 3D Studio MAX File Menu, choose "*Preferences…*"

4. Select the *Viewports* tab.

5. In the Display Drivers section, click the "*Choose Driver…*" button. The Driver Setup window will appear.

6. Choose the Custom Driver radio button, and select OXYGEN.HDI from the pop-up list.

5. Click the "OK" button.

6. You must now exit 3D Studio MAX R1 and re-launch the application to use the Dynamic Pictures Oxygen Heidi driver and take advantage of your Oxygen card. Perform these steps only when switching Heidi drivers.

If you start 3D Studio MAX from a command shell, you may bring up the Driver Setup dialog by launching the application with the command:

3DSMAX -H

Troubleshooting Your Heidi Driver Installation

If you are experiencing problems when running 3D Studio MAX R1, you can effectively bypass the Oxygen card and use the unaccelerated default Heidi driver. To do this, bring up the 3D Studio MAX R1 Driver Setup window, and select the "Software Z Buffer" option. All graphics are drawn as Windows GDI primitives.

NOTE*:* Using the "Software Z Buffer" option will substantially degrade performance, so it should not be left enabled.

You can compare the appearance and performance of any graphics with those viewed using the Oxygen Heidi driver. Reinstall the driver using the steps outlined in the *Installing Your Software* section on page 5. If you continue to experience problems, please send e-mail to:

support@dynamicpictures.com

Appendix C: Using Dual Oxygen Cards

Oxygen software drivers version 2.1 or later can support two Oxygen cards in the same system. This configuration requires two available PCI slots in the system and two monitors - one for each card. Once installed, the dual Oxygen cards, **which must be the same model number**, provide you with twice the desktop area for accelerated 3D graphics. The supported resolution for each display in this dual screen configuration is 1024 x 768 at all pixel depths.

NOTE: Both displays will be set to the same resolution, and other resolutions are not supported when two cards are installed.

Once the Oxygen drivers and the two Oxygen cards are installed, detection of the two cards and setup of the "jumbo desktop" are automatic. However, you can disable the second card and monitor using the Oxygen control panel.

Dual Oxygen card installation

To take advantage of dual screen support, install Oxygen drivers version 2.1 or later, as described in the *Installing Your Software* section.

Next, install your Oxygen cards as described in the *Installing Your Oxygen Card* section on page 18. The second Oxygen card should be installed only after disabling the onboard VGA jumper. Please refer to *Switching Your Jumper* section on page 62 for details on switching the jumper. Restarting Windows NT will make both cards operational.

In addition to the Oxygen chip for accelerated graphics performance, your Oxygen card contains a VGA chip, which enables you to display simple VGA 2D graphics, often used while your system is starting up. Do not use a separate VGA card in the same machine with your Oxygen card(s).

Enable onboard VGA on one of the Oxygen cards. For configuration purposes, call this the "primary" card. Install this Oxygen card in the lower numbered PCI slot in the system. Usually this means the left slot in desktop systems and the lower slot in tower systems. Since this card will drive the left half of the "jumbo desktop" connect this card to the left monitor. Make sure that this monitor supports at least 1024x768 resolution at 60 Hz.

Next, disable VGA on the second Oxygen board and install this in the upper or right slot. This card drives the right half of the desktop and should be connected to the right monitor. When you power up the system, the VGA boot screen will appear on the left screen and then Windows NT will appear on both the screens.

NOTE: Only one Oxygen card can have the VGA jumper set to the enabled position, and at least one must have VGA disabled for proper operation. Both Oxygen cards must have VGA disabled if the motherboard VGA is enabled. Do not use a separate VGA card with your Oxygen card.

Switching Your Jumper

You can use the jumper on your Oxygen card to enable or disable the VGA subsystem. A *jumper* is a simple hardware switch. There is only one jumper on your Oxygen card. Your VGA jumper is set in the factory for single monitor operation.

Caution: Static Electricity

To avoid damage to your Oxygen card from static electricity discharge, leave the card in the anti-static bag until you are properly grounded. During the hardware installation and jumper switching procedures, use the anti-static wrist strap included with your Oxygen card.

Find the jumper on the diagram of your Oxygen card (Figure 20, 21 or 24) in the *Hardware Technical Overview* section. The jumper on your card is set in the factory to the VGA enabled position, as pictured (Figure 25). This is the position recommended for most users.

NOTE: Some computers may not support the Oxygen card when the jumper is moved and the VGA subsystem is disabled, as some computers do not support the simultaneous use of more than one video card.

To switch your VGA jumper:

1. Ground yourself to the system chassis using the anti-static wrist strap. It is now safe to remove your Oxygen card from the protective bag. Always handle the card by the edges.

2. Carefully slide the VGA jumper (blue or black in color) up and off the two metal prongs on which it rests. This breaks the connection between the "VGA" prong and the center prong.
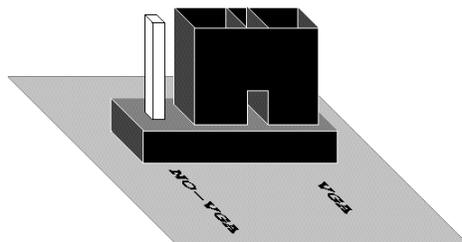
Figure 25: VGA Jumper (VGA Enabled)

3. Slide the jumper down, connecting the center prong and the "NO-VGA" prong that was not in contact before. The Oxygen card is now set to the VGA disabled position (Figure 26).
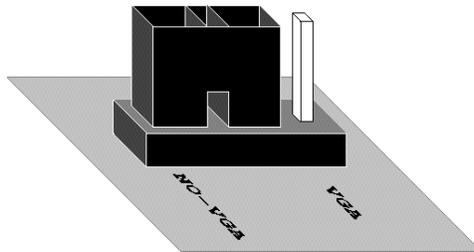
Figure 26: VGA Jumper (VGA Disabled)

4. You can now install your configured Oxygen card as instructed in the *Installing Your Oxygen Card* section on page 18. Each Oxygen card will display accelerated graphics on the monitor to which it is connected.

Dual display differences between Windows NT 3.51 and 4.0

Due to the way Windows NT implements desktops under these two versions, dual screen operation differs slightly in the way application windows behave when maximized and where system dialog boxes appear. Under Windows NT 3.51, when an application is maximized, it is maximized to one full screen size whereas under Windows NT 4.0, the application window becomes the size of both screens. However, once an application is created, it can be moved to any screen and can be resized to span both screens. A maximized application can be moved but not sized unless changed to its non-maximized size.

Under Windows NT 3.51, system dialog boxes are centered on the "primary" screen and the task manager appears on this screen. In Windows NT 4.0, the system dialog boxes appear straddling the two monitors and can be moved. In addition, the task manager can appear anywhere on the screen when running Windows NT 4.0.

Oxygen control panel dual screen operation

The control panel applet that is shipped with your Oxygen card allows you to disable the dual screen operation, in cases where you only want to use one display. When disabled, one display is operational and the other display is blank. After disabling this option, Windows NT must be restarted for this change to take effect.

This option is provided so that one of the Oxygen cards can be used at resolutions other than 1024x768 without having to remove the second Oxygen card. Once the dual screen option is disabled, it has to be re-enabled with the control panel applet before both the screens are operational again.

This option is grayed out in the Oxygen control panel unless there are two Oxygen cards detected in the system.

NOTE: The *Oxygen Status* page in the Oxygen control panel will show how many Oxygen cards are detected. For more information, refer to the *Oxygen Control Panel* section on page 24.

Appendix D: Warranty Information

THREE (3) YEAR PARTS AND LABOR LIMITED WARRANTY

Dynamic Pictures warrants that the Product will be free from defects in materials and/or workmanship for a period of three (3) years from the date of purchase. During the warranty period, Dynamic Pictures will correct any defects in material or workmanship, or any failure of the product to conform to hardware specifications, at no-charge for in-house labor and materials. Shipping costs must be pre-paid by Buyer. Any replacements parts/products will be new or serviceably used, and are warranted for the remainder of the original warranty or thirty (30) days from the date of shipment of the parts/products, whichever is longer. The warranty period is not extended as a result of purchasing any additional parts/products from Dynamic Pictures. Buyer must notify Dynamic Pictures in writing if there is a defect in material or workmanship. Written notice in all events must be received by Dynamic Pictures before expiration of the warranty period. This warranty is non-transferable. A purchase receipt or other proof of date of original purchase will be required before warranty is rendered. This warranty only covers failures due to defects in materials or workmanship that occur during normal use. It does not cover damage that occurs in shipment or failures that are result from, but are not limited to, accident, misuse, abuse, neglect, mishandling, misapplication, alteration, modification, fire, flood, earthquake, explosion, lightning, line power surge, introduction of sand, dust, humidity and liquids, or service by anyone other than Dynamic Pictures or an authorized Dynamic Pictures service center, or damage that is attributable to acts of God.

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Appendix E: Mechanical and Electrical Specifications

Mechanical

The Oxygen 102 graphics accelerator card is a mechanically compliant PCI option card in the PCI short-card form factor of 6.875 inches by 4.2 inches by 0.57 inches.

The Oxygen 202 graphics accelerator card is a mechanically compliant PCI option card in the PCI form factor of 9.25 inches by 4.2 inches by 0.57 inches.

The Oxygen 402 graphics accelerator card is a PCI option card in the PCI form factor of 12.28 inches by 4.2 inches by 0.59 inches.

Electrical

The Oxygen 102 card has a maximum power consumption of 10.5 watts, the Oxygen 202 card has a maximum power consumption of 24.7 watts, and the Oxygen 402 card has a maximum power consumption of 35.4 watts. The following table lists the measured current draw at all supply voltages.

Maximum PCI Power Consumption

Supply (Volts)	Consumption (Amps)		
	Oxygen 102	Oxygen 202	Oxygen 402
+5 +/- 5%	2.0	4.7	6.7
+3.3 +/- 5%	0	0	0
+12 +/- 5%	0	0	0
-12 +/- 5%	0	0	0

Appendix F: Declaration of Conformity

We, Dynamic Pictures, Incorporated,
5225 Betsy Ross Drive
Santa Clara, CA 95054-1102
Phone 408-327-9000
Fax 408-327-9010
United States of America

declare under our sole responsibility that the products

Dynamic Pictures® Oxygen™ 102
Dynamic Pictures® Oxygen™ 202
Dynamic Pictures® Oxygen™ 402

to which this declaration relates is in conformance with the following standards:

EN55022:1987
EN50082-1:1992
IEC 801-2:1984
IEC 801-3:1984
IEC 801-4:1987

following the provisions of the 89/336/EEC Directive.
Santa Clara California, March 1, 1997
Dynamic Pictures, Inc.

We, Dynamic Pictures, Incorporated,
5225 Betsy Ross Drive
Santa Clara, CA 95054-1102
Phone 408-327-9000
Fax 408-327-9010
United States of America

declare under our sole responsibility that the product

Dynamic Pictures® Oxygen™ 202
Dynamic Pictures® Oxygen™ 402

complies with Part 15 of FCC Rules. Operation is subject to the following two
conditions: (1) this device may not cause harmful interference, and (2) this device
must accept any interference received, including interference that may cause undesired
operation.

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