COMPAQ

Compaq PowerStorm 300
Graphics Controller Options

Windows NT and Hardware Installation

Part Number: EK−PBXAC−IN. C01/330430-003

February 1999

This guide describes the installation of the Compaq PowerStorm 300/AGP and 300/PCI Graphics Controller options on Compaq Professional and DIGITAL Personal Workstation (DPWS) products.

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Preface

Purpose of This Guide

This guide describes how to install the Compaq PowerStorm 300/AGP and 300/PCI Graphics Controller option hardware and software in your workstation. It includes installation and operation information for the PowerStorm 300 device drivers for Windows NT Version 4.0.

Who Should Use This Guide

This guide is intended for anyone who has purchased the Compaq PowerStorm 300/AGP or 300/PCI Graphics Controller option, either already installed or as an add-on. Users should have a basic understanding of Windows NT before installing PowerStorm 300 software.

Structure of This Guide

This guide is organized as follows:

- **Chapter 1, PowerStorm 300/AGP Hardware Overview** Provides an overview of the Compaq PowerStorm 300/AGP Graphics Controller option hardware.

- **Chapter 2, PowerStorm 300/PCI Hardware Overview** Provides an overview of the Compaq PowerStorm 300/PCI Graphics Controller option hardware.

- **Chapter 3, Installation** Describes how to install the Compaq PowerStorm 300/AGP and 300/PCI Graphics Controller option hardware and software in your Compaq Professional Workstation running Windows NT.

- **Chapter 4, Operation** Describes post-installation tasks and use of the OpenGL display driver.

Preface

Related Documentation

- *Using OpenGL* (DIGITAL order number AA–QMZH*–TK)

- Microsoft Windows NT online help

- *PowerStorm 300 Unix Graphics Support Installation and Release Notes* (AA-RELPA-TE)

Conventions Used in This Guide

In this guide, "Windows NT" refers to the Microsoft Windows NT operating system.

This guide also uses the following conventions:

Convention	Meaning
Note	A note calls the reader's attention to any item of information that may be of special importance.
Caution	A caution contains information essential to avoid damage to the equipment.
italic type	*Italic type* indicates complete titles of manuals.
bold type	**Bold type** indicates text that is highlighted for emphasis.
`Monospaced`	In text, this typeface indicates the exact name of a command, routine, partition, pathname, directory, or file.

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1

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PowerStorm 300/AGP Hardware Overview

1.1 Introduction

This chapter provides a brief overview of the PowerStorm 300/AGP Graphics Controller option hardware.

1.2 Module Description

The PowerStorm 300/AGP Graphics Controller option accelerator module is a single expansion-slot, 32-bit AGP bus graphics option that provides 2D and 3D graphics acceleration for Compaq Professional Workstations running Windows NT.

The PowerStorm 300/AGP graphics option includes 16 MB of CDRAM texture memory and is available in an ATX or a full-length NLX form factor. These options are described in Table 1-1.

Table 1-1 PowerStorm 300/AGP Graphics Controller Options

Compaq Option Part Number	Description
328778-B21	PowerStorm 300/AGP graphics module in a full-length ATX form factor.
328778-B21	PowerStorm 300/AGP graphics module in a full-length NLX form factor.

Table 1-2 provides a matrix of support information for the PowerStorm 300/AGP graphics option.

Table 1-2 Compaq PowerStorm 300/AGP Support Matrix

System	Service Pack	O/S Version
Compaq Professional Workstation AP500	Service Pack3 or later	Windows NT 4.0
Compaq Professional Workstation SP700	Service Pack3 or later	Windows NT 4.0

The PowerStorm 300/AGP Graphics Controller option (see Figure 1-1 and Figure 1-2) contains one standard 15-pin VGA connector on the AGP bulkhead.

The option module contains one 3-pin jumper for enabling or disabling the VGA capability when more than one VGA graphics module is installed in the same system.

Figure 1-1 PowerStorm 300/AGP Graphics Controller ATX Form
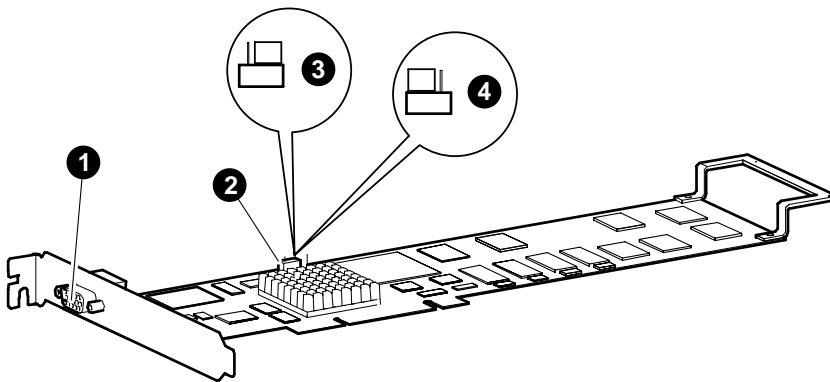
ML014617

❶ Standard 15-pin VGA connector

❷ VGA enable/disable jumper

❸ VGA enabled (default)

❹ VGA disabled

Figure 1-2 PowerStorm 300/AGP Graphics Controller NLX Form

ML014616

❶   Standard 15-pin VGA connector   ❸   VGA enabled (default)

❷   VGA enable/disable jumper   ❹   VGA disabled

1.3 Connector Pinout

Table 1-3 contains a listing of the pins and signals found on the standard 15-pin VGA connector.

Table 1-3 Standard 15-Pin VGA Connector Pinout

Pin No.	Signal
1	RED VIDEO
2	GREEN VIDEO or COMPOSITE SYNC with GREEN VIDEO
3	BLUE VIDEO
4	NC (no connection)
5	GROUND
6	GROUND
7	GROUND
8	GROUND
9	+5V
10	GROUND
11	NC (no connection)
12	SERIAL DATA
13	HORIZONTAL SYNC or COMPOSITE SYNC
14	VERTICAL SYNC (VCLK)
15	SERIAL CLOCK

1.4 Specifications

Table 1-4 lists the specifications for the PowerStorm 300/AGP Graphics Controller option.

Table 1-4 PowerStorm 300/AGP Graphics Controller Option Specifications

Resolution	1280 x 1024 (maximum) @ 85 Hz
Color planes	24 bit double buffered
Overlay	8 bit, shared with Alpha planes
	4 bit, shared with stencil
Stencil planes	4 bit, shared with overlay
Alpha planes	8 bit, shared with 8 bit overlay
Window ID	4 bit
Z-buffer	24 bit
Total bits/pixel	96
Frame buffer	15 MB
Texture memory	16 MB
Form factor	Single full-length AGP card in ATX or NLX form
AGP	AGP 1X, 32-bit, 66 MHz, 5V signaling
Input voltage	3.3 Vdc, 5 Vdc, +12 Vdc
Power	25 W maximum
Operating temperature	10°C to 40°C (50°F to 104°F)
Relative humidity	10% to 90% noncondensing

2
PowerStorm 300/PCI Hardware Overview

2.1 Introduction

This chapter provides a brief overview of the PowerStorm 300/PCI Graphics Controller option hardware.

2.2 Module Description

The PowerStorm 300/PCI Graphics Controller option accelerator module is a single expansion-slot, 32-bit PCI bus graphics option that provides 2D and 3D graphics acceleration for Compaq Professional Workstations running Windows NT. The PowerStorm 300/PCI graphics option includes 16 MB of CDRAM texture memory. This option is described in Table 2-1.

Table 2-1 PowerStorm 300/PCI Graphics Controller Option

DIGITAL Option Part Number	Compaq Option Part Number	Description
SN-PBXGD-AD	317733-B21	PowerStorm 300/PCI graphics module.

Table 2-2 provides a matrix of support information for the PowerStorm 300/PCI graphics option.

Table 2-2 Compaq PowerStorm 300/PCI Support Matrix

System	Service Pack	Minimum BIOS	O/S Version
DIGITAL Personal Workstation 500a (enhanced)	Service Pack3 or later	V5.65	Windows NT 4.0
DIGITAL Personal Workstation 600a (enhanced)	Service Pack3 or later	V5.65	Windows NT 4.0
Compaq Professional Workstation XP1000	Service Pack3 or later	V5.68	Windows NT 4.0

The PowerStorm 300/PCI graphics option (see Figure 2-1) contains one standard 15-pin VGA connector on the PCI bulkhead.

The option module contains one 3-pin jumper for enabling or disabling the VGA capability when more than one VGA graphics module is installed in the same system.
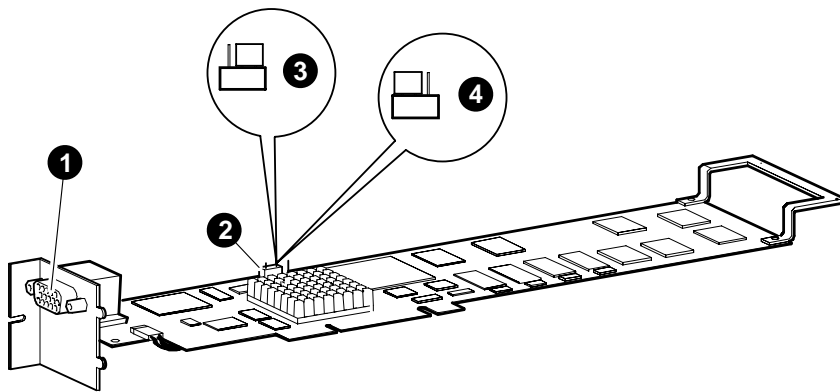
Figure 2-1 PowerStorm 300/PCI Graphics Controller Option
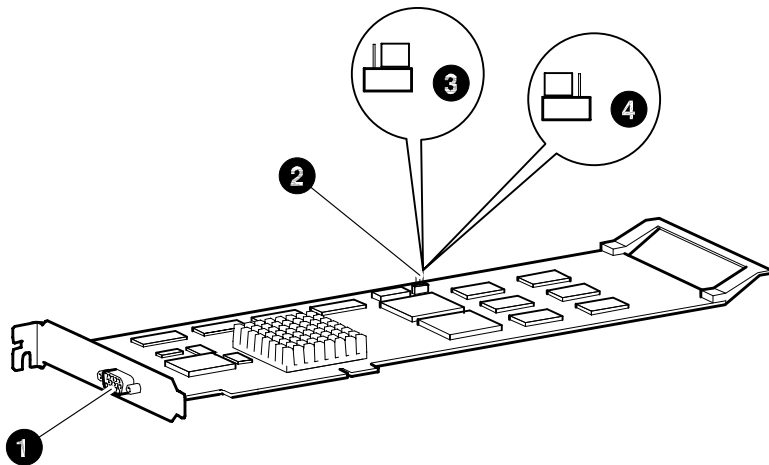
ML014615

❶ Standard 15-pin VGA connector   ❸ VGA enabled (default)

❷ VGA enable/disable jumper   ❹ VGA disabled

2.3 Connector Pinout

Table 2-3 lists the pins and signals found on the standard 15-pin VGA connector.

Table 2-3 Standard 15-Pin VGA Connector Pinout

Pin No.	Signal
1	RED VIDEO
2	GREEN VIDEO or COMPOSITE SYNC with GREEN VIDEO
3	BLUE VIDEO
4	NC (no connection)
5	GROUND
6	GROUND
7	GROUND
8	GROUND
9	+5V
10	GROUND
11	NC (no connection)
12	SERIAL DATA
13	HORIZONTAL SYNC or COMPOSITE SYNC
14	VERTICAL SYNC (VCLK)
15	SERIAL CLOCK

2.4 Specifications

Table 2-4 lists the specifications for the PowerStorm 300/PCI Graphics Controller option.

Table 2-4 PowerStorm 300/PCI Graphics Controller Option Specifications

Resolution	1280 x 1024 (maximum) @ 85 Hz
Color planes	24 bit double buffered
Overlay	8 bit
Stencil planes	4 bit
Window ID	4 bit
Z-buffer	24 bit
Total bits/pixel	96
Frame buffer	15 MB
Texture memory	16 MB
Form factor	Single full-length PCI card
PCI	PCI 2.1, 32-bit, 33 MHz, 5V signaling
Input voltage	3.3 Vdc, 5 Vdc, +12 Vdc
Power	25 W maximum
Operating temperature	10°C to 40°C (50°F to 104°F)
Relative humidity	10% to 90% noncondensing

3
Installation

3.1 Introduction

This chapter describes the installation of the PowerStorm 300/AGP and 300/PCI Graphics Controller option hardware and software in a Compaq Professional Workstation system or a DIGITAL Personal Workstation system (DPWS). Topics included in this chapter are:

- Hardware installation
- Software installation

3.1.1 Unpacking

The graphics option hardware is packaged in a single carton that contains the graphics option and an installation guide. The PowerStorm 300 software package includes a "break-the-seal" license and a CD-ROM containing the PowerStorm 300 driver.

3.2 Hardware Installation

_____ **Caution** _____

If you are installing PowerStorm 300 graphics option hardware and will be upgrading or installing the graphics software drivers *only*, install the hardware at the *end* of the procedure (step 17) described in Section 3.3.5.

If you will be installing PowerStorm software during a Windows NT upgrade or new installation, install the PowerStorm 300/AGP or 300/PCI graphics option hardware *first* as described in Section 3.2.2. You can then install Windows NT as described in the Windows NT documentation and refer to Section 3.3.4 in this guide.

_____

3.2.1 Changing the PowerStorm 300/AGP Bulkhead Bracket

The PowerStorm 300/AGP graphics option is shipped with the ATX bulkhead bracket (see Figure 1-1) attached. The NLX bulkhead bracket (see Figure 1-2) is also included in the option kit and can be switched by the customer or service provider.

Use the following procedure to remove the ATX bulkhead bracket and install the NLX bulkhead bracket:

_____ **Caution**_____

Static electricity can damage sensitive electronic components. When handling your graphics option, use an antistatic wriststrap that is connected to a grounded surface on your computer system. The wriststrap must be worn when handling any module to prevent damage to the module.

_____

1. Put on an antistatic wriststrap.

2. Use a 3/16-inch nutdriver to remove the two nuts on either side of the VGA connector that secure the ATX bulkhead bracket to the PowerStorm 300/AGP graphics option.

3. Remove the ATX bulkhead bracket.

4. Install the NLX bulkhead bracket onto the graphics option.

5. Secure the NLX bulkhead bracket to the PowerStorm 300/AGP graphics option with the two nuts that were removed in step 2.

3.2.2 Installing the Option Module

The following section describes the installation procedure for either the PowerStorm 300/AGP or 300/PCI Graphics Controller option. To install the option, follow these steps:

_____ **Note** _____

Before installing the graphics option, check your monitor specification for signal compatibility and supported features offered by the graphics option.

_____

_____ **Caution** _____

Static electricity can damage sensitive electronic components. When handling your graphics option, use an antistatic wriststrap that is connected to a grounded surface on your computer system. The wriststrap must be worn when handling any module to prevent damage to the module.

_____

1. Shut down your computer system and disconnect the monitor cable.

2. Disconnect the power cord from your computer system.

3. Remove the cover from your computer (refer to your system documentation).

4. Put on an antistatic wriststrap.

5. If your computer has an existing graphics module, remove the screw that secures it and then remove the module.

6. Refer to the documentation shipped with your workstation for information about graphics option slots. Remove the slot cover if you are using a new slot.

7. Grasp the top edge of the graphics option and carefully insert it into the slot, then firmly seat it.

8. Secure the module retaining bracket.

9. Replace the computer cover.

10. Ensure that the monitor cable is connected to the video output connector located on the back of the graphics option.

11. Reconnect the power cord, and restart your computer system.

3.3 Software Installation

This section describes the installation of the Microsoft Windows NT version of the PowerStorm 300 Software. For instructions on installing the UNIX version of the PowerStorm 300 software, see *PowerStorm 300 Unix Graphics Support Installation and Release Notes*, which comes with this kit.

3.3.1 Microsoft Windows NT Software Installation

The PowerStorm 300 software is a set of graphics display drivers compatible with Microsoft Windows NT. These drivers provide OpenGL support and enable you to run the PowerStorm 300 graphics device. This section explains how to install PowerStorm 300 device drivers on a Compaq Professional Workstation or DIGITAL Personal Workstation running Windows NT Version 4.0.

Keep this document in case you need to reinstall the PowerStorm 300 software for any reason.

3.3.2 PowerStorm 300 Software Components:

The Powerstorm 300 software CD–ROM contains 2D drivers and 3D drivers (the Compaq accelerated OpenGL support). See Table 3-1.

Table 3-1 PowerStorm 300 Components on the CD–ROM

Component Description	File Name
GDI display driver	*pbxgdac.dll*
Kernel mode miniport driver	*pbxgdac.sys*
OpenGL driver—client-side file only	*pbxgdacogl.dll*
Configuration application	*pbxgdactab.dll*
Release Notes, which can be read using the *Notepad* application in Windows NT. You access this application by selecting the *Program Manager* icon, the *Accessories* program icon, and the *Notepad* icon.	*readme.txt*
Support for PowerStorm 300 in VGA mode	*a2100vga.sys*

3.3.3 Before You Begin

The operating system version required is:

Microsoft Windows NT Version 4.0, Service Pack3 (SP3) or later.

Please note the following two possible installation sequences:

- **If you are installing a new version of, or upgrading, Microsoft Windows NT,** follow the procedures in Sections 3.3.4 and 3.3.5.

- **If you are upgrading your PowerStorm 300 software display drivers only,** follow the procedure in Section 3.3.5.

3.3.4 New Installation or Upgrade of Windows NT

_____ **Note** _____

If a graphics option other than the PowerStorm 300/AGP or 300/PCI was previously operating in the system, keep that option installed and install the PowerStorm 300 software drivers (refer to Section 3.3.5). If the previously installed graphics option is not available or it is not operational, follow the procedure in this section.

_____

Before installing PowerStorm 300 software during a Windows NT upgrade or new installation, you must have already installed a PowerStorm 300 hardware module. You can then install Windows NT according to the Windows NT documentation.

During Windows NT installation, a hardware and software component list like the one below is displayed:

Computer: *Compaq Professional Workstation xxx* (*xxx* = CPU type)

Display: *VGA Compatible*

Keyboard: *XT, AT, or Enhanced Keyboard (83-104 keys)*

Keyboard Layout: *US*

Pointing Device: *Mouse Port Mouse*

No Changes: *The above list matches my computer*

When you have completed the Windows NT installation, go to Section 3.3.5.

3.3.5 Installing/Upgrading PowerStorm 300 Software Display Drivers

If you have purchased the PowerStorm 300/AGP or 300/PCI graphics option as an add-on, you must install the Compaq PowerStorm Software drivers. To install the 2D and 3D drivers (the Compaq optimized OpenGL support) from the Compaq PowerStorm software CD-ROM, follow these steps:

1. Boot your system and log into Windows NT if you have not already done so.

2. From the desktop, choose *My Computer*.

3. From My Computer, choose *Control Panel*.

4. From Control Panel, choose *Display*.

5. From the Display Properties dialog box, choose the *Settings* tab.

6. From the Settings dialog box, choose the *Display Type* button.

7. From the Display Type dialog box, choose *Change*.

8. From the Change Display dialog box, choose *Have Disk*.

9. In the Install from Disk dialog box, you are prompted to insert the manufacturer's installation disk into the selected drive. Insert the Compaq PowerStorm Software CD-ROM into the CD-ROM drive unit.

10. Enter the path of the PowerStorm 300 driver and choose *OK*.

    The path is of the following format, where `dev:\` is the drive name (for example, `E:\` for the E drive):

    ```
    dev:\intel\nt40\powerstorm_300_drivers (Intel systems)
    dev:\alpha\nt40\pbxgdac\               (Alpha systems)
    ```

11. In the Change Display dialog box, the driver whose path you just defined is displayed. Confirm this choice by choosing *OK*.

    The driver name displayed is:

    ```
    Compaq PowerStorm 300 (pbxgdac)
    ```

12. When the message displays stating that this is a third party driver, confirm by choosing *Yes*.

    A status box displays reflecting the progress of the driver installation.

13. When the Compaq PowerStorm 300 files have been copied to your hard disk, a dialog box indicating that the driver was successfully installed is displayed. Choose *OK* and remove the CD-ROM from the drive.

14. Choose *Close* to close the Display Type dialog box.

15. Choose *Close* to close the Display Properties application.

16. When a message displays stating that you must restart your computer to use the new display driver, choose *No*.

17. Shut down your system by choosing *Shut Down* from the Start menu, then remove power from your computer system and install the PowerStorm 300/AGP or 300/PCI graphics option as described in Section 3.2 if you haven't already done so.

18. After installing the PowerStorm 300/AGP or 300/PCI Graphics Controller option, reboot your system to access the new display driver. After your system reboots, a message displays indicating that the default screen resolution and refresh rate are being used. For information on changing these values, see Section 4.2.1.

3.3.6 OpenGL Acceleration

OpenGL functionality is available with the OpenGL display driver provided on the Microsoft Windows NT CD–ROM. In addition to this generic OpenGL driver, you have access to an optimized OpenGL display driver from Compaq, in the *pbxgdacogl.dll* file. This driver maximizes the performance of applications that are written with OpenGL, and supports OpenGL Version 1.1 and the OpenGL Utility Library (GLU) Version 1.2.

The *pbxgdacogl.dll* file is located in the *%SystemRoot%\system32* directory, where "*%SystemRoot%*" is the environment variable defining the path of the system root directory; for example, *D:\winnt40*. For more information on using the Compaq OpenGL drivers with the PowerStorm 300 device, refer to Section 4.3

4
Operation

4.1 Introduction

This chapter provides information about post-installation tasks and use of the OpenGL display driver.

4.2 After Installation

After you have installed the PowerStorm 300 driver, you may need to change the screen resolution and refresh rate, manage buffer swap, or identify the display driver version for troubleshooting purposes. The following sections describe how to perform these tasks.

4.2.1 Changing the Screen Resolution and Refresh Rate

The screen resolution and refresh rate are collectively referred to as the *display mode*. Before changing the display mode, verify that your monitor can handle the new values (see your monitor documentation). Then perform the following steps:

1. From the desktop, choose *My Computer*.

2. From My Computer, choose *Control Panel*.

3. From Control Panel, choose *Display*.

4. From the Display Properties dialog box, choose the *Settings* tab.

5. From the Settings dialog box, click on the arrows in the *Desktop Area* to change the screen resolution.

   To change the refresh rate, choose one of the options in *Refresh Frequency*. (You can also change the resolution and refresh rate by choosing *List All Modes* and the desired mode, and then choosing *OK*.) If the refresh rate selected is not supported by the resolution you chose, the resolution will automatically change to the nearest value supported by that refresh rate, or the refresh rate will change to support the resolution.

6. Choose *Test* to verify that the settings work correctly. A test pattern will be displayed on your monitor for about 5 seconds.

7. You will now see the question, "Did you see the test bitmap properly?" If you are satisfied with the video display, choose *Yes*.

   Choose *OK* to change the settings.

8. You may have to adjust your monitor to align the new resolution to the monitor. This is typically done by using the controls on the front or side of the monitor.

4.2.2 Managing Buffer Swap

In Windows NT Version 4.0, you can enable/disable the double-buffer synchronization. In most cases, double-buffer swaps are synchronized with vertical retrace to avoid visual "tearing" effects.

Tearing and flickering can occur for a combination of reasons:

- Many large triangles are being processed

- A large window is being used

- High resolution and refresh rate values are defined

Most applications do not experience visual tearing and could take advantage of the higher frame rates and better performance available when no synchronization is used. Therefore, you should try using this mode.

If unwanted visual effects do occur, however, use the tear-free (sync with refresh) double-buffering mode, choosing the highest vertical refresh rate supported by your monitor at your chosen resolution (see Section 4.2.1).

You can change the double-buffer synchronization mode using the display application, as described in Section 4.2.2.1.

4.2.2.1 Using the Display Application

To use the display application, follow these steps:

1. From the desktop, choose *My Computer*.

2. From My Computer, choose *Control Panel*.

3. From Control Panel, choose *Display*.

4. From Display, select *REALimage Settings*.

5. In the REALimage section, select the check box *Minimize Flicker* to synchronize with the vertical refresh, or turn off the check box to disable it.

6. When prompted, press OK to reboot your system.

When you use the REALimage application to set the double-buffer synchronization mode, this definition remains effective across reboots until changed.

4.2.3 Identifying the Display Driver Version

If you encounter a problem with the PowerStorm 300 driver, you can report it to Compaq. When reporting a problem, you must include the version of the driver with your description of the problem.

To identify the version of the display driver, follow these steps:

1. Select *Start*, *Programs*, and *Windows NT Explorer* to view the files currently installed on your machine.

2. To ensure that all files are listed, select *View*, *Options*, and the *View* tab, and verify that the *Show all Files* box is selected. Choose *OK*.

3. Locate the *pbxgdac.dll* file in the list.

   This file is found in the *%SystemRoot%\system32* directory.

4. Click once on the file name to highlight it.

5. From the File Menu, choose *Properties*.

6. In the Properties dialog box, choose the *Version* tab.

   The Version dialog box displays driver information, including the version and date.

4.3 Using OpenGL

This section describes the PowerStorm 300 OpenGL display driver, which is designed to optimize OpenGL performance on Compaq Professional Workstations. This section includes the following topics:

- Using OpenGL Applications, for users running applications developed with OpenGL

- Developing OpenGL Applications, for users developing OpenGL applications

For a more comprehensive discussion of the OpenGL interface, refer to the DIGITAL *Using OpenGL* manual, and the Microsoft Windows NT OpenGL documentation included in the Microsoft Windows NT Version 4.0 Software Developer's Kit (SDK).

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4.3.1 Using OpenGL Applications

In addition to a generic OpenGL display driver, Windows NT OpenGL includes a
mechanism by which OpenGL rendering can be performed by vendor-supplied display
drivers. Compaq provides such an OpenGL display driver in the PowerStorm 300 Software
product. This driver takes advantage of hardware features that improve rendering
performance and quality, and is used with the PowerStorm 300 graphics device.

When an application requests a pixel format, Windows NT OpenGL will satisfy the
request with the pixel format that best fits the description. This pixel format can be one of
the following:

- A hardware pixel format, supported by the PowerStorm 300 OpenGL driver

- A software pixel format, supported by the generic Windows NT OpenGL driver

4.3.2 Developing OpenGL Applications on Intel Platforms

This section provides information for developing OpenGL applications that optimize the
PowerStorm 300 graphics device on Intel platforms.

4.3.2.1 Pixel Format Support

The PowerStorm 300 driver and device, in combination with Windows NT OpenGL,
support a fully compliant implementation of OpenGL. Color index mode support is
provided by the Windows NT generic OpenGL implementation, and thus is not hardware-
accelerated.

On the PowerStorm 300 device the display driver supports the pixel formats listed in
Table 4-1.

Table 4-1 Intel Supported Pixel Formats on PowerStorm 300 Device

Pixel Format	1	2	3	4
Pixel Type	RGBA	RGBA	RGBA	RGBA
Double Buffered	No	Yes	No	Yes
Stereo	No	No	No	No
Draw to Window	Yes	Yes	Yes	Yes
Draw to Pixmap	No	No	No	No
Swap Layer Buffers	Yes	Yes	Yes	Yes
Support GDI	Yes	Yes	Yes	Yes
Support OpenGL	Yes	Yes	Yes	Yes
Support Overlays (*)	Yes	Yes	Yes	Yes
Generic Format	No	No	No	No
Need Palette	No	No	No	No
Need System Palette	No	No	No	No
Color Bits	32	32	32	32
Red Bits	8	8	8	8
Red Shift	16	16	16	16
Green Bits	8	8	8	8
Green Shift	8	8	8	8
Blue Bits	8	8	8	8
Blue Shift	0	0	0	0
Alpha Bits	8	8	8	8
Alpha Shift	24	24	24	24
Accum Bits	0	0	32	32
Depth Bits	24	24	24	24
Stencil Bits (*)	4	4	4	4
Overlay Bits (*)	4	4	4	4
Reserved	1	1	1	1
Auxiliary Buffers	0	0	0	0

* You can select either 4-bit Stencil or 4-bit Overlay, which can be set with the Display Application.

Operation

4.3.2.2 Performance Considerations

The PowerStorm 300 device accelerates virtually all OpenGL Version 1.1 operations from the rasterization stage through the remainder of the OpenGL pipeline. However, some aspects of OpenGL use can affect performance as described in the following sections.

4.3.2.2.1 Texture Mapping

Several aspects of texture mapping can affect application performance. Some of these are under the control of the application user. Others are under the control of the application developer:

- When an application defines textures to OpenGL, it can explicitly specify the resolution (for example, 16 or 32 bits per texel) with which textures are to be stored. Alternatively, the application can leave this decision to OpenGL. In this case, the PowerStorm 300 OpenGL driver will, by default, use 16 bits per texel for RGB and RGBA textures. The application user can override this default behavior by setting the *Texel 32 Bit Default* selection in the Display Application.

  Allocating 16 bits per texel allows more textures to be stored in the texture cache and may provide slightly higher rasterization rates. On the other hand, using 32 bits per texel provides better texture resolution in the same way that a color frame buffer with 8 bits per color component has better color resolution than a frame buffer with 4 bits per color component.

- The PowerStorm 300 rasterization rate is twice as fast for bilinear texture filtering as for trilinear texture filtering.

- Software developers should use OpenGL Version 1.1 texture objects when an application has more than one texture.

4.3.2.2.2 Overlay Planes

The PowerStorm 300 provides hardware support for 2-bit double-buffered overlay planes. Note that for performance reasons, not all pixel formats support overlay planes. If you do not require overlay planes, selecting a pixel format without overlay support will ensure maximum performance. The availability of pixel formats with overlay planes can be disabled by using the Display Application.

4.3.2.2.3 Stencil Planes

The PowerStorm 300 device driver provides hardware support for a 4-bit stencil buffer. Note that for performance reasons, not all pixel formats support stencil planes. If you do not require stencil planes, selecting a pixel format without stencil planes will ensure maximum performance. The availability of pixel formats with stencil planes can be disabled by using the Display Application.

4.3.2.2.4 SoftImage Customizations

When using the PowerStorm 300 with Microsoft's SoftImage®, you should enable *SoftImage Customizations* using the Display Application. In addition, you also need to enable 4-bit overlay using the Display Application. Before starting Softimage, you need to make sure that the following environment variable is set:

> SI_OVERLAY = USE_ONE_BIT

When *SoftImage Customizations* are enabled, other OpenGL applications may not behave correctly. Therefore it is recommended that *SoftImage Customizations* be disabled before running other OpenGL applications.

4.3.3 Developing OpenGL Applications on Alpha Platforms

This section provides information for developing OpenGL applications that optimize the PowerStorm 300 graphics device on Alpha platforms.

4.3.3.1 Pixel Format Support

The PowerStorm 300 driver and device, in combination with Windows NT OpenGL, support a fully compliant implementation of OpenGL. Color index mode support is provided by the Windows NT generic OpenGL implementation, and thus is not hardware-accelerated.

On the PowerStorm 300 device, the display driver supports the pixel formats listed in Table 4-2.

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Table 4-2 Alpha Supported Pixel Formats on PowerStorm 300 Device

Pixel Format	1	2	3	4
Pixel Type	RGBA	RGBA	RGBA	RGBA
Double Buffered	Yes	No	Yes	No
Stereo	No	No	No	No
Draw to Window	Yes	Yes	Yes	Yes
Draw to Bitmap	No	No	No	No
Support GDI	No	No	No	No
Support OpenGL	Yes	Yes	Yes	Yes
Generic Pixel Format	No	No	No	No
Need Palette	No	No	No	No
Need System Palette	No	No	No	No
Swap Exchange	Yes	Yes	Yes	Yes
Swap Copy	No	No	No	No
Swap Layer Buffers	No	No	No	No
Generic Accelerated	No	No	No	No
Color Bits	24	24	24	24
Red Bits	8	8	8	8
Red Shift	16	16	16	16
Green Bits	8	8	8	8
Green Shift	8	8	8	8
Blue Bits	8	8	8	8
Blue Shift	0	0	0	0
Alpha Bits	0	0	0	0
Alpha Shift	0	0	0	0
Accum Bits	48	48	48	48
Depth Bits	24	24	24	24
Stencil Bits (*)	0	0	4	4
Reserved (Support Overlays)	0 (No)	0 (No)	0 (No)	0 (No)
Auxiliary Buffers	0	0	0	0

* Availability of pixel formats with overlay and/or stencil planes can be disabled using the Display Application.

Table 4-1 Alpha Supported Pixel Formats on PowerStorm 300 Device (cont.)

Pixel Format	5	6	7	8
Pixel Type	RGBA	RGBA	RGBA	RGBA
Double Buffered	Yes	No	Yes	No
Stereo	No	No	No	No
Draw to Window	Yes	Yes	Yes	Yes
Draw to Bitmap	No	No	No	No
Support GDI	No	No	No	No
Support OpenGL	Yes	Yes	Yes	Yes
Generic Pixel Format	No	No	No	No
Need Palette	No	No	No	No
Need System Palette	No	No	No	No
Swap Exchange	Yes	Yes	Yes	Yes
Swap Copy	No	No	No	No
Swap Layer Buffers	No	No	No	No
Generic Accelerated	No	No	No	No
Color Bits	24	24	24	24
Red Bits	8	8	8	8
Red Shift	16	16	16	16
Green Bits	8	8	8	8
Green Shift	8	8	8	8
Blue Bits	8	8	8	8
Blue Shift	0	0	0	0
Alpha Bits	0	0	0	0
Alpha Shift	0	0	0	0
Accum Bits	48	48	48	48
Depth Bits	24	24	24	24
Stencil Bits (*)	0	0	4	4
Reserved (Support Overlays*)	1 (Yes)	1 (Yes)	1 (Yes)	1 (Yes)
Auxiliary Buffers	0	0	0	0

* Availability of pixel formats with overlay and/or stencil planes can be disabled using the Display Application.

Operation

4.3.3.2 Performance Considerations

The PowerStorm 300 device accelerates virtually all OpenGL Version 1.1 operations from the rasterization stage through the remainder of the OpenGL pipeline. However, some aspects of OpenGL use can affect performance as described in the following sections.

4.3.3.2.1 Texture Mapping

Several aspects of texture mapping can affect application performance. Some of these are under the control of the application user. Others are under the control of the application developer.

- When an application defines textures to OpenGL it can explicitly specify the resolution (e.g. 16 or 32 bits per texel) with which textures are to be stored. Alternatively, the application can leave this decision to OpenGL. In this latter case the PowerStorm 300 OpenGL driver will, by default, use 16 bits per texel for RGB and RGBA textures. The application user can override this default behavior by setting the *Texel 32 Bit Default* selection in the Display Application.

  Allocating 16 bits per texel allows more textures to be stored in the texture cache and may provide slightly higher rasterization rates. On the other hand, using 32 bits per texel provides better texture resolution in just the same way that a color frame buffer with 8 bits per color component has better color resolution than a frame buffer with 4 bits per color component.

- The PowerStorm 300 rasterization rate is twice as fast for bilinear texture filtering as for trilinear texture filtering.

- Software developers should use OpenGL Version 1.1 texture objects when an application has more than one texture.

4.3.3.2.2 Alpha Buffers

The PowerStorm 300 device does not provide an alpha buffer (it has 0 alpha planes). Few applications actually need an alpha buffer. The two operations that depend on the values stored in the alpha buffer are:

- *Storing alpha values so that they can be read later*

  The application needs an alpha buffer if it must store alpha values for later retrieval by the **glReadPixels** function with one of the following formats:

  – GL_ALPHA

  – GL_RGBA

  – GL_LUMINANCE_ALPHA

- *Blending, using a destination alpha value*

  The application needs an alpha buffer if it calls the **glBlendFunc** function with one of the following values:

  – DST_ALPHA

  – ONE_MINUS_DST_ALPHA

  – ONE_MINUS_DST_COLOR

  – SRC_ALPHA_SATURATE

In conformance with OpenGL, glReadPixels returns 1.0 for all alpha values, and OpenGL uses 1.0 for all destination alpha values when computing blending factors.

Note that all alpha related aspects of the rasterization and per-fragment portions of the OpenGL pipeline (blending, alpha test, alpha related texturing functionality) are supported by the PowerStorm 300.

4.3.3.2.3 Overlay Planes

The PowerStorm 300 provides hardware support for 8-bit double-buffered overlay planes. Note that for performance reasons, not all pixel formats support overlay planes. If you do not require overlay planes, selecting a pixel format without overlay support will ensure maximum performance. The availability of pixel formats with overlay planes can be disabled by using the Display Application.

4.3.3.2.4 Stencil Planes

The PowerStorm 300 device driver provides hardware support for a 4-bit stencil buffer. Note that for performance reasons, not all pixel formats support stencil planes. If you do not require stencil planes, selecting a pixel format without stencil planes will ensure maximum performance. The availability of pixel formats with stencil planes can be disabled by using the Display Application.

4.3.3.2.5 SoftImage Customizations

When using the PowerStorm 300 with Microsoft's SoftImage®, you should enable *SoftImage Customizations* using the Display Application. This will ensure maximum performance and compatibility with SoftImage. When SoftImage Customizations are enabled, availability of pixel formats with overlay planes will be automatically enabled. If you wish to make changes to this setting, you must disable SoftImage Customizations. You can then enable and disable overlay planes normally.

When *SoftImage Customizations* are enabled, other OpenGL applications may not behave correctly. Therefore it is recommended that *SoftImage Customizations* be disabled before running other OpenGL applications.