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Compaq Professional Workstations Graphics Product Positioning

Abstract: This paper covers all graphics options offered for Compaq Professional Workstations. Detailed specifications, positioning, comparisons between products and selection criteria are included.

In addition, a new approach to classifying workstation graphics, based on application software requirements, is introduced.

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Compaq Professional Workstations Graphics Product Positioning
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Introduction

Graphics controllers for workstations have changed dramatically over the past few years. Until recently, there was a clear distinction between 2D and 3D graphics, and low-cost graphics was often restricted to lower resolution and 256 colors.

Today, it is difficult to find a pure 2D graphics controller. Virtually all graphics controllers have at least some 3D capabilities and boast specifications that appear similar to traditional 3D controllers. Additionally, support for higher resolution (1280x1024 or even higher) and 24-bit color is available at virtually all price points.

Further, specialized graphics options have emerged, such as multi-display and geometry accelerated 3D solutions, as well as customer driven choices, such as graphics controllers that allow the use of a single standard graphics driver across all systems installed at a site.

Based on extensive work with application developers, customers, graphics suppliers and internal development, Compaq is offering a broad portfolio of graphics controllers, which are described in detail in this document.

These graphics controllers are classified by a combination of their technical characteristics and by the markets in which they are used. The major graphics segments are:

- **2D/Multi-Display 2D:** Leadership 2D performance combined with multi-display support to enable large viewing environments. Also targeted to customer requirements for common driver support.
- **Entry 3D:** Combines fast 2D with robust 3D capabilities at an affordable price. The standard graphics choice for a broad range of applications.
- **Professional 3D:** Mid-range and enhanced 3D with the advanced 3D features required by technical applications.

Compaq Graphics Controllers

2D/Multi Display 2D	Entry 3D	Professional 3D
Matrox Millennium G200 Matrox Productiva G100 Quad Multi-Monitor Series (MMS)	ELSA Synergy II ELSA GLoria Synergy+ ELSA GLoria Synergy	Compaq PowerStorm 300 3Dlabs Oxygen GVX1 Compaq PowerStorm 350 Compaq PowerStorm 600

- The Matrox Millennium G200 is a 2D controller that is software compatible with the Matrox Millennium II and Matrox Productiva G100 Quad Multi-Monitor Series (MMS) controllers. This means that a single unified driver can be used to support all of these controllers. This allows use of a standardized software environment across a wide range of systems, which is a requirement of some customers. The Millennium G200 also offers the highest 2D performance.
- The Matrox Productiva G100 Quad MMS controller is a multi-display 2D controller able to drive up to four displays per controller. When 3 to 8 display environments are required, these controllers meet the need.
- Entry 3D graphics controllers can be found with the AGP-based ELSA Synergy II and GLoria Synergy+. These versatile controllers meet the needs of many applications and users, offer good performance, and are exceptionally cost effective. In addition, the PCI-based ELSA GLoria Synergy controller is available for multi-display environments when used with the GLoria Synergy+ and on AlphaPowered™ systems.
- Compaq's Professional 3D graphics controllers, the 3Dlabs Oxygen GVX1 and Compaq PowerStorm 300 and 350, offer full 3D functionality and high performance. The Oxygen GVX1 provides the additional benefit of on board geometry acceleration. They are well suited to technical 3D applications, such as mechanical CAD, animation and scientific visualization.
- The Compaq PowerStorm 600 is an Enhanced 3D graphics controller that adds the fastest geometry acceleration to speed 3D graphics operations. The PowerStorm 600 meets the needs of applications that require the graphics horsepower to render large models with complex visual realism.

The following sections of this document provide detailed specifications of each graphics controller, information on the applications for which they are best suited, and selection criteria to help make a selection.

Matrox Millennium G200

2D Graphics

Overview

The Matrox Millennium G200 AGP and PCI graphics controllers are low-cost 2D accelerators designed for general purpose and business computing. They are especially popular in large financial institutions, where high-performance 2D is key and where a unified driver approach is an important feature. Both the AGP and PCI Matrox Millennium G200 graphics controllers come with up to 16 MB of frame buffer memory, support high-resolution display, true color display, and a variety of 3D modes via Direct3D. The Matrox Millennium G200s do not provide OpenGL drivers.

Target Applications

The Matrox Millennium G200s are versatile boards suited to general purpose computing, especially where superb 2D performance and broad driver compatibility are required. Representative applications include financial trading, electronic CAD, entry mechanical CAD, web page development and software development.

Key Features

- Unified driver offering driver compatibility with other Matrox controllers (Matrox Millennium II and Matrox Productiva G100 Quad MMS)
- Up to 16 MB SGRAM on AGP version or 16 MB of SDRAM on PCI version
- Up to 1920x1200 resolution in true color (24-bit)
- Leadership 2D performance

Description

The Matrox Millennium G200 is a cost-effective 2D graphics controller based on the latest MGA graphics chip from Matrox, which is suitable for a wide range of applications. They provide high performance in 2D operations and compatibility with a broad range of Matrox graphics controllers.

The Matrox Millennium G200 graphics controller provides full AGP 2X support (AGP version), 8 MB of graphics memory upgradeable to 16 MB, and a high-speed 250 MHz RAMDAC.

Both the AGP and PCI versions of the Matrox Millennium G200 are implemented as single slot

Selection Criteria

Selection of the Matrox Millennium G200 is typically chosen for compatibility with existing environments or for maximum 2D performance. Key questions include:

- Has the customer environment standardized on Millennium graphics?
- Is maximum 2D performance required?
- Is resolution greater than 1280x1024 in true color required?

If the answer to these questions is "yes," then the Matrox Millennium G200 is the logical choice.

- Does the application need high-end 3D capabilities, such as true color double buffered display with Z-buffer at a resolution of 1280x1024?
- Does the application extensively use texture mapping? Does it use trilinear interpolation of textures?
- Does the application support overlay planes?

If the answer to these questions is "yes," then other graphics controllers should be considered.

- If Entry 3D capabilities are required, the Synergy II is recommended.
- If Professional 3D support is required, the Oxygen GVX1 or PowerStorm 300 is recommended.
- If Professional 3D support is required as well as larger texture memory, then the PowerStorm 600 is suggested.

Positioning within Product Line

The Matrox Millennium G200 provides higher 2D performance than the ELSA Synergy II, GLoria Synergy+ and GLoria Synergy. The ELSA Synergy II, GLoria Synergy+ and GLoria Synergy have better 3D capabilities.

Specifications

Hardware specifications for Matrox Millennium G200:

Performance 3D	No
3D Support	Not applicable
Bus Interface	AGP (NLX and ATX) and PCI 2.1
Slots Used	1
Video Signal Connection	VGA
Video Memory	8 MB (upgradeable to 16 MB)
Hardware Texture Mapping	No
Highest Texture Memory	Not applicable
Standard Texture Memory	Not applicable
Maximum Texture Memory	Not applicable
Maximum Resolution	1920x1200
Maximum Refresh (1280x1024)	100 Hz
Stereo	No
Video Layout	
Color Planes	8-bit, 16-bit, 24-bit
Z-buffer	No
Overlay Planes	0
Stencil Planes	0
Alpha Planes	0
Window ID Planes	0
Fast Clear Planes	Not applicable
Total Bits/Pixel	Not applicable

Multi-Display Support

Multi-display functionality is available by combining the AGP-based Matrox Millennium G200 controller with up to three Matrox Millennium G200 PCI controllers.

Supported Platforms and Operating Systems for Matrox Millennium G200:

System	Platform Support	OS Support
AP200	Yes	Windows NT 4.0, 3.51, Windows 95, 98
AP400	Yes	Windows NT 4.0, 3.51, Windows 95, 98
AP500	Yes	Windows NT 4.0, 3.51, Windows 95, 98
SP700	Yes	Windows NT 4.0, 3.51, Windows 95, 98
XP1000	None	None
XP900	None	None

Matrox Productiva G100 Quad Multi-Monitor Series (MMS)

Multi-Display 2D Graphics

Overview

The Matrox Productiva G100 Quad Multi-Monitor Series (MMS) graphics controller is a four-port solution that has the ability to support up to four displays in a single PCI slot. It is used when massive amounts of information must be displayed, such as monitoring applications or financial trading.

Two Matrox Productiva Quad G100 controllers can be used in a single system to support 5 to 8 displays.

Target Applications

The Matrox Productiva G100 Quad MMS supports financial traders, financial analysts and engineers who require maximum screen real estate in a 2D environment.

Key Features

- 4 graphics ports able to support 4 monitors with each monitor displaying separate information
- 4 MB memory per port, 16 MB total per controller
- Up to 1600x1200 resolution per port in HiColor (16-bit); up to 1280x1024 resolution per port in true color (24-bit)
- Up to 24-bit color (true color)
- Excellent 2D performance
- Can use two Matrox Productiva G100 Quad MMS graphics controllers to support up to 8 displays

Description

The Matrox Productiva G100 Quad MMS is designed to meet the needs of users who require large amounts of screen real estate to display massive amounts of information. The Productiva G100 Quad MMS is implemented as a single PCI controller, requiring only a single PCI slot. This provides maximum system flexibility, allowing the use of both multiple displays and other

The Matrox Productiva G100 Quad MMS supports a range of resolution and color depth choices. All ports are set to the same resolution, color depth and refresh rate.

Selection Criteria

The Matrox Productiva G100 Quad MMS is a specialized solution. While other graphics controllers enable multiple displays, the Productiva G100 Quad MMS supports up to 4 monitors with a single controller, and up to 8 monitors total. If PCI slots are limited or more than two monitors are required, the Matrox Productiva G100 Quad MMS should be chosen.

Positioning within Product Line

The Matrox Productiva G100 Quad MMS is the newest multi-port display for Compaq Professional Workstations.

Specifications

Hardware specifications for the Matrox Productiva G100 Quad MMS:

3D Support	Not applicable
Bus Interface	PCI 2.1
Slots Used	1
Video Signal Connection	VGA (up to 4)
Video Memory	4 MB per port, 16 MB total
Hardware Texture Mapping	No
Highest Texture Mode	Not applicable
Standard Texture Memory	Not applicable
Maximum Texture Memory	Not applicable
Maximum Resolution	1600x1200
Maximum Refresh (1280x1024)	100 Hz
Stereo	No
Video Layout	
Color Planes	8-bit, 16-bit, 24-bit
Z-buffer	Not applicable
Overlay Planes	Not applicable

Multi-Display Support

The Matrox Productiva G100 Quad MMS graphics controller is designed to support 1 to 4 displays per controller, and a maximum of 2 controllers per system supporting up to 8 displays per system.

Supported Platforms and Operating Systems for Matrox Productiva G100 Quad MMS:

System	Platform Support	OS Support
AP200	Yes	Windows NT 4.0, 3.51, Windows 95, 98
AP400	Yes	Windows NT 4.0, 3.51, Windows 95, 98
AP500	Yes	Windows NT 4.0, 3.51, Windows 95, 98
SP700	Yes	Windows NT 4.0, 3.51, Windows 95, 98
XP1000	None	None
XP900	None	None

ELSA Synergy II

Entry 3D Graphics

Overview

The ELSA Synergy II (AGP) Graphics Controller offered by Compaq is an excellent 2D and robust entry 3D solution that provides leadership performance at an affordable price. Key features include high-resolution support in true color mode, optimized 2D and 3D OpenGL drivers, and a unified frame buffer with 32 MB of SDRAM. This unified frame buffer has the ability to support up to 24-bits double buffered with a 24-bit Z-buffer and 8 stencil planes. In addition, a portion of this unified frame buffer can be allocated as texture memory. The ELSA Synergy II is supported on Intel based systems.

Target Applications

The Synergy II is a versatile board suited to general purpose computing and to cost-sensitive technical computing. The ELSA Synergy II is targeted at entry CAD applications; cost-conscious, high-end CAD application users; GIS professionals; and 2D and 3D DCC application users. Representative applications include AutoCAD, Bentley MicroStation, SolidWorks, Discreet, and software development.

Key Features

- 32 MB SDRAM memory
- Up to 1920x1200 resolution at 24 bits double-buffered (true color)
- Full 24-bit Z-buffer and 8 stencil planes
- Support for AGP 2X and 4X
- OpenGL 1.1 support
- Software tools and utilities that enhance functionality
 - *POWERdraft*
 - *ELSAview3D*
 - *MAXtreme*
- Hardware accelerated texture mapping with point sampled and trilinear interpolated textures. Graphics memory is shared between frame buffer and texture storage.

Description

The ELSA Synergy II delivers leadership performance by combining the powerful RIVA TNT 2 processor from NVIDIA with ELSA's optimized driver and application suite.

From the raw horsepower of the Twin-Texel TNT 2 128-bit processor to ELSA's robust OpenGL ICD, *POWERdraft* drivers, *ELSAview3D* and *MAXtreme* support, the Synergy II is the most robust entry 3D solution available. In addition, the ELSA Synergy II supports AGP 2X and 4X, 32 MB of memory, and a 300-MHz RAMDAC for optimal performance and functionality.

With a unified frame buffer consisting of 32 MB of memory, the Synergy II is capable of supporting resolutions as high as 1920 x 1200 in 24-bit double-buffered mode with a 24-bit Z-buffer, 8 stencil planes, and hardware texturing capabilities allowing the display of very realistic images.

The ELSA Synergy II offers a rich OpenGL implementation including hardware triangle setup, texture blending support, and full scene anti-aliasing, as well as an OpenGL software implementation that has been optimized for and tested with numerous workstation applications.

ELSA has also provided a multitude of software tools and utilities that enhance the functionality of the Synergy II making ELSA's solution the most robust entry 3D offering in the industry. *POWERdraft* is a 2D-display list driver for AutoCAD that offers unparalleled performance and an easy-to-use navigation interface that increases productivity. *ELSAview3D* is a real-time editing and viewing tool for 3D CAD models that assists in increasing productivity by allowing users to view and edit 3D models without the burden of having to run the full application. *MAXtreme* is a driver that is specialized to increase performance for Discreet MAX users. In addition, the Synergy II OpenGL driver is optimized to take advantage of SIMD for increased performance.

Combining the powerful RIVA TNT 2 processor with ELSA's enhanced software package provides an excellent solution for CAD applications, such as Autodesk AutoCAD and PTC Pro/ENGINEER, as well as DCC applications, such as Discreet MAX, Discreet Edit, and NewTek Lightwave 3D.

Selection Criteria

The ELSA Synergy II is a very flexible, general purpose graphics controller that should be considered as the default choice in most workstation selections. The main question to ask is whether the applications used require greater capabilities than the Synergy II provides. Key questions include:

- Does the application require 3D support?
- Is cost a factor in selecting a 3D solution?
- Is a 32MB unified frame buffer sufficient for the application?

- If Professional 3D support is required as well as larger texture memory, the PowerStorm 600 is suggested.

Positioning within Product Line

The Synergy II is the entry level 3D graphics choice. It should be used unless application requirements indicate the need for a more expensive controller.

Specifications

Hardware specifications for ELSA Synergy II:

Professional 3D	No
3D/2D Controller	NVIDIA TNT2
3D Support	OpenGL 1.1
VGA Controller	Integrated
Bus Interface	AGP 2X/4X (ATX and NLX)
Slots Used	1
Video Signal Connection	VGA
RAMDAC	Integrated 300 MHz
Memory Type	SDRAM
Memory Amount	32 MB (maximum)
Memory Speed	143 MHz
Controller Clock Speed	125 MHz
Maximum Vertical Refresh Rate	120 Hz
Maximum Pixel Clock	300 MHz
Hardware Texture Mapping	Yes
Highest Texture Mode	Trilinear
Standard Texture Memory	Shared with frame buffer
Maximum Texture Memory	Shared with frame buffer
Stereo	No
Video Layout	
Color Planes	24-bit double buffered
Overlap	n

Multi-Display Support

Multi-display support is not available with the ELSA Synergy II at this time. However, Compaq will continue to investigate the requirement for such a solution in this graphics line. Multi-display support is currently available with our offering of Matrox controllers.

Supported Platforms and Operating Systems for ELSA Synergy II:

System	Platform Support	OS Support
AP200	Yes	Windows NT 4.0, Windows 95, 98
AP400	Yes	Windows NT 4.0, Windows 95, 98
AP500	Yes	Windows NT 4.0, Windows 95, 98
SP700	Yes	Windows NT 4.0, Windows 95, 98
XP1000	None	None
XP900	None	None

ELSA GLoria Synergy+/Synergy

Entry 3D Graphics

Overview

The ELSA GLoria Synergy+ and ELSA GLoria Synergy are affordable 2D/3D graphics controllers designed for general purpose computing and are the predecessor(s) to the ELSA Synergy II. The ELSA GLoria Synergy+/Synergy are excellent 2D displays and support a variety of 3D modes. The GLoria Synergy+ comes with 4 or 8 MB of memory, which is used for both frame buffer and texture storage. The GLoria Synergy comes with 8 MB of memory. It is important to note that the ELSA GLoria Synergy+ is supported on Intel based systems, while the ELSA GLoria Synergy is supported on both Intel and Alpha based systems. The ELSA Synergy II is now the most robust solution in this space, however, if end-users have already standardized their application test-beds on the ELSA GLoria Synergy+/Synergy, they may still want to continue to do so. (Note: The Synergy II is only supported on Intel systems).

Target Applications

The GLoria Synergy+ and GLoria Synergy are versatile boards suited to general purpose computing and to cost-sensitive technical computing. Representative applications include Autocad, Bentley MicroStation, SolidWorks, 3D Studio MAX, and software development.

Key Features

- 4 or 8 MB SGRAM memory on the ELSA GLoria Synergy+
- 8 MB of SGRAM on the ELSA GLoria Synergy
- Up to 1920x1200 resolution HiColor (Windows NT 4.0 on Intel and Compaq Tru64 UNIX on AlphaPowered systems only)
- 1280x1024 True Color
- Up to 24-bit color (true color)
- True color, double buffered with Z-buffer at up to 1024x768 resolution. (UNIX driver does not implement 3D functions or provide Z-buffer support)
- OpenGL 1.1 support (OpenGL and 3D graphics operations not supported under Tru64 UNIX)
- Hardware accelerated texture mapping with point sampled and bilinear interpolated textures. Graphics memory is shared between frame buffer and texture storage.

Description

The GLoria Synergy+ and GLoria Synergy are cost effective 2D/3D graphics controllers based on the Permedia P2 graphics chipset from 3Dlabs, which is suitable for a wide range of applications. The ELSA GLoria Synergy+ has an embedded Permedia P2A chip, while the ELSA GLoria Synergy has an embedded Permedia P2 chip. They provide high performance in 2D operations and hardware acceleration of 3D shading operations. The differences between the ELSA GLoria Synergy+ and the ELSA GLoria Synergy are summarized in the following:

GLoria Synergy+:

- AGP based graphics accelerator
- Standard with 4 or 8 MB of memory (depending upon platform), 4 MB controllers upgradable to 8 MB
- Higher refresh rates
- Supported on Intel platforms

GLoria Synergy:

- PCI based graphics accelerator
- Standard 8MB of memory
- Supported on Intel and Alpha platforms

The GLoria Synergy+ and GLoria Synergy include 4 or 8 MB of memory (as noted above), which is shared between frame buffer and texture. It provides a number of choices between resolution, double buffering, color depth and Z-buffering.

The GLoria Synergy+ is implemented as a single slot AGP controller, and it is available in both NLX (low profile) and ATX form factors. The GLoria Synergy is implemented as a single slot PCI controller. As noted previously, the AGP version is used on the Intel processor based Affordable Performance and Scalable Performance workstation lines. The PCI version is used on the AlphaPowered Extreme Performance line, and to provide multiple display support on the Intel based workstations.

Selection Criteria

The GLoria Synergy+ and GLoria Synergy are very flexible, general purpose graphics controllers that should be considered if the customer requires entry 3D and does not want to switch his or her current environment to newer technology. In addition, the GLoria Synergy+ and GLoria Synergy combination can be considered if the customer requires this class of card and wants to run multi-display. Some additional points to take into consideration:

- Does the application require 3D functionality?
- Is cost a factor in selecting a 3D solution?
- Does the customer have an existing environment with a GLoria Synergy+ and/or GLoria Synergy?
- Does the customer absolutely require the GLoria Synergy+ and/or GLoria Synergy instead of the Synergy II (example: customer does not have a Pentium III system)?

If the answer to these questions is “yes,” then the ELSA Synergy controllers should be considered.

- If maximum 2D performance and single driver support is required, the Matrox Millennium G200 is recommended.
- If Entry 3D is required and the latest entry 3D technology is wanted, then the Synergy II is the correct solution.
- If Professional 3D functionality is needed, the 3Dlabs Oxygen GVX1 or PowerStorm 300 are recommended.
- If 3D geometry acceleration is needed to meet graphics performance requirements, the Oxygen GVX1 is recommended.
- If Professional 3D functionality is required as well as larger texture memory, the PowerStorm 600 is suggested.

Positioning within Product Line

The GLoria Synergy+ and GLoria Synergy are the entry level graphics choices, which have been replaced by the ELSA Synergy II (AGP) card (except in instances noted previously).

Specifications

Hardware specifications for ELSA GLoria Synergy+/Synergy:

	GLoria Synergy+	GLoria Synergy
Professional 3D	No	No
3D Support	OpenGL 1.1	OpenGL 1.1
Bus Interface	AGP (NLX and ATX)	PCI
Slots Used	1	1
Video Signal Connection	VGA	VGA
Video Memory	4 or 8 MB	8 MB
Hardward Texture Mapping	Yes	Yes
Highest Texture Mode	Bilinear	Bilinear
Standard Texture Memory	Shared with frame buffer	Shared with frame buffer
Maximum Texture Memory	Shared with frame buffer	Shared with frame buffer
Maximum Resolution	1920x1200	1920x1200 (Intel and UNIX) 1600x1200 (Alpha Windows NT)
Maximum Refresh (1280x1024)	85 Hz	85 Hz (75 Hz UNIX)
Stereo	No	No
Video Layout		
Color Planes	8-bit, 16-bit, 24-bit	8-bit, 16-bit, 24-bit
Z-buffer	16-bit	16-bit
Overlay Planes	0	0
Stencil Planes	0	0
Alpha Planes	0	0
Window ID Planes	1	1
Fast Clear Planes	Not applicable	Not applicable
Total Bits/Pixel	96	96

NOTE: Software drivers for Compaq Tru64 UNIX implement 2D functionality only. Tru64 UNIX drivers do not support OpenGL, Z-buffer, or other 3D capabilities. Tru64 UNIX drivers support X-Windows with both true color and high resolution.

Multi-Display Support

On Intel based platforms, one ELSA GLoria Synergy+ can be combined with up to three ELSA GLoria Synergy controllers.

On Alpha based platforms under Windows NT, one ELSA GLoria Synergy controller is supported running in 3D mode. Up to three ELSA GLoria Synergy controllers are supported running in 2D mode.

On Alpha based platforms under Tru64 UNIX, up to three ELSA GLoria Synergy controllers are supported running in 2D mode only. 3D support is not available under Tru64 UNIX.

Supported Platforms and Operating Systems for ELSA GLoria Synergy+ and Synergy

System	GLoria Synergy+	GLoria Synergy	OS Support
AP200	Yes	Yes (multi-display) under Windows NT 3.51 and 4.0	Windows NT 4.0, 3.51, Windows 95, 98
AP400	Yes	Yes (multi-display) under Windows NT 3.51 and 4.0	Windows NT 4.0, 3.51, Windows 95, 98
AP500	Yes	Yes (multi-display) under Windows NT 3.51 and 4.0	Windows NT 4.0, 3.51, Windows 95, 98
SP700	Yes	Yes (multi-display) under Windows NT 3.51 and 4.0	Windows NT 4.0, 3.51, Windows 95, 98
XP1000	No	Yes	Windows NT, Tru64 UNIX
XP900	No	Yes	Tru64 UNIX, OpenVMS

3Dlabs Oxygen GVX1

Professional 3D Graphics

Overview

The 3Dlabs Oxygen GVX1 Graphics Controller is a high-performance 3D graphics solution for users who require Professional 3D graphics features and the best balance of price and performance. The 3Dlabs Oxygen GVX1 is based on the 3Dlabs GLINT R3 graphic rendering controller and GLINT Gamma geometry processor. The GLINT R3 implements a complete Professional 3D quality graphics pipeline and display management sub-system on a single device, enabling the Oxygen GVX1 to provide performance and functionality that will surpass most of today's highest performance adapters at a much lower cost. GLINT Gamma is the industry's first single chip designed to break the 3D lighting and geometry bottleneck on Intel based workstations. GLINT Gamma implements the complete OpenGL 3D lighting and geometry pipeline. The combination of the GLINT R3 and GLINT Gamma on the Oxygen GVX1 makes this graphics controller an ideal choice for 3D-application performance for CAD, CAM, DCC, GIS, solids modeling, and visual data analysis applications. The 3Dlabs Oxygen GVX1 includes 3Dlabs' new-generation PowerThreads SSE OpenGL drivers. The PowerThreads SSE drivers with Dynamic Load Balancing provide optimized support for OpenGL1.1, SIMD extensions and are optimized for multiprocessor systems under Windows NT 4.0.

The 3Dlabs Oxygen GVX1 Graphics Controller is available in an AGP ATX form factor. Both a VGA connector and Digital Flat Panel (Panel Link) connector are standard on Oxygen GVX1. The Oxygen GVX1 is supported as the primary graphics device on selected Compaq Professional Workstations running Windows NT 4.0.

Target Applications

The 3Dlabs Oxygen GVX1 is best suited to high-end technical applications in MCAD, GIS, DCC, Scientific Visualization and Visual Simulation. Representative examples include: Pro/ENGINEER, Unigraphics, CATIA, Matra Datavision, ERDAS, Maya, Discreet, Lightwave3D, AVS, Alias Maya, and Paradigm Vega.

Key Features

- High performance 3D graphics
- Excellent 2D performance

Description

The 3DLabs Oxygen GVX1 AGP includes 32 MB of memory. It features a unified memory architecture that allows optimum use of local memory for the frame buffer and texture memory. In addition to the local memory capacity of 32 MB, the Oxygen GVX1 product supports a unique 3DLabs technology known as Virtual Texture Mapping. This technology features on-demand loading of textures into local memory on a page-by-page basis, with a 4-KB page granularity. The loading of new texture pages is handled by the GLINT R3, with no memory management support required of the software drivers.

The bilinear fill rate of 230M texels/second and trilinear fill rate of 115M texels/second and the ability to display 4.75 million fully transformed and lit polygons per second are key performance features of this Professional 3D graphics solution.

The 3DLabs Oxygen GVX1 is a high-quality graphics controller for professionals requiring solid 2D and 3D features, best balance of price and performance along with full OpenGL 1.1 support.

Users of Professional 3D graphics applications, such as Discreet MAX, Lightwave and Softimage, as well as CAD and CAE applications like PRO/E, UG, Solidworks, and AutoCAD, benefit from the capabilities of this graphics controller. The Oxygen GVX1 is bundled with Soft Engine 4 AutoCAD display list drivers from Vibrant Graphics, Inc.

The Oxygen GVX1 has excellent Gamma correction support via Sonnetech, Ltd.'s "Colorific" technology. Utilizing this process allows users to have their display color corrected to accurately reflect their output medium, whether it is print or film.

The 3DLabs Oxygen GVX1 runs applications in 16.7 million photo-realistic colors. It also supports true 24-bit color at resolutions up to 1920 x 1200 at 76 Hz refresh rate.

Selection Criteria

Is the 3Dlabs Oxygen GVX1 the best choice for the application? The primary selection criterion is whether or not the applications used take advantage of the capabilities of the 3Dlabs Oxygen GVX1. Key questions include:

- Is geometry acceleration needed to meet the graphics performance requirements of the application?
- Does the application use texture mapping?
- Does the application support overlay planes?
- Is the customer more oriented to performance?
- Is hardware accelerated OpenGL required?
- Is stereo support required?

If the answer to these questions is "yes," then the 3Dlabs Oxygen GVX1 merits serious consideration.

- If Professional 3D support is not required, the ELSA Synergy II is recommended.
- If maximum 2D performance and single driver support is required, the Matrox Millennium G200 is recommended.
- For large model and complex screen rendering, the Compaq PowerStorm 600 is recommended.

Positioning within Product Line

The 3Dlabs Oxygen GVX1 replaces the PowerStorm 300 for Pentium III and Pentium III Xeon based Professional Workstations. It offers better 3D functionality and performance than the ELSA Synergy II. The PowerStorm 600 generally offers better performance (at a higher price) for large model and complex screen rendering. The Matrox Millennium G200 offers higher 2D performance.

Specifications

Hardware specifications for the 3Dlabs Oxygen GVX1:

Professional 3D	Yes
3D Support	OpenGL 1.1
Controller	GLINT R3
Geometry	GLINT Gamma
Bus Interface	AGP 2X (ATX only), AGP 4X compatible
Video Signal Connection	VGA
RAMDAC	Integrated
Memory Type	SGRAM
Memory Amount	32 MB (maximum)
Memory Speed	125 MHz
Controller Clock Speed	125 MHz
Highest Texture Mode	Trilinear
Standard Texture Memory	Shared with frame buffer
Maximum Texture Memory	Shared with frame buffer
Stereo	Yes
Video Layout	
Color Planes	24-bit double buffered
Overlay	8-bit, shared with alpha
Stencil Planes	8-bit with 24-bit Z-buffer
Alpha Planes	8-bit, shared with overlay
Z-buffer	32-bit (with no stencil)
Total Bits/Pixel	96

Multi-Display Support:

Multi-display support is not available with the 3DLabs Oxygen GVX1 at this time. However, Compaq will continue to investigate the requirement for such a solution in this graphic line. Multi-display support is currently available with our offering of Matrox controllers.

Supported Platforms and Operating Systems for the 3DLabs Oxygen GVX1:

System	Platform Support	OS Support
AP200	Yes	Windows NT 4.0
AP400	None	None
AP500	Yes	Windows NT 4.0
SP700	Yes	Windows NT 4.0
XP1000	None	None
XP900	None	None

PowerStorm 300

Professional 3D Graphics

Overview

The PowerStorm 300 is a high performance, full function 3D graphics controller designed for demanding 3D technical applications using OpenGL. Two versions are available, supporting AGP and PCI bus interfaces. The PowerStorm 300 supports high-resolution display and allows simultaneous use of all graphics features.

The PowerStorm 300 AGP supports Windows NT on Intel based Compaq Professional Workstations.

The PCI version of the PowerStorm 300 supports Windows NT and Compaq Tru64 UNIX on the AlphaStation XP1000.

The PowerStorm 300 accelerates rendering functions, including triangle setup, Gouraud shading, depth buffering (Z buffering) and texture mapping. The PowerStorm 300 relies on the host processor for geometry processing.

Target Applications

The PowerStorm 300 is best suited to high-end technical applications in MCAD, GIS, DCC, Scientific Visualization, and Visual Simulation. Representative examples include: Pro/ENGINEER, Unigraphics, CATIA, Matra Datavision, ERDAS, Maya, Discreet, Lightwave3D, AVS and Paradigm Vega.

Key Features

- Competitive 3D performance
- 3D performance: 4M triangles per second, 90M Pixel textured fill rate
- Excellent 2D performance
- AGP interface supporting both standard ATX and low profile NLX form factors via a bracket change.
- PCI interface supporting AlphaPowered XP1000 workstation
- Supported under Windows NT on Intel based workstations and both Windows NT and Compaq Tru64 UNIX on the AlphaStation XP1000
- 1280x1024 resolution, 24-bit true color, double buffered with 24-bit Z-buffer

Description

The PowerStorm 300 is a competitive performance, mid-range 3D graphics accelerator. It provides full acceleration for OpenGL, including shading, texturing, stencil, transparency and overlay planes. The PowerStorm 300 AGP is a single slot AGP device, supporting both ATX and NLX form factors and using DMA data transfers for maximum performance.

The PowerStorm 300 includes 15 MB of frame buffer memory, implemented with 3DRAM. 3DRAM integrates graphics processing and frame buffer memory on a single chip. The use of 3DRAM increases performance on the PowerStorm 300 by combining high performance memory operations with 12-way parallel processing of pixel level graphics operations. The PowerStorm 300 supports a 1280x1024 resolution with a true color, double buffered display, a 24-bit Z buffer, 8-bit double buffered overlay planes, as well as window ID. Hardware support for OpenGL stencil planes and destination alpha planes is provided. (NOTE: destination alpha planes are not supported on AlphaPowered systems.)

The PowerStorm 300 comes with 16 MB of texture memory. It supports all OpenGL texture modes, including point sampled, bilinear interpolation, and trilinear interpolation. Perspective correction of textures is done on a per-pixel basis. Texture maps are stored as 32-bit texels, providing full 24-bit color plus 8 plane alpha per texel, or as 16-bit texels, supporting larger textures and higher performance.

The PowerStorm 300 delivers high performance. It is capable of displaying 4M triangles per second, 4M anti-aliased 3D vectors per second, and 4M 3D vectors per second. Texture fill is 90 Mpixels per second for point sampled and bilinear interpolated textures, and 45 Mpixels per second for trilinear interpolated textures.

The PowerStorm 300 is supported under Windows NT 4.0 on the Compaq Affordable Performance and Scalable Performance workstations and under both Windows NT 4.0 and Compaq Tru64 UNIX on the XP1000 workstation.

Selection Criteria

Is the PowerStorm 300 the best choice for the application? The primary selection criterion is whether or not the applications used take advantage of the capabilities of the PowerStorm 300.

Key questions include:

- Does the application need a true color, double buffered display at a resolution of 1280x1024?
- Does the application use 3D rendering with Z buffering?
- Does the application use texture mapping?
- Does the application support overlay planes?
- Is host-based geometry processing adequate?
- Is the customer using a Pentium II or Pentium II Xeon based Professional Workstation?

If the answer to these questions is "yes," then the PowerStorm 300 merits serious consideration.

- If Professional 3D support is not required, the ELSA Synergy II is recommended.
- If maximum 2D performance and single driver support is required, the Matrox G200 is recommended.
- If resolution greater than 1280x1024 and 3D geometry acceleration is needed, the Oxygen GVX1 is recommended.
- For larger models and complex screen rendering, the PowerStorm 600 is recommended.

Positioning within Product Line

PowerStorm 300 replaces the Diamond Fire GL 4000 and the PowerStorm 4D30T. It offers better 3D functionality and performance than the ELSA Synergy II. The GVX1 replaces the PowerStorm 300 in the newer Intel-based systems. The PowerStorm 600 generally offers better performance (at a higher price) for large models and complex rendering. The Matrox Millennium G200 offers higher 2D performance.

Specifications

Hardware specifications for PowerStorm 300:

	AGP	PCI
Professional 3D	Yes	Yes
Bus Interface	AGP 1X (ATX and NLX)	PCI 2.1
Controller	Evans & Sutherland Realimage 2100	Evans & Sutherland Realimage 2100
RAMDAC	IBM RGB640	IBM RGB640
Video Signal Connection	VGA	VGA
Memory Type	3DRAM and CDRAM	3DRAM and CDRAM
Memory Amount	15 MB and 16 MB	15 MB and 16 MB
Maximum Memory	15 MB and 16 MB	15 MB and 16 MB
Memory Speed	10 ns 3DRAM	10 ns 3DRAM
Data Path	64-bit	64-bit
Controller Clock Speed	100 MHz	100 MHz
Maximum Vertical Refresh Rate	85 Hz	85 Hz
Maximum Pixel Clock	220 MHz	220 MHz
Highest Texture Mode	Trilinear	Trilinear
Standard Texture Memory	16 MB	16 MB
Maximum Texture Memory	16 MB	16 MB
Maximum Resolution	1280x1024	1280x1024
Maximum Refresh (1280x1024)	85 Hz	85 Hz
Stereo	No	No
Video Layout		
Color Planes	24-bit, double buffered	24-bit, double buffered
Overlay	8-bit, shared with alpha	8-bit
Overlay (alternative)	4-bit, shared with stencil	Not applicable
Stencil Planes	4-bit, shared with overlay	4-bit

Multi-Display Support:

Two PowerStorm 300 PCI controllers can be used under Windows NT or Compaq Tru64 UNIX on the AlphaStation XP1000.

Supported Platforms and Operating Systems for PowerStorm 300:

System	AGP	PCI	OS Support
AP200	Yes	No	Windows NT 4.0
AP400	Yes	No	Windows NT 4.0
AP500	Yes	No	Windows NT 4.0
SP700	Yes	No	Windows NT 4.0
XP1000	No	Yes	Windows NT, Tru64 UNIX
XP900	No	No	None

PowerStorm 350 (AlphaStation only)

Professional 3D Graphics

Overview

The PowerStorm 350 (PCI) is a high performance, ultra-high resolution (up to 1920x1200) full function 3D graphics controller designed for demanding 3D technical applications using OpenGL. It supports high resolution display and allows simultaneous use of all graphics features.

The PowerStorm 350 supports Windows NT and Compaq Tru64 UNIX on the Compaq AlphaStation XP1000 and Compaq Tru64 UNIX and Open VMS on the Compaq AlphaStation XP900. The PowerStorm 350 accelerates rendering functions, including triangle setup, Gouraud shading, depth buffering (Z buffering) and texture mapping. It relies on the host processor for geometry processing.

The PowerStorm 350 is based on the same graphics chipset as the PowerStorm 300, but doubles the size of the frame buffer to support higher resolution and doubles the size of texture memory to support more or larger texture maps. Stereo display support is also included.

Target Applications

The PowerStorm 350 is best suited to high-end technical applications in MCAD, GIS, DCC, Scientific Visualization and Visual Simulation. Representative examples include: Pro/ENGINEER, Unigraphics, CATIA, Matra Datavision, ERDAS, Lightwave3D, AVS and Paradigm Vega. The PowerStorm 350 should be used where high-resolution, large texture and/or stereo requirements are not met by the PowerStorm 300.

Key Features

- High performance 3D graphics on the XP1000 under both Windows NT and Compaq Tru64 UNIX and on the XP900 under Compaq Tru64 UNIX and Open VMS
- Excellent 2D performance
- 1920x1200 resolution, 24 bit true color, double buffered with 24 bit Z-buffer
- Full OpenGL quad buffered stereo in a window
- 8-bit double buffered overlay planes
- Full OpenGL 1.1 support
- Hardware accelerated texture mapping with 32 MB of dedicated texture memory and support for tri-linear interpolation of textures

Description

The PowerStorm 350 is a high performance, mid-range 3D graphics accelerator. It provides full acceleration for OpenGL, including shading, texturing, stencil, transparency and overlay planes. The PowerStorm 350 is a full-length single-slot PCI 2.1 compliant device, using DMA data transfers for maximum performance.

The PowerStorm 350 includes 30 MB of frame buffer memory, implemented with 3DRAM. 3DRAM integrates graphics processing and frame buffer memory on a single chip. The use of 3DRAM increases performance on the PowerStorm 350 by combining high-performance memory operations with 12-way parallel processing of pixel level graphics operations. The PowerStorm 350 supports a 1920x1200 resolution with a true color, double buffered display, a 24-bit Z buffer, 8-bit double buffered overlay planes, as well as window ID. Hardware support for OpenGL stencil planes and alpha planes is provided.

The PowerStorm 350 comes with 32 MB of texture memory. It supports all OpenGL texture modes, including point sampled, bilinear interpolation, and trilinear interpolation. Perspective correction of textures is done on a per-pixel basis. Texture maps are stored as 32 bit texels, providing full 24-bit color plus 8 plane alpha per texel, or as 16-bit texels, supporting larger textures and higher performance.

The PowerStorm 350 delivers high performance. It is capable of displaying 4M triangles per second, 4M anti-aliased 3D vectors per second, and 4M 3D vectors per second. Texture fill is 90 Mpixels per second for point sampled and bilinear interpolated textures, and 45 Mpixels per second for trilinear interpolated textures.

The PowerStorm 350 supports full OpenGL quad-buffered stereo for the highest 3D visual quality when using head mounted displays and shutter glasses.

Selection Criteria

The primary selection criteria is whether or not the applications used take advantage of the capabilities of the PowerStorm 350. Key questions include:

- Does the application need a true color, double buffered display at a resolution of 1920x1200?
- Does the application use 3D rendering with Z buffering?
- Does the application use texture mapping?
- Is stereo viewing required?
- Does the application support overlay planes?
- Is the customer more oriented to performance than price?
- Is host-based geometry processing adequate?

If the answer to these questions is "yes," then the PowerStorm 350 merits serious consideration.

- If Professional 3D support is not required, the ELSA GLoria Synergy is recommended.
- If resolution greater than 1280x1024 or texture memory larger than 16 MB is not required, the PowerStorm 300 is recommended.

Positioning within Product Line

- The PowerStorm 350 offers better 3D functionality and performance than the ELSA GLoria Synergy
- The PowerStorm 350 provides greater functions than the PowerStorm 300 (1920x1200 resolution, 32 MB of texture memory, and stereo).

Specifications

Hardware specifications for PowerStorm 350:

Professional 3D	Yes
Bus Interface	PCI 2.1
Controller	Evans & Sutherland Realimage 2100
RAMDAC	IBM RGB640
Video Signal Connection	VGA
Memory Type	3DRAM and CDRAM
Memory Amount	30 MB and 32 MB
Maximum Memory	30 MB and 32 MB
Memory Speed	10 ns 3DRAM/10 ns CDRAM
Data Path	64-bit
Controller Clock Speed	100 MHz
Maximum Vertical Refresh Rate	85 Hz
Maximum Pixel Clock	220 MHz
Highest Texture Mode	Trilinear
Standard Texture Memory	32 MB
Maximum Texture Memory	32 MB
Maximum Resolution	1920x1200
Maximum Refresh (1280x1024)	85 Hz
Stereo	Yes
Video Layout	
Color Planes	24-bit double buffered
Overlay	8-bit
Stencil Planes	4-bit
Alpha Planes	0
Window ID	4-bit
Z-buffer	24-bit
Total Bits/Pixel	96

Multi-Display Support

Two PowerStorm 350 controllers can be used under Windows NT or Compaq Tru64 UNIX on the AlphaStation XP1000

Supported Platforms and Operating Systems for PowerStorm 350:

System	Platform Support	OS Support
AP200	None	None
AP400	None	None
AP500	None	None
SP700	None	None
XP1000	Yes	Windows NT, Tru64 UNIX
XP900	Yes	Tru64 UNIX and OpenVMS

PowerStorm 600

Enhanced Professional 3D Graphics

Overview

The PowerStorm 600 is an ultra high-performance accelerated 3D graphics device that provides maximum performance available on the Intel-based Compaq Professional Workstation SP700 Pentium III Xeon systems. It is based on the award-winning Wildcat 4000 from Intense3D. In addition to high performance 3D rendering, such as that provided by the PowerStorm 300 and PowerStorm 350, the PowerStorm 600 also accelerates 3D geometric operations including lighting calculations and geometric transformations.

The high performance geometry processing hardware included in the PowerStorm 600 not only increases the speed with which these operations can be performed, but also offloads this processing from the workstation processor, freeing it to perform application processing.

Target Applications

The PowerStorm 600 is best suited to high-end technical applications in MCAD, DCC, Scientific Visualization and Visual Simulation. Representative examples include: Pro/ENGINEER, Unigraphics, CATIA, Matra Datavision, ERDAS, Maya, Discreet, Lightwave3D, AVS and Paradigm Vega.

Key Features

- Workstation 3D rendering, including shading, texturing and Z-buffering
- Hardware acceleration of 3D geometry calculations, including lighting and geometric transformations
- 1280x1024 resolution, 24-bit true color, double buffered with 24 bit Z-buffer
- 4-bit double buffered overlay planes at 1280x1024; 8-bit double buffered overlay planes at 1152x864
- Full OpenGL 1.1 support
- Hardware accelerated texture mapping with 64 MB of dedicated texture memory and support for tri-linear interpolation of textures
- 3D performance: 3.4M triangles per second, 68 MPixel per second textured fill rate (trilinear interpolated 32 bit texels)
- Stereo support

The two controllers are physically connected through a Vertex Data Bus, which is implemented as a ribbon cable.

The PowerStorm 600 is packaged with a Compaq Professional Workstation SP700 Pentium III Xeon system under a single orderable part number. This is due to the specialized power, cooling and packaging requirements. The PowerStorm 600 is not available for other workstations, or as an upgrade to existing SP700 workstations.

The PowerStorm 600 includes 16 MB of frame buffer memory, implemented with SDRAM. The PowerStorm 600 supports a 1280x1024 resolution with a true color, double buffered display, a 24 or 32-bit Z buffer, 4 or 8-bit double buffered overlay planes, 6 or 8-bit stencil planes and up to 8-bit Alpha planes.

The PowerStorm 600 comes with 64 MB of texture memory. It supports all OpenGL texture modes, including point sampled, bilinear interpolation, and trilinear interpolation. Perspective correction of textures is done on a per-pixel basis. Texture maps are stored as 32-bit texels, providing full 24-bit color plus 8 plane alpha per texel

The PowerStorm 600 delivers high performance. The rendering portion of the PowerStorm 600 is capable of displaying 3.4M triangles per second, 3M anti-aliased 3D vectors per second, and 7.3M 3D vectors per second. Texture fill is 68 Mpixels per second for point sampled, bilinear and trilinear interpolated textures, using 32-bit texels.

The PowerStorm 600 supports full OpenGL quad buffered stereo for the highest 3D visual quality when using head mounted displays and shutter glasses.

Selection Criteria

The primary selection criterion is whether or not the applications used take advantage of the capabilities of the PowerStorm 600. Key questions include:

- Is application performance limited by OpenGL geometry processing?
- Are the OpenGL functions used by the application accelerated by the PowerStorm 600 geometry accelerator?
- Is performance more important than price?
- Is the application using larger textures?

The performance question is generally answered through application level benchmarking. If the answer to these questions is "yes," then the PowerStorm 600 merits serious consideration.

If Entry 3D price and performance are required, the Synergy II is the correct product. If full Professional 3D capabilities are required, but price is more important than performance, the PowerStorm 300 or the PowerStorm 350 merits serious consideration.

Specifications

Hardware specifications for PowerStorm 600:

Professional 3D	Yes
Bus Interface	AGP and PCI 2.1
Number of Slots	2 (1 AGP and 1 PCI)
Controller	Intense3D Pro 3600 LynxV
RAMDAC	IBM RGB640
Video Signal Connection	VGA
Memory Type	SDRAM
Memory Amount	80 MB (16 MB frame buffer/64 MB texture)
Maximum Memory	80 MB
Memory Speed	143 MHz and 147 MHz
Data Path	112-bit
Controller Clock Speed	170 MHz
Maximum Vertical Refresh Rate	85 Hz
Maximum Pixel Clock	157 MHz
Highest Texture Mode	Tilinear
Standard Texture Memory	64 MB
Maximum Texture Memory	64 MB
Maximum Resolution	1280x1024
Maximum Refresh (1280x1024)	85 Hz
Stereo	Yes

Pixel Layout

The PowerStorm 600 supports two pixel depths: 100 bit per pixel and 128 bit per pixel. 100 bit per pixel is supported at the maximum 1280x1024 resolution. 128 bits per pixel is supported as resolutions of 1152x864 and lower.

Total Bits/Pixel	100 bits at 1280x1024	128 bits at 1152x864
Image Planes	24-bit double buffered	24-bit double buffered
Z-buffer	24-bit	32-bit
Overlay	4-bit (maximum) double buffered	8-bit (maximum) double buffered
Stencil Planes	6-bit (maximum)	8-bit (maximum)
Alpha Planes	0	8
Mask	2-bit	4-bit
Window ID	None	None
Image DB Control	1-bit	1-bit
Overlay DB Control	1-bit	1-bit
Fast Clear Buffer	1-bit double buffered	1-bit double buffered
Image VLT Selection	4-bit	4-bit

Multi-Display Support

Multi-display support is not available with the PowerStorm 600.

Supported Platforms and Operating Systems for PowerStorm 600:

System	Platform Support	OS Support
AP200	None	None
AP400	None	None
AP500	None	None
SP700	Yes, Pentium III Xeon models	Windows NT 4.0