

WHITE PAPER

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Compaq Professional Workstation Affordable Performance Line New Key Technologies White Paper for February 26th, 1999 Announcement

*The purpose of this paper is to provide an overview of the Key Technologies incorporated into the Compaq Professional Workstation Affordable Performance Line. This paper will primarily focus on **new** technologies that are being introduced in the Affordable Performance Line on February 26, 1999. The objective is to provide the technical information and benefits of these features.*

For a more complete overview of key technologies for the Affordable Performance Line, refer to previous Key Technologies White Papers at:

<http://www.compaq.com/products/workstations/tech/index.html>

For more information about our graphics offering refer to:

<http://www.compaq.com/products/workstations/graphics/index.html>

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Compaq Professional Workstation Affordable Performance Line Key Technologies White Paper

February 1999

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Introduction

Compaq Professional Workstations, consisting of the Affordable Performance Line, Scalable Performance Line, and Extreme Performance Line, offer customers a broad range of powerful Intel®-based and Alpha-based workstations that operate with Windows NT® or Compaq Tru64™ UNIX. These product lines are designed to meet the needs of workstation users who are using applications for financial trading or analysis, computer-aided design (CAD), computer-aided engineering (CAE), digital content creation (DCC), electronic design automation (EDA), or geographical information systems (GIS). This key technology paper will focus on the Affordable Performance Line.

Compaq Professional Workstation Affordable Performance Line

The Affordable Performance Line provides the latest workstation-class technologies for value-oriented customers. This line of Intel/Windows NT-based workstations is designed to deliver the broadest range of choices for users who need to strike a balance between performance and price. The Affordable Performance Line workstations provide *affordable performance* for users moving up the x86 performance curve. These users are interested in increasingly powerful and more full-featured Intel-based platforms. The following are examples of workstation applications these users typically operate:

- Financial trading applications that supply real-time data, such as Reuters RW32, Reuters Kobra, TIBCO Marketsheet, TIBCO TIB, MarketNet Real Time Toolkit, and NeoVision Heatmaps; also, risk management software, such as Summit v.2.6 and NeoVision RiskMaps.
- Entry CAD or AEC applications, such as AutoCAD and MicroStation, or CAD applications, such as Mechanical Desktop, SolidWorks, Pro/ENGINEER, SDRS, and EDS Unigraphics
- DCC applications for 2D or entry-3D desktop publishing, web authoring, non-linear editing, compositing, or animation, such as Photoshop, Pagemaker, Premiere, 3D StudioMAX, and Frontpage
- EDA applications for design entry and component layout, such as Cadence Concept, Mentor Graphics Board Station, Viewlogic Workview Office, VeriBest PCB, and OrCAD Express
- GIS applications for infrastructure and asset management, facilities management and land/natural resource management. Application examples: Autodesk AutoCAD Map, Bentley MicroStation Geographics, ESRI ARC/INFO and ArcView GIS.
- Applications for Software Development on Intel/Windows NT-based platforms.

The Affordable Performance Line features the latest Intel Pentium® III processors and the Intel 440BX AGPset with the 100-MHz Front Side Bus. One of the ways Affordable Performance Line products achieve excellent performance at an affordable price is by providing a choice between Wide-Ultra SCSI hard drives, Wide Ultra2 SCSI hard drives (available on AP400 and AP500) and Ultra ATA (EIDE) hard drives.

The Affordable Performance Line consists of three product families: Compaq Professional Workstation AP200, AP400, and AP500. A brief description of these families follows.

Professional Workstation AP200

- The entry level Windows NT-based workstation that provides exceptional performance and features for budget-conscious customers.
- Innovative, flexible convertible minitower design with Quick-Change drives allows easy conversion from a minitower to a desktop to adapt to and maximize valuable work space.

The Compaq Professional Workstation AP200 is ideal for technical or creative professionals who may have been using high-end PCs or other single processor workstations, such as the Hewlett-Packard Kayak XA, to run entry-level CAD, EDA, DCC, GIS or financial trading applications. For example, Mainstream CAD users, such as those running AutoCAD or MicroStation, will find the AP200 extremely appealing as a powerful solution that is very affordable.

Professional Workstation AP400

- The Windows NT-based workstation in a desktop design that delivers advanced performance for users seeking an affordable 2P system.
- The low profile desktop design that easily fits into space-constrained environments, such as financial trading floors.

The Compaq Professional Workstation AP400 provides industry-leading price/performance in a space-saving desktop form factor for customers in the financial, CAD, DCC, GIS and EDA segments.

Professional Workstation AP500

- The Windows NT-based workstation with outstanding expandability to meet the needs of users seeking an affordable 2P system.
- Easy-to-service rackable minitower design saves valuable desk space and provides excellent future expandability.

The Compaq Professional Workstation AP500 delivers outstanding performance and expandability to meet the needs of users seeking an affordable, dual-processor workstation. A minitower with ample room to add specialized boards and storage devices is often a requirement among CAD, GIS and DCC users who are using 3D applications.

Intel Pentium III Processor **NEW!**

The Compaq Professional Workstation Affordable Performance Line incorporates Intel's new Pentium III 500-MHz processor. Compaq Professional Workstation Affordable Performance Line will also introduce Pentium III 550-MHz processor models when available from Intel in 2Q99. The Pentium III is Intel's most advanced and powerful processor. The processor features the key attributes of the P6 microarchitecture, such as Dynamic Execution, a multi-transactional system bus, and Intel MMX media enhancements. In addition to these features, the Pentium III introduces new Streaming SIMD Extensions and processor serial number (PSN).

Pentium III processors will significantly improve performance on Floating Point Unit calculations. This performance improvement will be seen on the 3D benchmarks (Ziff Davis 3D Winbench 99), which take advantage of the new Streaming SIMD instructions. Although applications currently do not exercise the Streaming SIMD capabilities in Pentium III processors, new graphics solutions that will take advantage of these instructions are expected to be introduced in 2Q99.

Workstations based on Pentium III processors have the horsepower to maintain responsiveness even when several background processes are operating and the user is involved in a compute-intensive foreground application. Examples of these applications include automated data compression, encryption and information management agents. Upcoming software programs include Microsoft Chrome Effects, Outlook - Intelligent email.

The Professional Workstation AP400 and AP500 can support up to two Intel Pentium III or II processors. Pentium II and Pentium III processors cannot be mixed. For dual-capable workstations to function properly, they must either contain two Pentium III or two Pentium II processors. The Professional Workstation AP200 is a uni-processor workstation and can support one Intel Pentium III or II processor.

Streaming SIMD Extensions

The Pentium III processors are the first Intel processor family to offer Streaming SIMD Extensions. These new multimedia extensions are designed to significantly boost multimedia performance. As opposed to the current 80 bits, they access a set of eight new registers that are 128-bits wide. Most of these instructions pertain to SIMD (Single Instruction, Multiple Data) operations for floating point instructions but also offer new integer MMX instructions. SIMD-style instructions are particularly suited to floating point arithmetic, commonly used in 3D geometry calculations, as well as audio and speech processing. The new Pentium III processor runs at 500 MHz, compared to previous Pentium II processors, which ran at 450 MHz maximum. The new Intel Pentium III processor is fully compatible with existing Intel Architecture-based software. New Streaming SIMD Extension benefits include:

- Higher resolution and higher quality images can be viewed and manipulated than previously possible
- High quality audio, MPEG2 video and simultaneous MPEG2 encoding and decoding
- Reduced CPU utilization for speech recognition, as well as higher accuracy and faster response times

While 2D applications will experience limited performance benefits from Streaming SIMD Extensions, significant performance improvements will be seen on 3D applications. The Ziff Davis 3D Lighting & Transformation benchmark showed the Pentium III 450 MHz processor performance as 74% better relative to a Pentium II 450 MHz processor. 3D graphics solutions that fully utilize Streaming SIMD Extensions will be available in 2Q99.

To take full advantage of the Streaming SIMD Extensions performance gains, either the driver for OpenGL-capable graphics controllers or applications need to include Streaming SIMD Extension instructions. Compaq will provide Streaming SIMD Extensions-enabling graphics drivers on our web site when they are available.

Processor serial number (PSN)

The Intel processor serial number (PSN) feature consists of silicon devices in Intel's Pentium III processor that are programmed to a specific number during manufacturing. PSN serves as an identifier similar to the serial numbers on other electronic devices or products, except the processor's serial number is implemented electronically, rather than being placed on the exterior of the product.

Compaq will ship Compaq Professional Workstations with the processor serial number disabled in BIOS as the default setting prior to shipment. Compaq believes the control of the processor serial number feature should remain in the hands of the users, thus providing the ability to choose whether or not to release personal information. Compaq Professional Workstation customers can enable the processor serial number feature by running Computer Setup - F10.

In response to privacy concerns, Intel developed a control utility application that can be installed in the Windows "Start" folder. The control utility is used by some manufacturers or users to disable/enable PSN. The control utility's default setting will be in the "OFF" position, which is designed so the system will remember the most recent selection and set the processor number correctly to "ON" or "OFF" each time the computer is reset. If customers want to turn the processor serial number "ON," they must change the default setting in the utility to "ON" and reset the processor. The Intel software control utility can be used with Compaq Professional Workstations. However, upon running the utility, the user must still access Computer Setup to enable the PSN feature since BIOS instruction overrides software.

NOTE: Compaq Professional Workstation customers can "enable" PSN through Computer Setup – F10 without the assistance of Intel's software Control Utility. Intel will make the control utility available on its Web site at www.intel.com once the Pentium III processor is introduced.

In addition to the new Streaming SIMD Extensions and Intel processor serial number (PSN) features, Intel Pentium III processors retain the valuable features Intel Pentium II processors offered, such as:

- 100-MHz Front Side Bus
- Dynamic execution technology
- Multi-transaction system bus
- Intel MMX media enhancement technology
- 512 KB of integrated non-blocking L2 cache
- Dedicated 64-bit cache bus
- High performance Dual Independent Bus architecture (system bus and cache bus)

Customer Benefits

- **New high performance features delivered with Intel Pentium III processors.** Quality and performance is enhanced with new Streaming SIMD Extensions
- **Major leaps in processor power.** The new Pentium III 500-MHz processor provides a significant increase in processing power over previous Intel processors. The Pentium III 500-MHz processors deliver up to an 11.1% performance boost over the Pentium II 450-MHz processors in certain integer or multimedia benchmarks.
- **Improved overall system performance.** The 100-MHz FSB improves the overall performance of the workstation by enhancing the speed at which data is transferred between the processor and other parts of the system.
- **Improved value.** The new Pentium III processors deliver a great value by delivering higher performance at an affordable price.

Wide Ultra2 SCSI **NEW!**

- *Available on Compaq Professional Workstation AP500 as standard configuration. Available on both the Compaq Professional Workstation AP400 and AP500 as an option or flexible configuration (flexible configuration available in North America only)*

Wide Ultra2 SCSI utilizes LVD (low voltage differential) signaling and a 40 MHz clock rate to allow maximum burst rates on the Wide Ultra2 SCSI bus of 80 MB/sec, which doubles the maximum burst rate of Wide Ultra SCSI. This higher data burst rate provides superior performance in large data transfers, such as streaming video, loading large CAD models and in configurations with several high-speed hard drives on a single controller. The Wide Ultra2 controller offers more bandwidth headroom for demanding applications than is available on the Wide-Ultra SCSI controller, and is therefore less likely to experience performance degradation when the SCSI bus is overloaded. LVD uses differential signaling technology, which has lower voltage swings and is less susceptible to noise than Ultra SCSI technology.

Wide Ultra2 SCSI LVD is backward-compatible with all previous versions of SCSI. When a Wide Ultra2 drive is installed on a previous-version SCSI bus, performance defaults to the specifications of that bus.

Customer Benefit

Maximum burst rate doubled. Wide Ultra2 SCSI features an 80 MB per second burst rate compared to Wide-Ultra SCSI's 40 MB per second. This saves time through faster performance in some applications where the SCSI bus is the bottleneck. In multiple disk configurations, significant performance gains are evident when large blocks of data are sequentially accessed.

RAID Controller **NEW!**

- Available on Compaq Professional Workstation AP400 and AP500 as an option

Compaq offers the Mylex AcceleRAID 150 Array Controller, which is a single channel PCI-to-Ultra2 SCSI LVD RAID adapter. The Mylex AcceleRAID 150 is a Wide Ultra2 SCSI single-channel array controller that fits into a PCI slot. It supports RAID 0, RAID 1, RAID 0+1, and RAID 5.

Mylex AcceleRAID 150 plugs directly into a PCI slot. The AcceleRAID 150 is a fully independent Ultra2 SCSI RAID adapter. Mylex AcceleRAID 150 supports Windows NT 4.0 Workstation.

The Mylex AcceleRAID 150 Array Controller has important management features, such as:

- RAID expansion – allows users to add drives to existing arrays and re-stripe data across all the drives
- BIOS configuration utility – enables automatic configuration of the system, independent of the operating system and without requiring the use of extra software utilities

Another critical management tool is GAM™ (Global Array Manager), which enables the RAID system to be configured, maintained and monitored. GAM will be a feature available 2Q99.

AcceleRAID 150 offers many of the same fault detection and fault tolerance features typical of expensive high-end RAID controllers. These features include:

- Parity cache memory
- Automatic detection of failed drives
- Automatic and transparent rebuild of failed drives with hot spare
- On-line RAID capacity expansion
- Hot spare drive support
- RAID configuration stored on both disk and in non-volatile RAM
- SMART capable drive support and SAF-TE enclosure management

Customer Benefits

- **Industry standard PCI for low cost RAID.** Compaq Professional Workstations support industry standard PCI for low cost RAID while other vendors have opted to use proprietary PCI derivatives, such as RAIDport.
- **Ease of set up, flexibility and management.** The immediate RAID availability feature enables the array to be used as soon as it is configured. Many other RAID controllers require administrators to wait up to several hours as the initialization tasks are completed.

- **Fault tolerance features.** Features such as automatic detection of failed drives and automatic and transparent re-build of replacement drives provide high security for your important data.

7200 rpm Ultra ATA Hard Drives **NEW!**

- Available on Compaq Professional Workstation AP200, AP400 and AP500 as standard configuration, option or flexible configuration (flexible configuration available in North America only)

Compaq Professional Workstation AP200, AP400 and AP500 now offer 7200 rpm Ultra ATA hard drives in addition to 5400 rpm hard drives. This faster rotation speed lowers seek time and increases transfer rates. This eliminates or minimizes the disk subsystem as a performance bottleneck.

Ultra ATA is a definition for an ATA data transfer protocol. The Ultra ATA protocol is included in the ATA-4 specification, an industry-wide specification designed to provide firm guidelines to hardware developers and manufacturers. The development of the transfer protocol "Ultra ATA" hard drives (also known as UDMA, UATA, Ultra DMA, Ultra DMA-33) has increased the burst data transfer rate to 33.3 MB/s, effectively doubling the transfer rate versus Fast ATA. Due to faster transfer rates, Ultra ATA technology processes data twice as fast.

Customer Benefits

- **Faster rotation speed.** 7200 rpm UATA hard drives provide increased performance over 5400 rpm UATA hard drives
- **Doubles the data transfer rate.** Provides improvement over Fast ATA speed of 16.6 MB per second to 33.3 MB per second.
- **Fully backward compatible.** Uses the same electrical connection as Fast ATA and can run in standard EIDE mode with old ATA chipsets. Ultra ATA devices can also operate on an ATA bus with non-Ultra ATA devices.

100-MB ATAPI ZIP Drive **NEW!**

- Available on Compaq Professional Workstation AP200, AP400 and AP500 as an option or flexible configuration (flexible configuration available in North America only)

The 100-MB ATAPI ZIP Drive is a removeable storage device that utilizes 100-MB ZIP disks to store data. The ATAPI ZIP connects internally through an IDE/ATAPI interface. ZIP disks are slightly larger than conventional floppy disks, and about twice as thick. They can hold 100 MB of data. The drive fits into 5.25" standard bays. The 100-MB ATAPI ZIP Drive provides flexibility because it allows employees to share their work and move files between home and office.

Customer Benefits

- **Improved value.** The ATAPI ZIP Drive adds life to your system by adding 100-MB capacity with each ZIP disk
- **Increased flexibility and convenience.** Users can share files by transporting information on ZIP disks and can move large data files between home and office, a key benefit as typical file sizes have rapidly outgrown the capacity of standard 1.44-MB diskettes.

6X DVD-ROM with MPEG-2 Decoder **NEW!**

- *Available on Compaq Professional Workstation AP200 and AP400 as an option or flexible configuration (flexible configuration available in North America only)*

The Compaq Professional Workstation Affordable Performance Line also offers a 6X DVD-ROM drive with MPEG-2 decoder. DVD-ROM stands for Digital Versatile Disc Read Only Memory. Like CD-ROM discs, DVD-ROM discs are intended for computer use. However, CD-ROMs have a limited capacity of 650 MB while DVD-ROM can store up to 4.7 GB of information. DVD-ROMs are backward compatible with standard CD-ROMs and CD audio discs.

Compaq includes a software-based MPEG-2 decoder with the DVD-ROM drive. MPEG stands for Moving Picture Experts Group. The term refers to the family of digital video compression standards and file formats by the group. MPEG generally produces better quality video than competing formats. MPEG achieves a high compression rate by storing only the changes from one frame to another, instead of storing each frame in its entirety.

Our DVD-ROM drive features the MPEG-2 standard, which offers resolutions of 720x480 and 1280x720 at 60 fps (frames per second) with full CD-quality audio. Any DVD-ROM title that contains MPEG-2 video sequences, or a DVD-Video movie, requires an MPEG-2 decoder to decompress the video stream and pass data to the VGA display controller in order to be viewed on the monitor.

Customer Benefits

- **High quality audio and video playback.** DVD-ROM provides better video and audio playback than a standard CD-ROM.
- **Higher capacity information storage.** DVD-ROM has a capacity of 4.7 GB of information compared to 650 MB of capacity on a CD-ROM.
- **Backward compatibility with CD-ROM.** There is no need to worry about your existing CD-ROMs; DVD-ROM drives can play CD-ROMs or audio CDs.

System Architecture

Intel 440BX AGPset

The Affordable Performance Line will continue to use the Intel 440BX AGPset. The Intel 440BX AGPset was designed as a follow on to the 440LX, which replaced the previous generation of 440FX chipsets used with Pentium Pro and early Pentium II processors. Chipsets include technologies that allow processors, memory, I/O, graphics, and other devices to communicate and work together in a computer.

The 440LX was Intel's first chipset designed specifically for more advanced Pentium II systems, providing built-in support for SDRAM, Ultra ATA hard drives, and Accelerated Graphics Port (AGP) technology. The Intel 440BX AGPset supports these features as well as a 100-MHz FSB. As mentioned earlier, the benefits of the 100-MHz FSB are greater processor-to-memory bandwidth and faster performance. The 440BX supports the 100-MHz FSB, an upgraded infrastructure designed to support clock speeds of 350 MHz and above in the more advanced Pentium II and Pentium III processors. This additional 100-MHz FSB support is the key difference between the BX and the LX chipsets.

Customer Benefits

- **Performance.** Support for up to 1 GB of SDRAM for memory-intensive applications and data files. This increases system performance.
- **Speed.** Clock speeds of 350 MHz and above are possible with support for the 100-MHz Front Side Bus.
- **Support for better, faster graphics.** Brings built-in support for Accelerated Graphics Port (AGP) technology.
- **ACPI-ready.** ACPI defines a hardware interface that allows a standard way to integrate power management features throughout the workstation system. The workstation ships standard with ACPI-ready hardware. You will be able to utilize ACPI features once future ACPI-enabled Microsoft operating systems become available.

Accelerated Graphics Port (AGP)

The Affordable Performance Line will continue to offer AGP as a standard feature. Today's three-dimensional graphics applications consume large amounts of memory bandwidth. Consequently, the proliferation of 3D applications is increasing the need for high-speed access to larger amounts of graphics memory. AGP is an industry standard solution to improve the bandwidth between the graphics accelerator and the system memory so that a portion of the 3D rendering data structures can be shifted into main memory. The higher bandwidth of AGP (compared to PCI) also improves sharing rendering tasks between the system processor and the graphics accelerator.

AGP improves system performance by establishing pipeline access to the system's main memory and effectively reducing latency. AGP also transfers data up to four times faster than PCI, utilizing the bandwidth of the 100-MHz system memory bus more efficiently. The maximum data transfer rate of AGP is 533 MB/s, compared to 133 MB/s for PCI.

Customer Benefits

Some specific applications that can benefit from AGP include:

- Video applications, like conferencing or DVD playback, where a steady stream of images must be sent from system memory to the graphics frame-buffer for display.
- Graphics command lists, such as lengthy data sets defining vertices for 3D objects.
- Texture memory for 3D rendering, where textures are overlaid on 3D objects for realistic effects. To improve realism, texture sizes will grow to 32 MB and beyond in 1999.

NOTE: 3D texture data is the most immediate and important target opportunity for AGP. By shifting texture data to system memory, bandwidth load and memory size can be balanced between system and local graphics frame-buffer memory. The bandwidth and space required for textures are split between the heavily loaded frame-buffer and the (comparatively) lightly loaded system memory. Since texture data is not persistent (unlike display buffers), system memory used for texture data is returned to the free memory heap when a 3D application concludes.

To gain the full benefit of AGP performance, the system must have the following features:

- Pentium II or Pentium III class microprocessors
- AGP Sideband and Pipeline functions in the core logic, which improve data transfer efficiency
- 100-MHz system memory architecture to meet system processor and AGP bandwidth demands
- Microsoft Windows® 95 OSR2.1, Windows 98, or Windows 2000 Professional operating systems to provide necessary memory management services

NOTE: Windows NT 4.0 can operate AGP subsystems as PCI 66MHz-type devices only.

AGP promises to enable photo-realistic 3D rendering and other high-performance 3D graphics capabilities. The cutting edge graphics performance of AGP will benefit 3D content providers by enabling a much wider market for their products.

Graphics

Choice of High-Performance Graphics Solutions

The Compaq Professional Workstation Affordable Performance Line offers a wide variety of powerful graphics solutions for applications demanding fast 2D and 3D performance. All graphics controllers are optimized for Windows NT users who demand fast 24-bit color processing (up to 16.7 million colors) and very high resolution. Compaq has worked closely with the manufacturers to fully test and integrate the graphics controllers into our environment.

- The **ELSA GLoria Synergy+ Graphics Controller** provides new levels of price/performance for a broad range of 2D and 3D graphics. The newest models in the Affordable Performance Line include 8 MB of SGRAM on the graphics controller; previous models included 4 MB of SGRAM.
- The **Matrox Millennium G200 Graphics Controller** provides fast 2D performance for applications, such as software development, electronic design automation (EDA), financial planning, and digital editing and compositing.
- NEW!** • The new **Matrox Productiva G100 Quad Multi-Monitor Series (MMS) Graphics Controller** is a 64-bit PCI video card that supports up to 4 displays in a single PCI slot. The graphics controller supports up to 16 MB of powerful graphics memory (4 MB per port) and true-color visuals up to 1280x1024 are also supported. The Matrox G100 Quad Multi-Monitor Series Graphics Controller provides fast 2D performance for multi-display environments.
- The **Compaq PowerStorm 300 Graphics Controller** provides a competitive mid-range 3D solution for CAD and DCC applications. Target applications are: High-end 2D/3D animation (3D StudioMAX, Softimage, Maya) and CAD/CAE applications (Pro/E, UG, CATIA, I-DEAS, Hypermesh, Uclid, etc.)

The following table lists the features of each graphics controller:

Feature	Matrox Millennium G200	Matrox Productiva G100 Quad MMS	ELSA GLoria Synergy+	Compaq PowerStorm 300
Graphics technology	Matrox MGA-G200	Matrox MGA-G100 (4)	3Dlabs Permedia-2A	Evans & Sutherland REALimage 2100
Display memory (Frame buffer)	8-16 MB SGRAM	4 MB per display	8 MB SGRAM	15 MB 3D-RAM (Frame- & Z-buffer)
Local memory (Z-buffer/texture)	N/A	N/A	N/A	16 MB CDRAM (Texture)
Resolution/ Refresh Rate	800x600x16.7M 1920x1200x256	800x600x16.7M 1600x1200x256	800x600x16.7M 1600x1200x256	1280x1024x16.7M*
Bus connection	AGP	PCI	AGP	AGP
Special features	Hardware MPEG	Supports up to 4 displays on a single controller	HDTV support	32-bit Z-buffers, Gouraud shading, stencils, accelerated hardware texture mapping

* In 3D mode with double-buffering active

Compaq Graphics Driver Compatibility

All controllers are high-performance graphics solutions, optimized for Microsoft Windows NT applications that require up to 16.7 million color processing and high resolutions. The drivers for each are developed by their respective manufacturers and have been thoroughly tested by Compaq to ensure compatibility with existing applications.

Matrox Millennium G200 Graphics Controller (AGP)

The Matrox Millennium G200 AGP Graphics Controller offered by Compaq is an integrated 2D-video accelerator that provides leadership 2D performance, high-resolution support, and multi-display capabilities when combined with Matrox Millennium G200 PCI controllers. Both the AGP and PCI Matrox Millennium G200 graphics controllers are high-performance accelerators that will increase productivity in 2D environments including financial trading, electronic design automation, entry CAD, and web page development.

Compaq continues to excel in performance with key features that include high-performance video controllers with full AGP 2X support (AGP version), 8 MB of graphics memory upgradable to 16 MB, and leadership 2D Winbench 98 performance. In addition, the Matrox Millennium G200 controllers offer a new MGA-G200 128-bit Dual Bus graphics chip and provide a high-speed 250 MHz RAMDAC.

The Matrox Millennium G200s offered by Compaq are high-quality graphics controllers for business users and professional 2D designers. It delivers outstanding performance in all 2D, 3D, and software DVD video acceleration; and a high quality 3D rendering engine for Direct3D based applications. The G200 does not currently support OpenGL.

Multi-display functionality is also available as the AGP-based Matrox Millennium G200 controller can be combined with up to three Matrox Millennium G200 PCI controllers increasing view area while minimizing use of desktop real estate.

Support for 16 MB of memory and a new Vibrant Color Quality feature ensures superior image quality and rendering precision for web-site development, electronic design automation, and much more.

The Matrox Millennium G200 controllers run applications in 16.7 million photo-realistic colors. They also support true 24-bit color at resolutions up to 1920 x 1200, bringing photo-realism to documents with incredible detail, and are capable of supporting 24-inch monitors.

Color and Resolution Support

Maximum Color Depth Single-Buffer Mode		
Resolution	8-MB SGRAM	Maximum Refresh Rate
1800 x 1440	65K (16.7M)	70 Hz (60 Hz)
1920 x 1200	16.7M	65 Hz
1920 x 1080	16.7M	70 Hz
1600 x 1200	16.7M	75 Hz
1280 x 1024	16.7M	100 Hz
1152 x 864	16.7M	120 Hz
1024 x 768	16.7M	140 Hz
800 x 600	16.7M	180 Hz
640 x 480	16.7M	200 Hz

Features and Technical Specifications

Features	Technical Specifications
Controller	Matrox MGA – G200
Bus Type	AGP (ATX and NLX) PCI
RAMDAC	Integrated 250 MHz
Memory Type	SGRAM/SDRAM
Memory Amount	8 MB standard (8-MB optional upgrade)
Memory Speed	132 MHz
Data Path	128-bit
Controller Clock Speed	66 MHz
Max Vertical Refresh Rate	200 Hz
Max Horizontal Scan Rate	113.55 kHz
Max Pixel Clock	250 MHz
Video	PS/2 Standard

Matrox Productiva G100 Quad Multi-Monitor Series (MMS) Graphics Controller

The Matrox Productiva G100 Quad Multi-Monitor Series (MMS) Graphics Controller is a single PCI slot, four-port, solution that has the ability to support up to four displays (one per port). The Matrox Productiva G100 Quad MMS Graphics Controller is the perfect 2D solution for financial traders, financial analysts, and for engineers who require greater display “real estate” without sacrificing multiple slots.

Compaq continues to offer key 2D graphics solutions for multi-display environments. Each Matrox Productiva G100 Quad MMS Graphics Controller supports 4 MB of SGRAM per port, for a total of 16 MB per controller and four MGA-G100 processors. In addition, a robust 230 MHz RAMDAC enables 24-bit, true color support at resolutions as high as 1280x1024 per channel. Excellent performance and minimal cost per display are also key attributes offered by the Matrox Productiva G100 Quad MMS solution.

The Matrox Productiva G100 Quad MMS Graphics Controller offered by Compaq is a high-performance 2D graphics controller targeted for financial traders, financial analysts, and engineers who require more viewing space. It delivers excellent 2D performance and high quality 3D rendering for Direct3D based applications. The Productiva G100 Quad MMS does not currently support OpenGL.

The multi-display functionality available with the Matrox Productiva G100 Quad MMS solution provides support for up to four displays with one, single slot, PCI card minimizing cost without sacrificing performance. A second Matrox Productiva G100 MMS Quad Graphics Controller can be added to support up to 5-8 displays (supported beginning with SmartStart V4.2).

Other features include the ability to run applications in 16.7 million true-color visuals at resolutions up to 1280 x1024 and software offering special window and desktop management functionality.

Color and Resolution Support

Resolution	Maximum Colors	Maximum Refresh Rate
1600 x 1200	65K	75 Hz
1280 x 1024	16.7M	100 Hz
1152 x 864	16.7M	120 Hz
1024 x 768	16.7M	140 Hz
800 x 600	16.7M	180 Hz
640 x 480	16.7M	180 Hz

Features and Technical Specifications

Features	Technical Specifications
Horizontal Frequency	31-113 kHz
Vertical Frequency	60-200 Hz
Video	PS/2 Standard
Default	VGA Mode 3 (80 characters, 25 lines)
Controller	Matrox MGA-G100
Bus Type	PCI
RAMDAC	Integrated 230 MHz
Memory Type	SGRAM
Memory Amount	4 MB per port for total of 16 MB (143 MHz)
Maximum Memory	16 MB
Memory Speed	125 MHz
Data Path	64 bit
Controller Clock Speed	66 MHz
Maximum Vertical Refresh Rate	200 Hz
Maximum Horizontal Scan Rate	113.55 kHz
Maximum Pixel Clock	230 MHz
Operating System Support	Windows NT 4.0, 3.51 Windows 95, 98.

ELSA GLoria Synergy+ (AGP) Graphics Controller

The ELSA GLoria Synergy+ (AGP) graphics controller in the Compaq Professional Workstation Affordable Performance Line is a low-cost, high-performance leader in the 2D/entry-3D segment. Users requiring fast windowing and menu level performance, as well as robust 3D rendering capabilities, can take advantage of 2D/3D graphics capabilities. Requirements for the 2D/3D graphics segment include exceptional 2D/3D-vector performance, 3D shading and lighting, and texture mapping support. These features, used by mainstream OpenGL- and Heidi-based applications, typically offer great price and performance without sacrificing required functionality. This combination is important for mainstream CAD applications, such as AutoCAD, MicroStation, and SolidWorks, which have recently integrated 3D techniques into their environment. It is also useful in DCC where 2D and 3D animation applications are used in the same environment. Financial analysis and trading environments can benefit from the 2D performance provided by these solutions.

The ELSA GLoria Synergy+ (AGP) graphics controller is based on the Permedia-2A graphics engine from 3Dlabs. It provides the 2D performance of a Matrox Millennium II while adding a robust 3D environment that rivals the performance of previous GLINT Delta/TX controllers, such as the GLoria-L. The GLoria Synergy+ is the perfect low-cost solution for mainstream CAD, web authoring, pre-print, and 2D/3D animation applications that do not require greater than 1024x768 resolution for true-color rendering. The GLoria Synergy+, as an AGP device, can also take advantage of main memory for texture mapping operations. This is a feature that will be supported in Windows 2000 Professional from Microsoft.

Color and Resolution Support

Maximum Color Depth Single-Buffer Mode		
Resolution	8-MB SGRAM	Maximum Refresh Rate
1920 x 1200	32,768	75 Hz
1920 x 1080	32,768	80 Hz
1600 x 1280	32,768	75/85 Hz
1600 x 1200	32,768	85 Hz
1600 x 1000	32,768	100 Hz
1536 x 1152	32,768	85 Hz
1280 x 1024	16.7 million*	100/80 Hz
1152 x 864	16.7 million	100 Hz
1024 x 768	16.7 million	100 Hz
800 x 600	16.7 million	100 Hz
640 x 480	16.7 million	100 Hz

* 1280 x 1024 can run in a double-buffered visual if it is reduced to 32,768 colors.

Features and Technical Specifications

The following features are included in the ELSA GLoria Synergy+ (AGP) Graphics Controller:

- Provides 2D windowing performance equivalent to the Matrox Millennium II
- A low-cost solution for professional 3D applications, such as AutoCAD, MicroStation, SolidWorks, and 3D StudioMAX
- Supports a wide range of resolutions and color depths for flexibility and performance in a variety of 3D graphics environments
- Supports up to 4 displays using additional GLoria Synergy (PCI) controllers
- Uses 3Dlabs Permedia-2A processor for highly integrated 2D and robust 3D rendering requirements
- Comes standard with 4 MB or 8MB of SGRAM (depending on model)
- Supports up to 1920x1200 resolution at 16 bpp (requires 8-MB)
- Provides a 16-bit double buffered environment at 1024x768 resolution (16-bit/single buffer at 1280x1024 including a 16-bit Z-buffer)
- Optimized graphics drivers for OpenGL and Heidi under Windows NT 4.0 and 3.51, display list drivers for AutoCAD, and Direct3D driver for Windows 95

Features	Technical Specifications
Controller	3Dlabs Permedia-2A
Bus Type	AGP
RAMDAC	Integrated 250 MHz
Memory Type	SGRAM
Memory Amount	8 MB standard (depends on model)
Memory Speed	8 ns
Data Path	64-bit
Controller Clock Speed	90 MHz
Maximum Vertical Refresh Rate	219 Hz
Maximum Horizontal Scan Rate	281 kHz
Maximum Pixel Clock	250 MHz at 8 bpp and 16 bpp/5:5:5 145 MHz at 32 bpp/8:8:8
Video Features: Interface	VGA

Features	Technical Specifications
3D Graphics Features: <ul style="list-style-type: none"> • Integrated geometry pipeline setup processor • True-color 3D graphics • Polygon based with Z-buffer • Texture decompression • Full scene anti-aliasing • Enhanced GUI Acceleration: <ul style="list-style-type: none"> • Ultra-fast BLT engine and 2D rasterizer • Stretch BLTs, monochrome/color expansion and logic ops • Fast on-chip SVGA • Autodesk Display list driver • Heidi drivers support for 3D Studio MAX 	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes
Operating Systems	Windows 95, Windows 98 Windows NT 3.51/4.0

Compaq PowerStorm 300 (AGP) Graphics Controller

Standard on certain models of the Compaq Professional Workstation Affordable Performance Line is the Compaq PowerStorm 300 (AGP) graphics controller. The Compaq PowerStorm 300 provides a high-performance, mid-range, 3-dimensional graphics solution at a very competitive price.

Professionals that use more visually-demanding workstation applications require the performance of mid-range 3D graphics solutions. CAD and CAE applications, such as Pro/E and Unigraphics, take advantage of this graphics controller to provide a high-performance rendering solution for solids modeling and visual data analysis. The PowerStorm 300 also provides superior performance and visual quality for DCC applications, such as 3D StudioMAX. System performance is key for these applications where the graphics controller must not be perceived as a bottleneck.

The PowerStorm 300 is an optimized, high-performance solution for mid-range 3D graphics requirements in these segments. Based on the next-generation REALimage 2100 architecture from Evans & Sutherland, it provides the fastest 3D-application performance in its class. The PowerStorm 300 is the graphics controller to use when up against other non-geometry accelerated solutions, such as the Intergraph 3400T (VX113T).

Color and Resolution Support

Maximum Color Depth Single-Buffer Mode			
Resolution	3D Acceleration with Double Buffering, Colors Supported	Texture Memory	Maximum Refresh Rate
800 x 600	16.7 million	16 MB	72 Hz
1024 x 768	16.7 million	16 MB	85 Hz
1280 x 1024	16.7 million	16 MB	85 Hz

Features and Technical Specifications

The following features are included in the Compaq PowerStorm 300:

- Optimized solution at 1280 x 1024, true-color double buffered for demanding solids modeling, animation, and visualization applications
- Next-generation high-performance rendering engine based on the Evans & Sutherland REALimage 2100 architecture
- 15-MB 3D-RAM for frame buffer and Z-buffer, 16-MB CDRAM (cache DRAM) for fast texture buffering
- Dual display support using an additional PCI controller

Features	Technical Specifications
Controller	Evans & Sutherland REALimage 2100
Bus Type	AGP
RAMDAC	IBM 640
Memory Type	3D RAM and CDRAM
Memory Amount	15-MB 3D RAM, 16-MB CDRAM
Memory Speed	10-ns 3D RAM, 15-ns CDRAM
Data Path	64-bit
Controller Clock Speed	100 MHz
Maximum Vertical Refresh Rate	120 Hz
Maximum Pixel Clock	220 MHz

Features	Technical Specifications
Hardware Accelerated 3D: <ul style="list-style-type: none"> • 24-bit Z-buffering • Gouraud Shading • Stencils • Texture Mapping (bilinear and trilinear) 	Yes Yes Yes Yes
Performance: <ul style="list-style-type: none"> • Random 10-Pixel Solid Lines • Filled 25-Pixel Triangles 	4 million/s 4 million/s
Pixel Fill Rates: <ul style="list-style-type: none"> • Bilinear • Trilinear 	90 million/s 45 million/s
Operating System	Windows NT 4.0

For a complete overview of Compaq monitors, please refer to the monitor area on Compaq's web site: <http://www.compaq.com/products/monitors>

Network Interface Controller (NIC) and Wake-on-LAN Support

NEW!

A new 3-pin header has been added to the Compaq Professional Workstation AP400 and AP500 system board. The 3-pin header provides Wake-on-LAN (WOL) support for third party network controllers in the Compaq Professional Workstation AP400 and AP500. This new feature provides added flexibility to AP400 and AP500 users.

The Compaq Professional Workstation AP400 and AP500 continues to include a Compaq NC3161 Fast Ethernet NIC Embedded (10/100 Mbps) standard. The product's Wake-on-LAN (WOL) feature enables remote system power-up and maintenance during non-working hours, making it easy to perform routine updates, audits, and other management operations without interrupting end users. The Compaq Professional Workstation AP200 provides similar functionality with the Compaq NC3121 Fast Ethernet NIC PCI (10/100 Mbps) card, which is delivered as a standard feature.

Workstation Software Platform

Interoperability

Customers who have already made the move to Windows NT, or are planning to, can be assured that Compaq's Interoperability Program provides seamless integration with applications and information on existing networks. Compaq has partnered with the best integration ISVs in the industry to deliver a broad range of high-performance interoperability solutions for Windows NT, UNIX, and Macintosh. Compaq and its partners perform joint testing to ensure ease and compatibility for a wide variety of operations, such as application access, resource access and sharing, distributed application execution, systems administration, porting and migration, internetworking, and mail. Once the right set of tools have been selected from Compaq's Interoperability ISVs, the ability to access networked information from the Windows NT desktop includes the following application examples: UNIX applications, UNIX OpenGL 3D applications, IBM applications, and files resident on UNIX network File System (NFS). The Compaq Interoperability Program provides the right set of solutions for a heterogeneous enterprise environment.

Unattended Network Installation Toolkit (UNIT)

Compaq provides an open, customizable, free toolkit called UNIT that allows customers to distribute unique software solutions across hundreds of systems in as little as an hour. UNIT simplifies and automates deployment of applications, drivers, upgrades, etc., over the network to help save time and money for customers and resellers. Designed to work with Compaq Software Support CD, which comes standard with all Compaq Professional Workstations, UNIT is available for free download from the Compaq Web site at <http://www.compaq.com/products/workstations/software-platform/unattend.html>.

Intelligent Manageability

Intelligent Manageability is Compaq's industry-leading, award-winning client management solution that helps lower the total cost of ownership by making personal computers more manageable from a single point on the network. It is available on all commercial products from Compaq including desktops, portables, and workstations. Intelligent Manageability supports a variety of the leading third-party management solutions, such as Unicenter TNG, HP OpenView, Microsoft SMS, Intel LANdesk Management Suite, Novell ManageWise, and BMC Patrol.

Initial Configuration and Deployment Features

- Remote ROM Flash - secure, fail-safe flashing of ROMs over the network
- Remote Wakeup and Shutdown- allows a system administrator to power on/power off a computer from a remote location; enables distribution of software or management of inventories at any time
- SmartStart CD - allows you to restore the factory image in the event the original configuration becomes damaged, or in the event of a hard drive failure
- Wired for Management - Intel-led industry initiative to make Intel architecture-based systems universally manageable and universally managed; includes asset management, network boot, power management

Fault Notification and Recovery Features

- ECC Memory - check and corrects 1 bit errors, detects and reports 2 bit errors
- Pre-failure Warranty - alerts user before component fails; covers processors, hard drives and memory
- SMART hard drives - (Self Monitoring Analysis and Reporting Technology) drives constantly monitor their activity and predict failures before they occur
- Thermal Sensor - monitors temperature within the chassis
- Surge Tolerant Power Supply - withstands power surges up to 2000V

Asset Tracking and Security Features

- AssetControl - provides the capability to track items such as: serial number, model, manufacturer for system, hard drives and monitors; ROM versions
- Remote Security Management - allows the ability to control security settings over the network
- DMI 2.0 compliant - industry standard for managing computer components, when used with DMI complaint management apps, components can be managed over the network

Software Updating and Management Features

- Support Software CD - contains latest drivers, flashable ROM images, and utilities
- Website updates - easy access to latest drivers and ROMPAQs