Sun Ultra™ 10 Workstation

Just the Facts

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Positioning

Figure 1. The Sun Ultra™ 10 workstation

The Sun Ultra™ 10 workstation is based upon the UltraSPARC™-IIi processor running at 440 MHz. The Ultra 10 workstation features PCI I/O, Sun's Ultra port architecture (UPA), a high-speed graphics interconnect slot, and a mini-tower enclosure, which allows for additional PCI card expansion, memory expansion, and Sun™ Creator3D and Sun Elite3D graphics accelerators.

The Ultra 10 workstation allows Sun to compete on both price and performance with Pentium-III and Xeon-class PC personal workstations. When combined with the optional UPA graphics cards, the Ultra 10 workstation offers powerful computing and excellent graphics performance at aggressive prices.

The Ultra 10 workstation includes the following features:

- **Processor**
  - 440-MHz UltraSPARC-IIi
  - 2-MB external cache
- **Graphics**
  - Onboard PGX24™ 24-bit graphics, standard
  - Sun Creator3D graphics
  - Sun Elite3D m6 graphics
- **Internal storage**
  - Up to two 20-GB, 7200-rpm EIDE hard disks
  - 48X-speed CD-ROM drive standard
  - 1.44-MB floppy standard
- **Memory**
  - Up to 1-GB EDO error correcting DRAM (50 ns)
- **Networking**
  - 10/100BASE-T Ethernet

Key Messages

- **High performance for an entry price-point workstation**

  – 440-MHz UltraSPARC-IIi processor with 2-MB external cache

  – Up to 1 GB of 168-pin, 50-ns EDO JEDEC DRAM with ECC error correction

  – Provides both performance and capacity for the most demanding technical applications and solutions

- **Powerful graphics for interactive media and 3-D applications**

  – UPA slot provides a fast, large-bandwidth data path from processor to UPA graphics cards

  – Integrated visual instruction set (VIS™) in the UltraSPARC-IIi processor provides support for multimedia applications

  – Advanced, fast 24-bit accelerated Sun Creator3D and Sun Elite3D m6 UPA graphics cards available

  – On-board PGX24 graphics provides 24-bit video support up to a resolution of 1152 x 900 and 8-bit support up to a resolution of 1280 x 1024. PGX24 graphics can also be used to support a second monitor on systems configured with Sun Creator3D or Sun Elite3D m6 graphics accelerators.

  – Sun Creator3D graphics supports 24-bit color up to 1920 x 1200 resolution at 70 Hz on the 24-inch, wide-screen monitor

- **Multiple PCI options available**

  – Four full-size PCI slots provide access to a variety of Sun and third-party PCI cards

  – High-speed networking, such as Sun Quad FastEthernet™, ATM, token ring, and FDDI, plus many more, are ready and available

  – Additional graphics cards, SCSI expansion cards, and audio/video input cards are also available

  – The ability to expand and change is key to today's technical professional, and the availability of PCI options meets this need today and in the future

- **Easy internal storage and expansion**

  – Up to two internal 20-GB, 7200-rpm EIDE hard disks

  – Internal mirroring supported on systems with two internal EIDE hard disks

  – Internal 48X-speed EIDE CD-ROM, photo-CD compatible

  – PCMCIA bay provided for third-party PCMCIA options

  – Ample local storage capacity for large multimedia files, data, and technical applications

- **Advanced networking capabilities**

  – Fast Ethernet, 100BASE-T, auto-sensing, and autoswitching down to 10BASE-T for backward compatibility

  – Simply plug in and turn on; the Ultra 10 workstation automatically adjusts to the customer's network environment

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- **Robust, reliable, scalable, secure, network-centric Solaris™ Operating Environment**

  – The 64-bit, ready-to-run Solaris 7 and 8 Operating Environments are preinstalled on all Ultra 10 workstations

  – The Solaris Operating Environment is one of the technical industry's leading enterprise operating environments with over 12,000 applications to choose from

  – Scalable from the lowest priced Ultra workstation (the Ultra 5 workstation) to the most powerful Sun server (the Sun Enterprise™ 10000 server), the Solaris Operating Environment provides the ability to scale both up and down as a customer's business needs change

  – The Solaris Desktop Extensions administration tools provide simple setup, use, and management, facilitating more reliable installations and simpler system maintenance

- **World-class Sun Enterprise Services offers the SunClient℠ program, an inexpensive, customizable service and support plan**

  – Allows customers to save costs by choosing only the services needed

  – Easy administration reduces administrative workload and costs

  – Another example of Sun's commitment to reducing the costs and overhead of technical computing for customers

Product Family Placement

Sun's desktop product family scales from the lowest entry-priced workstation up to the multiprocessing Sun Ultra 80 and Sun Blade™ 1000 workstations.

System	Description
Ultra 5	The Ultra 5 workstation is designed to meet the needs of price-sensitive and volume-purchase customers that require Solaris 7 or earlier OS support, the Ultra 5 workstation is a long standing member of Sun's entry-level offering in the personal workstation market. Target markets include software development, 2-D content creation, finance, EDA, telecommunications, and embedded systems.
Sun Blade 100	For a price comparable to a Wintel-based 32-bit PC branded workstation, customers can buy an entry-level, 64-bit UNIX® workstation with workstation-class features. These features are required for a powerful computer used for demanding scientific or engineering applications. The entry-level Sun Blade 100 workstation meets this definition by providing a 500-MHz UltraSPARC-IIe processor, up to 2-GB ECC error correcting SDRAM (PC133) memory, support for up to two 15-GB disk drives, and integrated I/O features on the motherboard, such as four USB ports, two IEEE 1394 (also called FireWire®) ports, and on-board, 24-bit, 2-D Sun PGX64 graphics.
Ultra 10	The Ultra 10 workstation is the entry point of Sun's high-performance graphics computing systems. The Ultra 10 workstation provides optional UPA-based graphics cards and greater PCI expansion, faster processing, and twice the memory capacity when compared to the Ultra 5 workstation. Target markets for this workstation include software development, MCAD, electronic design automation, financial analysis, and modeling. With the installation of Sun Elite3D m6 graphics, the applications are extended to include animation, 3-D content creation, and simulation

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System	Description
Ultra 60 and 80 Sun Blade 1000	The Ultra 60, Ultra 80, and Sun Blade 1000 workstations are designed for the technical user who requires high performance and multiprocessing capability in a Solaris Operating Environment. They also address the needs of graphics intensive users and continue to support and build upon the upgradability features to which Ultra workstation users have grown accustomed.
	The target customer is the traditional "power desktop" user who has performance and expansion requirements that exceed the capabilities of the Ultra 5 and Ultra 10 systems. This includes both technical and commercial users who need the large number of applications and the functional capabilities of the Solaris Operating Environment, the high-performance of the UltraSPARC CPU, dual-headed graphics, and excellent throughput

Sun Ultra 10 Workstation Configurations

The Sun Ultra 10 workstation is offered in a variety of workstation configurations based upon the DRAM and graphics accelerator options.

Processor speed	440 MHz
Cache size	2 MB
SPECint_95	17.9
SPECfp_95	22.7

The graphics options are:

- PGX24 24-bit graphics built into the motherboard with 4 MB of SGRAM
    - 24-bit support for up to 1152 x 900 resolution at 85 Hz
    - 8-bit support for up to 1280 x 1024 resolution at 76 Hz
- Sun™ PGX64 graphics with 24-bit-only true color video support up to 1920 x 1200
- Accelerated 24-bit, 2-D and 3-D Sun Creator3D graphics with single-buffer resolution support up to 1920 x 1200 dpi
- Accelerated high-performance 24-bit, 2-D and 3-D with Sun Elite3D m6 graphics

Target Users

The Ultra 10 workstation is ideal for customers who require a workstation with excellent graphics capabilities but do not need the added expansion and throughput capabilities of the Ultra 60, 80, or Sun Blade 1000 workstation. The Ultra 10 workstation spans the needs of the cost-conscious customers and those requiring more powerful and capable graphic options.

Target Markets

The market opportunities for the Sun Ultra 10 workstation are technical and commercial areas in which high-performance computing and advanced graphics capability are required.

Industry	Key Features to Highlight
Electronic Design (EDA) • Chip designers, board designers • System houses • Telco	• High-performance CPUs • High memory capacity • Availability of applications
Entertainment/DCC Industry • Animation and rendering • Displaying and viewing completed animations	• CPU performance • High-performance graphics
Financial • Stock and commodity traders • Banks	• High performance • Multimedia capabilities
Mechanical Design (MCAD/MCAE) • Automotive • Aerospace • Defense industry • Mechanical equipment designers	• High-performance CPUs • High-end graphics performance and functionality • Availability of applications
Publishing and Imaging • Newspapers • Magazines • Image banks • Advertising agencies	• High-performance CPUs • High-end performance and functionality for both graphics and imaging operations • Wide-screen 24-inch color monitors, 24-bit at 1920 x 1200 resolution (Sun Creator3D graphics only)
Research and Development • In-house development • Research institutions	• High computing performance • Feature-rich Solaris Operating Environment
Software and Java™ Development • ISVs • In-house development at large organizations	• High-performance Solaris Operating Environment • Availability of applications • Multithreaded application development

Availability

Ultra 10 workstation configurations are currently available.

Ultra 10 workstation configurations with Sun Elite3D m3 graphics are scheduled to transition per the following schedule:

• Last Order Date: May 22, 2001

• Last Ship Date: August 31, 2001

Compatibility

The 440-MHz Ultra 10 workstation runs the following Solaris Operating Environment versions:

- Solaris 8 (Hardware: 01/00 preinstalled)
- Solaris 7 Hardware: 3/99 or later (Hardware 11/99 preinstalled)
- Solaris 2.6 Hardware: 5/98 or later
- Solaris 2.5.1 Hardware: 11/97 or later

As a result, the Ultra 10 workstation can run 32-bit applications unmodified from the Solaris 2.3 and Solaris 2.4 Operating Environments, so these systems are totally compatible with previous systems and software.

Selling Highlights

Key Applications

Sun works closely with major software vendors in testing their applications and making them available and officially supported soon after all new releases. All major applications that are available can be found in the Sun Developer Connection℠ program catalog of third-party solutions.

Target Market	ISV	Software Applications
MCAD/MCAE	Computervision	CADDS 5, Medusa
	Dassault	Catia, Catia Studio
	EDS/Unigraphics	Unigraphics
	Parametric Technology Corp.	Pro Engineer, ProDesigner, TrueGrid
	SDRC	I-Deas Master Series
	Technomatix	ROBCAD
	Altair	Hypermesh
	Mechanical Dynamics	ADAMS
	Matra Datavision	Euclid-IS, Prelude
	Marc Analysis	MARC
	MacNeal-Schwendler	NASTRAN, PATRAN III, Conceptstation
	Ansys	Ansys
	Tripos Inc.	Unify
	Bentley Systems	Microstation
Earth Resources Oil and Gas GIS	Advanced Visual Systems	AVS Express, Toolmaster, AVS5
	Cognesis	VoxelGeo
	GeoQuest	GeoViz, Charisma
	Landmark Graphics	ProMax, Seisworks, Strata Model, Earth Cube
	Geovision	Vision
	Shell Oil	VolumeViewer
	ERDAS	ER Mapper, ERDAS Imagine
	ESRI	ArcView, ARCInfo
	Cognisies	
	Paradyme Geophysical	VoxelGeo

Target Market	ISV	Software Applications
Health Care	Cemax	VIP 2.0
	Context Vision	Imaging processing for refining MR data
	ISG	Silohet
	Virtual Vision Software	C-MED
	Visualization Technologies	
	Sensible Technologies	PHANToM (haptic peripheral device)
Digital Content Creation Entertainment/ Animation	Adobe	Photoshop
	NewTek	Lightwave 3-D
	Electric Image	Electric Image
	Lightwork	Kinetix (rendering tool kit)
	Nichimen	NWorld
	XaosTools	Pandemonium
	ArSciMed	Kinema/Sim
	Mental Images	Mental Ray
	SoftImage	SoftImage 3-D
	Radiance Software International	Ez3d VRML Author Pro
	Apunix Computer Services	Apunix Openscan
	Engineering Animation Inc.	VisProducts
	Pixar	Renderman
Visualization/ Simulation	Advanced Visual Systems	AVS Express, Toolmaster AVS5
	Engineering Animation Inc.	VisProducts, VisMockUp,VisFly
	Sense8	WorldUp, Sense8 World Tool Kit
	Autometrics	Edge and Soft Plotter
	Division	dVise, dVise Flythru
	ArSciMed	Kinema/Sim
	Parametric Technology Corp	ProFlythrough
	Facet	Facet
	Template Graphics	OpenInventor
	Muse Technology	MuSE
	IBM	IBM Visualization Data Explorer
	Sensible Technologies	PHANToM (haptic peripheral device)
	US Department of Defense	Battlefield Visualization
	Fluent	Fluent, Rampant, Nekton

Target Market	ISV	Software Applications
	Compuflow	Flotran
	Vital Images	Voxelmath
	Visual Numerics	PV Wave, Exponent Graphics
	Fluid Dynamics International	Fidep
	Woltham Research	Mathmatica
	SAS Institute	SAS
	Lockheed-Martin Federal Systems	Power Image
Molecular biology	MSI Biodesign	Piograf, NMRgraf
	Biosym Technology	Discover, Insight II
	Molecular Simulations	CHARM, Quanta
	Genasys II	Genemap, Genacell

Product Architecture
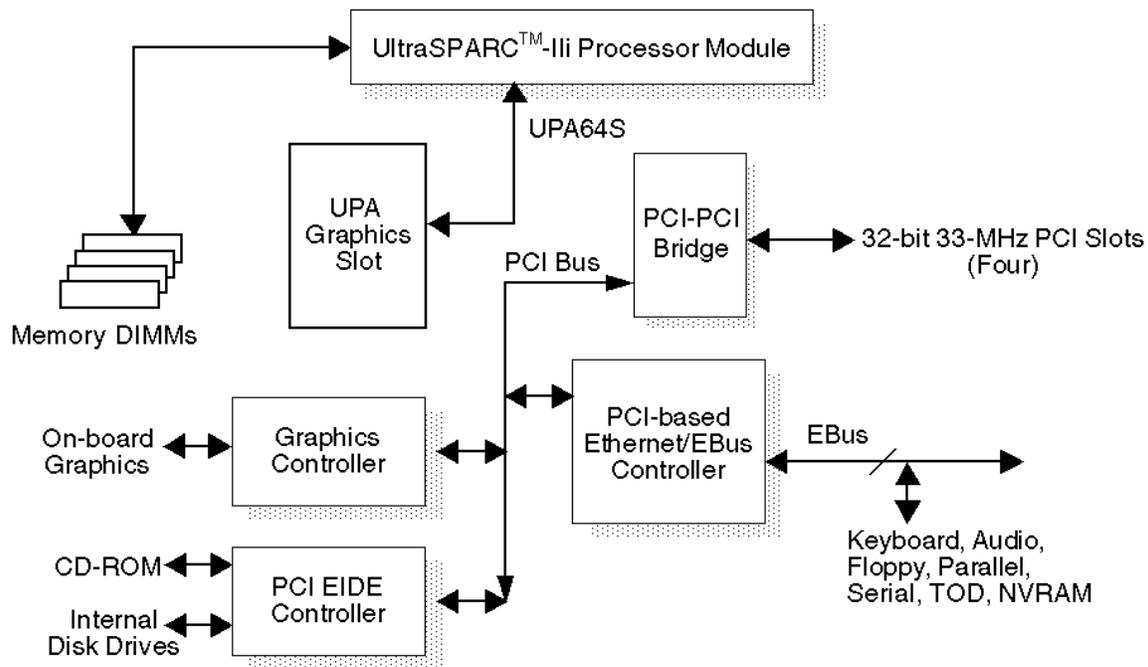
Figure 2. Sun Ultra™ 10 workstation block diagram

The Sun Ultra™ 10 workstation is designed to provide high performance, scalability, and flexibility at low cost. The use of high-volume components and application-specific integrated circuits (ASICs) has resulted in a greatly reduced part count, high reliability, and low cost without compromising access to a full complement of expansion options through high-performance, standardized interfaces.

On the Ultra 10 workstation, a single LPX-sized motherboard is used. Features integrated into or supported by the motherboard include:

• Modular processor card with 2 MB of external cache

• Four 168-pin EDO JEDEC DRAM DIMM sockets with ECC error correction (50-ns memory for Model 440)

• Riser-card connector to support four full-size, 32-bit, 33-MHz, 5-volt PCI slots

• UPA64s vertical connector for Sun™ Creator, Sun Creator3D, and Sun Elite3D graphics cards

• 10BASE-T/100BASE-T self-sensing Fast Ethernet

• Two 16.7-MB/second EIDE connectors for hard disk(s) and CD-ROM

- Two serial ports
  - Asynchronous/synchronous RS423A / RS232A (DB25 connector)
  - Asynchronous RS423A (DB9 connector)
- Centronics-compatible parallel-port interface, IEEE 1284 bidirectional (DB25 connector)
- Sun Type 6 keyboard and mouse support, compatible with Type 5
- CD-quality, EBus-based audio
- PGX24™ on-board graphics with 4-MB VRAM (DB15 connector)
  - 24-bit-only support for resolutions up to 1152 x 900 @ 85 Hz
  - 8-bit-only support for resolutions up to 1280 x 1024 @ 76 Hz
  - Supports 17-inch color, and 21-inch color monitors
- Time-of-day NVRAM for clock and ID functions

Refer to the *Ultra 5 and Ultra 10 Architecture* White Paper for more detailed information about the product architecture.

UltraSPARC™-IIi Processor

The Ultra 10 workstation is a high-performance system built around the UltraSPARC™-IIi microprocessor. The UltraSPARC-IIi processor is Sun's latest release of the SPARC™ processor family and the second generation of 64-bit UltraSPARC processors. It utilizes the latest 0.22-micron technology. This process technology is the key to the UltraSPARC-IIi processor's higher clock rates and increased performance. This process technology also enables the UltraSPARC-IIi processor to operate at a core voltage of 1.9 volts. This low voltage reduces power consumption and allows the chip to operate at higher frequencies without increasing total power requirements or heat dissipation—both major design issues in today's high performance systems.

The UltraSPARC-IIi processor supports both 2-D and 3-D graphics as well as image processing, video compression and decompression, and video effects through the sophisticated visual instruction set (VIS™ software). VIS provides high levels of multimedia performance, including real-time H.261 video compression and decompression and two streams of MPEG-2 decompression at full broadcast quality with no additional hardware support.

The UltraSPARC-IIi processor interfaces have been optimized to the "sweet spot" of typical uniprocessor system requirements. This provides a balanced price-performance solution delivering the power and features that the majority of high-end applications need, optimizing power utilization and supporting manufacturability and ease of use.

Features	Benefits
• Integrated VIS instruction set	• Ready for increased performance on multimedia and networking operations
• Uses the latest 0.22-micron process technology which greatly decreases the die size	• Results in a significant increase in performance and a decrease in power consumption (due to a low core voltage of 1.9 volts)
• CPU is mounted on a field-installable module card with associated UPA data buffers and external cache	• Facilitates easy system service and upgrades

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Memory

The Ultra 10 workstation supports up to 1 GB of 168-pin EDO JEDEC DRAM with ECC error correction. The four double in-line memory modules (DIMMs) used by the Ultra 10 workstation are the same as those used in the Ultra 5 workstation, but are not compatible with DRAM modules used in any other Sun Workstation™ system. The Ultra 10 workstation supports 32-, 64-, 128-, and 256-MB DIMM units.

Note: *The Ultra 10 Models 440 is factory configured with 50-ns DRAM. DRAM DIMMs must be installed in pairs of identical size. Adding DIMMs in a set of four identical-sized DIMMs results in the best memory-system performance for the Ultra 10 workstation.*

Features

- Lower-cost, industry-standard memory modules

- ECC memory

Benefits

- Less expensive, allowing customers to move up to higher levels of memory at lower cost

- Superior error correction and system reliability

Storage

- Internal data storage for the Ultra 10 workstation is provided by up to two internal 20-GB, 7200-rpm disk drives.

- The Ultra 10 workstation includes a CD-ROM bay for the standard internal 48X-speed EIDE CD-ROM drive.

- A 1.44-MB, 3.5-inch, manual-eject floppy drive is standard.

Features

- Up to two fast 20-GB, 7200-rpm, enhanced IDE internal disk drives

- Photo-CD compatible internal CD-ROM drive

Benefits

- Ample storage capacity for storing large files and applications locally

- Provides access to large multimedia and data files

The Ultra 10 workstation minitower enclosure features the following device bays:

- Two 1.6-inch, half-height, 5.25-inch, front-accessible bays (for CD-ROM and second hard drive)

- One 3.5-inch, internal hard-drive mount (for primary hard disk)

- One 3.5-inch, floppy-drive bay

- One PCMCIA-ready, front-access bay with flip-up access door

System I/O—High-performance PCI Technology

System I/O for the Ultra 10 workstation is provided by the industry-standard peripheral component interconnect (PCI) data bus. The PCI bus in the Ultra 10 workstation complies with the 2.1 revision of the PCI specification, released in March 1995. To provide maximum expandability, the Ultra 10 workstations feature four full-size 32-bit, 33 MHz, 5-volt PCI slots.

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Sun supports a variety of PCI-based adapter cards, including Ethernet, token ring, ATM, and FDDI networking cards, video and audio input, SCSI adapters, and high-speed serial and parallel interfaces. In addition, Sun is working with a host of third-party partners to develop PCI hardware and software that is certified for operation on Sun's entire line of workstations, including the Ultra 10 workstation.

Refer to the Ordering Information section of this document or the Sun Pricebook for a listing of PCI cards provided by Sun that have been qualified on the Ultra 10 workstation.

See `http://www.sun.com/io_technologies/pci/index.html` for a list of tested PCI cards.

SunPCi™ IIpro Coprocessor Card

The SunPCi™ IIpro coprocessor card is a cost-effective hardware and software product that provides PC compatibility to customers who wish to run PC applications on Sun workstations using Solaris™ Operating Environment software. The SunPCi IIpro card brings together the ease of use of Microsoft Windows programs and the powerful features of the Solaris Operating Environment, giving users access to powerful workstation technology without sacrificing access to Microsoft Windows applications.

The SunPCi IIpro card is integrated with the workstation in which it is installed. It uses the workstation's keyboard, mouse, floppy drive, and Ethernet port as if they were its own, and it uses files from the Solaris file system to emulate C:\ and D:\ drives. If the VGA port on the card is not used for a second display, the video from the SunPCi II card is routed to an X11 window on the workstation's monitor.

Other Solaris Operating Environment services are available to the SunPCi IIpro card. Any file system which is mounted on the hosting workstation, local or networked, including CD-ROMs, can be mapped to a network drive symbol on the PC. In addition, SunPCi IIpro coprocessor can access printers connected to a Solaris Operating Environment network.

Nearly any Solaris Operating Environment service for which there is a Microsoft Windows client can be used from the SunPCi IIpro card. The SunPCi IIpro card must be assigned its own IP address, and the SunPCi Solaris Operating Environment drivers select net traffic addressed to the card and pass it to the card. This is transparent to the SunPCi IIpro card.

Features and Benefits of the SunPCi IIpro Card

Features	Benefits
• Runs Microsoft Windows 2000 Professional Edition and Server, Windows NT 4.0 Terminal Server and Workstation, Window ME, and Windows 98 SE applications, whether off-the-shelf or developed in-house	• Full PC application compatibility • Multiple people can work on a single coprocessor card if running a server version of Windows
• Solaris Operating Environment/PC interoperability	• Integrates Ultra workstations into heterogeneous enterprise environments • Increases productivity by allowing access to technical and productivity applications via the same monitor, keyboard, and mouse • Allows sharing of files, data, and cut/copy/paste functions between Solaris Operating Environment and PC environments • Saves desktop real estate with all-in-one design • Helps reduce system management costs

Features	Benefits
• 733-MHz Celeron processor	• Provides power and performance to run demanding productivity and technical applications and get the job done in a hurry
• 128-MB to 1-GB RAM on-card	• Runs multiple PC applications without memory constraints
	• Provides dedicated memory for PC applications
	• Expandable to grow with customer needs
• USB, parallel, and serial ports	• Standard ports to connect to devices new and old: keyboards, mice, multimedia devices, printers, etc.
• 24-bit graphics, monitor port	• Drives an optional second monitor dedicated to PC environment in 24-bit, 1600 x 1200 graphics
• SoundBlaster-compatible sound	• Audio performance for running multimedia PC applications
• Audio in/out ports	• Supports stereo speakers, microphone in
• New slimmer PCI form factor	• The SunPCi IIpro coprocessor supports all of Sun's PCI-based workstations: Ultra 5, 10, 60, and 80, and Sun Blade 1000. The 40 percent slimmer form factor allows use of neighboring PCI slots.

Note: *A Microsoft Windows license is not included with the SunPCi IIpro coprocessor card. Solaris 2.6 Operating Environment or later is required for SunPCi IIpro card.*
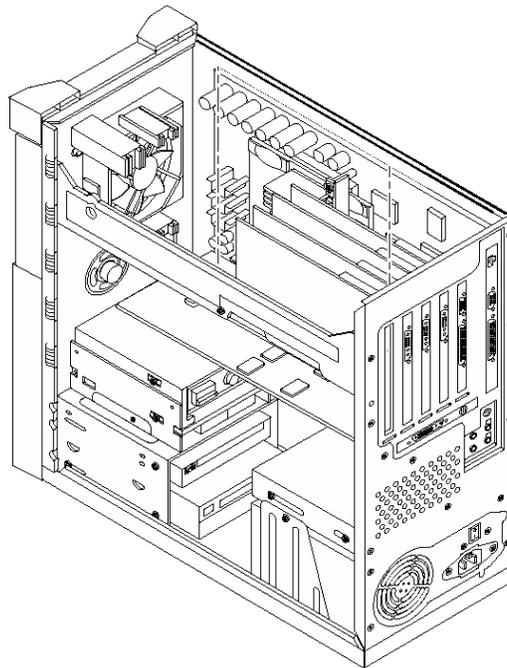
Figure 3. Ultra 10 Workstation chassis with access panel removed, providing full access to internal options

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Sun PGX64 Graphics

Sun PGX64 graphics is the next generation low-cost PCI graphics product in the PGX™ family. It is the PGX32™ graphics successor. Sun PGX64 graphics provides Sun with a very low-cost, flexible 24-bit, 2-D graphics board supporting the widest range of Sun systems and supporting up to four boards in systems that can accommodate four PCI boards. Sun PGX64 graphics is a PCI-based graphics board providing support for all Sun PCI-based workstations ,workgroup and enterprise servers including the Sun Blade 100, 1000, Ultra™ 5, 10, 60, and 80 workstations, Sun Enterprise™ 250, 220R, 420R, and 450 workgroup servers and Sun Enterprise 3500, 4500, 5500 and 6500 mid-range servers as well as future workstations and workgroup servers supporting PCI.

Sun PGX64 graphics include the following features:

- ATI's RageXL graphics processor
    - 2-D graphics acceleration
    - 8-MB SGRAM
    - 24-bit-only true color video support up to 1920 x 1200
    - 8-bit-only pseudo color video support up to 1600 x 1000
- 33-MHz, 32-bit, 5-volt PCI card, short form factor (< 7-inch length)
- Low power consumption (< 8 watts)
- HD15 video connector on the motherboard supports composite and separate video sync timing
- Compatible with OpenWindows™ environment, CDE windowing, and supports the following APIs: X11, Motif, JDK, XGL, XIL and OpenGL API via a software pipeline.
- Backwards compatibility with Sun's PGX24™ and PGX32 graphics accelerators (including MUX support, support for VESA/Sun resolutions, flexibility, and so on)
- Support for all Sun monitor products released since 1995
- A HD15-to-13W3 vide connector cable is included to connect to monitors with the 13W3 interface.

Sun PGX64 graphics supports the resolutions shown in the table below.

Display Resolution	Vertical Refresh Rate	Sync Standard	Aspect Ratio	Color Depth
1920 x 1200	70 Hz	Sun	16:10	8-bit
1920 x 1080	72 Hz	Sun	16:9	24-bit
1600 x 1280	76 Hz	Sun	5:4	24-bit
1600 x 1200	75 Hz	VESA	4:3	8-bit
1600 x 1000	66, 76 Hz	Sun	16:10	24-bit
1440 x 900	76 Hz	Sun	16:10	24-bit
1280 x 1024	60, 75, 85 Hz	VESA	5:4	24-bit
1280 x 1024	67, 76 Hz	Sun	5:4	24-bit
1280 x 800	76 Hz	Sun	16:10	24-bit
1152 x 900	66, 76 Hz	Sun	5:4	24-bit
1152 x 864	75 Hz	VESA	4:3	24-bit
1024 x 768	60, 70, 75, 85 Hz	VESA	4:3	24-bit
800 x 600	56, 60, 72, 75, 85 Hz	VESA	4:3	24-bit

Display Resolution	Vertical Refresh Rate	Sync Standard	Aspect Ratio	Color Depth
720 x 400	85 Hz	VESA	9:5	24-bit
640 x 480	60, 72, 75, 85 Hz	VESA	4:3	24-bit

Note: *8-bit color support is via emulation in 24-bit window. Sun PGX64 graphics outputs separate sync for VESA resolutions and composite sync for Sun resolutions.*

Sun PGX64 graphics supports 64-bit/66-MHz, 64-bit/33-MHz, or 32-bit/33-MHz PCI slots in all PCI-based Sun workstations and servers, as indicated in the following table.

System	Standard Configuration?	X-option?	Max. Number of Boards per System	Slot Configuration	Number Supported, if UPA Graphics also Configured
Sun Ultra 5		Yes	3		NA
Sun Ultra 10		Yes	4		1
Sun Ultra 60		Yes	4	1 in 66-MHz slots; 3 in 33-MHz slots	2
Sun Ultra 80		Yes	4	1 in 66-MHz slots; 3 in 33-MHz slots	1 or 2
Sun Blade™100	on-board version	Yes	3		NA
Sun Blade 1000	ATO	Yes	4	1 in 66-MHz slots; 3 in 33-MHz slots	1 or 2
Sun Enterprise 250, 450, 220R, 420R	ATO	Yes	4	1 in 66-MHz slots; 3 in 33-MHz slots	NA
Sun Enterprise 280R		Yes	4	1 in 66-MHz slots; 3 in 33-MHz slots	1 or 2
Sun Enterprise 3500, 4500, 5500, 6500	ATO	Yes	4		N/A

On the Ultra 60, Ultra 80, and Sun Blade 1000 systems, the Sun PGX64 graphics board cannot be installed if there is a double-wide UPA frame buffer (Sun Elite3D m6 graphics) installed in the adjacent UPA slot.

In addition, it is suggested for the Sun Enterprise server systems that at least one CPU be installed for each Sun PGX64 card.

Sun Creator Graphics Series 3 Overview

Sun Creator graphics series 3 is the latest generation of the Sun Creator graphics family of accelerators. With one architecture it can accelerate and support diverse types of graphic needs ranging from 8-bit and 24-bit windowing to high-end 3-D graphics.

Sun Creator graphics is designed as an integral part of Sun Ultra workstations or Sun Enterprise servers and is, therefore, designed to take advantage of the UltraSPARC CPU performance increases to 300 MHz and beyond. The original generation of Sun Creator graphics has a single graphics/frame buffer clock for all on-board logic. This generation has one clock for the internal graphics processing and

another clock for the frame buffer. This design makes it possible to drive each part at its maximum speed.

Until May 1999, Sun Creator graphics was available in two configurations:

• The single-buffered configuration (known as Sun Creator) supports hardware acceleration of 2-D graphics.

• The double-buffered configuration (known as Sun Creator3D) is used for fast, high-quality transformation and display of 3-D solid and wireframe objects. It also provides support for high-resolution (1920 x 1200) monitors such as the Sun 24-inch, wide-screen display.

Only the double-buffered configuration (Sun Creator 3D) is currently available.

Sun Creator3D graphics series 3 is available for most Ultra workstations (all except the Ultra 5 workstation) as well as the mid-range Sun Enterprise servers (Sun Enterprise 3500–6500 servers).

Sun Creator Graphics Models

The two models, Sun Creator and Sun Creator3D, are physically different boards. A Sun Creator board cannot be upgraded to a Sun Creator3D board by adding more 3D-RAM memory. An upgrade is performed by changing the graphics board.

Sun Creator (no longer available)	Sun Creator3D
• Full 2-D imaging and windowing acceleration	• Full 2-D imaging and windowing acceleration, plus full 3-D acceleration
• Suited for 2-D, windowing, and imaging applications including: CASE, color publishing, EDA, medical imaging, and general research	• Ideal for high-end 2-D, mid-range 3-D graphics, and solids in MCAD and MCAE, as well as high-end imaging and color publishing applications
• 24-bit true color, single-buffered	• 24-bit true color, double-buffered up to 1280 x 1024 • 28-bit Z-buffer
• 8-bit overlay and visual planes	• 8-bit overlay and visual planes
• Stereo display up to 960 x 680 at 112 Hz non-interlaced	• Stereo display up to 960 x 680 at 112 Hz non-interlaced, double- and Z-buffered
• 5-MB 3D-RAM memory	• 15-MB 3D-RAM memory
• 1280 x 1024 at 76 Hz standard with programmable bootprom resolution	• 1280 x 1024 at 76 Hz standard with programmable bootprom resolution
• NTSC/PAL video timings	• NTSC/PAL video timings
• 64-bit DAC	• 128-bit DAC • High resolution 1920 x 1200 at 70 Hz (single buffered) supporting 24-inch wide screen display series 2 and series 3

Key Messages

- **High-performance graphics**

  Sun Creator graphics performance is based upon the Sun Creator approach to designing graphics. In series 3, the Sun Creator graphics technology is enhanced, with up to 50 percent graphics performance improvement over series 1.

  – UltraSPARC CPU

    Sun Creator graphics relies on the power of the UltraSPARC CPU for floating point calculations, and on the visual instruction set (VIS software) to accelerate imaging-related operations. This eliminates the need for a dedicated graphics processor, and results in a significant cost advantage.

  – Ultra port architecture (UPA) high-speed interconnect for graphics

    UPA provides a high-speed, high-bandwidth interconnect between the CPU, Sun Creator graphics, and main memory. It raises overall graphics performance while maintaining a balanced throughput. Unlike the peripheral buses, such as SBus or PCI, the UPA interconnect ties Sun Creator graphics directly to the CPU and memory, and delivers greater bandwidth by orders of magnitude.

    UPA also allows Sun Creator3D to utilize main system memory for texturing, allowing large texture-mapping possibilities.

  – Sun Creator-rendering ASIC (FBC2)

    The FBC2 ASIC renders graphic primitives at very high speeds. FBC2 accelerates fills, scrolling, text, lines, and polygon rendering.

  – 3D-RAM graphics memory

    The 3D-RAM breakthrough in graphic memory provides high-bandwidth and built-in acceleration for 3-D graphics.

- **Scalable performance**

  The performance of Sun Creator graphics takes advantage of general system performance enhancements and will scale up with increases in CPU clock rate, making it unnecessary to upgrade graphics as new generations of CPUs become available.

- **More standard functionality**

  All Sun Creator graphics products come standard with high resolution and 24-bit true color, as well as an 8-bit overlay plane. Sun Creator3D supports 24-bit double buffering and a 28-bit Z-buffer. In addition, stereo output support is built-in. Sun Creator graphics has established a standard for workstation graphics functionality.

  Sun Creator3D graphics series 2 and series 3 also add support for high-resolution monitors (up to 1920 x 1200) and hardware acceleration of color-space conversion during video playback.

  Four 8-bit color maps for dynamic color-map segment allocation within the 8-bit color overlay plane and support for adjustable gamma correction give applications greater access to colors even in 8-bit mode and give the user the ability to color adjust (gamma correct) for optimal display quality.

- **Fully compatible with existing APIs**

  Sun Creator graphics accelerates existing APIs, including OpenGL® and X11 graphics libraries.

Sun Elite3D Graphics Overview

While Sun Elite3D graphics leverages components and technologies similar to Sun Creator graphics, it is architecturally different in the way it implements the graphics pipeline. On Sun Creator3D systems, the 3-D graphics pipeline is handled by both the UltraSPARC CPU and the Sun Creator frame buffer, with the UltraSPARC CPU doing the front portion and processing (transform, lighting, and clipping) of the pipeline. On Sun Elite3D systems, the entire graphics pipeline is handled directly by the dedicated hardware located on the Sun Elite3D graphics subsystem.

Sun Elite3D graphics greatly accelerates the rendering of 3-D triangles, vectors, and texture maps by adding specialized graphics floating-point units and more powerful pixel-drawing chips. It supports a 1280 x 1024 96-bit-deep frame buffer, configured the same as the double-buffered and Z-buffered Sun Creator3D graphics. The 96-bit pixels support two 24-bit color buffers, an 8-bit pseudo-color overlay buffer and a 28-bit Z buffer, plus some miscellaneous control planes.
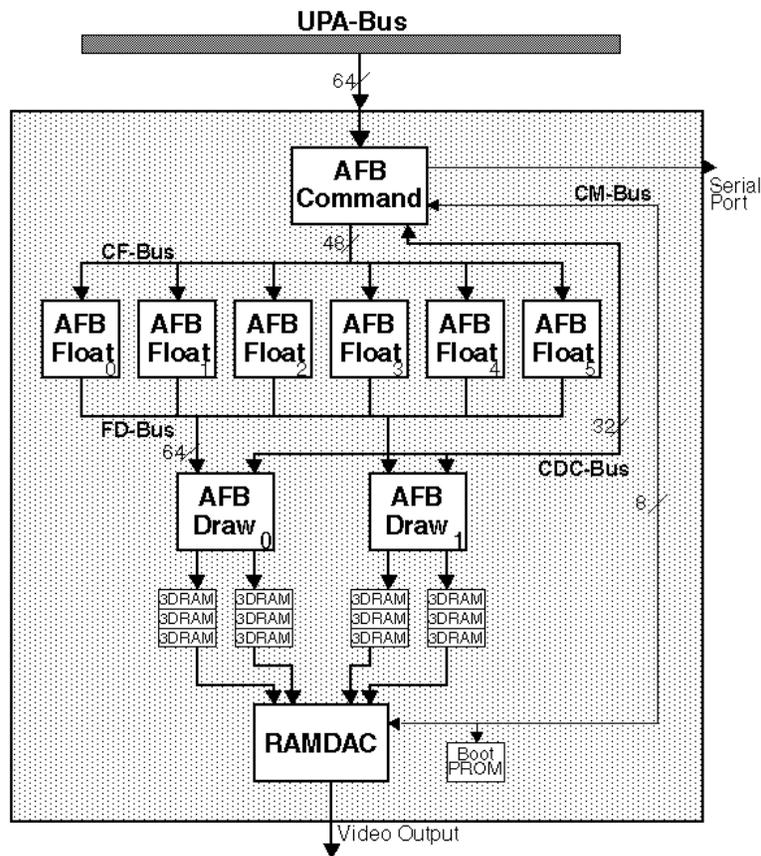
Figure 4. Sun Elite3D m6 graphics chip-level diagram

Sun Elite3D graphics has a highly parallel and efficient graphics pipeline. The Sun Elite3D graphics architecture uses a new generation 3D-RAM chip. This chip speeds up a read/modify/write pixel access from 160 ns to 10 ns, changing all of the rules about graphics pipeline behavior.

AFB-Command, at the interface level, is a superset of the Creator ASIC chip. The additional functionality supports rendering of model space geometry. The main change is to allow the most important bits to be packaged up into single-header words that can be passed down with the geometric data without stopping the pipeline. Additional functionality includes complete binary compatibility with the register set and functions of Sun Creator3D graphics and support for the OpenGL API.

Given the technological changes brought on by 3D-RAM, the primary justification for the existence of a 3-D graphics accelerator is to deliver an order of magnitude more floating-point performance than a contemporary general purpose RISC CPU, at a price less than that of a single CPU and cache.

The Sun Elite3D series 2 graphics product line incorporates hardware acceleration for geometry decompression. The new decompression capabilities are transparent to existing features and functionality such as imaging, 3-D, and media playback in the earlier Sun Elite3D series 1 product. The Sun Elite3D m6 graphics includes six dedicated graphics processing engines.

Features	Benefits
• Integrated imaging	• Can do fast imaging and 3-D on unified frame buffer
• Very-high-performance, accelerated, 24-bit, double-buffered 3-D graphics	• Smooth animation and interactivity of 3-D graphics
• 28-bit Z-buffer	• Improves visual quality and depth accuracy
• 8-bit overlay plane	• Allows overlay of 8-bit windows on top of the 24-bit visuals without damaging the underlying visual. This allows seamless integration and manipulation of windows
• Gouraud shading	• Allows smooth shading of solid geometry
• Acceleration for geometry decompression	• Allows complex compress geometry to be decompressed at hardware rates.
• Alpha blending and screen door transparency	• Simulates transparent materials such as glass
• Line and big dot antialiasing	• Needed in MCAD and visualization for better visual quality
• Per-pixel depth cueing	• More accurate depth cueing or fog
• Per-pixel alpha interpolation	• Variable transparency
• 4-bit stencil support with hardware acceleration of OpenGL stencil functions	• Enables hardware acceleration for OpenGL
• Accelerated lighting	• More lights can be turned on for enhanced visual display without encountering large performance penalties
• Four 8-bit color maps	• Dynamic color map segment allocation when running 8-bit window systems should eliminate color flashing problems
• Adjustable gamma correction	• Allows users to gamma-correct visuals for enhanced visual quality
• NTSC/PAL video timing support	• Supports frame buffer to video timing
• Stereo 960 x 680 at 112 Hz supported with 21-inch monitor	• With frame buffer, monitor, and window systems support for stereo, users can see better representation of 3-D data
• 1280 x 1024 at 76 Hz resolution standard	• High-resolution display quality
• Two serial-port connectors	• For VR peripherals
• Dual-headed support: one Sun Elite3D m6 frame buffer and an additional Sun Creator/Sun Creator3D frame buffer	• For users who need to be able to do multiple things simultaneously, such as command and control applications, 3-D and video playback for animators, design and analysis for engineers, and so on
• Sun™ OpenGL® for Solaris 1.2.1, X, and Java 3D™ API support	• A choice of APIs
• Binary compatibility with Sun Creator graphics product family.	• Interoperability with existing applications and users

Sun microsystems

Sun Ultra 10 Workstation UPA-based Graphics Performance

Graphics Supported	PGX24 Ultra 10 440-MHz (24-bit mode)	Sun Creator3D Ultra 10 440-MHz	Sun Elite3D m6 Ultra 10 440-MHz
Xmark93	10.2	29.6	30.8
2-D vectors/sec.	873	5.0 M	5.0 M
3-D vectors/sec. **3-D triangles/sec.** **3-D quads/sec.**	521 K — —	3.7 M 1.5 M 698 K	8.8 M 5.9 M 1.3 M
PLBwire93 **PLBsurf93**	18.3 —	250 403	435 673
ViewPerf OpenGL • **ProCDRS-02** • **DX-05**	 — —	 8.6 12.0	 19.0 30.7

Notes
- Performance data as of December 2000; configuration for timing includes Solaris 8 Operating Environment and OpenGL 1.2.1.
- Performance data is subject to change. Please see Sun's web site at `http://www.sun.com/desktop` for latest performance numbers.

Metrics Defined

- 2-D vectors are 10 pixels long, X11 perf numbers

- 3-D mesh are 25 pixel triangle mesh, one light source

- 3-D quads are 100 pixel, independent quadrilaterals, with one directional light source

- Configuration with 24-inch monitor uses Sun Creator3D graphics in single-buffer mode unless otherwise noted

- 3-D quads are 100-pixel 3-D quads, one light—ambient, diffuse, isolated, perspective, Gouraud shaded, and Z-buffered with culling (in thousands)

Special Features

Accelerated imaging and advanced 3-D graphics with Gouraud shading, line antialiasing, per-pixel depth cueing, subpixel addressing, transparency, and stereo viewing with monitor.

Sun Ultra 10 Workstation Configuration

Feature	Specification
Dimensions	
• Height	402 mm (15.8 inches)
• Width	176 mm (6.9 inches)
• Depth	435 mm (17.1 inches)
CPU and UPA	
• Architecture	UltraSPARC-IIi
• Clock rate	440 MHz
• External cache	2 MB
Memory	
• Memory type	168-pin EDO JEDEC, ECC error correction
• Number of slots	4
• Capacity	512 MB to 1 GB (minimum factory-configured system is 512 MB)
• DRAM speed	50 ns
• DIMM sizes	32, 64, 128, and 256 MB (installed in pairs)
Storage	
• Maximum internal	Up to two 20-GB, 7200-rpm EIDE hard disks
Graphics	
• UPA	One slot supports optional Sun PGX64, Sun Creator3D, and Sun Elite3D m6 graphics cards
• On-board PGX24™ 24-bit graphics	On-board 24-bit frame buffer with accelerated text, windowing, 2-D and 3-D wireframe Support for color monitors up to 21 inches 24-bit support for resolutions up to 1152 x 900 @ 85 Hz 8-bit support for resolutions up to 1280 x 1024 @ 76 Hz
I/O Interfaces	
• PCI I/O bus	Four full-size 33-MHz PCI slots (version 2.1)
• Serial ports	One D-Sub 25-pin, asynch/synch RS423A/RS232A One D-Sub 9-pin, asynch RS423A
• Parallel port	One D-Sub 25-pin, IEEE 1284 bidirectional
• PCMCIA bay	One front-access bay with flip-up access door
Networking Ports	10BASE-T/100BASE-T Fast Ethernet, self-sensing
Backup and Distribution	
• Floppy	1.44-MB, 3.5-inch, manual-eject floppy
• CD-ROM	48X-speed EIDE, photo-CD compatible
Operating Environment	Solaris 8 Solaris 7 Hardware: 3/99 Solaris 2.6 Hardware: 5/98 Solaris 2.5.1 Hardware: 11/97

Sun microsystems

Software

Ultra™ 5 and Ultra 10 Workstations Plug-and-Play Systems

The Solaris™ Desktop Edition is preinstalled on all Ultra™ 5 and Ultra 10 workstations. This plug-and-play feature provides users with a ready-to-run workstation right out of the box. Customers are up and running within minutes. The following software is preinstalled on Ultra 10 workstations.

Solaris 7 11/99 Preinstalled Software	Solaris 8 01/00 Preinstalled Software
• Solaris 7 11/99 Operating Environment	• Solaris 8 Operating Environment
• Solaris 7 11/99 AnswerBook 2 documentation	• Solaris 8 AnswerBook 2 documentation
• Java™ Development 1.17 and Java 2 Software Development 1.2.1	• Java 2 Software Development Kit 1.2.2
• Java Plug-In 1.1.1	• Java Plug-In 1.2.1
• Java 3D™ 1.1.1	• Java 3D 1.1.2
• Java Media Framework 2.1	• Java Media Framework 2.1
• Netscape™ Communicator 4.5	• Netscape Communicator 4.7
• Sun™ OpenGL® for Solaris 1.2	• Sun OpenGL for Solaris 1.2.1
• ShowMe TV™ 1.3	• ShowMe TV 1.3
• SunForum™ 3.1	• SunForum 3.1
• ODBC Driver Manager 2.11	• StarOffice 5.2
• mediaLib™ 1.2	• Apache Server 1.3.9
• StarOffice ™ 5.2	• Perl 5
	• Java Communications API 2.0
	• PC Launcher 1.0

- The AnswerBook2™ software includes:
    - Sun Ultra 5 and Ultra 10 Hardware AnswerBook™
    - Solaris Operating Environment User Collection
    - Solaris Operating Environment System Administration Collection, Volume 1 and Volume 2
    - Solaris Operating Environment Software Developer Collection, Volume 1 and 2
    - Solaris Operating Environment on Sun Hardware AnswerBook
- The Solaris Operating Environment preinstalled software comes with the following languages:
    - English
    - French
    - German
    - Italian
    - Spanish
    - Swedish
    - Traditional Chinese
    - Simplified Chinese
    - Korean
    - Japanese

Solaris 8 Operating Environment

Sun Ultra 10 systems are supported by the Solaris 2.5.1 Hardware: 11/97, Solaris 2.6 Hardware: 5/98, Solaris 7, and Solaris 8 Operating Environments.

The Solaris 8 Operating Environment is Sun's latest release in this product family. The Solaris 8 Operating Environment continues the tradition of reliability, availability, and scalability (RAS) of the earlier operating environment releases, including features IPv6/IPsec/Mobile IP, realtime application support, filesystem logging, and remote console.

Existing applications that adhere to the Solaris application binary interface (ABI) will run unmodified with Solaris 8 software on both SPARC processor-based platforms and Intel platforms. In addition, Sun provides an easy-to-use AppCert testing tool for developers, so they can verify existing Solaris application binaries and report on any potential incompatibilities.

Key Features in the Solaris 8 Operating Environment

- **Productivity features**

  Solaris 8 software offers enhanced diagnosing capabilities, availability, scalability, performance, Java technology, and graphics. With the Solaris 8 Operating Environment, the customer gets a full suite of integrated tools for browsing, collaborating, and interoperating with PCs. The Solaris 8 Operating Environment provides a 32-bit and 64-bit UNIX platform that provides customizable workspaces, graphical system monitoring, and business/office productivity tools, including the StarOffice productivity suite.

- **Advanced networking**

  Support for IPv6 in the Solaris 8 Operating Environment is integrated into NFS, RPC, NIS, NIS+, and DNS. IPsec enables secure virtual private networks and network access control. Mobile IP provides Internet disconnect/reconnect capabilities with no data loss.

- **Bundled software**

  Includes Oracle 8i, `lxrun` for Linux application compatibility (for Solaris on Intel), Apache Webserver, Netscape Communicator, i-Planet Directory Server, `gzip`, `bash`, and `tcsh`.

  The Solaris 8 Operating Environment ships with support for a number of software components that increase overall availability including Solaris Resource Manager™ software for fine-grained control of system resources, Solaris Bandwidth Manager software for enhanced network resource availability, Sun Cluster 2.2 software for high availability, and soon, Sun Cluster 3.0 software (shipping in a subsequent update to Solaris 8 software) for even greater application availability through a clustered file system, scalable data services, and built-in load balancing.

- **Enhancements to the Common Desktop Environment (CDE)**

  The latest generation of the Common Desktop Environment (CDE) comes standard, providing workstation users with an easy-to-use, open, secure platform. Personal Digital Assistant (PDA) support synchronizes data from most Palm Computing devices with the CDE calendar, mail, memo, and address book. CDE now features streaming video using MPEG1, MPEG2, Quicktime, and AVI formats as well as MIDI audio using the Java Media Framework.

- **Improved system error messages, system debugging capabilities, and a new remote console capability**

  Allows the customer to apply scarce system expertise remotely across the enterprise.

- **File system logging**

  Logging file system features and parallel SCSI probes make rebooting faster.

- **Live Upgrade**

  Allows Solaris 8 software to be installed on a separate partition from the currently running version of the operating environment. When installation is complete, a simple reboot enables the Solaris 8 Operating Environment to take control. Since Live Upgrade includes a version migration and fallback feature, the customer can also fallback to the previous release—through a simple reboot—without losing administration information.

- **Real-time video creation and broadcast support**

  A new Java Media Framework (JMF) player provides access to the latest industry-standard audio and video files, including MPEG1/2, Quicktime, VIVO, AVI, AIFF, GSM, WAV, RMF, AU, and MIDI.

The Solaris 7 Operating Environment, Hardware: 3/99

The Solaris 7 Operating Environment contains the base-level functionality required for all Sun workstations. The Solaris 7 Operating Environment is a solid, scalable 32-bit and 64-bit operating environment. The Solaris 7 Operating Environment includes

- A 32-bit and 64-bit kernel
- Standards-based networking with easy access to a wide range of computing environments and network technologies
- Platform support for both SPARC processor and Intel
- Integrated Java software
- System administration support

The Solaris Operating Environment delivers a competitive advantage to businesses through networked computing, scalability, and multi-architecture support. The Solaris Operating Environment provides an advanced, superior solution for all customer IT needs, both technical and business. With its strength in enterprise-class reliability, scalability, and performance, the Solaris Operating Environment is an industrial-grade solution with the quality and robustness required to deliver mission-critical computing.

The Solaris 7 Operating Environment Features and Benefits

Features	Benefits
• Higher performance	• A complete 64-bit computing environment provides greater computing capacity, precision, and performance
• Improved scalability	• The 64-bit kernel provides access to and capacity for more system resources; this allows more applications to be consolidated onto a single server, and enables systems to handle much larger problem sets
• Greater ease of use	• Web-based installation, text and voice notes, and graphical process manager make Solaris software easy to install and use
• Comprehensive global product	• Support for the euro currency symbol, complex text formats for Arabic, Thai, and Hebrew languages, and the development of multilingual applications
• 100 percent binary compatibility	• Software investment protection—all of today's Solaris Operating Environment-certified 32-bit applications continue to run on the Solaris 7 Operating Environment with out modification

Sun microsystems

Graphics Software Interfaces

The Ultra 10 system supports all Solaris 8 Operating Environment graphics and window system APIs, including OpenGL® and Display PostScript™. A large number of Sun and third-party graphics APIs are also supported, including IRIS GL, OpenGL, GKS, HOOPS, and Java 3D™ software. Industry-standard X-extension libraries, such as Xlib and PEXlib, are available.
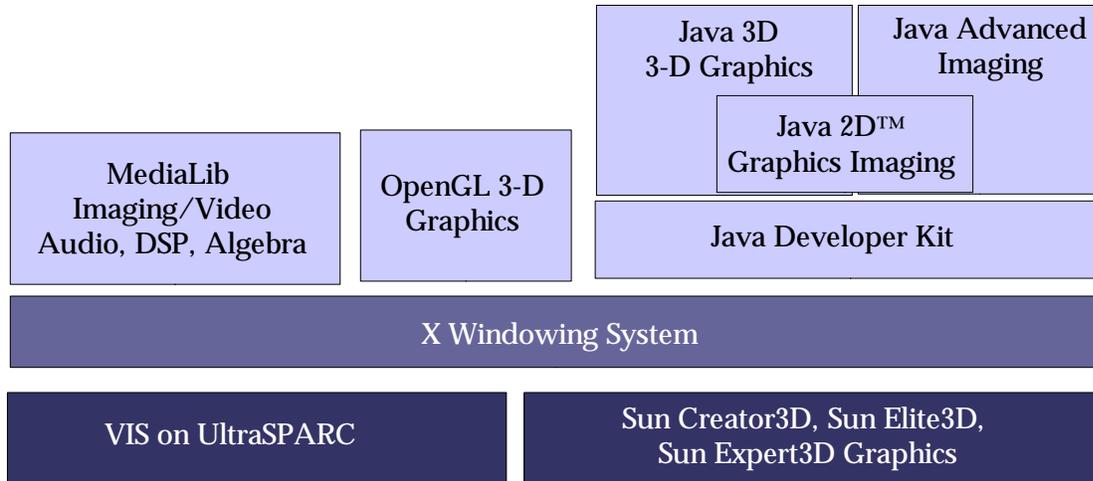
Figure 5. Graphics software interfaces

The Solaris Operating Environment System Requirements

Disk Space	
• End user • Developer	25 MB 40 MB (runtime binaries and header files)
Memory	
• Minimum • Recommended	64 MB 128 MB or higher (for serious applications)

The Solaris Operating Environment Licensing and Usage

All Sun system and system-board products include a Solaris license. The type of Solaris license(s) shipped with each platform reflects the way in which that system is most commonly used. Additional Solaris licenses are available to allow increased usage of the software.

Ultra 10 workstations come with a Solaris Desktop License. The Solaris Desktop License is a limited license. It does not provide several of the services provided by the Solaris Server License, such as

- Allowing more than two users to be directly connected

- Providing database or compute services for more than two continuous users

- Providing swap disk space for any other system

- Providing home directory space for any other system

If a system that is shipped with a Solaris Desktop License will be used as a server (requires services listed above), the system must be upgraded to a Solaris Server license.

Customers using a Solaris Operating Environment version prior to the Solaris 8 Operating Environment release may purchase a Desktop to Workgroup Server license upgrade (part number SOL-DTWG-LU). For the Solaris 8 Operating Environment release, a license covering both desktop and server is included with the system purchase.

Sun OpenGL for Solaris 1.2.1 Software

Sun OpenGL for Solaris 1.2.1 software provides a powerful programming environment for developing and deploying interactive 3-D applications on SPARC workstations. It allows mainstream 3-D graphics and visualization applications to be deployed on Sun's Ultra family of graphics workstations at a compelling price-to-performance ratio.

Sun OpenGL for Solaris 1.2.1 software is an application programming interface (API) that provides 2-D and 3-D graphics features. Features include modeling, transformations, color, lighting, and smooth shading, as well as advanced features such as texture mapping, NURBS, fog, alpha blending, and motion blur. Sun OpenGL for Solaris 1.2.1 software works in both immediate and non-editable display-list modes.

Using the Xinerama X window extension available in Solaris 8 or Solaris 7 Operating Environment (release 11/99 or later), users can configure their systems to utilize multiple frame buffers as one large, super-high resolution, virtual display. Sun OpenGL for Solaris 1.2.1 software allows existing OpenGL API-based applications to run virtually without change in a multi-screen Xinerama environment.

Widespread multivendor availability of OpenGL software allows source-code portability of 3-D graphics applications across platforms. Sun OpenGL for Solaris 1.2.1 software is a compliant implementation of OpenGL 1.2 specification from the OpenGL Architecture Review Board (ARB) and is source-code compatible with other conformant OpenGL software on the market. Most existing OpenGL applications need only to be recompiled in order to run with Sun OpenGL for Solaris 1.2.1 software.

Sun OpenGL for Solaris 1.2.1 software is targeted at developers creating interactive 3-D graphics applications for technical, creative, and analytical markets. Potential users include those in computer-aided design and manufacturing, global information systems, simulation, industrial design and modeling, entertainment, biochemistry, and petroleum exploration market segments.

Sun OpenGL for Solaris 1.2.1 software is compatible with and accelerated for Sun's Ultra workstation systems with the Sun Creator, Sun Creator3D, Sun Elite3D, and Sun Expert3D graphics products. It is also compatible with all legacy SPARCstation™ systems equipped with SX, ZX, GX, GXplus, TurboGX™, TurboGXplus™, S24™, TCX, or FSV frame buffers.

Features and Benefits

Sun OpenGL for Solaris 1.2.1 software provides the following features:

Features	Benefits
- Multi-screen rendering for super-high resolution 3-D visualization (Xinerama)	- Users no longer need to rewrite their 3-D applications to take advantage of the multiple screens
- 64-bit OpenGL library support	- Allows OpenGL applications to take advantage of the full 64-bit addressing in the Solaris Operating Environment

Features	**Benefits**

- Interface imaging and 3-D texturing

  - Texture level of detail control

  - BGRA and packed-pixel formats

  - Texture specular color

  - Texture edge clamping

  - Constant texture data extension

- General performance improvements

  - Improved drivers

  - Occlusion culling test extension

- Additional extensions

  - Triangle list primitive

  - Vertex extension

  - Global alpha extension

- Offers a more portable interface for imaging operation during 3-D texture mapping

  - Offers better texture memory utilization

  - Supports more file- and hardware-data types

  - Allows more realistic lighting effects with texturing

  - Avoids blending border and image texels during texturing

  - Helps reduce texture mapping memory utilization and loading time

  - Enables better performance for all supported graphics cards; in particular, there has been some substantial performance gains for Sun Elite3D frame buffers—for some applications over 100 percent

  - Enables applications to trivially reject occluded objects in a scene, resulting in big improvements in interactive rendering performance for visualization of large models

  - Allows multiple triangle strips or fans to be specified within a single glBegin glEnd pair; improves performance

  - Allows applications to specify all vertex data (color, normal, coordinates, and so on) in a single function call; saves function call overhead

  - Allows applications to specify an alpha component which can be applied globally to all primitives; useful for cases where many vertices share the same alpha value because the application does not have to send an alpha component for each vertex

Sun OpenGL for Solaris 1.2.1 Software Tech Facts

Sun OpenGL for Solaris 1.2.1 software system requirements are shown in the following table.

Platforms	UltraSPARC™ and SPARC processor-based systems using Sun Elite3D, Sun Creator, Sun Creator3D, Sun Expert3D, PGX, ZX, GX, TCX, SX, and S24 frame buffers
Operating environments supported	Solaris 2.5.1 Solaris 2.6 Solaris 7 Solaris 8 Note: Multi-display Xinerama support requires Solaris 7 Operating Environment (11/99 or later) or the Solaris 8 Operating Environment
Recommended patches • Using PGX graphics on an Ultra 5 or 10 workstation • Using Sun Elite3D graphics	Solaris 2.5.1: patch 103792-19 (or later) Solaris 2.6: patch 105362-19 (or later) Solaris 2.5.1: patch 105791-16 (or later) Solaris 2.6: patch 105362-19 (or later) Solaris 7: patches 106148-03 and 106144-05 (or later)
Window system supported	CDE or OpenWindows™
Disk space • For end-user runtimes • For ISV developers (total to build examples)	 32 MB for 32 bit; 55 MB for 64 bit 54 MB for 32 bit; 77 MB for 64 bit
Memory	64 MB minimum with 128 MB or more recommended

System Management

Many of Sun's workstations deliver the kind of power and graphics needed by customers who use heavy compute-intensive applications in markets such as MCAE, oil and gas, simulation, visualization, and animation. Customers who run these compute-intensive applications generate and handle critical technical and scientific data, and require an operating environment that can deliver highly reliable, available, fast, and safe desktop computing environment. Built into the Solaris™ Operating Environment are systems management and security features that help deliver the computing environment demanded by these customers. These features are described below.

Admintool

Admintool is a GUI-based administration tool that provides local systems administration. Admintool can be used to manage user accounts, groups, hosts, printers, serial ports, and installation/removal of software.

Sun™ Management Center Software

Sun™ Management Center software is a GUI-based system management tool for Sun systems. Sun Management Center software enables system administrators to proactively monitor and manage the health and status of many Ultra™ workstations from a central location. Sun Management Center software simplifies the management of many workstations, establishing highly stable and reliable workstation computing environment for running business-critical applications. In addition, Sun Management Center software is also scalable enough to run entirely on a workstation as a stand-alone application.

Key Features

- **Performance monitoring and management**

  Provides proactive monitoring and management of workstation hardware and the Solaris Operating Environment, by detecting impending failures

- **Predictive failure analysis**

  Enables administrators to predict potential memory and disk hardware failures on a statistical bases, thereby enhancing the decision making process and increasing machine availability

- **Fault and event management**

  Collects alarms and events, and then helps users identify the root cause of the problems.

- **Physical view of workstations**

  Provides enhanced serviceability with visual view that highlights failed hardware components

Solstice AutoClient™ Software

Solstice AutoClient™ software reduces the cost of Ultra workstation management by enabling centralized administration. This centralization eliminates the need to do backups, installations, and software management on the workstation itself. Solstice AutoClient software caches the Solaris Operating Environment, required applications, and user data onto the workstation's disk from a network server.

Key Features

- **Centralized software management model**

  Reduces workstation administration costs by allowing workstations to be managed from a server

- **Hands-off installation**

  When an application is needed, Solstice AutoClient automatically pulls the software from the server and loads it onto the workstation disk, resulting in built-in software distribution

- **Workstations become field-replaceable units**

  Ultra workstations can be replaced easily in the event of hardware failure, minimizing user down time

- **No workstation backups required**

  Solstice AutoClient workstations only have cached data, so there is no need to back up the workstation; the backup occurs on the server, saving considerable time and resources

Performance Meter

This GUI-based performance meter enables users to quickly monitor some of the key system resources such as CPU, load, disk, page, context, job swaps, interrupts, packets, collisions, and errors.

SunVTS™ Software

The SunVTS™ system exerciser is a graphically oriented UNIX® application that permits the continuous exercising of system resources and internal and external peripheral equipment. Used to determine if the system is functioning properly, SunVTS software incorporates a multifunctional stress test of the system through operating-system-level calls, and allows the addition of new tests as they become available.

ShowMe How™ Software: State-of-the-Art Installation and Maintenance Instruction

ShowMe How™ software is a documentation system that presents information in a highly understandable multimedia format. Installation and service tutorials as well as reference information provide users with comprehensive, easy-to-use instruction. ShowMe How software streamlines installation and maintenance for lower service costs and maximum system uptime.

Key Features

- Distributed on CD-ROM with every system

- Movies of installation and replacement procedures played through ShowMe TV™ software

- Photo sequences with narrated installation and replacement procedures

- Text-based instructions, taken from standard Sun documentation that can be viewed on-line and printed

- Photos with active callouts link to more detailed photos and text-based reference information

AnswerBook2™ Tool: System Administration Guide

The AnswerBook2™ product is Sun's on-line documentation system. It uses a web-browser interface that lets the customer view and print a variety of Solaris information, including SGML-based AnswerBook™ collections, Display PostScript™ AnswerBook collections, and man pages.

The AnswerBook2 product provides a search engine that lets the customer find information throughout the documentation library. The customer can install AnswerBook2 document collections on a centralized documentation server or on a local server.

Features and Functions

- Uses a web-browser-based interface so that the customer can view on-line documentation from any platform (running any operating system), provided that the customer's web browser supports HTML 3.2

- Contains support for multimedia (video and audio) content

- Provides a search engine for finding words and word phrases throughout the documentation library

- Lets the user define a subset of document collections (a Personal Library) to be displayed when using a specific documentation server

- Lets users copy information from AnswerBook2 documents and paste it into other locations, such as the command line, depending on the web browser's functionality

- Gives users the ability to print sections and books directly from the AnswerBook2 interface in a PostScript™ format that is near print-quality output

- Allows the user to choose a language in which to view on-screen instructions and Help information

- Provides a command-line interface (CLI) and a browser-based interface (GUI) for performing documentation server administration functions

The Sun Ultra™ 10 workstation utilizes a marketing part-number scheme that includes the Solaris Operating Environment version preinstalled on the hard drive and the choice of country kit in the marketing part number. This page explains how to read the part number scheme, and the next section explains the changes in specifying or ordering the country kit.

A11AAA1A1A-A111AAC

```
System
    Microprocessor
    family
        Microprocessor
        speed
            Ecache Size      Country Kit code   Frame Buffer
                Number of                          Monitor
                Microprocessors

                                                "Non-standard"
                                                System

                                          Hard drive/CD-ROM

                                          Memory

                                    Operating Environment
                                    Version Preinstalled
```
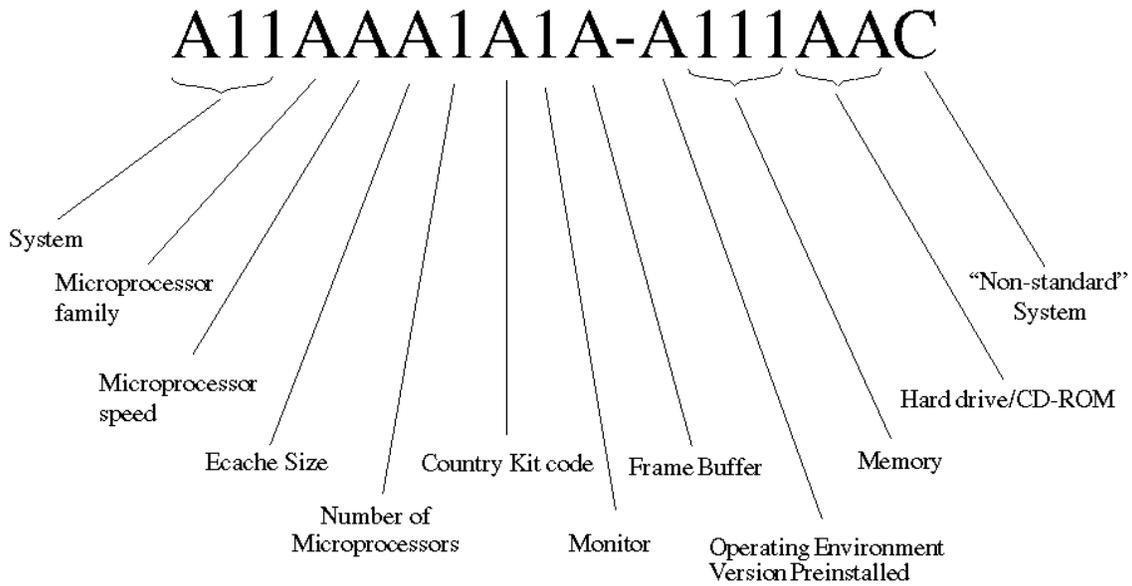
(Note: A = alpha character, 1 = numeric character, C = optional alpha or numeric character)

Model Key (Subset of Part-Number Definitions)

System	Number of Processors	Frame Buffer	Memory
A22 = Sun Ultra 10	1 = Single processor	P = On-board PGX24™	512 = 512 MB
		L = Sun™ Creator3D, series 3	
Microprocessor Family	**Country Kit Code**	Z = Sun Elite3D m6, series 2	**Hard Disk/CD-ROM**
U = UltraSPARC™-IIi	A = North America		CY = 20 GB, 48X
	UNIX®	**Operating Environment**	CD-ROM
Microprocessor Speed	B = Japanese language	**Version Preinstalled**	
K = 440 MHz	Z = No country kit	C = Solaris™ 7 11/99 and	
		Solaris 8 01/00	
Ecache Size	**Monitor**		
C = 2 MB	9 = No monitor		

Choice of Country Kit

Unlike traditional Sun systems, the Ultra 10 workstation has the country kit physically included within the System Ship Kit. The choice of country kit is specified by adding an additional character to the Ultra 10 workstation marketing part number. The eighth character of the Ultra 10 workstation marketing part number specifies the choice of country kit. The single-character country kit codes are listed below.

Code	Country Kit
A	North American UNIX
B	Japanese language
Z	No included country kit

Japanese language and Japanese logoless kits no longer include the contents of the country kit in the CPU box when shipped from the point of manufacture. To order a country kit that is not shown on the table, specify the country kit code Z and order the country kit as a separate line item. Ultra 10 systems ordered with country kit codes B and Z do not include the contents of the country kit within the CPU box. In other words, the customer receives the CPU system in one box and the country kit in a separate box (this may vary in Japan). Customers who order country kit code A receive the CPU system and country kit in a single box.

Three examples using the same base Ultra 10 workstation configuration (512-MB DRAM, 20-GB, 7200-rpm hard disk, CD-ROM, on-board PGX24 graphics) are:

1. North American UNIX with 17-inch entry color monitor

A22UKC1A9P-C512CY	Note that the eighth character is "A" for North American UNIX
X7103A	Marketing number for 17-inch entry color monitor

2. Japanese language with 21-inch color monitor

A22UKC1B9P-C512CY	Note that the eighth character is "B" for Japanese language
X7121A	Marketing number for 21-inch color monitor
X471A	Marketing number for required 13W3-to-HD15 video adapter cable

3. No included country kit with 21-inch color monitor and separate Italian country kit

A22UKC1Z9P-C512CY	Note that the eighth character is "Z" for no country kit
X3574A	Marketing number for separate Italian country kit
X7121A	Marketing number for 21-inch color monitor
X471A	Marketing number for required 13W3-to-HD15 video adapter cable

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Ultra 10 Model 440 with On-board 24-bit PGX24 Graphics

Part Number	System
	Ultra 10 Model 440, 2-MB Ecache, 256-MB DRAM, 20-GB, 7200-rpm hard disk, 48X-speed CD-ROM, 1.44-MB floppy drive, on-board 24-bit PGX24 graphics, Solaris 7 and 8 Operating Environment preinstalled
A22UKC1A9P-C512CY **A22UKC1B9P-C512CY** **A22UKC1Z9P-C512CY**	North American UNIX country kit Japanese language No included country kit

Ultra 10 Model 440 with Sun Creator3D Series 3 Graphics

Part Number	System
	Ultra 10 Model 440, 2-MB Ecache, 512-MB DRAM, 20-GB, 7200-rpm hard disk, 48X-speed CD-ROM, 1.44-MB floppy drive, Sun Creator3D graphics series 3, Solaris 7 and 8 Operating Environment preinstalled
A22UKC1A9L-C512CY **A22UKC1B9L-C512CY** **A22UKC1Z9L-C512CY**	North American UNIX country kit Japanese language No included country kit

Ultra 10 Model 440 with Sun Elite3D m6 Series 2 Graphics

Part Number	System
	Ultra 10 Model 440, 2-MB Ecache, 512-MB DRAM, 20-GB, 7200-rpm hard disk, 48X-speed CD-ROM, 1.44-MB floppy drive, Sun Elite3D m6 graphics, Solaris 7 and 8 Operating Environment preinstalled
A22UKC1A9Z-C512CY **A22UKC1B9Z-C512CY** **A22UKC1Z9Z-C512CY**	North American UNIX country kit (included) Japanese language No included country kit

Ordering Guidelines and Notes

- **Memory**
  - The Ultra 10 workstation supports up to 1 GB of 50-ns, 168-pin EDO JEDEC DRAM with ECC error correction. The DIMMs are the same as those used in the Ultra 5 but are not compatible with other Sun workstations. The Ultra 10 workstation supports 32-, 64-, 128-, and 256-MB DIMM units.

– The Ultra 10 workstation can accommodate up to four DIMM units which must be installed in pairs. Adding DIMMs in the same set of four results in the best memory system performance.

Memory Expansion Options	Part Number
64-MB 50-ns ECC DRAM expansion kit (two 32-MB DIMMs)	X7036A
128-MB 50-ns ECC DRAM expansion kit (two 64-MB DIMMs)	X7037A
256-MB 50-ns ECC DRAM expansion kit (two 128-MB DIMMs)	X7038A
512-MB 50-ns ECC DRAM expansion kit (two 256-MB DIMMs)	X7039A

- **Keyboard**

  Type 6 keyboard and mouse is included with Model 440, except for configurations which are ordered with the Z country kit code.

- **Internal storage devices**

  The internal hard-disk drive and CD-ROM drive are unique to the Ultra 5 and Ultra 10 workstations and are not compatible with other Sun Workstation™ systems. In addition, all other Sun internal hard disks, CD-ROM drives, and other storage devices are not compatible with the Ultra 10 workstation.

Internal Storage Device	Part Number
Internal 20-GB, 7200-rpm, EIDE hard disk	X6174A
Internal 48X-speed EIDE CD-ROM	X5246A

Note: *The internal 48X-speed CD-ROM is standard on the Ultra 10 workstation.*

- **External and internal SCSI devices**

  A PCI SCSI adapter card is required to attach any external SCSI device since SCSI is not a feature of the Ultra 10 workstation. In addition, all internal SCSI options are not supported by the Ultra 10 workstation.

- **Monitors**

  The choice of monitors is not reflected in the Ultra 10 workstation marketing part number. A monitor is ordered as an optional separate line item. The Ultra 10 workstation supports the monitors listed below. For some monitor and frame buffer combinations, a video adapter cable may be required; consult the table below.

Monitor	Video Adapter Required		
	Any PGX Graphics	Sun Creator3D Series	Sun Elite3D
17-inch color (X7143A)	None	X3872A	X3872A
21-inch color (X7136A)	X471A	None	None
24-inch wide-screen (X7124A)	Not recommended	None	Not recommended

Note: Sun *PGX64 graphics is an X-option (X3768A) and is not included in any of the standard configurations listed above.*

Transition Timeline

128-MB and 256-MB configurations of the Ultra 10 workstation configurations are scheduled to transition per the following schedule:

- Last Order Date: December 14, 2001
- Last Ship Date: March 15, 2002

The 128-MB and 256-MB memory X-options will not be transitioned.

Options

Below is a comprehensive list of system expansion, networking, graphics, and multimedia options that are supported by Sun Ultra 10 workstation. Older options may also be compatible, but are not listed here. Refer to the Sun Price Book and configuration guides for an up-to-date list of the options available, configuration notes, and ordering information. When no maximum number is listed, refer to ordering or configuration notes for that option.

Part Number	Option Description	Maximum Number Supported	Comments
Memory			
X7036A	64-MB, 50-ns ECC DRAM expansion kit (two 32-MB DIMMs)	2	These are all pairs of DIMM units
X7037A	128-MB, 50-ns ECC DRAM expansion kit (two 64-MB DIMMs)	2	
X7038A	256-MB, 50-ns ECC DRAM expansion kit (two 128-MB DIMMs)	2	
X7039A	512-MB, 50-ns ECC DRAM expansion kit (two 256-MB DIMMs)	2	
Mass Storage Internal			
X5246A	Internal 48X-speed EIDE CD-ROM	1	
X6174A	Internal 20-GB, 7200-rpm Enhanced IDE hard drive	2	
X5236A	*Internal 9.1-GB, 7200-rpm EIDE hard disk*	*2*	
X6171A	*Internal 32X-speed EIDE CD-ROM*	*1*	
Mass Storage Tape Libraries			
X6079A	*Sun StorEdge L3500 tape library, 3.5-TB capacity, 2 drives*		
X6080A	*Sun StorEdge L3500 tape library, 3.5-TB capacity, 7 drives*		
Mass Storage Sun StorEdge UniPack	*The following Sun StorEdge UniPack options come with a 68-68 pin SCSI cable:*		A PCI SCSI adapter card is required to attach any external SCSI device to the Ultra 10
SG-XTAP8MM-010A	7-GB to 14-GB, 8-mm drive in a UniPack desktop enclosure	2	
SG-XTAP8MM-011A	*20-GB to 40-GB, 8-mm drive in a UniPack desktop enclosure*	*2*	
Mass Storage Sun StorEdge FlexiPack			
SG-XTAP-4MM-021A	12-GB to 24-GB, 4-mm DDS-3 tape FlexiPack	2	
SG-XTAP-4MM-031A	72-GB to 144-GB, 4-mm DDS-3 tape FlexiPack, desktop autoloader	2	
SG-XTAP-8MM-020A	14-GB, 8-mm tape FlexiPack	2	

Part Number	Option Description	Maximum Number Supported	Comments
SG-XTAP-8MM-021A	20-GB to 40-GB, 8-mm tape FlexiPack, desktop	2	A PCI SCSI adapter card is required to attach any external SCSI device to the Ultra 10
SG-XDSK010C-9G	*9.1-GB, 7200-rpm UniPack*		
SG-XDSK010C-18G	*18.2-GB, 7200-rpm UniPack*		
SG-XTAP4MM-011A	*12-GB, 4-mm DDS-3 tape drive, desktop enclosure*	*2*	
SG-XTAP-DLT-021A	*35-GB to 70-GB, DLT 7000 tape, desktop*	*2*	
Mass Storage MultiDisk Pack			A PCI SCSI adapter card is required to attach any external SCSI device to and Ultra 10
SG-XDSK020C-18G	18.2-GB (2 x 9.1-GB) 10000-rpm MultiPack		
SG-XDSK020C-36G	36.4-GB (2 x 18.2-GB) 10000-rpm MultiPack		
SG-XDSK040C-36G	36.4-GB (4 x 9.1-GB) 10000-rpm MultiPack		
SG-XDSK040C-72G	72.8-GB (4 x 18.2-GB) 10000-rpm MultiPack		
SG-XDSK020A-18G	*18.2-GB (2 x 9.1-GB) 10000-rpm MultiPack*	*1*	
SG-XDSK020B-36G	*36.4-GB (2 x 18.2-GB) 10000-rpm MultiPack*	*1*	
SG-XDSK040A-36G	*36.4-GB (4 x 9.1-GB) 10000-rpm MultiPack*	*1*	
SG-XDSK040B-72G	*72.8-GB (4 x 18.2-GB) 10000-rpm MultiPack*	*1*	
SG-XDSK060A-54G	*54.6-GB (6 x 9.1-GB) 10000-rpm MultiPack*	*1*	
SG-XDSK060B-109G	*109.2-GB (6 x 18.2-GB) 10000-rpm MultiPack*	*1*	
SG-XLIBDLT1-280G	*280-GB to 560-GB DLT 7000 tape autoloader (desktop)*	*1*	
SG-XLIBDLT2-280G	*280-GB to 560-GB DLT 7000 tape autoloader (rackmount)*	*1*	
Mass Storage Sun StorEdge A1000 Disk Arrays			A PCI SCSI adapter card is required to attach any external SCSI device to and Ultra 10
SG-XARY144A-36G	36-GB Sun StorEdge A1000 tabletop array (4 x 9.1-GB, 10000-rpm)	8	
SG-XARY151A-72G	72-GB Sun StorEdge A1000 tabletop array (4 x 18-GB, 10000-rpm)	8	
SG-XARY161A-145G	145-GB Sun StorEdge A1000 tabletop array (4 x 36.4-GB, 10000-rpm)	1	
SG-XARY146A-36G	36-GB Sun StorEdge A1000 rackmountable array (4 x 9.1-GB, 10000-rpm)	1	
SG-XARY152A-72G	72-GB Sun StorEdge A1000 rackmountable array (4 x 18-GB, 10000-rpm)	1	
SG-XARY162A-145G	145-GB Sun StorEdge A1000 rackmountable array (4 x 36.4-GB, 10000-rpm)	1	

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Part Number	Option Description	Maximum Number Supported	Comments
SG-XARY144A-109G	*109-GB Sun StorEdge A1000 tabletop array* *(12 x 9.1-GB, 10000-rpm)*	*8*	
SG-XARY151A-218G	*218-GB Sun StorEdge A1000 tabletop array* *(12 x 18.2-GB, 10000-rpm)*	*8*	
SG-XARY161A-291G	*291-GB Sun StorEdge A1000 tabletop array* *(8 x 36.4-GB, 10000-rpm)*	*1*	
Mass Storage Sun StorEdge D1000 Arrays			
SG-XARY145A-36G	36-GB Sun StorEdge D1000 tabletop array (4 x 9.1-GB, 10000-rpm)	8	
SG-XARY153A-72G	72-GB Sun StorEdge D1000 tabletop array (4 x 18-GB, 10000-rpm)	8	
SG-XARY163A-145G	145-GB Sun StorEdge D1000 tabletop array (4 x 36.4-GB, 10000-rpm)	1	
SG-XARY147A-36G	36-GB Sun StorEdge D1000 rackmountable array (4 x 9.1-GB, 10000-rpm)	1	
SG-XARY154A-72G	72-GB Sun StorEdge D1000 rackmountable array (4 x 18-GB, 10000-rpm)	1	
SG-XARY164A-145G	145-GB Sun StorEdge D1000 rackmountable array (4 x 36.4-GB, 10000-rpm)	1	
SG-XARY145A-109G	*109-GB Sun StorEdge D1000 tabletop array* *(12 x 9.1-GB, 10000-rpm)*	*8*	
SG-XARY153A-218G	*218-GB Sun StorEdge D1000 tabletop array* *(12 x 18.2-GB, 10000-rpm)*	*8*	
SG-XARY163A-291G	*291-GB Sun StorEdge D1000 tabletop array* *(8 x 36.4-GB, 10000-rpm)*	*1*	
Input Devices			
X180A	SunButtons™ 32-key function I/O device	1	
X190A	SunDials™ 8-dial interactive graphics I/O device for 3-D	1	
SUNX-MICII/G5	*SunMicrophone™ II*	*1*	
PCI Expansion Cards			
X1032A	10/100BASE-T Ethernet with SunPCI UltraSCSI	4	
X1033A	10/100BASE-T with MII PCI adapter	4	
X1034A	PCI Quad Fast Ethernet controller PCI adapter	2	
X1089A	SunVideo Plus™ 1.3 Realtime video/audio compression card	1	
X1152A	SunFDDI™ single-attach PCI adapter 2.0	4	
X1153A	SunFDDI dual-attach PCI adapter 2.0	4	
X1155A	High-speed serial interface PCI adapter 2.0	4	

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Part Number	Option Description	Maximum Number Supported	Comments
X1157A	SunATM™-155 Multimode Fiber 4.0	2	
X1158A	SunATM-155 Cat-5 UTP 4.0	2	
X1159A	SunATM-622 Multimode Fiber 4.0	1	
X2069A	Sun Gigabit Ethernet plus FC-AL combination adapter (PCI)	1	
X2154A	Token ring interface/PCI adapter 5.0 for Solaris 8 and earlier releases	2	Requires Solaris 8
X2156A	Serial asynchronous interface PCI adapter 3.0 for Solaris 8 and earlier releases	3	Requires Solaris 8
X5010A	Single-channel, single ended UltraSCSI host adapter	3	
X6540A	Dual-channel, single-ended UltraSCSI controller	2	
X6541A	Dual-channel, differential UltraSCSI controller	2	
X6729A	PCI FC/AL single-channel adapter	1	
X2132A	SunPCi IIpro 733-MHz coprocessor card	1	
X7042A	Optional SunPCi II and IIpro 128-MB SODIMM		
X7044A	Optional SunPCi II and IIpro 256-MB SODIMM		
X7045A	Optional SunPCi IIpro 512-MHz SODIMM		
X2131A	*SunPCi™ II 600-MHz coprocessor card*	*1*	
X1131A-64.2	*SunPCi™ 400-MHz coprocessor card*	*1*	
X7041A	*64-MB DIMM memory expansion for SunPCi card*		
X7035A	*128-MB DIMM memory expansion for SunPCi card*		
Monitors and Graphics			
X3679A	Sun Elite3D m6 graphics accelerator	1	UPA
X3670A	Sun Creator3D series 3, 24-bit color, double-buffered graphics, vertical	1	UPA
X3768A	Sun PGX64 graphics card	4	
X3668A	*PGX32™ 32-bit color PCI graphics frame buffer*	*4*	
X3677A	*Sun Elite3D m3, 24-bit color graphics accelerator, vertical*	*1*	*UPA*
X7143A	17-inch entry color monitor		One monitor per graphics accelerator
X7127A	18.1-inch flat-panel color display		
X7136A	21-inch color monitor		
X7124A	24-inch color monitor		
X7126A	*17-inch color monitor*		
X7135A	*19-inch color monitor*		
X7137A	*24-inch color monitor*		
X470A	*13W3F-to-HD15M video adapter cable*		One cable per monitor as needed
X3872A	HD15F-to-13W3M video adapter cable		

Part Number	Option Description	Maximum Number Supported	Comments
Other Options			
X3856A	Fast-wide 68-68 pin SCSI cable and GEO-specific power cord		A PCI SCSI adapter card is required to attach any external SCSI device to the Ultra 5 and Ultra 10
X901A	0.8-meter wide-to-narrow 68-68-pin UltraSCSI	1	
X902A	2.0-meter wide-to-narrow 68-68-pin UltraSCSI	1	
X903A	1.2-meter wide-to-narrow 68-68-pin SCSI adapter cable	1	
X904A	2.0-meter wide-to-narrow 68-68-pin SCSI adapter cable	1	
X471A	BAE video connector 13W3F/HD15M		
X499A	PCI multimedia kit		
X907A	*Optional power cable, CPU to monitor, 1.5 meter*	*1*	
X908A	*Optional power cable, CPU to monitor, 2.5 meter*	*1*	
X467A	*MII-AUI converter*	*1*	
Type 6 Country Kits			
X3508A	North American Universal	1	Except for Z country kit codes, the country kit contents are included with every Ultra 5 and Ultra 10 configuration. Refer to the "Choice of " sub-section (above) for ordering details
X3509A	French	1	
X3510A	German	1	
X3511A	Swiss-French	1	
X3512A	Swiss-German	1	
X3513A	Swedish	1	
X3514A	United Kingdom	1	
X3515A	European UNIX	1	
X3516A	Japanese UNIX	1	
X3517A	Taiwanese	1	
X3519A	Japanese	1	
X3520A	United Kingdom UNIX	1	
X3522A	Norwegian	1	
X3523A	Portuguese	1	
X3524A	Spanish	1	
X3525A	Danish	1	
X3526A	Italian	1	
X3527A	Dutch (Netherlands)	1	
X3528A	Australian	1	
X3529A	Finnish	1	
X3581A	Simplified Chinese	1	
X3584A	Russian	1	

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Upgrade Information

Sun™ upgrades offer customers outstanding investment protection for their existing Sun equipment.

Key Messages

- Sun offers customers a variety of flexible upgrade paths to the most popular Sun systems
- Choose from full array of chassis upgrades
- Existing investments in non-Sun hardware can be leverage by upgrading to Sun through competitive upgrades

Sun Upgrade Allowance Program (Sun UAP)

Under Sun UAP, allowance codes or part numbers have been created and the percentage allowance is built into this part number (see below). These allowance codes replace the previous UG/CU marketing codes used for all desktop upgrades.

Allowance codes can be found in the Sun Pricebook starting with the September 2000 version. Please note that allowance codes apply to configured systems and **cannot be applied to X-options, other than monitors** (see ordering notes below).

Allowance Code Numbering Scheme

Below is an example allowance code, along with a breakdown of the components.

Allowance code = ALW-15-T-D-A22-P2

- **ALW** = Upgrade identifier. (All allowance codes start with ALW.)
- **15** = Allowance percentage. Percentage is applied to the list price of a standard marketing part number. 15 means 15% off of list price, 08 means 8% off of list price, and so on.

  (Note: Any other discounts such as volume discounts should also be taken off the list price and not the net of the above.)
- **T** = Desktop upgrades, S for server upgrades, and D for storage upgrades.
- **D** = Indicates the residue group. A way of grouping system in the Sun installed base. The letters A through X are reserved for Sun systems. The letter Z is used for competitive systems.
- **A22** = Identifies the product family that the customer is purchasing.
- **P2** = Promotion code. Used for tracking corporate sponsored and other types of promotions.

How to Determine the Right Allowance Code

Scenario: My customer has a SPARCstation™ 10 workstation and would like to upgrade to an Ultra™ 10 workstation. What allowance part number should I select?

1. From left hand column select the platform the **customer has.**

2. From the top row select the platform the customer would like to **UPGRADE TO.**

3. Where the UPGRADE FROM column and the UPGRADE TO row intersect (noted with **) is the allowance part number that is applied to the list price of the standard marketing part number.

DESKTOP SYSTEM MIGRATION AND ALLOWANCE MATRIX

UPGRADE TO: FROM:	Ultra 5 (A21)	Ultra 10 (A22)	Ultra 60 (A23)	Ultra 80 (A27)
Early Sun SPARCstation systems	ALW-08-T-A-A21	ALW-08-T-A-A22	ALW-08-T-A-A23	ALW-06-T-A-A27
SS4, 5, 10, or 20**	ALW-12-T-B-A21	**ALW-12-T-B-A22	ALW-10-T-B-A23	ALW-08-T-B-A27
UltraSPARC™ 1, 5, 10, and 30	ALW-14-T-C-A21	ALW-16-T-C-A22	ALW-16-T-C-A23	ALW-12-T-C-A27
UltraSPARC 2 and 60	ALW-14-T-D-A21	ALW-16-T-D-A22	ALW-18-T-D-A23	ALW-16-T-D-A27
Non-Sun workstations	ALW-10-T-Z-A21	ALW-12-T-Z-A22	ALW-10-T-Z-A23	ALW-10-T-Z-A27

Answer: Allowance part number ALW-12-T-B-A22 should be selected. Your customer gets a 12 percent allowance off the list price of any Ultra 10 workstation configuration for returning the SPARCstation 10.

Ultra 10 Workstation Upgrade Ordering Notes

• No disks, memory, or CD-ROM drives migrate to the Ultra 10 workstation

• Country kits (keyboard and localized manuals)

– The Ultra 10 workstation has the country kit physically included within the System Ship Kit. Please note other country kit choices are also available.

– Country kits are not provided with upgrades from SPARCstation 4, SPARCstation 5, SPARCstation 10, SPARCstation 20, and Ultra 1 systems. These platforms are very likely to have Type 5 keyboards and can be migrated to the Ultra 10 workstation. Customers can keep old keyboards or order new.

– The Ultra 10 workstation does not support the Type 4 keyboard. If a customer has a Type 4 keyboard, please order appropriate country kit. Type 5 keyboards can migrate to the Ultra 10 workstation.

• Monitors

– Monitors are not included with any Ultra 10 workstation upgrades. If a monitor is needed, order the appropriate X-option or refer to monitor upgrade section of the price book and apply the appropriate allowance code.

– Sun branded 17-inch and 20-inch monitors migrate from previous generation Sun systems; however, the customer may need to purchase a monitor adapter X470A.

– For some monitors, a video adapter may be required. Please order correct adapter (i.e., 21-inch color monitor with on-board 8-bit graphics requires X470A). Adapter choices are:

  • X3872A—HD15F-to-13W3 video adapter

  • X471A—13W3F-to-HD15M video adapter (10-inch cable)

– N1 (Sony GDM 17E10), N2 (Sony GDM 20E20, GDM 17E20), P4 (Sony GDM20D10) are supported monitors on Ultra 5 and Ultra 10 workstations. Customers may migrate any of these monitors. However, an adapter is required for operation.

Sun Enterprise Services Offerings

Sun Enterprise Services provides two service offerings: SunClient℠ program or low-level, low-cost support and SunSpectrum℠ program for high-level support and mission-critical response. Both support programs are available to service Ultra™ 10 workstations.

SunClient Program

Now there is a way to reduce hardware and software support costs for network computers and the Ultra 5 and Ultra 10 workstations. The SunClient support program is a new suite of offerings that is separate, yet complementary to the SunSpectrum program. SunClient Support provides:

- A new choice for optimizing low-cost workstation support
- Flexibility to select only the services needed
- Administrative simplicity, saving time and money
- Access to world-class UNIX® networking experts

Feature	SunClient Maintenance	SunClient Central Maintenance	SunClient Software Tech Support Option*
Systems approach coverage	*	*	—
Solaris™ and unbundled software technical support	—	—	*
9 a.m.-5 p.m., M-F telephone coverage	*	*	*
8 a.m.-5 p.m., M-F on-site coverage	*†‡	*‡	—
Response times (phone/onsite)	4-hour callback/next business day response	4-hour callback/second business day response	4-hour callback
Centralized on-site repair of multiple units	—	*	Not Applicable
Patches	Not Applicable	Not Applicable	*
SunSolve℠ license	Not Applicable	Not Applicable	*
SunSolve EarlyNotifier℠ Service	Not Applicable	Not Applicable	*
Software Updates	Not Applicable	Not Applicable	Not Applicable

*Can only be sold as an option to SunClient Maintenance or SunClient Central Maintenance.
† Next business day on-site response requires that the request for service be received by 3:00 p.m. If the call is received after 3:00 p.m., service will be provided on the second business day.
‡ Customers located more than 50 miles from an authorized service provider or reseller will be charged an additional fee for service activity.

Features and Benefits of the SunClient Program

Features	Benefits
• Unbundled hardware and software support	• **Flexibility**: Select the type and amount of coverage needed for desktop systems, so service dollars are targeted where they are needed most.
	• **Cost savings**: Pay only for the support services needed.
• Next business day (SunClient Maintenance) or second business day (SunClient Central Maintenance) on-site response	• **Cost efficiency**: Because Sun can more efficiently manage spare inventory and labor scheduling, the savings can be passed on to the customer.
• Single contract with choice of automatic warranty upgrade	• **Simplicity**: One contract covers a predefined number of systems at one low price. New systems acquired can be upgraded to the SunClient service level.
• SunClient Central Maintenance	• **Cost savings**: Sun realizes an economy of scale by repairing multiple systems with one visit and leverages existing support infrastructures, so cost efficiency is maximized while duplication of effort is minimized.
• Service delivery by Sun experts	• **Consistency**: Selected desktops can be deployed anywhere with assurance of cost-effective, quality service and support.

For more information, visit the SunClient Support (external) web site at:
`http://www.sun.com/service/support/sunclient`

The SunSpectrum Program

The SunSpectrum program is an innovative and flexible service offering that allows customers to choose the level of service best suited to their needs, ranging from mission-critical support for maximum solution availability to backup assistance for self-support customers. The SunSpectrum program provides a simple pricing structure in which a single fee covers support for an entire system, including related hardware and peripherals, the Solaris Operating Environment software, and telephone support for Sun™ software packages. The majority of Sun's customers today take advantage of the SunSpectrum program, underscoring the value that it represents. Customers should check with their local Sun Enterprise Services representatives for program and feature availability in their areas.

SunSpectrum program support contracts are available both during and after the warranty program. Customers may choose to uplift the service and support agreement to meet their business needs by purchasing a SunSpectrum contract.

The four levels of SunSpectrum support contracts are outlined below.

Program	Description
Mission-Critical **SunSpectrum Platinum℠ Support**	Designed to support client-server, mission critical solutions by focusing on failure prevention, rapid recovery and year round technical services planning. Support is provided 24 x 7.
Business-Critical **SunSpectrum Gold℠ Support**	Includes a complete package of proactive and responsive services for customers who require maximum uptime for their strategic business-critical systems. Support is provided 24 x 7.
System Coverage **SunSpectrum Silver℠ Support**	Combines the service expertise, responsive on-site support and technical support by telephone and SunSolve CD/on-line services. Support is provided 8 a.m. to 8 p.m. Mon. through Fri.
Self-Directed **SunSpectrum Bronze℠ Support**	Provided for customers who rely primarily upon their own in-house service capabilities. Enables customers to deliver high quality service by giving them access to UNIX® expertise, Sun certified replacement parts, software releases and technical tools. Support is provided 8 a.m. to 5 p.m. Mon. through Fri.

Warranty

Standard Sun warranty offered with all Ultra 10 systems. For warranty terms and conditions, see the warranty web site at: `http://www.sun.com/service/support/warranty/features.html`.

Glossary

24-bit color	The ability to render objects from a palette of 16.7 million colors. It is often referred to as true color and results in much more realistic shading of 3-D objects for enhanced image quality.
3D-RAM	Dual-ported video memory with graphics functionality built into the memory chip.
100BASE-T	Also known as Fast Ethernet, the IEEE standard for 100-Mb Ethernet.
Antialiasing	A graphics technique that greatly enhances the quality of images by eliminating many of the inaccuracies (jaggies) inherent to rendering on a raster display. Typically found only in high-end graphics systems.
DIMM	Double inline memory module. A memory unit that can come in a variety of sizes, such as 16, 32, 64, and 128 MB.
DX-05	OPC ViewPerf benchmark. The IBM Visualization Data Explorer (DX) is a general-purpose software package for scientific data visualization and analysis. It employs a data-flow driven client-server execution model and is currently available on UNIX workstations from Sun, Silicon Graphics, IBM, Hewlett-Packard, and Digital Equipment. The tests visualize a set of particle traces through a vector flow field. The width of each tube represents the magnitude of the velocity vector at that location. Data such as this might result from simulations of fluid flow through a constriction. The object represented contains about 1,000 triangle meshes containing approximately 100 vertices each. This is a medium-sized data set for DX.
Fast Ethernet	IEEE standard for 100-Mb Ethernet.
MII	Media independent interface. Used for connecting external transceivers to Fast Ethernet.
ODBC	Open database connectivity.
OpenGL®	A standard software interface for graphics hardware that allows programmers to create interactive 3-D applications. OpenGL provides a full-featured, network-transparent application programming interface.
PCI	Peripheral component interconnect. An industry standard for connecting peripherals such as disk drives, tapes drives, and other devices used in the PCs.
PLBwire93	The Picture Level Benchmark for wireframe performance. A benchmark standardized by the National Computer Graphics Associated GPC committee. The value represents the geometric mean performance on several commonly used 3-D wireframe operations.
PLBsurf93	The Picture Level Benchmark for 3-D surface performance. A benchmark standardize by the National Computer Graphics Associated GPC committee. The value represents the geometric mean performance on several commonly used 3-D surface operations.

Sun microsystems

ProCDRS-02	OPC ViewPerf benchmark. CDRS is Parametric Technology's modeling and rendering software for computer-aided industrial design (CAID). It is used to create concept models of automobile exteriors and interiors, other vehicles, consumer electronics, appliances and other products that have challenging free-form shapes. The users of CDRS are typically creative designers with job titles such as automotive designer, products designer or industrial designer.
	CDRS, which contains seven different Viewperf tests, is a modeling and rendering application for computer-aided industrial design. There are seven tests specified that represent different types of operations performed within CDRS. Five of the tests use a triangle strip data set from a lawnmower model created using CDRS. The other two tests show the representation of the lawnmower.
UPA	Ultra port architecture. A high-speed, packet-switched mother board interconnect.
V9	Version 9 of the SPARC™ definition.
VIS™	Visual instruction set. The UltraSPARC™ processor implements a special instruction set that is aimed primarily at image and video processing. Some of the instructions allow the CPU to directly access and operate on image data with a high degree of parallelism. Other instructions provide facilities for formatting and moving data at very high rates of speed both within the CPU, and between the CPU and the other system components.

Materials Abstract

All materials are available on SunWIN, except as otherwise noted.

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Powerpack				
– *Sun Ultra™ 10 Workstation: Just the Facts*	Reference Guide (this document)	Training Sales Tool	SunWIN, Reseller Web	76924
– *Sun Ultra Workstations Customer Presentation*	Presentation with Slide Notes	Sales Tool	SunWIN, Reseller Web	111990
Just the Facts				
– *SunPCi™ II Coprocessor Card: Just the Facts*	Reference Guide	Training Sales Tool	SunWIN, Reseller Web	92629
– *Sun™ Elite3D Graphics: Just the Facts*	Reference Guide	Training Sales Tool	SunWIN, Reseller Web	75245
– *Sun Creator Graphics Series 3: Just the Facts*	Reference Guide	Training Sales Tool	SunWIN, Reseller Web	75246
Quick Reference Cards				
– *Quick Reference Card Sun Workstation Product Line Overview*	Quick Reference Card	Sales Tool	SunWIN, Reseller Web, First Resort	10826
– *Quick Reference Card Sun Workstation Graphics Products Overview*	Quick Reference Card	Sales Tool	SunWIN, Reseller Web, First Resort	24507
– *Quick Reference Card Competitive Summary Workstations*	Quick Reference Card	Sales Tool	SunWIN, Reseller Web, First Resort	12259
– *Quick Reference Card Upgrade Paths*	Quick Reference Card	Sales Tool	SunWIN, Reseller Web, First Resort	24513
Product Literature				
– *Sun Ultra Desktop Family Brochure*	Data Sheet	Sales Tool	SunWIN, Reseller Web COMAC	69376 BE604-3
– *Sun Ultra 10 Workstation Data Sheet*	Data Sheet	Sales Tool	SunWIN, Reseller Web COMAC	69377 DE778-6

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
− *Graphics Brochure Imagine It*	Data Sheet	Sales Tool	SunWIN, Reseller Web COMAC	60585 BE508-3
Competitive Analyses				
− *PC Workstation Battle Brief*	Competitive Brief	Sales Tool	SunWIN	75270
− *SGI Competitive Battle Brief*	Competitive Brief	Sales Tool	SunWIN	70605
Product Presentations				
− *Graphics Product Presentation*	Product Presentation, with Notes	Sales Tool	SunWIN, Reseller Web	75254
− *Sun in Software Development Customer Presentation*	Product Presentation, with Notes	Sales Tool	SunWIN, Reseller Web	59375
− *Sun in EDA Customer Presentation*	Product Presentation, with Notes	Sales Tool	SunWIN, Reseller Web	59078
− *Sun in MCAD/MCAE Customer Presentation*	Product Presentation, with Notes	Sales Tool	SunWIN, Reseller Web	59074
White Paper				
− *Ultra 5 and Ultra 10 Architecture White Paper*	Technical Brief	Sales Tool Training	SunWIN, Reseller Web	75258
− *SunPCi II Coprocessor Card White Paper*	Technical Brief	Sales Tool Training	SunWIN, Reseller Web	92632
External Web Sites				
− *Sun Home Page*	`http://www.sun.com/desktop`			
− *List of Tested PCI Cards*	`http://www.sun.com/pci/pci.cards.ihv.html`			
− *SunClient℠ Support Web Site*	`http://www.sun.com/service/support/sunclient`			