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 333 and 440 MHz. The Ultra 10 workstation features PCI I/O, Sun's Ultra port architecture (UPA), high-speed graphics interconnect slot, and a mini-tower enclosure, which allows for additional PCI card expansion, memory expansion, Creator3D and Sun Elite3D m3 and m6 graphics accelerators.

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

The Ultra 10 workstation includes the following features:

- **Processor**
  - 333-MHz or 440-MHz UltraSPARC-IIi
  - 2-MB external cache
- **Graphics**
  - Onboard PGX24™ 24-bit graphics, standard
  - Creator3D graphics
  - Sun Elite3D m3 graphics
  - Sun Elite3D m6 graphics
- **Internal Storage**
  - Up to two 9.1-GB, 7200-rpm EIDE hard disks
  - 32X-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
  - 333-MHz or 440-MHz UltraSPARC-IIi processor with 2-MB external cache
  - Up to 1 GB of 168-pin 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
  - 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 can also be used to support a second monitor on systems configured with Creator3D, Sun Elite3D m3, or Sun Elite3D m6 graphics accelerators.
  - Advanced, fast 24-bit accelerated Creator3D, Sun Elite3D m3, and Sun Elite3D m6 UPA graphics cards available
  - Creator3D supports 24-bit color up to 1920 x 1200 resolution at 70 Hz on the 24-inch, wide-screen monitor
  - The Ultra 10 workstation is clearly the entry point for Sun's high-performance graphics systems. Customers can choose the level of graphics performance they need now and in the future
- 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 fast internal 9.1-GB, 7200-rpm EIDE hard disks
  - Internal 32X-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 adjusts automatically to the customer's network environment
- Robust, reliable, scalable, secure, network-centric Solaris™ operating environment
  - The Solaris 7 64-bit ready-to-run operating environment is preinstalled on all Ultra 10 workstations
  - The Solaris operating environment is the technical industry's leading enterprise operating environment 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℠ product, 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 Ultra 5 workstation up to the two-way multiprocessing Sun Ultra 60 workstation.

Ultra 5	The Ultra 5 workstation is Sun's lowest-priced workstation. Designed to meet the needs of price-sensitive and volume-purchase customers without sacrificing performance, the Ultra 5 workstation is 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.
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 Creator3D, Sun Elite3D m3, or Sun Elite3D m6 graphics, the markets are extended to animation, 3-D content creation, and simulation.
Ultra 2	The Ultra 2 system is an SBus-based multiprocessing workstation. It is targeted for the technical user who requires high performance and multiprocessing (MP) capability. The market 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, and the integration and support capabilities provided by the Sun channels.
Ultra 60	The Ultra 60 workstation is a more advanced Ultra 2 workstation. Like the Ultra 2 workstation, the Ultra 60 workstation is designed for the technical user who requires high performance and multiprocessing capability. The Ultra 60 workstation also addresses the needs of graphics-intensive users and continues to support and build upon the upgradability features to which Ultra 2 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 10, Ultra 2, or Ultra 30 workstations. 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-II processor(s), dual UPA-based graphics, and superior throughput and bandwidth.

Sun Ultra 10 Workstation Configurations

The Sun Ultra 10 workstation is offered in a variety of workstation configurations based upon the processor speed and graphics option. 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
- Accelerated 24-bit, 2-D, and 3-D Creator3D Graphics—available on Model 333
- Accelerated high-performance 24-bit, 2-D, and 3-D Sun Elite3D m3 or Sun Elite3D m6 Graphics—available on Model 440

Processor speed	333 MHz	440 MHz
Cache size	2 MB	2 MB
SPECint_95	14.1	17.9
SPECfp_95	18.3	22.7

Target Users

The Ultra 10 workstation is ideal for customers who require a powerful workstation with exceptional graphics capabilities but do not need the added expansion and throughput capabilities of the Ultra 60 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

Industry	Key Features to Highlight
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 (Creator3D 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

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 Catalyst[SM] catalog of third-party solutions.

Target Market	ISV— Software Applications	
Entertainment, Animation, and Content Creation	Adobe	PhotoShop
	ArSciMed	Kinema/Sim
	Electric Image	Electric Image
	Engineering Animation Inc.	Vislab
	Lightwork	Kinetix (rendering tool kit)
	NewTek	Lightwave 3D
	Nichimen	NWorld
	XaosTools	Pandemonium
EDA	Avant!/ISS	DRC/ERC product
	Avant!/Meta Software	HSpice
	Cadence Design	Vampire Dracula
	Compass Design	Pathfinder
	K2 Technologies	Mask Compose and QuickView
	Mentor Graphics	Caliber ICVerify Checkmate
	Mentor/Precedence	Co-Simulation Backplane Simulators
	Silvaco	Atlas Athena Spice
	SpeedSim	SpeedSim
	Systems Science	Vera
	Viewlogic/Vantage Analysis	SpeedWave MT
	Simplex	Thunder and Lightning Fire and Ice
	Silvaco	Virtual Wafer Fab Automation Tools
	For general information see: `http://www.sun.com/desktop`	
Health Care	Cemax	VIP 2.0
	Context Vision	Imaging processing for refining MR data
	ISG	Silohet
	Virtual Vision Software	

Target Market	ISV— Software Applications	
MCAE	ANSYS, Inc.	ANSYS
	Computational Dynamics, Inc.	StarCD
	ESI	Pam-Crash
	EXA Corporation	Powerflow
	Fluent, Inc.	Fluent, Fluent UNS, Rampant, Nekton
	Fluid Dynamics, Inc. (FDI)	FIDAP
	Hibbitt, Karlsson & Sorensen, Inc	ABAQUS
	Livermore Software Technology Corporation (LSTC)	LSDyna 3D
	MacNeal-Schwendler (MSC)	PATRAN, NASTRAN
	MARC Analysis Research Corp	Mentat, MARC
	For general information see: `http://www.sun.com/desktop`	
MCAD	Computervision	CADDS5, Medusa
	Dassault	Catia, Catia Studio
	EDS/ Unigraphics	Unigraphics
	Matra Vision	Euclid
	Parametric Technology Corp	Pro Engineer, Pro CDRS, ProFlythrough
	SDRC	I-Deas Master Series

Compatibility

The Ultra™ 10 workstation runs the following Solaris™ operating environments:

Ultra 10 360-MHz Model	Ultra 10 440-MHz Model
• Solaris 7 preinstalled	• Solaris 7 Hardware: 3/99 preinstalled
• Solaris 2.6 Hardware: 3/98	• Solaris 2.6 Hardware: 5/98
• Solaris 2.5.1 Hardware: 11/97	• Solaris 2.5.1 Hardware: 11/97

As a result, it can run 32-bit applications unmodified from the Solaris 2.3 and Solaris 2.4 operating environments, so these new systems are totally compatible with previous systems and software.

UltraSPARC™-IIi Processor

The Sun Ultra™ 10 workstation uses the UltraSPARC™-IIi, a highly integrated 64-bit SPARC™ V9 superscalar processor. Created for the Ultra 5 and Ultra 10 workstations, the UltraSPARC-IIi processor is part of a second generation of products based on the UltraSPARC processor architecture. In addition to using a new process technology, the UltraSPARC-IIi processor provides a higher clock frequency, multiple SRAM modes, and system-to-processor clock ratios that accommodate varying economics for a range of products. At the same time, it provides software compatibility with existing systems based on the UltraSPARC processor architecture.

PCI Technology

PCI is a high-performance 32-bit local bus that is optimized for high-speed data transfers. It resides on the motherboard and operates at high speeds between highly integrated components such as peripherals, add-on boards, and memory systems. A high-performance bridge ASIC interfaces the UltraSPARC UPA bus to the 33-MHz PCI buses.

In addition to Sun's commitment to expand the capacity and performance of all Sun systems, Sun is continually looking for ways to increase the openness and standards-compliance of its systems. Sun has chosen to support PCI on the Ultra 5, Ultra 10, Ultra 30, and Ultra 60 workstations as well as on future systems, for the following reasons:

- **PCI is an open, architecture-independent bus**

  Because PCI is open and shipping in volume, it has been adopted quickly by both customers and producers of computer hardware. As a result, the potential exists for a large number of platform-independent peripherals to be supported.

- **PCI is fast**

  The PCI bus architecture is designed to provide high performance, with its I/O performance a key differentiator from other bus architectures. Running at 33 MHz, PCI offers configurations that meet a variety of developer and user needs.

- **PCI is standardized**

  PCI is a standard bus architecture that has been adopted by the volume personal computer industry. Because of its wide acceptance, PCI promises that compliant adapter cards will be available from more sources than ever before.

The PCI bus is based on the industry-standard PCI specification version 2.1. Unlike most standards, the PCI specification is very broad. It covers everything from multiple form-factors and voltages to connector types.

SunPCi™ PC Coprocessor Card

The SunPCi™ 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. SunPCi brings together the ease of use of DOS and Microsoft Windows programs and the powerful features of the Solaris operating environment, giving users access to powerful workstation technology without sacrificing access to DOS and Microsoft Windows applications.

SunPCi Feature Summary

- Full PC compatibility
- Solaris operating environment/PC interoperability
- 300-MHz AMD K6-2 processor
- 64- to 256-MB RAM on-card
- USB, parallel, and serial ports
- 24-bit graphics, monitor port
- Audio in/out ports
- PCI form factor

PGX24™ Graphics

PGX24™ is the new on-board graphics built into the motherboard of the Ultra 10 workstation. PGX24 graphics is the entry-level 24-bit capable graphics subsystem for cost conscious customers who do not need the higher performance capabilities offered by the Creator graphics accelerator. PGX24 utilizes the ATI RagePRO graphics processor with 4 MB of SGRAM and provides up to 1152 x 900 resolution for 24-bit-only windowing and up to 1280 x 1024 resolution for 8-bit-only windowing.

Note: *Unlike Creator3D and Sun Elite3D graphics, PGX24 graphics does not offer both 24-bit and 8-bit windowing environments simultaneously. PGX24 graphics is user configurable to display either 24-bit-only windowing or 8-bit-only windowing. A minority of applications require an 8-bit-only windowing environment to operate properly. Customers who require the use of these applications will need to configure the PGX24 graphics to display 8-bit-only windowing or move up to Creator3D or Elite3D Graphics.*

PGX24 includes the following features:

- ATI's RagePRO graphics processor
- 2-D graphics acceleration
- 220-MHz integrated DAC and 4-MB SGRAM provide:
  - 24-bit-only true color video support up to 1152 x 900 @ 85Hz
  - 8-bit-only pseudo color video support up to 1280 x 1024 @ 76Hz
- HD15 video connector on the motherboard supports composite and separate video sync timing
- Compatible with OpenWindows™ and CDE

Creator Graphics Series 3

Creator Graphics leads the way, integrating high-performance graphics with 24-bit imaging, windowing, video playback and 2-D/3-D graphics with Sun's UltraSPARC-II processors. For accelerated imaging and video playback, Creator is combined with the visual instruction set (VIS™), an extremely comprehensive set of imaging and graphics instructions built into the CPU.

Creator Graphics is designed as an integral part of the workstation and is able to draw on system resources for functions traditionally built into the graphics board itself with specialized hardware. The result is that Creator Graphics is very fast and very cost effective.

Creator Graphics series 3 is the latest generation of the Creator Graphics family of accelerators. With one architecture it can accelerate and support diverse types of graphics needs, ranging from 8-bit and 24-bit windowing to high-end 3-D graphics. It is available in a version oriented toward 2-D use (Creator) and in a version that also has high-resolution 2-D and 3-D acceleration (Creator3D). Creator3D provides fast, high-quality transformation and display of 3-D solid and wireframe objects.

Creator Graphics series 3 has four 8-bit color maps for better dynamic color-map segment allocation to applications running in 8-bit and 24-bit color. This feature gives applications better access to private color map segments that do not interfere with other applications. Creator Graphics series 3 also supports adjustable gamma correction, which gives the user the ability to adjust display color to best match individual preferences. Creator3D series 3 adds hardware acceleration of OpenGL® stencil planes. This results in increased application performance for many OpenGL-based applications.

In addition, Creator3D series 3 supports a 1920 x 1200 resolution with Sun's 24-inch monitors (in single-buffer mode). Typical uses for configurations with the 24-inch monitor are in prepress, publishing, imaging, and other situations in which high-quality 2-D imaging or large amounts screen real estate are essential.

Sun Elite3D Graphics

Sun Elite3D Graphics represents a high-powered graphics subsystem for the 3-D graphics market and is complementary to the Creator Graphics product line. Sun Elite3D Graphics retains the basic underlying architecture of Creator Graphics, and maintains full API layer compatibility and transparent acceleration of 3-D graphics APIs. Like the Creator Graphics, Sun Elite3D Graphics is combined with the visual instruction set. Sun Elite3D comes in two models: Sun Elite3D m3 is twice as fast as Creator3D and Sun Elite3D m6 four to five times the performance of Creator3D graphics.

Sun Elite3D provides very fast, high-quality transformation and display of 3-D solid and wireframe objects, and dramatically accelerates high-end functionality, such as double-buffering, triangle and quad rendering, and lighting and shading. At the same time, Sun Elite3D accelerates 2-D objects that meet X11 rules. Fast 8-bit and 24-bit window system and imaging performance are provided. Sun Elite3D systems provide 96-bit planes, including full 24-bit double-buffer planes required for smooth animation. A 28-bit Z-buffer is included to provides hardware assistance for hidden surface removal and dynamic rendering for 3-D objects.

Sun Elite3D systems utilize 3D-RAM technology. This technology is responsible for implementing fast, inexpensive 3-D frame buffers. In addition, Sun Elite3D has three or six (depending on the model) on-board floating-point processors that speed up floating-point-intensive operations such as transformations, clip tests, face determinations, and lighting.

Sun Elite3D is fully compatible with Creator3D accelerators, and does not compromise the windowing system, 2-D graphics, imaging, or video performance. Sun Elite3D simply adds significant performance gains for 3-D applications.

Product Architecture

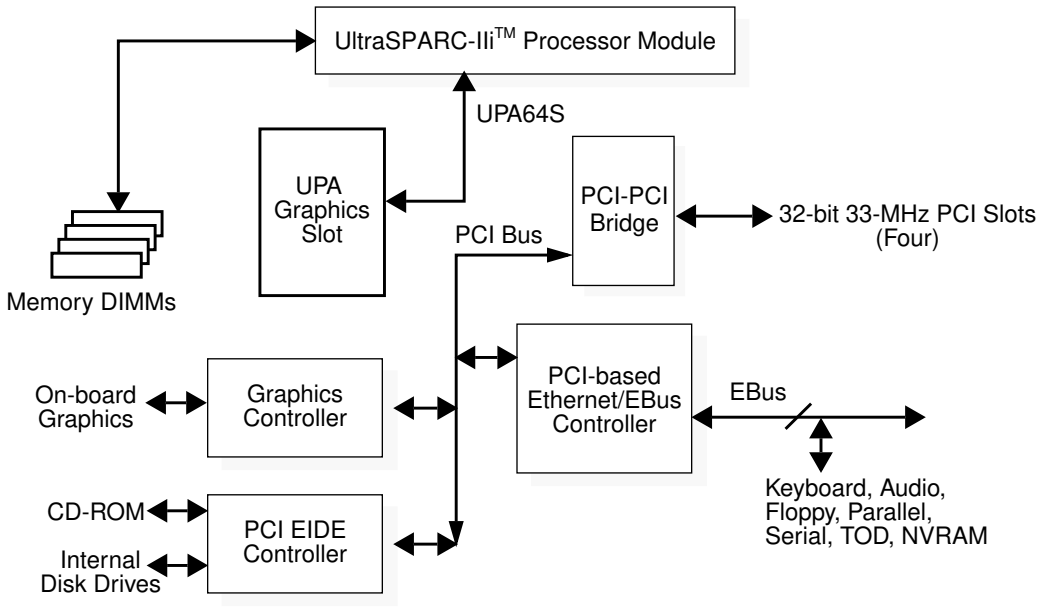


Figure 2. Sun Ultra™ 10 workstation block diagram

The Sun Ultra™ 10 workstation was 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 the following:

- 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
  - 50-ns or 60-ns memory for Model 333
- Riser-card connector to support four full-size, 32-bit, 33-MHz, 5-volt PCI slots
- UPA64s vertical connector for Creator, 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)

- Keyboard and mouse support:
  - Sun6 keyboard and mouse support for Model 440
  - Sun5 keyboard and mouse support for Model 333
- 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, 19-inch color, and 21-inch color monitors
- Time-of-day NVRAM for clock and ID functions

See 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 0.25-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 2.5 volts, rather than the UltraSPARC-I processor's 1.9 volts. This lower 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 VIS™ instruction set. 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

- Integrated VIS instruction set
- Uses the latest 0.25-micron process technology which greatly decreases the die size
- CPU is mounted on a field-installable module card with associated UPA data buffers and external cache

Benefits

- Ready for increased performance on multimedia and networking operations
- Results in a significant increase in performance and a decrease in power consumption (due to a lower core voltage of 1.9 volts)
- Facilitates easy system service and upgrades

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™. The Ultra 10 workstation supports 32-MB, 64-MB, 128-MB, and 256-MB DIMM units.

Note: *The Ultra 10 Models 440 is factory configured with 50-ns DRAM. Additionally, the faster 50-ns DRAM will function properly in the 333-MHz Ultra 10, but does not enhance the performance of the system.*

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	Benefits
• Lower-cost, industry-standard memory modules	• Less expensive, allowing customers to move up to higher levels of memory at lower cost
• ECC memory	• Superior error correction and system reliability

Storage

- Internal data storage for the Ultra 10 workstation is provided by up to two internal 9.1-GB, 7200-rpm disk drives.
- The Ultra 10 workstation includes a CD-ROM bay for the standard internal 32X-speed ATAPI CD-ROM drive.
- A 1.44-MB, 3.5-inch, manual-eject floppy drive is standard.

Features	Benefits
• Up to two fast 9.1-GB, 7200-rpm, enhanced IDE internal disk drives	• Ample storage capacity for storing large files and applications locally
• Photo-CD compatible internal CD-ROM drive	• 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.

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 for a listing of Sun PCI cards that have been qualified on the Ultra 10 workstation. The cards listed below are currently available or are under development.

– Fast Ethernet/SCSI	– Ultra/Diff/SCSI	– ATM 155 single and multi
– Quad Fast Ethernet	– 10/100 Ethernet	– ATM 155/622 (PCI 66)
– ISDN—basic rate	– Gigabit Ethernet	– ATM 25 MB
– ISDN—primary rate	– Token ring (TRI/S)	– FDDI single attach
– Hard bus	– High-speed serial	– FDDI dual attach
– "TGX+-like"	– VDC/MPEG	– Serial-parallel controller
– RAID arrays	– Video teleconference	– 2K x 2K frame buffers
– IEEE-488	– HIPPI	– Video frame grabber
– DR11W	– 1394	– X.25
– T1/E1	– PCI bus expansion	– ESCON
– 8/16/32 Port MUX	– SCSI	– Telephony
– Imaging and cameras	– SS7	– A/D and enablers
– Parallel	– Fax	– Voice/speech
– Audio	– Fibre Channel	– SCI
– SBus expansion	– 1553	– DR-11W
– PCMCIA		

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

SunPCi™ PC Coprocessor Card

The SunPCi™ 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. SunPCi brings together the ease of use of DOS and Microsoft Windows programs and the powerful features of the Solaris operating environment, giving users access to powerful workstation technology without sacrificing access to DOS and Microsoft Windows applications.

The SunPCi 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 is routed to an X11 window on the workstation's monitor.

Other Solaris operating environment services are available to the SunPCi 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 can access printers connected to a Solaris network.

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

Features	Benefits
• Full PC compatibility	• Runs Microsoft Windows NT, Windows 95, Windows 3.x, and DOS applications, whether off-the-shelf or developed in-house
• Solaris/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 and PC environments • Uses Solaris resources and peripherals from within PC environment: Ethernet networking (file, print, etc.), Solaris file system, removable media (CD-ROM, floppy, etc.), and shared monitor • Saves desktop real estate with all-in-one design • Reduces system management costs
• 300-MHz AMD K6-2 processor	• Provides power and performance to run demanding productivity and technical applications and get the job done in a hurry • Runs Microsoft Windows NT/95 and DOS applications at native, Pentium II- and Pentium III-class speeds
• 64- to 256-MB RAM on-card	• Runs multiple PC applications without memory constraints • Provides dedicated memory for PC applications • Expandable to grow with your 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, 1280 x 1024 graphics
• SoundBlaster-compatible sound	• Audio performance for running multimedia PC applications
• Audio in/out ports	• Supports stereo speakers, microphone in
• PCI form factor	• PC coprocessor supports all of Sun's PCI-based Ultra workstations: Ultra 5, Ultra 10, Ultra 30, Ultra 60, and Ultra 450

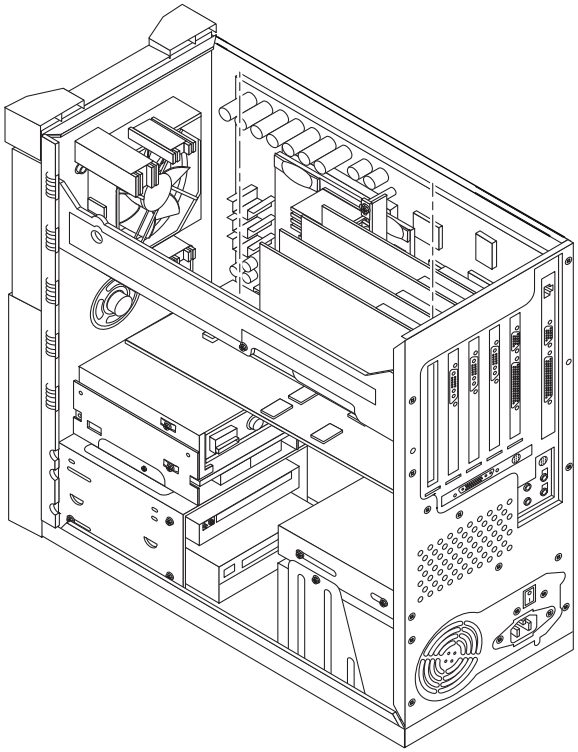


Figure 3. Ultra 10 Workstation chassis with access panel removed, providing full access to internal options

PGX32™ PCI-based Graphics

PGX32™ is Sun's first high-resolution 8-bit and 24-bit color PCI graphics frame buffer supporting all Sun PCI I/O-based workstations and workgroup servers. The PGX32 frame buffer is targeted towards professionals requiring fast X Window system performance, displaying 24-bit and 8-bit graphics at full speed. With 8 MB of SGRAM, the PGX32 frame buffer is capable of providing full 24-bit hardware double buffering at resolutions up to 1152 x 900, 8+24-bit color up to 1280 x 1024 and support up to 1600 x 1200 in pseudo color (8-bit color) mode. PGX32 supports the following resolutions

Display Resolution	Color Mode	Double Buffered	Vertical Refresh Rate (Hz)
640 x 480	8-bit, 24-bit, 8+24-bit	Yes	60/72/75/85
800 x 600	8-bit, 24-bit, 8+24-bit	Yes	60/72/75/85
1024 x 768	8-bit, 24-bit, 8+24-bit	Yes	60/70/75/77/85
1024 x 800	8-bit, 24-bit, 8+24-bit	Yes	85
1152 x 900	8-bit, 24-bit, 8+24-bit	Yes	60/66/70/75/76
1152 x 900	8-bit	Yes	60/66/70/75/76/85
1280 x 800	8-bit, 8+24-bit	Single Only	76
1280 x 1024	8-bit	Yes	60/67/75/76/85
1280 x 1024	24-bit, 8+24-bit	Single Only	60/67/75/76
1600 x 1000	8-bit	Yes	66/76
1600 x 1200	8-bit	Yes	60/65/66/70/75/76/80

The PGX32 frame buffer supports all standard Sun video timings and also supports VESA timings for supporting PC type displays and flat panels. It is also capable of supporting Sun's 24-inch display @ 1600 x 1000.

The PGX32 frame buffer can work in single or multiheaded configurations and can be set as the only frame buffer in the system, as the console or as the secondary frame buffer. Up to four PGX32 frame buffers are supported in any system. The PGX32 frame buffer supports all releases of Solaris 2.6 and the latest Solaris 7 operating environment release. The product has not been tested with all configurations with Solaris 2.5.

Features	Benefits
• Simultaneous 8-bit and 24-bit	• Eliminates colormap flashing display visual support when running both 8-bit and 24-bit applications; allows legacy 8-bit applications to run while simultaneously running the latest 24-bit applications
• 24-Bit true color video support	• Display the highest quality color on screen
• Support for high resolutions	• Ability to display more information with higher quality and image detail
• PCI 33-MHz format	• Allows usage in the widest variety of systems from the Ultra 5 up to the Sun Enterprise™ 450 workgroup server
• 1280 x 1024 at 76-Hz resolution	• High-resolution display quality standard
• Multi-headed (display) support; multiple frame buffers (with support for up to four PGX32 frame buffers in one system)	• For users who must do multiple tasks simultaneously, for example, command and control applications, design, and analysis for engineers
• 8-bit overlay plane	• Allows overlay of 8-bit windows on top of the 24-bit visuals without damaging the underlying visual, resulting in seamless integration and manipulation of windows

Creator Graphics Series 3 Overview

Creator Graphics series 3 is the latest generation of the Creator Graphics product family. Creator Graphics accelerates and supports diverse types of graphics needs ranging from 8-bit and 24-bit windowing to high-end 3-D graphics.

Creator Graphics series 3 is designed to match CPU performance increases beyond the currently available CPU speeds. Series 3 accelerators have one clock for internal graphics processing and another clock for the frame buffer, enabling each part to run at maximum speed independently from each other.

Creator Graphics performance is based on a unique system-level approach to designing graphics.

- UltraSPARC-IIi processor
  - Creator Graphics relies on the power of the UltraSPARC-IIi processor for floating-point calculations, and on the VIS to accelerate imaging. This eliminates the need for a dedicated graphics processor, and results in a significant cost advantage with Creator Graphics.

- UPA graphics interconnect
  - UPA provides a high-speed, high-bandwidth interconnect between the CPU, Creator Graphics, and system memory. It raises overall graphics performance while maintaining a balanced throughput. UPA interconnect ties Creator Graphics directly to the CPU and memory, and delivers orders-of-magnitude greater bandwidth compared to the traditional way of attaching graphics accelerators through a peripheral bus such as PCI.
- Creator rendering ASIC
  - A powerful ASIC renders graphics primitives at very high speeds. The Creator ASIC accelerates fills, scroll, text, lines, polygon rendering, and color space conversion.
- 3D-RAM graphics memory
  - Specialized graphics memory provides high bandwidth and built-in acceleration for 3-D graphics. Creator Graphics series 3 uses the fastest available 3D-RAM chips.

Creator Graphics Model Features

Creator Graphics is available in two configurations: Creator, a single-buffered version that provides hardware acceleration of 2-D graphics; and Creator3D, a double-buffered version that has the full capabilities of Creator, plus increased 3-D graphics acceleration. Only Creator3D is supported on the Ultra 10 workstation.

The features provided by Creator Graphics series 3 on both the single-buffered and double-buffered cards are:

- Accelerated video decompression (playback) by YCC-to-RGB color space conversion
- Imaging and windowing support, including contrast stretch and consecutive-block prefetch for SFB reads
- High-resolution video and monitor support
  - Line doubling for interlaced video writes
  - DDC2B monitor serial communication, with EDID default resolution support in the Creator bootprom
  - Provides a utility to change the resolution within the upper and lower limits of what the new Creator Graphics boards can easily support
- Accelerated imaging and advanced 3-D graphics with Gouraud shading, line antialiasing, per-pixel depth cueing, subpixel addressing, transparency, and stereo viewing with monitor
- Four 8-bit color maps for intelligent and dynamic color-map segment allocation give 8-bit and 24-bit color applications better color access and virtually eliminate interference (such as color flashing) between color-intensive applications
- Adjustable gamma correction offers the user the ability to adjust color to individually preferred settings and optimal display quality

The double-buffered (Creator3D) option has the following additional features:

- Buffer B addressing for stateless (DFB) and video accesses
- Single-buffered, high-resolution (2.3 million pixels) support
  - 1920 x 1200 landscape mode (HDTV-style 16:10 format) on the available 24-inch color monitor
- Hardware acceleration of OpenGL® stencil functions are provided for the double-buffered, including overlay SOV support

Creator Graphics Model Summary

Creator	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

Sun Elite3D Overview

Sun Elite3D greatly accelerates the rendering of 3-D triangles, vectors, and texture maps over what is possible with Creator or a raw CPU. It does this 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 Creator3D. 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.

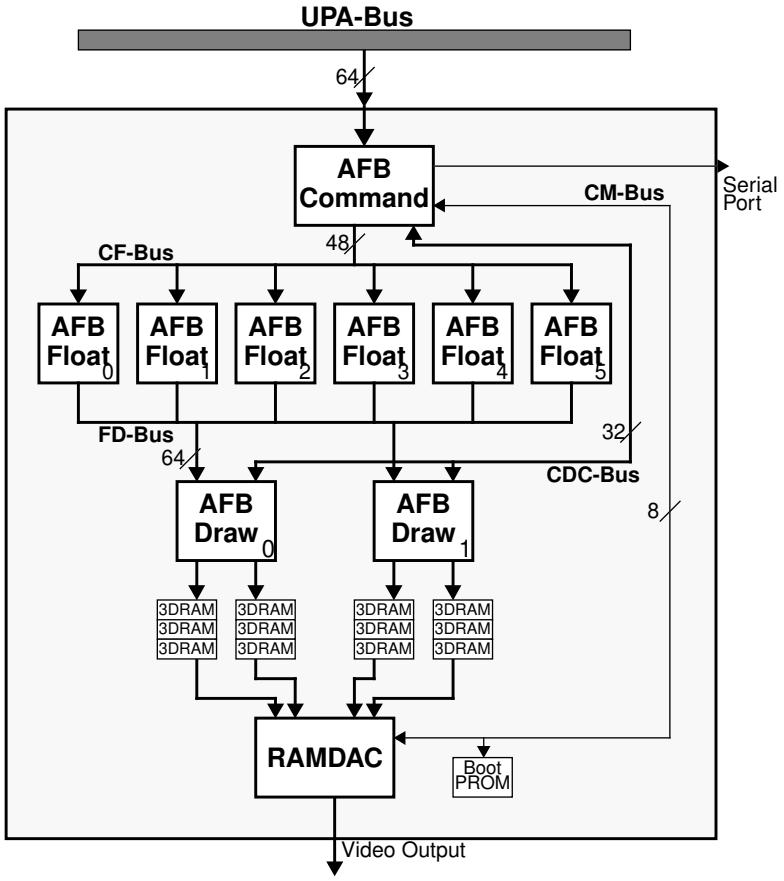


Figure 4. Sun Elite3D m6 chip-level diagram

Sun Elite3D has a highly parallel and efficient graphics pipeline. The Sun Elite3D architecture uses a new generation of 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 Creator3D and support for OpenGL.

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.

Features	Benefits
• Integrated imaging	• Performs fast imaging and 3-D on unified frame buffer
• 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; allows seamless integration and manipulation of windows
• Gouraud shading	• Allows smooth shading of solid geometry
• Alpha blending and screen-door transparency	• Simulates transparent materials such as glass
• Line and 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	• Greater accuracy and image quality
• 4-bit stencil support with hardware acceleration of OpenGL stencil functions	• Provides greater performance
• Accelerated lighting	• More lights can be turned on for enhanced visual display without encountering large performance penalties
• Compressed geometric decompression	• Allows much more geometric data to be stored in the available memory, but also reduces bus bandwidth needs as well; for efficient geometry handling to enable network-centric graphics collaboration
• Four 8-bit color maps	• For dynamic colormap 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 output
• Stereo video output (960 x 680 at 112 Hz) supported with 19- and 21-inch monitors	• With frame buffer, monitor, and window systems support for stereo, users can get more accurate representation of 3-D data
• 1280 x 1024 at 76-Hz resolution standard	• High-resolution display quality
• Dual-headed support (two Sun Elite3D m6 frame buffers)	• For users who need to do multiple things simultaneously, such as command and control applications, 3-D, and video playback for animators, or design and analysis for engineers

Features

- OpenGL 1.1.2., XGL™ 3.0, XIL™, X Windows, Java 3D™, Java™ Media Framework, and MediaLib 1.2 (SDK) support
- Binary compatibility with Creator Graphics product family

Benefits

- A choice of APIs
- Interoperability with existing applications and users

Sun Ultra 10 Workstation UPA-based Graphics Performance

Graphics Supported	PGX24 (24-bit mode)	PGX32™ (24-bit mode)	Creator3D	Sun Elite3D m3	Sun Elite3D m6
Xmark93	10.2	11.5	29.6	30.8	30.8
2-D vectors/sec.	873	897	5.0 M	5.0 M	5.0 M
3-D vectors/sec. **3-D triangles/sec.** **3-D quads/sec.**	521 K — —	521 K — —	3.7 M 1.5 M 698 K	4.9 M 3.0 M 1.2 M	8.8 M 5.9 M 1.3 M
PLBwire93 **PLBsurf93**	18.3 —	28.1 —	250 403	303 519	435 673
ViewPerf OpenGL • **ProCDRS-01** • **DX-04**	 — —	 — —	 8.2 11.2	 13.7 27.8	 19.0 30.7

Notes

- Performance data as of April 1999; Configuration for timing includes Solaris 2.6 Hardware: 5/98 and OpenGL 1.1.2.
- Performance data is subject to change. Please see Sun's web site at `http://www.sun.com` for latest performance numbers.

Metrics Defined

- 2-D vectors are 10 pixels long, X11 perf numbers
- 3-D vectors are 10 pixels long, depth-cued, clip-tested, perspective projection, and solid line through XGL
- 3-D mesh are 25 pixel triangle mesh, with one light source
- 3-D quads are 100 pixel, independent quadrilaterals, with one directional light source
- Both 3-D mesh and quads are Gouraud shaded, randomly oriented, transformed, clip-tested, with perspective projection and Z-buffered through XGL
- Configuration with 24-inch monitor uses Creator3D 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)
- XIL numbers are in million pixels (megapixels per second) for a single-band image

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

	Model 333	Model 440
Dimensions • Height • Width • Depth	402 mm (15.8-inches) 176 mm (6.9-inches) 435 mm (17.1-inches)	
CPU and UPA • Architecture • Clock rate • External cache	UltraSPARC-IIi 333 MHz 2 MB	UltraSPARC-IIi 440 MHz 2 MB
Memory • Memory type • Number of slots • Capacity • DRAM speed • DIMM sizes	168-pin EDO JEDEC, ECC error correction 4 128 MB to 1 GB (minimum factory-configured system is 128 MB) 50 ns 32 MB, 64 MB, 128 MB, and 256 MB (installed in pairs)	
Storage Maximum internal	Up to two 9.1-GB, 7200-rpm EIDE hard disks	
Graphics • UPA • On-board PGX24™ 24-bit graphics	One slot supports optional Creator3D, and Sun Elite3D m3, and Sun Elite3D m6 graphics cards • 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 • Serial ports • Parallel port • PCMCIA bay	Four full-size 33-MHz PCI slots (version 2.1) One D-Sub 25-pin, asynch/synch RS423A/RS232A One D-Sub 9-pin, asynch RS423A One D-Sub 25-pin, IEEE 1284 bidirectional One front-access bay with flip-up access door	
Networking Ports	10BASE-T/100BASE-T Fast Ethernet, self-sensing	
Backup and Distribution • Floppy • CD-ROM	1.44-MB, 3.5-inch, manual-eject floppy 32X-speed ATAPI, photo-CD compatible	
Operating Environment	Solaris 7 (preinstalled) Solaris 2.6 Hardware: 3/98 Solaris 2.5.1 Hardware: 11/97	Solaris 7 Hardware: 3/99 Solaris 2.6 Hardware: 5/98 Solaris 2.5.1 Hardware: 11/97

The Solaris™ 7 Operating Environment

Sun™ workstations are supported by one of the industry's leading enterprise operating environment, the Solaris™ 7 operating environment. 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- 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™ and Intel
- Integrated Java™ software
- System administration support

The Solaris operating environment delivers a competitive advantage to businesses through networked computing, scalability, and multiarchitecture 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 Sun Ultra™ 10 workstation runs the following Solaris operating environment releases:

Ultra 10 360-MHz Model	**Ultra 10 440-MHz Model**
• Solaris 7 preinstalled	• Solaris 7 Hardware: 3/99 preinstalled
• Solaris 2.6 Hardware: 3/98	• Solaris 2.6 Hardware: 5/98
• Solaris 2.5.1 Hardware: 11/97	• Solaris 2.5.1 Hardware: 11/97

As a result, it can run 32-bit applications unmodified from the Solaris 2.3 and Solaris 2.4 operating environments, so these new systems are totally compatible with previous systems and software.

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

Features	Benefits
• 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 without modification

What's New in the Solaris 7 Operating Environment?

The Solaris 7 operating environment release culminates the phased release of the Solaris 64-bit technology, and provides enhancements in overall performance, scalability, reliability, availability, security, and ease of use, while maintaining backwards compatibility with all existing 32-bit applications.

The strategy for delivering and extending Solaris reliability consists of four interrelated activities: leading-edge features, stringent quality standards, extensive product testing, and a robust global support model.

The Solaris 7 operating environment delivers several major enhancements over the Solaris 2.6 operating environment:

- **Increased performance**

  The Solaris 7 operating environment's complete 64-bit computing environment provides greater capacity, precision, and performance. By increasing capacity from 32 to 64 bits, customers realize significantly increased performance for applications that need to address more than 4 GB of memory to run in main memory rather than from disk. This makes the operating environment *10 to 100 times faster in application access and performance*.

  An updated version of the Java Development Kit (JDK™ 1.1.6) performs up to 9 times faster than JDK 1.1.3, which was included in the Solaris 2.6 operating environment. This improvement is due to the inclusion of an advanced, multithreaded virtual machine, with fast-thread synchronization, a new memory system, and a highly optimized just-in-time compiler.

- **Mainframe-class reliability, availability, and serviceability (RAS)**

  The Solaris 7 operating environment allows customers to add, remove, and replace defective hardware without rebooting the system, resulting in greater system stability and even less system downtime.

- **Extended scalability**

  64-bit virtual addressing, more file descriptors, more processes, and more available sockets increasing scalability by:

  – Enabling access to more system resources

  – Allowing more applications and processes to be consolidated onto a single Solaris application server

  – Enabling applications to handle much larger data sets

  – Allowing customers to add significantly more memory (up to 32 GB) to existing hardware

- **Greater ease of use**

  Sun continues to improve the Solaris operating environment to make it easy for customers to use. In this release, Sun enhanced the Web-based installation, enhanced the graphical process manager, and added more GUI-interfaces to the most commonly used command line UNIX® commands.

- **Comprehensive global product**

  All localized Solaris operating environment versions now share a single global binary. The Solaris operating environment supports up to 37 languages and 95 locales. In particular, The Solaris operating environment now includes support for the euro currency symbol, complex text formats for Arabic, Thai, and Hebrew languages, and support for the development of multilingual applications.

  In addition, more local versions of Solaris software are available during installation: customers no longer have to purchase an additional package to get European locales.

- **100 percent binary compatibility—protecting customer's software investment**

  Complete binary compatibility among the Solaris 7, Solaris 2.5, and Solaris 2.6 operating environments allows all of Sun's customers' 32-bit applications to continue to run on the Solaris 7 operating environment without modification. This protects their large investment in software.

Graphics Software Interfaces

Sun systems support all Solaris 2.5.1, Solaris 2.6, and Solaris 7 graphics and window system APIs, including OpenGL®, XGL™, XIL™, 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™. Industry-standard X-extension libraries, such as Xlib and PEXlib, are available and are accelerated via the XGL and XIL foundation graphics libraries.

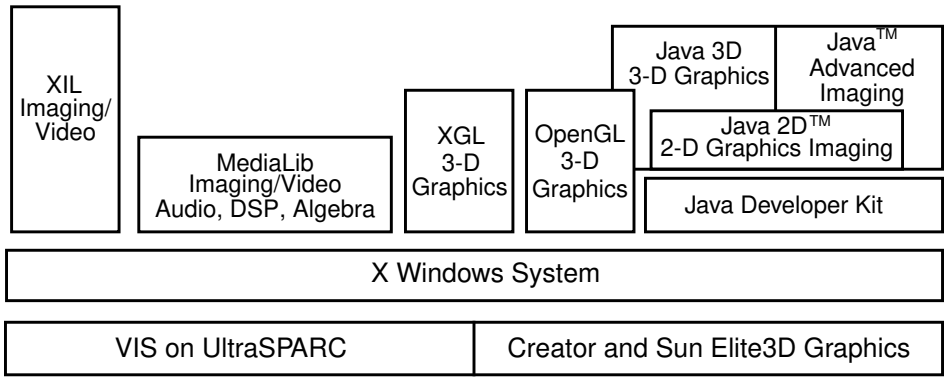


Figure 5. Graphics software interfaces

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 5 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.

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

The Solaris 7 Desktop Edition is preinstalled on all new Ultra 5 and Ultra 10 workstations beginning in November 1998. This new plug-and-play feature provides users with a ready-to-run workstation right out of the box. Customers are up and running within minutes.

- Preinstalled on Ultra 5 and Ultra 10 workstations:
  - The Solaris 7 operating environment (3/99)
  - CDE 1.3
  - JDK/ JVM 1.1.6
  - ODBC 2.11
  - PC File viewer 1.0.1
  - SunVTS™ 3.1
  - ShowMe TV™ 1.2.1
  - SunForum™ 1.0 (English version)
  - Netscape™ Communicator 4.5
  - OpenGL 1.1.2 run time (with 64-bit support for Sun Elite3D frame buffers)
  - XIL 1.4 run time
  - Java Plug-in
  - Developer Tools—Try and Buys
    - Java WorkShop™ 2.0
    - Java Studio™ 1.0
  - AnswerBook2™
    - Sun Ultra 5 and Ultra 10 Hardware AnswerBook™
    - Solaris 7 Operating Environment User Collection
    - Solaris 7 Operating Environment System Administration Collection, Volume 1 and Volume 2
    - Solaris 7 Operating Environment Software Developer Collection, Volume 1 and 2
    - Solaris 7 Operating Environment on Sun Hardware AnswerBook

- The Solaris 7 operating environment preinstalled software comes with the following languages:
  - English
  - French
  - German
  - Italian
  - Spanish
  - Swedish
  - Traditional Chinese
  - Simplified Chinese
  - Korean
  - Japanese

Sun OpenGL 1.1.2 for the Solaris Operating Environment

Sun OpenGL for the Solaris operating environment software provides a complete solution for developing and deploying interactive 3-D applications across SPARC workstations. It enables mainstream, industry-leading 3-D graphics and visualization applications to be deployed on Sun's Ultra family of graphics workstations at a compelling price-to-performance ratio. OpenGL is an application programming interface (API) that provides 2-D and 3-D graphics functions, including modeling, transformations, color, lighting, and smooth shading, as well as advanced features such as texture mapping, NURBS, fog, alpha blending, and motion blur. OpenGL works in both immediate and non-editable display-list graphics modes.

OpenGL is targeted at developers creating interactive 3-D applications for the enterprise, the intranet, and the Internet. These developers are affiliated with ISVs or VEUs in technical markets or in research labs. 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.

Widespread multivendor availability of OpenGL allows source-code portability of 3-D graphics clients. OpenGL 1.1.2 for the Solaris operating environment is a compliant implementation of OpenGL 1.1 from the OpenGL Architecture Review Board (ARB) and is, therefore, source-code compatible with other conformant OpenGL applications on the market. Most existing OpenGL applications need only to be recompiled in order to run with OpenGL 1.1.2 for the Solaris operating environment software.

OpenGL 1.1.2 for the Solaris operating environment is available for the Creator, and Sun Elite3D Graphics product families, where the OpenGL functionality is accelerated in hardware. In addition, it is available on all the legacy SPARCstation™ systems equipped with SX, ZX, GX, GXplus, TurboGX™, TurboGXplus™, S24™, TCX, or FSV frame buffers, which is made possible through an optimized software-rendering pipeline.

Features and Benefits

Sun OpenGL 1.1.2 for the Solaris operating environment provides the following new features:

Features	Benefits
• 64-bit OpenGL libraries	• Allows OpenGL applications to take advantage of the full 64-bit addressing in Solaris 7 operating environment
• Occlusion culling test extension	• Enables applications to trivially reject occluded objects in a scene, resulting in big improvements in interactive rendering performance for visualization of large models
• Improvements in DPA rendering support	• Enables OpenGL rendering on Ultra 5 and Ultra 10 systems using the PGX™ or PGX24™ frame buffers
• Constant texture data extension	• Reduces texture mapping memory utilization and loading time
• General performance improvements	• 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

Sun OpenGL 1.1.2 for the Solaris Operating Environment Tech Facts

Sun OpenGL 1.1.2 software for the Solaris operating environment has these system requirements:

Platforms	Sun Elite3D, Creator3D, Creator, PGX, ZX, GX, TCX, and SX product families
• Operating environments supported	Solaris 2.5.1 Maintenance Update 3 Solaris 2.6 or higher Solaris 7
• Window system supported	CDE or OpenWindows™
Disk space	
• For end-user runtimes	32 MB for 32-bit 55 MB for 64-bit
• For developers	
– Runtime binaries and header files	44 MB for 32-bit 67 MB for 64-bit
– To build examples	54 MB for 32-bit 77 MB for 64-bit
Memory	64 MB minimum 128 MB or more recommended

System Management

Many of the Sun™ 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™ 7 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 Enterprise SyMON™ 2.0 Software

Sun Enterprise SyMON™ 2.0 software is a GUI-based system management tool for Sun systems. Sun Enterprise SyMON software enables system administrators to proactively monitor and manage the health and status of many Ultra™ workstations from a central location. Sun Enterprise SyMON 2.0 software simplifies the management of many workstations, establishing highly stable and reliable workstation computing environment for running business-critical applications. In addition, Sun Enterprise SyMON 2.0 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™ 2.1 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™: 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 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™: System Administration Guide

The AnswerBook2™ product is Sun's on-line documentation system. It uses a web-browser interface that lets you 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 you find information throughout the documentation library. You can install AnswerBook2 document collections on a centralized documentation server or on a local server.

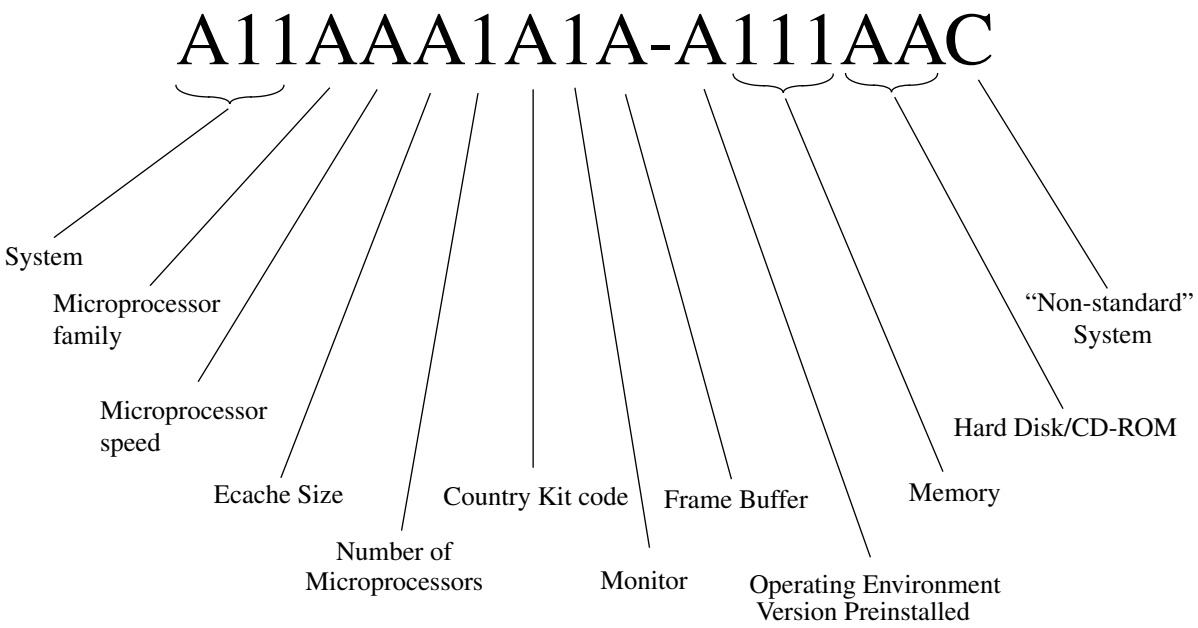
Features and Functions

- Uses a web-browser-based interface so that you can view on-line documentation from any platform (running any operating system), provided that your 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

Ordering Information

Sun Ultra™ 10 Workstation Ordering Information

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.



(Note: A = alpha character, 1 = numeric character, C = optional alpha or numeric character)

Model Key (Subset of Part-Number Definitions)

System A22 = Sun Ultra 10 **Microprocessor Family** U = UltraSPARC™-IIi **Microprocessor Speed** H = 333 MHz K = 440 MHz **Ecache Size** C = 2 MB	**Number of Processors** 1 = Single processor **Country Kit Code** A = North America UNIX® B = Japanese Language C = Japanese Logoless D = German Language E = United Kingdom F = French Language Z = No Country Kit	**Monitor** 9 = No monitor **Frame Buffer** L= Creator3D series 3 M = Sun Elite3D m6 Q = Sun Elite3D m3 P = On-board PGX24™ **Operating Environment Version Preinstalled** B = Solaris™ 7 C= Solaris 7 3/99	**Memory** 128 = 128 MB 256 = 256 MB 512 = 512 MB **Hard Disk/CD-ROM** CP = 9.1-GB, 32X CD-ROM

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 5 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
C	Japanese Logoless
D	German Language
E	United Kingdom
F	French 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 code B, C, 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 codes A, D, E, and F receive the CPU system and Country Kit in a single box.

Three examples using the same base Ultra 10 workstation configuration (128-MB DRAM, 9.1-GB, 7200-rpm hard disk, CD-ROM, on-board PGX24 graphics) are:

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

A22UKC1A9P-C128CP	Note that the eighth character is "A" for North American UNIX
X7103A	Marketing number for 17-inch entry color monitor

2. German Language with 21-inch color monitor

A22UKC1D9P-C128CP	Note that the eighth character is "D" for German Language
X7121A	Marketing number for 21-inch color monitor
X470A	Marketing number for required 13W3-to-HD15 video adapter cable

3. No Country Kit with 21-inch color monitor and separate Italian Country Kit

A22UKC1Z9P-C128CP	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
X470A	Marketing number for required 13W3-to-HD15 video adapter cable

Ultra 10 Model 333 with On-board 24-bit PGX24 Graphics

Part Number	System
	Ultra 10 Model 333, 2-MB Ecache, 128-MB DRAM, 9.1-GB, 7200-rpm hard disk, 32X-speed CD-ROM, 1.44-MB floppy drive, on-board 24-bit PGX24 graphics, Solaris 7 operating environment preinstalled
A22UHC1A9P-B128CP	North American UNIX Country Kit
A22UHC1B9P-B128CP	Japanese Language
A22UHC1C9P-B128CP	Japanese Logoless
A22UHC1D9P-B128CP	German Language
A22UHC1E9P-B128CP	United Kingdom
A22UHC1F9P-B128CP	French Language
A22UHC1G9P-B128CP	Swedish Language
A22UHC1Y9P-B128CP	Universal UNIX
A22UHC1Z9P-B128CP	No Included Country Kit
	Ultra 10 Model 333, 2-MB Ecache, 256-MB DRAM, 9.1-GB, 7200-rpm hard disk, 32X-speed CD-ROM, 1.44-MB floppy drive, on-board 24-bit PGX24 graphics, Solaris 7 operating environment preinstalled
A22UHC1A9P-B256CP	North American UNIX Country Kit
A22UHC1B9P-B256CP	Japanese Language
A22UHC1C9P-B256CP	Japanese Logoless
A22UHC1D9P-B256CP	German Language
A22UHC1E9P-B256CP	United Kingdom
A22UHC1F9P-B256CP	French Language
A22UHC1G9P-B256CP	Swedish Language
A22UHC1Y9P-B256CP	Universal UNIX
A22UHC1Z9P-B256CP	No Included Country Kit

Ultra 10 Model 333 with Creator3D Series 3 Graphics

Part Number	System
	Ultra 10 Model 333, 2-MB Ecache, 128-MB DRAM, 9.1-GB, 7200-rpm hard disk, 32X-speed CD-ROM, 1.44-MB floppy drive, Creator3D Graphics series 3, Solaris 7 operating environment preinstalled
A22UHC1A9L-B128CP	North American UNIX Country Kit
A22UHC1B9L-B128CP	Japanese Language
A22UHC1C9L-B128CP	Japanese Logoless
A22UHC1D9L-B128CP	German Language
A22UHC1E9L-B128CP	United Kingdom
A22UHC1F9L-B128CP	French Language
A22UHC1G9L-B128CP	Swedish Language
A22UHC1Y9L-B128CP	Universal UNIX
A22UHC1Z9L-B128CP	No Included Country Kit
	Ultra 10 Model 333, 2-MB Ecache, 256-MB DRAM, 9.1-GB, 7200-rpm hard disk, 32X-speed CD-ROM, 1.44-MB floppy drive, Creator3D Graphics series 3, Solaris 7 operating environment preinstalled
A22UHC1A9L-B256CP	North American UNIX Country Kit
A22UHC1B9L-B256CP	Japanese Language
A22UHC1C9L-B256CP	Japanese Logoless
A22UHC1D9L-B256CP	German Language
A22UHC1E9L-B256CP	United Kingdom
A22UHC1F9L-B256CP	French Language
A22UHC1G9L-B256CP	Swedish Language
A22UHC1Y9L-B256CP	Universal UNIX
A22UHC1Z9L-B256CP	No Included Country Kit
	Ultra 10 Model 333, 2-MB Ecache, 512-MB DRAM, 9.1-GB, 7200-rpm hard disk, 32X-speed CD-ROM, 1.44-MB floppy drive, Creator3D Graphics series 3, Solaris 7 operating environment preinstalled
A22UHC1A9L-B512CP	North American UNIX Country Kit
A22UHC1B9L-B512CP	Japanese Language
A22UHC1C9L-B512CP	Japanese Logoless
A22UHC1D9L-B512CP	German Language
A22UHC1E9L-B512CP	United Kingdom
A22UHC1F9L-B512CP	French Language
A22UHC1G9L-B512CP	Swedish Language
A22UHC1Y9L-B512CP	Universal UNIX
A22UHC1Z9L-B512CP	No Included Country Kit

Ultra 10 Model 440 with Sun Elite3D m3 Graphics

Part Number	System
	Ultra 10 Model 440 2-MB Ecache, 128-MB ECC DRAM, 9.1-GB, 7200-rpm hard disk, 32X-speed CD-ROM, 1.44-MB floppy drive, Sun Elite3D m3 Graphics, Solaris 7 operating environment (3/99) preinstalled
A22UKC1A9Q-C128CP	North American UNIX Country Kit (included)
A22UKC1B9Q-C128CP	Japanese Language
A22UKC1C9Q-C128CP	Japanese Logoless
A22UKC1D9Q-C128CP	German Language
A22UKC1E9Q-C128CP	United Kingdom
A22UKC1F9Q-C128CP	French Language
A22UKC1Z9Q-C128CP	No Included Country Kit
	Ultra 10 Model 440 2-MB Ecache, 256-MB ECC DRAM, 9.1-GB, 7200-rpm hard disk, 32X-speed CD-ROM, 1.44-MB floppy drive, Sun Elite3D m3 Graphics, Solaris 7 operating environment (3/99) preinstalled
A22UKC1A9Q-C256CP	North American UNIX Country Kit (included)
A22UKC1B9Q-C256CP	Japanese Language
A22UKC1C9Q-C256CP	Japanese Logoless
A22UKC1D9Q-C256CP	German Language
A22UKC1E9Q-C256CP	United Kingdom
A22UKC1F9Q-C256CP	French Language
A22UKC1Z9Q-C256CP	No Included Country Kit
	Ultra 10 Model 440, 2-MB Ecache, 512-MB ECC DRAM, 9.1-GB, 7200-rpm hard disk, 32X-speed CD-ROM, 1.44-MB floppy drive, Sun Elite3D m3 Graphics, Solaris 7 operating environment (3/99) preinstalled
A22UKC1A9Q-C512CP	North American UNIX Country Kit (included)
A22UKC1B9Q-C512CP	Japanese Language
A22UKC1C9Q-C512CP	Japanese Logoless
A22UKC1D9Q-C512CP	German Language
A22UKC1E9Q-C512CP	United Kingdom
A22UKC1F9Q-C512CP	French Language
A22UKC1Z9Q-C512CP	No Included Country Kit

Ultra 10 Model 440 with Sun Elite3D m6 Graphics

Part Number	System
	Ultra 10 Model 440 2-MB Ecache, 256-MB ECC DRAM, 9.1-GB, 7200-rpm hard disk, 32X-speed CD-ROM, 1.44-MB floppy drive, Sun Elite3D m6 Graphics, Solaris 7 operating environment (3/99) preinstalled
A22UKC1A9M-C256CP	North American UNIX Country Kit (included)
A22UKC1B9M-C256CP	Japanese Language
A22UKC1C9M-C256CP	Japanese Logoless
A22UKC1D9M-C256CP	German Language
A22UKC1E9M-C256CP	United Kingdom
A22UKC1F9M-C256CP	French Language
A22UKC1Z9M-C256CP	No Included Country Kit
	Ultra 10 Model 440, 2-MB Ecache, 512-MB ECC DRAM, 9.1-GB, 7200-rpm hard disk, 32X-speed CD-ROM, 1.44-MB floppy drive, Sun Elite3D m6 Graphics, Solaris 7 operating environment (3/99) preinstalled
A22UKC1A9M-C512CP	North American UNIX Country Kit (included)
A22UKC1B9M-C512CP	Japanese Language
A22UKC1C9M-C512CP	Japanese Logoless
A22UKC1D9M-C512CP	German Language
A22UKC1E9M-C512CP	United Kingdom
A22UKC1F9M-C512CP	French Language
A22UKC1Z9M-C512CP	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-MB, 64-MB, 128-MB, 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**

  The Type 5 keyboard is included with Model 333 Ultra 10 workstation configurations and the Type 6 keyboard is included with Model 440, except for configurations which are ordered with the “B”, “C”, or “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 9.1-GB, 7200-rpm, EIDE hard disk	X5236A
Internal 32X-speed ATAPI CD-ROM	X6171A

Note: *The internal 32X-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 incompatible with the Ultra 10 workstation.

- **Monitors**

  The choice of monitors is not reflected in the Ultra 10 workstation marketing part number. A monitor is required and is ordered as a 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		
	On-board 8-bit	Creator3D Series	Sun Elite3D
17-inch color (X7103A)	None	X3872A	X3872A
19-inch color (X7119A)	None	X3872A	X3872A
21-inch color (X7121A)	X470A	None	None
24-inch wide-screen (X7124A)	Not recommended	None	None

Options

Below is a comprehensive list of system expansion, networking, graphics, and multimedia options that are supported by Sun Ultra 10 workstation. The options listed below, which are in *italic font*, have been retired and can no longer be ordered from Sun, but are shown here for reference purposes. Refer to the Sun Price Book and configuration guides for currently available option listings, 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			
X5236A	Internal 9.1-GB, 7200-rpm EIDE hard disk	2	
X6171A	Internal 32X-speed ATAPI CD-ROM	1	
Mass Storage—External			
X814A	5-GB, 8-mm tape backup drive, desktop storage module	2	A PCI SCSI adapter card is required to attach any external SCSI device to the Ultra 5 and Ultra 10
X827A	20-GB, 4-mm tape autoloader, desktop storage module	2	
X545A	1.05-GB Fast SCSI-2 desktop disk pack	4	
X567A	2.1-GB Fast SCSI-2 desktop disk pack	4	
X737A	2.1-GB Fast SCSI-2 desktop disk pack	4	
X579A	SunCD 2Plus™, desktop storage pack	2	
X660A	150-MB QIC tape drive, desktop storage pack	2	
X822A	5.0-GB, 4-mm tape drive, desktop storage pack	2	
X834A	10-GB, 8-mm backup tape drive, desktop storage module	2	
X844A	14.0-GB, 8-mm tape drive, desktop storage pack	2	

Part Number	Option Description	Maximum Number Supported	Comments
Mass Storage—Sun StorEdge™ UniPack	*The following Sun StorEdge UniPack options come with a 68–68 pin SCSI cable*		
X5101A	1.05-GB, 7200-rpm fast/wide SCSI-2 disk UniPack	4	A PCI SCSI adapter card is required to attach any external SCSI device to the Ultra 5 and Ultra 10
X5103A	2.1-GB, 7200-rpm fast/wide SCSI-2 disk UniPack	4	
X5151A	2.1-GB, 7200-rpm fast/wide SCSI-2 disk UniPack	4	
X5209A	4.2-GB, 7200-rpm fast/wide SCSI-2 disk UniPack (68–68 pin)	1	
X5253A	9.1-GB, 7200-rpm fast/wide SCSI-2 disk UniPack (68–68 pin)	1	
X6151A	SunCD™ 4X CD-ROM UniPack	4	
X6201A	14-GB, 8-mm tape UniPack	4	
X6208A	14-GB, 8-mm tape UniPack	4	
X6251A	5-GB, 4-mm tape UniPack	4	
X6157A	SunCD 12x CD-ROM UniPack	4	
X6261A	4-GB to 8-GB, 4-mm DDS-2 drive	4	
X6280A	12-GB to 24-GB, 4-mm DDS-3 tape drive	4	
X6230A	20-GB to 40-GB, 8-mm tape drive	4	
	The following Sun StorEdge UniPack options come with a 50–68 pin SCSI cable:		
X5102A	1.05-GB, 7200-rpm fast/wide SCSI-2 disk UniPack	4	A PCI SCSI adapter card is required to attach any external SCSI device to the Ultra 5 and Ultra 10
X5152A	2.1-GB, 7200-rpm fast/wide SCSI-2 disk UniPack	4	
X5204A	2.1-GB, 7200-rpm fast/wide SCSI-2 disk UniPack	4	
X5213A	4.2-GB, 7200-rpm fast/wide SCSI-2 disk UniPack	2	
X5254A	9.1-GB, 7200-rpm fast/wide SCSI-2 disk UniPack	2	
X6102A	2.5-GB QIC tape UniPack	4	
X6152A	SunCD 4x CD-ROM UniPack	4	
X6160A	SunCD 12X CD-ROM (50-pin)	4	
X6202A	14-GB, 8-mm tape UniPack	4	
X6209A	14-GB, 8-mm tape UniPack	4	
X6252A	5-GB, 4-mm tape UniPack	4	
X6158A	SunCD 12x CD-ROM UniPack	4	
X6262A	4-GB to 8-GB, 4-mm DDS-2 tape drive	4	
X6281A	2-GB to 24-GB, 4-mm DDS-3 tape drive	4	
X6231A	20-GB to 40-GB, 8-mm tape drive	4	

Part Number	Option Description	Maximum Number Supported	Comments
Mass Storage—Sun StorEdge FlexiPack			
X6057A	DLT™ 4000 tape FlexiPack (68-pin)	4	A PCI SCSI adapter card is required to attach any external SCSI device to the Ultra 5 and Ultra 10
X6060A	DLT 7000 tape FlexiPack (68-pin)	4	
X6263A	4 to 8-GB 4-mm DDS-2 tape FlexiPack (68-pin)	4	
X6210A	8705 DX 14-GB 8-mm tape FlexiPack (68-pin)	4	
X6232A	20 to 40-GB Mammoth tape FlexiPack (68-pin)	4	
X6284A	12- to 24-GB 4-mm DDS-3 FlexiPack (68-pin)	4	
Mass Storage—MultiDisk Pack			
X569A	4.2-GB SCSI MultiDisk Pack (2 x 2.1-GB fast SCSI-2 disk)	2	A PCI SCSI adapter card is required to attach any external SCSI device to the Ultra 5 and Ultra 10
X570A	8.4-GB SCSI MultiDisk Pack (4 x 2.1-GB fast SCSI-2 disk)	1	
X739A	8.4-GB, 7200-rpm MultiDisk Pack (4 x 2.1-GB fast SCSI-2 disk)	1	
X748A	8.4-GB SCSI MultiDisk Pack (2 x 4.2-GB fast SCSI-2 disk)	2	
X749A	16.8-GB SCSI MultiDisk Pack (4 x 4.2-GB fast SCSI-2 disk)	1	
X771A	2.1-GB SCSI MultiDisk Pack (2 x 1.05-GB)	2	
X5211A	8.4-GB (2 x 4.2-GB), 7200-rpm fast/wide SCSI-2 MultiPack	2	
X5212A	16.8-GB (4 x 4.2-GB), 5400-rpm fast/wide SCSI-2 MultiPack	1	

Part Number	Option Description	Maximum Number Supported	Comments
Mass Storage—Sun StorEdge MultiPack			
X5511A	4.2-GB (2 x 2.1-GB), 7200-rpm fast/wide SCSI-2 MultiPack	1	A PCI SCSI adapter card is required to attach any external SCSI device to the Ultra 5 and Ultra 10
X5512A	12.6-GB (6 x 2.1-GB), 7200-rpm fast/wide SCSI-2 MultiPack	1	
X5513A	25.2-GB (12 x 2.1-GB), 7200-rpm fast/wide SCSI-2 MultiPack	1	
X5514A	8.4-GB (2 x 4.2-GB), 7200-rpm fast/wide SCSI-2 MultiPack	1	
X5515A	25.2-GB (6 x 4.2-GB), 7200-rpm fast/wide SCSI-2 MultiPack	1	
X5516A	50.4-GB (12 x 4.2-GB), 7200-rpm fast/wide SCSI-2 MultiPack	1	
X5501A	8.4-GB MultiPack (2 x 4.2-GB 5400-rpm) fast/wide SCSI-2	1	
X5502A	16.8-GB MultiPack (4 x 4.2-GB 5400-rpm) fast/wide SCSI-2	1	
X5503A	25.2-GB MultiPack (6 x 4.2-GB 5400-rpm) fast/wide SCSI-2	1	
X5504A	18.2-GB MultiPack (2 x 9.1-GB 7200-rpm) fast/wide SCSI-2	1	
X5505A	36.4-GB MultiPack (4 x 9.1-GB 7200-rpm) fast/wide SCSI-2	1	
X5506A	54.6-GB MultiPack (6 x 9.1-GB 7200-rpm) fast/wide SCSI-2	1	
X6527A	18.2-GB MultiPack (2 x 9.1-GB 7200-rpm) UltraSCSI	1	
X6528A	36.4-GB MultiPack (4 x 9.1-GB 7200-rpm) UltraSCSI	1	
X6529A	54.6-GB MultiPack (6 x 9.1-GB 7200-rpm) UltraSCSI	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		

Part Number	Option Description	Maximum Number Supported	Comments
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	1	
X1035A	SunFDDI™ single-attach PCI adapter (SAS/5.0)	4	
X1036A	SunFDDI dual-attach PCI adapter (DAS/5.0)	4	
X1039A	SunLink™ token ring interface/PCI adapter	4	Universal
X1040A	High-speed serial interface PCI adapter (SunHSI™), 1 port	4	
X1041A	Serial Asynchronous Interface (SunSAI) PCI adapter 8 ports	4	Universal
X1066A	SunATM™/P-155 Multimode Fiber	2	
X1067A	SunATM/P-155 Cat-5 UTP	2	
X1068A	SunATM/P-622 Multimode Fiber	1	
X3668A	PGX32™ 32-bit color PCI graphics frame buffer	4	
X6541A	Dual-channel, differential UltraSCSI controller	4	
X1131A	SunPCi™ 300-MHz K6-2 coprocessor card	1	
Monitors and Graphics			
X3663A	*Creator3D series 3, 24-bit color, double-buffered graphics, vertical*	*1*	*UPA*
X3664A	Sun Elite3D m3, 24-bit color graphics accelerator, vertical	1	UPA
X3665A	Sun Elite3D m6 graphics accelerator	1	UPA
X3668A	PGX32 32-bit color PCI graphics frame buffer	4	PCI Card
X3670A	Creator3D series 3, 24-bit color, double-buffered graphics, vertical	1	UPA
X7103A	17-inch color monitor		One monitor per graphics accelerator
X7119A	19-inch color monitor		
X7121A	21-inch color monitor		
X470A	13W3F-to-HD15M video adapter cable		One per monitor as needed
X3872A	HD15F-to-13W3M video adapter cable		
Other Options			
X901A	0.8-meter wide-to-narrow 68–68-pin UltraSCSI	1	A PCI SCSI adapter card is required to attach any external SCSI device to the Ultra 5 and Ultra 10
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	
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	

Part Number	Option Description	Maximum Number Supported	Comments
Type-5 Country Kits			
X3500A	North American	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 Country Kit" sub-section (above) for ordering details
X3550A	North American Universal	1	
X3540A	UNIX	1	
X3551A	UNIX Universal	1	
X3552A	Euro UNIX (Power Cordless)	1	
X3502A	French	1	
X3503A	German	1	
X3504A	Swiss-French	1	
X3505A	Swiss-German	1	
X3506A	Swedish	1	
X3577A	Finnish	1	
X3507A	U.K.	1	
X3547A	U.K. UNIX	1	
X3570A	Norwegian	1	
X3571A	Portuguese	1	
X3572A	Spanish	1	
X3573A	Danish	1	
X3574A	Italian	1	
X3575A	Dutch (Netherlands)	1	
X3544A	Taiwanese	1	
X3545A	Korean	1	
X3546A	Japanese	1	
X3542A	Japanese UNIX	1	
X3576A	Australian	1	
X3579A	Canadian Bilingual	1	

Part Number	Option Description	Maximum Number Supported	Comments
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 Country Kit" 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	
X3516A	Japanese UNIX	1	
X3517A	Taiwanese	1	
X3518A	Korean	1	
X3519A	Japanese	1	
X3520A	United Kingdom UNIX	1	
X3521A	Euro UNIX (Power Cordless)	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	

Upgrades

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

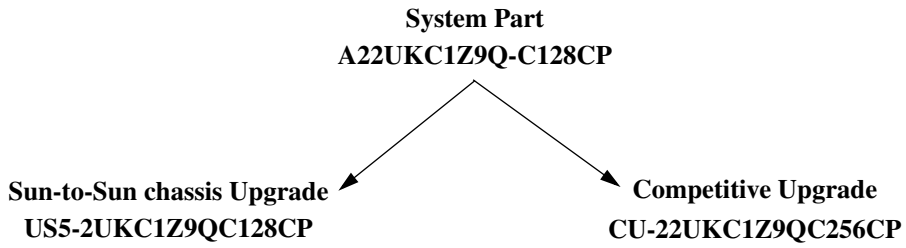
Key Messages

- 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 Ultra™ 10 Workstation Upgrade Paths

From	Receive	Return
Chassis upgrade from Any SLC™, ELC™, SunIPC™, 1/1+, SPARCclassic™, LX, IPX™, or SPARCstation™ 2 to Ultra™ 10 workstation	Sun Ultra 10 workstation	Workstation chassis, including CPU board, primary memory, frame buffer, and internal disk
Chassis upgrade from SPARCstation 4 or SPARCstation 5 to Ultra 10 workstation	Sun Ultra 10 workstation	Workstation chassis, including CPU board, primary memory, frame buffer, and internal disk
Chassis upgrade from SPARCstation 10 or SPARCstation 20 to Ultra 10 workstation	Sun Ultra 10 workstation	Workstation chassis, including CPU board, primary memory, frame buffer, and internal disk
Chassis upgrade from Ultra 1 to Ultra 10 workstation	Sun Ultra 10 workstation	Workstation chassis, including CPU board, primary memory, frame buffer, and internal disk
Competitive upgrade to Ultra 10 workstation	Sun Ultra 10 workstation	Competitive workstation

Marketing Upgrade Numbering Scheme



- The differences between the upgrade and system part numbers lie in the first eight characters; the ten trailing characters carry the same interpretation as new system parts.
- Sun-to-Sun upgrades begin with U or UG; competitive upgrades begin with CU.
- Sun-to-Sun upgrades show the “from” path system in the first three characters that follow the “U” or “UG”.
- Character representations following the “from” system have the same interpretation as new system parts, but dashes may be removed from left to right, as necessary, to meet the maximum part number length of eighteen characters.

333-MHz Sun Ultra 10 Workstation Upgrades with PGX24™ Graphics

Part Number	Description
U22S2UHC1A9PB128CP	Upgrade from any low-end Sun Workstation™ (such as SLC, ELC, IPC, 1/1+, SPARCclassic, LX, IPX, SPARCstation 2) to Ultra 10 333-MHz UltraSPARC™-IIi processor workstation with 2-MB Level II cache, 128-MB DRAM, 32X-speed CD-ROM, 10/100BASE-T Ethernet 9.1-GB, 7200-rpm hard drive, on-board PGX24™ graphics, with North American UNIX® Country Kit, and Solaris™ 7 operating environment preinstalled
U22S2UHC1A9PB256CP	Upgrade from any low-end Sun Workstation (such as SLC, ELC, IPC, 1/1+, SPARCclassic, LX, IPX, SPARCstation 2) to Ultra 10, 333-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 256-MB DRAM, 10/100BASE-T Ethernet, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, on-board PGX24 graphics, with North American UNIX Country Kit, and Solaris 7 operating environment preinstalled
U22S5UHC1Z9PB128CP	Upgrade from SPARCstation 4 or SPARCstation 5 workstation to Ultra 10, 333-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 128-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, 10/100BASE-T Ethernet, on-board PGX24 graphics, no Country Kit, and Solaris 7 operating environment preinstalled

U22S5UHC1Z9PB256CP	Upgrade from SPARCstation 4 or SPARCstation 5 workstation to Ultra 10, 333-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, 10/100BASE-T Ethernet, on-board PGX24 graphics, no Country Kit, and Solaris 7 operating environment preinstalled
U2220UHC1Z9PB128CP	Upgrade from SPARCstation 10 or SPARCstation 20 workstation to Ultra 10, 333-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 128-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, 10/100BASE-T Ethernet, on-board PGX24 graphics, no Country Kit, and Solaris 7 operating environment preinstalled
U2220UHC1Z9PB256CP	Upgrade from SPARCstation 10 or SPARCstation 20 workstation to Ultra 10, 333-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, 10/100BASE-T Ethernet, on-board PGX24 graphics, no Country Kit, and Solaris 7 operating environment preinstalled

333-MHz Sun Ultra 10 Workstation Upgrades with Creator3D Graphics

Part Number	Description
UGS5-UHC1Z9LB128CP	Upgrade from SPARCstation 4 or SPARCstation 5 workstation to Ultra 10, 333-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 128-MB DRAM, 9.1-GB, 7200-rpm hard drive, Creator3D Graphics series 3, 32X-speed CD-ROM, 10/100BASE-T Ethernet, no Country Kit, and Solaris 7 operating environment preinstalled
UGS5-UHC1Z9LB256CP	Upgrade from SPARCstation 4 or SPARCstation 5 workstation to Ultra 10, 333-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, Creator3D Graphics series 3, 32X-speed CD-ROM, 10/100BASE-T Ethernet, no Country Kit, and Solaris 7 operating environment preinstalled
US20-UHC1Z9LB128CP	Upgrade from SPARCstation 10 or SPARCstation 20 workstation to Ultra 10, 333-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 128-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, Creator3D Graphics series 3, 10/100BASE-T Ethernet, no Country Kit, and Solaris 7 operating environment preinstalled

US20-UHC1Z9LB256CP	Upgrade from SPARCstation 10 or SPARCstation 20 workstation to Ultra 10, 333-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, Creator3D Graphics series 3, 10/100BASE-T Ethernet, no Country Kit, and Solaris 7 operating environment preinstalled
UGU1-UHC1Z9LB128CP	Upgrade from Ultra 1 workstation to Ultra 10, 333-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 128-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, Creator3D Graphics series 3, 10/100BASE-T Ethernet, no Country Kit, and Solaris 7 operating environment preinstalled
UGU1-UHC1Z9LB256CP	Upgrade from Ultra 1 workstation to Ultra 10, 333-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, Creator3D Graphics series 3, 10/100BASE-T Ethernet, no Country Kit, and Solaris 7 operating environment preinstalled

440-MHz Sun Ultra 10 Workstation Upgrades with Elite3D m3 Graphics

Part Number	Description
US5-2UKC1Z9QC128CP	Upgrade from SPARCstation 4 or 5 to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level-II cache, 128-MB DRAM, 9.1-GB, 7200-rpm hard drive, 1.44-MB floppy drive, Sun Elite3D m3 Graphics, 32X-speed CD-ROM, 10/100BASE-T Ethernet, Solaris 7 operating environment (3/99) preinstalled, no Country Kit
UG1-2UKC1Z9QC256CP	Upgrade from Ultra 1 or Ultra 30 workstation to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level-II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 1.44-MB floppy drive, Sun Elite3D m3 Graphics, 32X-speed CD-ROM, 10/100BASE-T Ethernet, Solaris 7 operating environment (3/99) preinstalled, no Country Kit
USS-2UKC1Z9QC256CP	Upgrade from SPARCstation 10 or 20 to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level II-cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, 1.44-MB floppy drive, Sun Elite3D m3 Graphics, 10/100BASE-T Ethernet, Solaris 7 operating environment (3/99) preinstalled, no Country Kit

Part Number	Description
US5-2UKC1Z9QC256CP	Upgrade from SPARCstation 4 or 5 to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level-II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 1.44-MB floppy drive, Sun Elite3D m3 Graphics, 32X-speed CD-ROM, 10/100BASE-T Ethernet, Solaris 7 operating environment (3/99) preinstalled, no Country Kit
UES-2UKC1Z9QC256CP	Upgrade from early SPARCstation systems to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level-II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 1.44-MB floppy drive, Sun Elite3D m3 Graphics, 32X-speed CD-ROM, 10/100BASE-T Ethernet, Solaris 7 operating environment (3/99) preinstalled, no Country Kit
UG1-2UKC1Z9QC512CP	Upgrade from Ultra 1 or Ultra 30 workstation to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level-II cache, 512-MB DRAM, 9.1-GB, 7200-rpm hard drive, 1.44-MB floppy drive, Sun Elite3D m3 Graphics, 32X-speed CD-ROM, 10/100BASE-T Ethernet, Solaris 7 operating environment (3/99) preinstalled, no Country Kit
USS-2UKC1Z9QC512CP	Upgrade from SPARCstation 10 or 20 to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level II-cache, 512-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, 1.44-MB floppy drive, Sun Elite3D m3 Graphics, 10/100BASE-T Ethernet, Solaris 7 operating environment (3/99) preinstalled, no Country Kit

440-MHz Sun Ultra 10 Workstation Upgrades with Elite3D m6 Graphics

Part Number	Description
UG1-2UKC1Z9MC256CP	Upgrade from Ultra 1 or Ultra 30 workstation to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level-II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 1.44-MB floppy drive, Sun Elite3D m6 Graphics, 32X-speed CD-ROM, 10/100BASE-T Ethernet, Solaris 7 operating environment (3/99) preinstalled, no Country Kit
USS-2UKC1Z9MC256CP	Upgrade from SPARCstation 10 or 20 to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level II-cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, 1.44-MB floppy drive, Sun Elite3D m6 Graphics, 10/100BASE-T Ethernet, Solaris 7 operating environment (3/99) preinstalled, no Country Kit

Part Number	Description
US5-2UKC1Z9MC256CP	Upgrade from SPARCstation 4 or 5 to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level-II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 1.44-MB floppy drive, Sun Elite3D m6 Graphics, 32X-speed CD-ROM, 10/100BASE-T Ethernet, Solaris 7 operating environment (3/99) preinstalled, no Country Kit
UES-2UKC1Z9MC256CP	Upgrade from early SPARCstation systems to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level-II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 1.44-MB floppy drive, Sun Elite3D m6 Graphics, 32X-speed CD-ROM, 10/100BASE-T Ethernet, Solaris 7 operating environment (3/99) preinstalled, no Country Kit
UG1-2UKC1Z9MC512CP	Upgrade from Ultra 1 or Ultra 30 workstation to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level-II cache, 512-MB DRAM, 9.1-GB, 7200-rpm hard drive, 1.44-MB floppy drive, Sun Elite3D m6 Graphics, 32X-speed CD-ROM, 10/100BASE-T Ethernet, Solaris 7 operating environment (3/99) preinstalled, no Country Kit
USS-2UKC1Z9MC512CP	Upgrade from SPARCstation 10 or 20 to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level II-cache, 512-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, 1.44-MB floppy drive, Sun Elite3D m6 Graphics, 10/100BASE-T Ethernet, Solaris 7 operating environment (3/99) preinstalled, no Country Kit

333-MHz Sun Ultra 10 Workstation Competitive Upgrades

Part Number	Description
CUA22UHC1A9PB256CP	Upgrade from competitive system to Ultra 10, 333-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, on-board PGX24 graphics, 10/100BASE-T Ethernet, North American UNIX Country Kit, and Solaris 7 operating environment preinstalled

CUA22UHC1A9LB128CP	Upgrade from competitive system to Ultra 10, 333-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 128-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, Creator3D Graphics series 3, 10/100BASE-T Ethernet, North American UNIX Country Kit, and Solaris 7 operating environment preinstalled
CUA22UHC1A9LB256CP	Upgrade from competitive system to Ultra 10, 333-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, Creator3D Graphics series 3, 10/100BASE-T Ethernet, North American UNIX Country Kit, and Solaris 7 operating environment preinstalled

440-MHz Sun Ultra 10 Workstation Competitive Upgrades

Part Number	Description
CU-22UKC1Z9QC256CP	Upgrade from competitive system to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, Sun Elite3D m3 Graphics, 10/100BASE-T Ethernet, Solaris 7 operating environment preinstalled, and no Country Kit
CU-22UKC1Z9MC256CP	Upgrade from competitive system to Ultra 10, 440-MHz UltraSPARC-IIi processor workstation with 2-MB Level II cache, 256-MB DRAM, 9.1-GB, 7200-rpm hard drive, 32X-speed CD-ROM, Sun Elite3D m6 Graphics, 10/100BASE-T Ethernet, Solaris 7 operating environment preinstalled, and no Country Kit

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. 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.
  - The Ultra 10 workstation does not support the Type-4 keyboard. If a customer has a Type-4 keyboard, 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.
  - 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. Order the 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
    - X470A—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. Customer may migrate any of these monitors. However, an adapter is required for operation.
  - For Ultra 10 workstation competitive upgrades, a monitor must be ordered and entered as a separate line item. Customers have a choice of ordering either an X-option monitor or a competitive monitor upgrade.

Sun Enterprise™ Services Offerings

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

SunClient℠

Now there is a way to reduce hardware and software support costs for 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/on site)	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 p.m. If the call is received after 3 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're 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 eliminated.
• 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`.

SunSpectrum

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.

FEATURE	SUNSPECTRUM PLATINUM℠ Mission-critical Support	SUNSPECTRUM GOLD℠ Business-critical Support	SUNSPECTRUM SILVER℠ Systems Support	SUNSPECTRUM BRONZE℠ Self Support
Systems Features				
Systems approach coverage	Yes	Yes	Yes	Yes
System availability guarantee	Customized	No	No	No
Account Support Features				
Service account management team	Yes	No	No	No
Personal technical account support	Yes	Yes	No	No
Account support plan	Yes	Yes	No	No
Software release planning	Yes	No	No	No
On-site account reviews	Monthly	Semiannual	No	No
Site activity log	Yes	Yes	No	No
Coverage / Response Time				
Standard telephone coverage hours	7 day/24 hour	7 day/24 hour	8 a.m.–8 p.m., Monday–Friday	8 a.m.–5 p.m., Monday–Friday
Standard on-site coverage hours	7 day/24 hour	8 a.m.–8 p.m., Monday–Friday	8 a.m.–5 p.m., Monday–Friday	N/A
7-day/24-hour telephone coverage	Yes	Yes	Option	No
7-day/24-hour on-site coverage	Yes	Option	Option	N/A
Customer-defined priority setting	Yes	Yes	Yes	No
• Urgent (phone/on-site)	Live transfer/ 2 hour	Live transfer/ 4 hour	Live transfer/ 4 hour	4 hour / N/A
• Serious (phone/on-site)	Live transfer/ 4 hour	2 hour/next day	2 hour/next day	4 hour / N/A
• Not critical (phone/on-site)	Live transfer/ customer convenience	4 hour/ customer convenience	4 hour/ customer convenience	4 hour / N/A
Additional contacts	Option	Option	Option	Option

FEATURE	SUNSPECTRUM PLATINUM[SM] Mission-critical Support	SUNSPECTRUM GOLD[SM] Business-critical Support	SUNSPECTRUM SILVER[SM] Systems Support	SUNSPECTRUM BRONZE[SM] Self Support
Enhanced Support Features				
Mission-critical support team	Yes	Yes	No	No
Sun Vendor Integration Program (SunVIP[SM])	Yes	Yes	No	No
Software patch management assistance	Yes	No	No	No
Field change order (FCO) management assistance	Yes	No	No	No
Remote Systems Diagnostics				
Remote dial-in analysis	Yes	Yes	Yes	Yes
Remote systems monitoring	Yes	Yes	No	No
Remote predictive failure reporting	Yes	Yes	No	No
Software Enhancements and Maintenance Releases				
Solaris enhancement releases	Yes	Yes	Yes	Yes
Patches and maintenance releases	Yes	Yes	Yes	Yes
Sun unbundled software enhancements	Option	Option	Option	Option
Internet and CD-ROM Support Tools				
SunSolve license	Yes	Yes	Yes	Yes
SunSolve EarlyNotifier Service	Yes	Yes	Yes	Yes

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 MB, 32 MB, 64 MB, and 128 MB.
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.
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 primarily aimed 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.
XGL™	A foundation geometry-oriented 2-D/3-D graphics library that provides high functionality and performance to geometry applications and application program interfaces (APIs).
XIL™	A foundation imaging-oriented graphics library providing high functionality and performance to imaging applications.

Materials Abstract

All materials are available on SunWIN except where noted otherwise.

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Powerpack				
– *Sun Ultra™ 10 Workstation: Just the Facts*	Reference Guide for Sun Ultra 10 workstation	Training Sales Tool	SunWIN, Reseller Web	76924
References				
– *Sun Intro—New Sun Ultra 10 Workstation with PGX24™ Graphics*	Introduction E-mail	Sales Tool	SunWIN, Reseller Web, E-mail	93320
Just-the-Facts				
– *Sun Elite3D: Just the Facts*	Reference Guide for Sun Elite3D m6	Training Sales Tool	SunWIN, Reseller Web	75245
– *Creator Graphics series 3: Just the Facts*	Reference Guide for Creator Graphics, series 3	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 DE778-2
– *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

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
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*	White Paper	Sales Tool Training	SunWIN, Reseller Web	75258
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`			