Sun Ultra™ 2 Workstation

Just the Facts

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Sun Ultra 2 Workstation

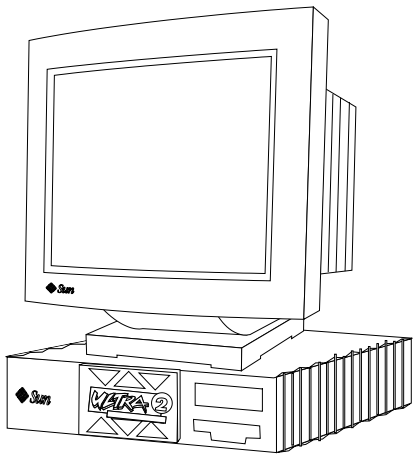


Figure 1. The Sun Ultra™ 2 workstation

Scalable Computing Power for the Desktop

Sun Ultra™ 2 workstations are designed for the technical users who require high performance and multiprocessing (MP) capability. The Sun Ultra™ 2 desktop series combines the power of multiprocessing with high-bandwidth networking, high-performance graphics, and exceptional application performance in a compact desktop package. Users of MP-ready and multithreaded applications will benefit greatly from the performance of the Sun Ultra 2 dual-processor capability.

The primary users of Ultra 2 workstations are customers who have a need for SBus-based I/O solutions. Any customer looking for SBus-based solutions can be confident that the Ultra 2 workstation will continue to be offered for an extended amount of time.

Product Line Summary

	Ultra 2 Model 1300	**Ultra 2 Model 1400**	**Ultra 2 Model 2300**	**Ultra 2 Model 2400**
Number of Processors	1 UltraSPARC™-II	1 UltraSPARC-II	2 UltraSPARC-II	2 UltraSPARC-II
Processor speed	300-MHz	400MHz	300-MHz	400MHz
External cache	2 MB	2 MB	2 MB	2 MB
Maximum internal HDD	18 GB	18 GB	18 GB	18 GB
I/O Slots	4	4	4	4
UPA Speed	100 MHz	100 MHz	100 MHz	100 MHz
Peak UPA bandwidth	1.6 GB/second	1.6 GB/second	1.6 GB/second	1.6 GB/second
Maximum memory with 128-MB DIMMs	2 GB	2 GB	2 GB	2 GB
SPECint95 SPECfp95	12.10 15.50	17.2 22.3	12.30 20.20	17.2 25.9

Key Messages

- High-performance UltraSPARC-II CPU
  - 64-bit SPARC version 9 at 300 MHz or 400 MHz, in either uniprocessor or dual-processor configurations
  - 2 MB of second-level cache memory
- 100 percent binary-compatible
  - 100 percent binary compatibility with current Solaris operating environment software while offering superior application performance with a 400-MHz UltraSPARC-II with 2 MB of cache
- High-bandwidth and low-latency memory interface
  - A 100-MHz UPA processor-to-memory interconnect delivers up to 1.6-GB/second peak throughput, with sustained rates of 800 MB/second.
  - UPA is based on a packet-switching architecture for reduced bus and memory latency. This results in improved memory access and performance.
  - A buffered cross-bar-switch memory interface raises memory bandwidth.
  - Wider paths to memory (576 bits) handle larger data traffic volume.
  - The Ultra 2 workstation supports up to 2 GB of memory using 128-MB DIMMs. DIMMs are compatible with the SPARCstation 20 and Ultra 1 workstations and Sun Enterprise™ servers.
- Excellent graphics performance is available
  - One UPA slot is available for a Creator3D or Sun Elite3D m6 Graphics accelerator card.
  - Enhanced Creator Graphics Series 3 provides comprehensive range of graphics functionality at low cost: 2-D, windowing, 24-bit true color graphics, and supporting both imaging and advanced 3-D graphics in one architecture
    - 1280 x 1024 pixels at 76 Hz and 24-bit true color are standard while also supporting high-resolution 1920 x 1200 pixels at 70 Hz for 24-inch wide-screen monitors in single-buffered mode.
  - The Sun Elite3D m6 Graphics provides high-end graphics for a breakthrough price-to-performance ratio
    - Creator3D Graphics functionality, plus accelerated large antialiased colors, floating-point depth buffer, and single-pass stereo.
    - Very high performance geometry is accelerated with four to five times the performance over Creator3D.
- Fast I/O
  - The Ultra 2 workstation supports 20-MB/second fast/wide SCSI for better application performance.
  - Fast/wide SCSI is supported internally and externally through a fast/wide SCSI port on the system.
- High-speed networking
  - The Ultra 2 workstation provides autosensing 10/100-Mb/s interface on the motherfoard.
  - Integrated twisted pair (RJ45) and media-independent interface (MII) are included for connection to AUI, TP, Thin Net, and Fiber.

- Easily expanded and upgraded
  - CPUs are modular, allowing for easy upgrades as the new generation of CPU technology becomes available
  - The Ultra 2 workstation offers the flexibility of starting with a single CPU and adding a second CPU later, as computing needs grow
  - Sixteen memory slots and four SBus slots are available for system expansion. SBus slots support all previous SBus graphics including TurboGX™ system, TurboGXplus™ system, ZX, and the Freedom graphics accelerators.

Availability

- Sun Ultra 2 workstation Models 1300 and 2300 began shipping in April 1997.
- Sun Ultra 2 workstation Models 1300 and 2300 with Sun Elite3D m6 began shipping in February 1998.
- Sun Ultra 2 workstations Models 1400 and 2400 began shipping in May 1999.

Product Placement Strategy

Target Users

Sun Ultra™ 2 workstations are designed for the technical users who require high performance and multiprocessing (MP) capability in a desktop workstation. Users of MP-ready and multithreaded applications will benefit greatly from the performance of the Sun Ultra 2 workstation.

The target customer is the traditional “power desktop” user who has performance and expansion requirements. This includes both technical and commercial users who need the large number of applications and the functional capabilities of the Solaris™ operating environment, the high-performance of the UltraSPARC™ CPU, and the integration and support capabilities provided by the Sun channels.

The primary users of Ultra 2 workstations are customers who need for SBus-based solutions. Any customer looking for solutions based on the SBus technology can be confident that the Ultra 2 workstation will continue to be offered for an extended amount of time.

Sun Ultra 2 Workstation Target Markets

Compared to the previous generation SPARCstation™ products, the higher performance and price/performance ratio of the Sun Ultra 2 workstation, as well as its advanced graphics and multimedia capabilities, offer increased market opportunities.

Industry	**Key Features to Highlight**
Mechanical Design (MCAD/MCAE) • Automotive • Aerospace • Defense industry • Mechanical equipment designers	• High-MP CPU performance; high-end graphics performance and functionality standard • MP configurations for high-application performance • Availability of applications
Electronic Design (EDA) • Chip designers • System houses • Telecommunications	• High-MP CPU performance; high-performance graphics in entry-level configurations • Availability of applications
Research and Development • In-house development • Research institutions	• High-computational MP performance • Feature-rich Solaris operating environment • Availability of applications
Financial • Stock and commodity traders • Banks	• High-performance MP CPU • Compact design

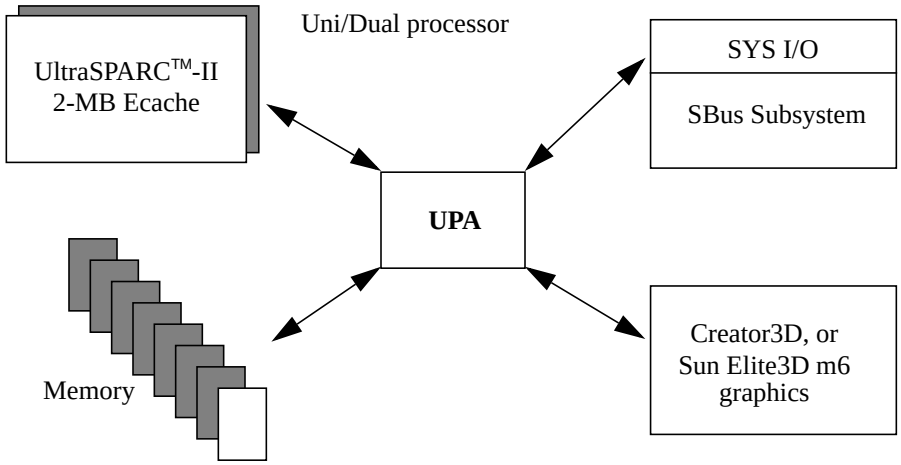


Figure 2. The Sun Ultra™ 2 workstation

Technology Overview

The Sun Ultra™ 2 workstation leverages all the experience from the highly successful SPARCstation™ family. The design inherits and expands upon the modularity, expandability, and configurability that have been a trademark of all SPARCstation designs. The continued commitment to the SPARC™ architecture allows for compatibility with the largest installed base of networked workstations while boosting performance with the advanced 64-bit UltraSPARC™ processor and a design aimed at providing balanced system performance.

UltraSPARC Processor

Features

- Uniprocessor or dual-processor capability
- CPU modules
- V9, 64-bit implementation of the SPARC definition,four-way superscalar design
- Integrated visual instruction set (VIS™)
- Multilevel trap handling

Benefits

- High throughput for multiprocessing
- Enables easy and inexpensive upgrades
- Very high application performance
- Ready for multimedia
- Efficient process handling

High-Speed Memory Bus

Features

- 576-bit path to memory
- High bandwidth
- Low latency

Benefits

- Provides greater bandwidth
- Better application performance
- High-performance access to memory

Creator3D Graphics—24-bit Accelerated Graphics Standard

Features	Benefits
• High perfomance,accelerated 24-bit double-buffered 3-D graphics, 28-bit Z-buffer	• Smooth animation and interactivity of 3-D graphics with improved visual quality and depth accuracy
• Four 8-bit color maps	• Dynamic color map segment allocation when running 8-bit window systems, eliminating color flashing problems
• 1920 x 1200 @ 70Hz, supports high resolution in single buffer mode	• 24-in wide, in full 24-bit color

Elite3D Graphics—24-bit Accelerated Graphics Standard

Features	Benefits
• Very high perfomance, accelerated 24-bit double-buffered 3-D graphics	• Smooth animation and interactivity of 3-D graphics
• Accelerated lighting	• More lights can be turned on to enchanced visual display without performance penalties
• Line and dot antialiasing	• Needed in MCAD and vsualization applications

I/O

Features	Benefits
• Four 25-MHz clock/64-bit wide Sbus slots, compatible with 32-bit SBus	• Highest-performance SBus
• 10/100BASE-T Ethernet(Autosensing)	• Fast access to network resources
• Fast/wide SCSI(20MB/sec)	• Fast access and retrieval of mass storage

It All Comes Together with Balanced Application Performance

Good performance through advanced applications typically demands excellent performance from more than one part of the system. Most often an application consists of data fetching, computation, and presentation. Unless the system is designed to address all of these, it will always be limited by the slowest part in the chain.

The Sun Ultra 2 workstation is designed for balanced system performance in applications. Its UltraSPARC processor, Creator3D or Elite3D Graphics, high-speed memory bus, SBus subsystem, fast/wide SCSI, and Fast Ethernet combine to accelerate every part of an application’s processing cycle.

The level of computing established with the Sun Ultra 2 workstation makes it possible to use more advanced methods than were previously feasible. The system is also designed to offer these features and this kind of performance to every workstation user, propagating higher efficiency throughout an organization.

Components of the New-Generation System

Key Facts

- High-performance UltraSPARC uniprocessor or dual-processor desktop system
- High-end graphics functionality and performance
- Balanced system design
  - Matching performance enhancement in I/O, networking, and memory access

Tech Facts

- High-performance system bus
  - Fast access to memory and graphics
- Easy disk expansion
  - Up to 18.2 GB of internal SCSI disk storage (two 9.1-GB disks)
  - Up to 2 TB of total disk storage
- Optional removable mass storage
  - One optional internal 32X CD-ROM drive or DAT tape
  - One optional floppy drive
- High-performance memory subsystem
  - Up to 2 GB with 128-MB DIMMs
  - Supports the SPARCstation 20, Ultra 1 workstation, and Sun Enterprise™ server DIMMs for compatibility and investment protection
  - Four-way interleaved 576-bit-wide memory path
- Designed for interactive media applications
  - Integrated visual instruction set (VIS) in the UltraSPARC-II CPU
  - Advanced 24-bit accelerated graphics standard
- Expansion to advanced networking
  - Built-in 100BASE-T; autosensing and autoswitchable to 10BASE-T for backward compatibility
  - MII connector for connection to other types of Ethernet transceivers and media
  - SunATM™ adapters available for the SBus to connect the system to the emerging ATM technology

The Sun Ultra 2 Workstation at a Glance

Product Specifications	Sun Ultra 2 Models 1300 and 2300	Sun Ultra 2 Models 1400 and 2400
Dimensions and Weight	450 mm x 130 mm x 444 mm (WxHxD) 12.3 kg to 16 kg (fully configured)	
CPU		
• Architecture	UltraSPARC-II	UltraSPARC-II
• Clock rate	300 MHz	400 MHz
• Cache on chip	16 Kb I / 16 Kb D	16 Kb I / 16 Kb D
• External cache	2 MB	2 MB
• CPU module slots	Two slots	Two slots
• Multiprocessing	Two CPUs maximum	Two CPUs maximum
Memory	128 MB to 2 GB (with 128 MB DIMMs)	
• Memory type	ECC	
• DRAM speed	60 ns	
• Bus width	576 bits	
• DIMM sizes	32, 64, and 128 MB	
Storage	20 MB/second SCSI	
• Maximum internal	18.2 GB	
• Maximum total	2 TB	
• Number of bays	2 x 1-inch drive bays	
I/O Architecture	SBus	
• SBus	4 x 25-MHz, 64-bit slots	
• Graphics	One dedicated slot (UPA)	
• Serial ports	Two asynch (76.8 Kbaud)/synch (64 Kbaud) DB25	
• Parallel port	One Centronics compatible (DB25)	
Networking Ports	TP Ethernet 100BASE-T/10BASE-T or external transceiver through MII connector plus optional ISDN, FDDI, and ATM through SBus cards	
Backup and Distribution		
• Internal	Optional 3.5-inch floppy drive Optional SunCD™ 32X drive Optional 4-mm DDS-3 tape Optional 8-mm tape	
• External	14-GB 8-mm tape 2.5-GB 0.25-inch tape 12-GB to 24-GB DDS-3 4-mm tape 72-GB 4-mm DDS-3 autoloader	
Operating Environment	Solaris™ 2.5.1 Hardware: 7/97 (for Creator3D) Solaris 2.5.1 Hardware: 1/98 (for Sun Elite3D m6) Solaris 2.6 Hardware: 3/98 (for Sun Elite3D m6) Solaris 7	Solaris™ 2.5.1 Hardware: 11/97 Solaris 2.6 Hardware: 3/98 Solaris 7

The Sun Ultra 2 Workstation Graphics at a Glance

Product Highlights	Creator3D (series 3)	Sun Elite3D m6
Color Monitors	21-inch	21-inch
Resolution, Color Planes, and Visual Capabilities	• NTSC/PAL • 1280 x 1024 at 76 Hz • 2 x 24-bit plus 8-bit overlay plus 4-bit stencil, for a total of 96 planes • 1152 x 900 at 76 Hz and other programmable resolutions • High-resolution support: 1920 x 1200 at 70 Hz* • 1600 x 1000 at 76 or 66 Hz* 1440 x 900 at 76 Hz* 1280 xt 800 at 76 Hz • Stereo double-buffered (960 x 680 at 112 Hz) * Creator3D in single-buffer mode	• NTSC/PAL • 1280 x 1024 at 76 Hz • 1152 x 900 at 76 Hz and other programmable resolutions
Buffers • Double buffer • Z-buffer	 2 x 24 bit 28 bit	 2 x 24 bit 28 bit
Multimedia Features	24-bit true color accelerated video playback	24-bit true color accelerated video playback
Graphics Market Positioning • Windowing and 2-D • 3-D wireframe • 24-bit and imaging • 3-D solids • Multimedia	 ✔ ✔ ✔ ✔ ✔	 ✔ ✔ ✔ ✔ ✔

Note: *1600 x 1280 resolution is not supported on Sun monitors.*

Creator Graphics Product Overview

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 graphic needs ranging from 8-bit and 24-bit windowing to high-end 3-D graphics.

Creator Graphics is designed as an integral part of Sun Ultra™ workstations or Sun Enterprise™ servers and is, therefore, designed to take advantage of the UltraSPARC™ CPU performance increases to 300 MHz and beyond. The original generation of Creator Graphics has a single graphics/frame buffer clock for all on-board logic. This new generation has one clock for the internal graphics processing and another clock for the frame buffer. This design makes it possible to drive each part at its maximum speed.

Until May 1999, Creator Graphics was available in two configurations:

- The single-buffered configuration (known as Creator) supports hardware acceleration of 2-D graphics.
- The double-buffered configuration (known as Creator3D) is used for fast, high-quality transformation and display of 3-D solid and wireframe objects. It also provides support for high-resolution (1920 x 1200) monitors such as the Sun 24-inch, wide-screen display.

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

Creator Graphics Models

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

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

Key Features

- **High-performance graphics**

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

  – UltraSPARC CPU

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

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

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

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

  – Creator-rendering ASIC (FBC2)

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

  – 3D-RAM graphics memory

    This new generation of the 3D-RAM breakthrough in graphic memory provides high-bandwidth and built-in acceleration for 3-D graphics.

- **Scalable performance**

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

- **More standard functionality**

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

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

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

- **Fully compatible with existing APIs**

  Creator Graphics accelerates existing APIs, including OpenGL®, X11, XIL™, and XGL™ graphics libraries.

Sun Elite3D System Overview

Sun Elite3D Graphics 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.

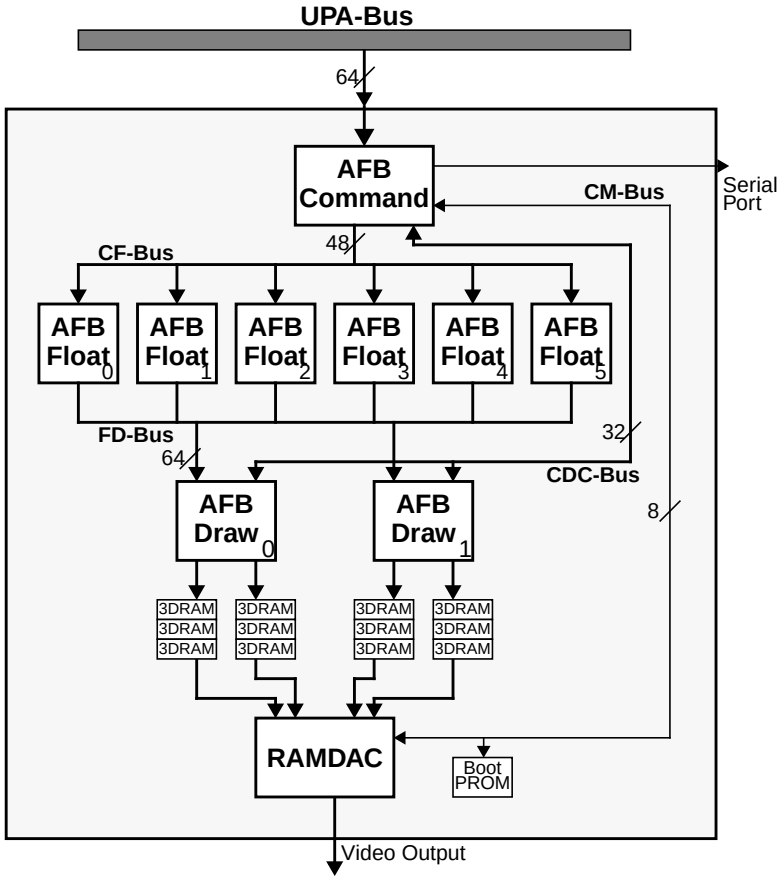


Figure 3. Sun Elite3D chip-level diagram

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 nanoseconds to 10 nanoseconds, which changes all of the rules about graphics pipeline behavior.

Sun Elite3D Overview

Advanced frame buffer (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 geometry data without stopping the pipeline. Additional functionality includes complete binary compatibility with Creator3D's register set and functions, support for OpenGL and a geometry decompression mode.

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.

Sun Elite3D Features and Benefits

Features	Benefits
• Integrated imaging	• Performs fast imaging and 3-D on unified frame buffer
• Very high-performance, accelerated, 24-bit, double-buffered 3-D graphics	• Smooth animation and interactivity of 3-D graphics
• 28-bit Z-buffer	• Improves visual quality and depth accuracy
• 8-bit overlay plane	• Allows overlay of 8-bit windows on top of the 24-bit visuals without damaging the underlying visual. This allows seamless integration and manipulation of windows
• Gouraud shading	• Allows smooth shading of solid geometry
• 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	• Improves stencil performance
• Accelerated lighting	• More lights can be turned on for enhanced visual display without encountering large performance penalties
• Compressed geometry decompression	• Allow much more geometry data to be stored in the available memory, but also reduces bus-bandwidth needs; 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-inch and 21-inch monitors	• With stereo support by frame buffer, monitor, and window systems, users can get more accurate representation of 3-D data
• 1280 x 1024 at 76 Hz resolution standard	• High resolution display quality
• Two serial-port connectors	• For peripherals
• Dual-headed support (one Sun Elite3D m6 frame buffer and an Creator3D)	• For users who need to do multiple things simultaneously such as command and control applications, 3-D and video playback for animators, design and analysis for engineers

Features

- OpenGL 1.1.2., XGL 3.0, XIL, X, Java 3D™ support
- Binary compatibility with Creator Graphics product family

Benefits

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

Graphics Performance

Benchmarks	Model 2300 Creator3D (series 3)	Model 2400 Creator3D (series 3)	Model 1300/2300 Sun Elite3D m6	Model 1400/2400 Sun Elite3D m6
Xmark93	29.3	34.0	31.4	36.3
2-D vectors/sec.	4.0 M	5.1M	4.3 M	5.0M
3-D vectors/sec.	3.7 M	3.7 M	8.2 M	8.2 M
3-D triangles/sec.	1.2 M	1.4M	5.9 M	5.9 M
3-D quads/sec.	450 K	450 K	1.2 M	1.2 M
PLBwire93	219	244	372	402
PLBsurf93	309	379	600	660
ProCDRS-01	N/A	8.2	N/A	19.2
DX-04	N/A	11.2	N/A	26.1

- 3-D vectors are 10-pixel, chained, parallel projection
- Antialiased 3-D vectors are 10-pixel, chained, parallel projection
- Triangles are 50-pixel 3-D triangles, one light (ambient, diffuse, chained, perspective, Gouraud shaded, Z-buffered with culling)
- Quads are 100-pixel 3-D quads, one light (ambient, diffuse, isolated, perspective, Gouraud shaded, Z-buffered with culling)

Solaris™ Operating Environment

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.

Sun Ultra™ 2 systems are supported by Solaris 2.5.1 Hardware: 11/97, Solaris 2.6 Hardware: 3/98, and Solaris 7 operating environments.

Solaris 7 Operating Environment

Sun workstations are supported by Solaris 7, one of the industry's leading enterprise operating environments. 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™ technology
- System administration support

Solaris 7 Operating Environment Features and Benefits

Features	Benefits
• Mainframe-class reliability, availability, and serviceability	• Provides greater system stability and less system downtime by allowing customers to add, remove, and replace defective hardware without rebooting the system
• 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	• Supports 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-certified 32-bit applications continue to run on Solaris 7 operating environment with out modification

Whats New in Solaris Operating Environment?

The Solaris 7 operating environment release completes the phased release of the Solaris operating environment 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 operating environment 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

  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 can realize significantly increased performance for those applications that need to address more than 4 GB of memory to allow for the application to run in main memory rather than from disk. This makes access times *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 Solaris 2.6. 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 (JIT) compiler.

- Mainframe-class reliability, availability, and serviceability

  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 our customers to use. In this release, Sun enhanced the Web-based installation and 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 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 locale 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 our customer's software investment

  Complete binary compatibility between the Solaris 7, Solaris 2.5, and Solaris 2.6 operating environments enables 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 operating environment 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, Java 3D™, and PHIGS. Industry-standard X-extension libraries, such as Xlib and PEXlib, are available and are accelerated via the XGL and XIL foundation graphics libraries.

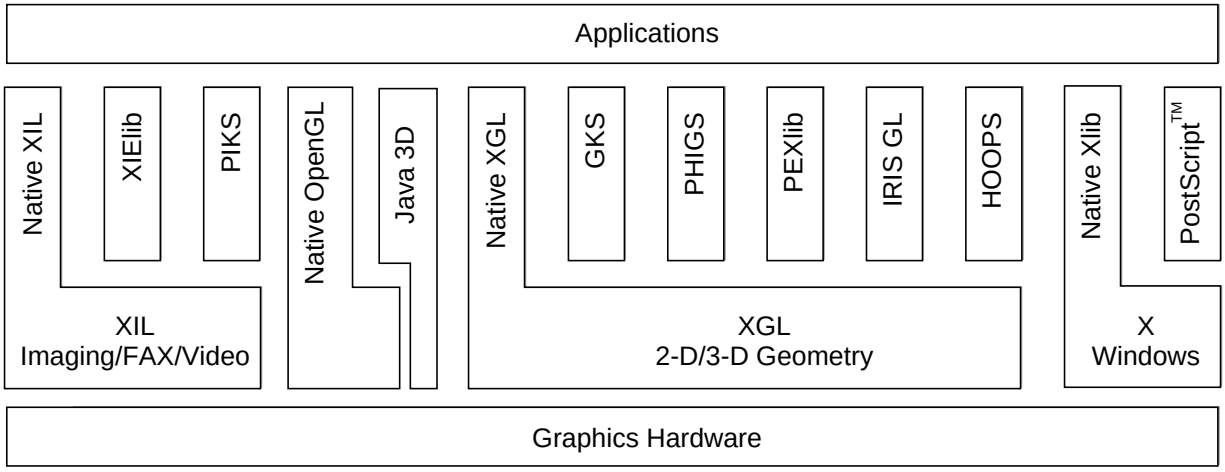


Figure 4. Graphics software interfaces

Solaris Operating Environment System Requirements

Disk Space	End user: 25 MB Developer: 40 MB (runtime binaries and header files)
Memory	64 MB minimum 128 MB or higher recommended for serious applications

Solaris Operating Environment Licensing and Usage

All Sun system and system-board products include a Solaris operating environment 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 2 workstations come with a Solaris Desktop license. This license is limited and 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 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.

OpenGL 1.1.2 for Solaris Operating Environment

OpenGL for the Solaris operating environment 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 just need to be recompiled in order to run with OpenGL 1.1.2 for the Solaris operating environment.

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.

OpenGL 1.1.2 Features and Benefits

OpenGL 1.1.2 provides the following 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

- Constant texture data extension
- General performance improvements

- Reduces texture mapping memory utilization and loading time
- Enables better performance for all supported graphics cards; in particular, there has been some substantial performance gains for Sun Elite3D frame buffers—for some applications over 100 percent

OpenGL 1.1.2 Tech Facts

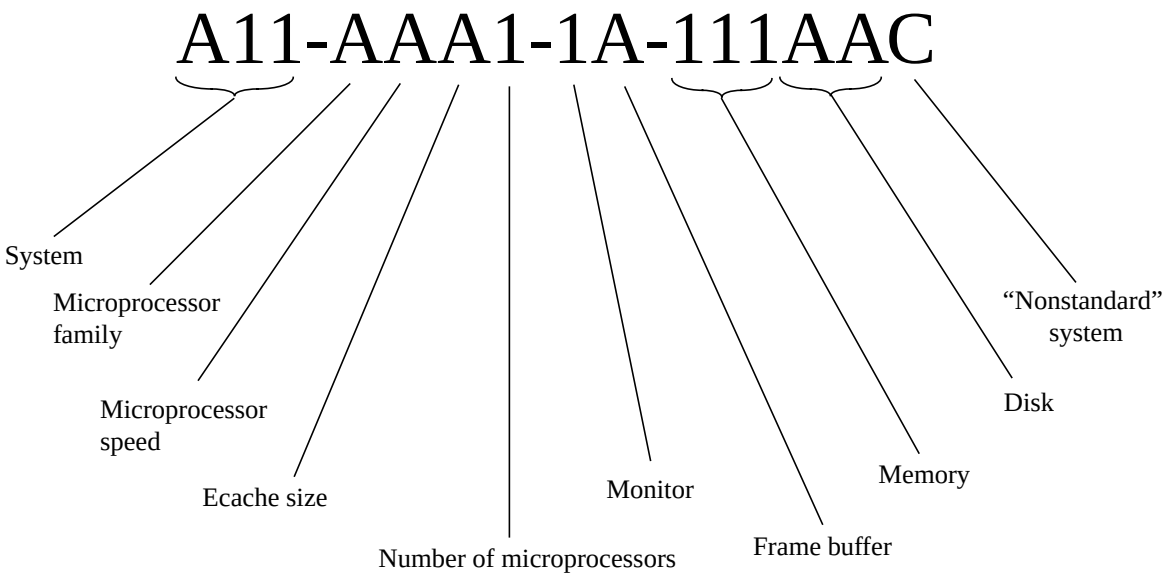
OpenGL 1.1.2 system requirements:

Platforms	Sun Elite3D, Creator3D, Creator, ZX, GX, TGX, 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 example files	54 MB for 32-bit 77 MB for 64-bit
Memory	64 MB minimum 128 MB or more recommended

Ordering Information

A New Marketing Order-Number Scheme

The Sun Ultra™ systems use a new marketing part-number scheme that is designed to provide greater flexibility and expandability. Below is an explanation of how to read the new part numbering scheme. “N” means “Not available” or “Not applicable.”



(Note: A = Alpha character, 1 = Numeric character, C = Optional alpha or numeric character)

Model Key (Subset of Part Number Definitions)

System	**Ecache Size**	**Frame Buffer**	**Disk**
A14 = Sun Ultra 2	C = 2 MB	L = Creator3D, Series 3	AH = 9 GB fast/wide SCSI-2 internal disk
	D = 4 MB	M = Sun Elite3D m6	NN = Diskless
Microprocessor Family		N = No frame buffer	
U = UltraSPARC™	**Monitor**		
	9 = Headless	**Memory**	
Microprocessor Speed		128 = 128 MB	
E = 300 MHz		256 = 256 MB	
J = 400 MHz		512 = 512 MB	
		1024 = 1 GB	

A Note on Ultra 2 Workstation Memory Configurations

Because memory needs to be upgraded in groups of four DIMMs of the same type in Ultra 2 workstations a customer anticipating adding more memory in the future should purchase a large initial memory configuration.

Amount of Memory in Standard Configurations	DIMMs	Maximum Memory Using 32-MB DIMMs	Maximum Memory Using 64-MB DIMMs	Maximum Memory Using 128-MB DIMMs
128 MB	4 x 32 MB	512 MB	896 MB	1664 MB
256 MB	4 x 64 MB	640 MB	1024 MB	1792 MB
512 MB	4 x 128 MB	896 MB	1280 MB	2048 MB

Sun Ultra 2 Workstation Model 1300

Order Number	Description
A14-UEC1-9L-128AH	Uniprocessor 300-MHz UltraSPARC-II, 2-MB cache, Creator3D Series 3 double-buffer graphics, 128-MB memory, 9-GB fast/wide SCSI-2 disk
A14-UEC1-9M-128AH	Uniprocessor 300-MHz UltraSPARC-II, 2-MB cache, Sun Elite3D m6 Graphics, 128-MB memory, 9-GB fast/wide SCSI-2 disk
A14-UEC1-9L-512AH	Uniprocessor 300-MHz UltraSPARC-II, 2-MB cache, Creator3D Series 3 double-buffer graphics, 512-MB memory, 9-GB fast/wide SCSI-2 disk

Sun Ultra 2 Model 2300

Order Number	Description
A14-UEC2-9L-256AH	Dual-processor 300-MHz UltraSPARC-II, 2-MB cache, Creator3D Series 3 Graphics, 256-MB memory, 9-GB fast/wide SCSI-2 disk
A14-UEC2-9M-256AH	Dual-processor 300-MHz UltraSPARC-II, 2-MB cache, Sun Elite3D m6 Graphics, 256-MB memory, 9-GB fast/wide SCSI-2 disk
A14-UEC2-9L-512AH	Dual-processor 300-MHz UltraSPARC-II, 2-MB cache, Creator3D Series 3 Graphics, 512-MB memory, 9-GB fast/wide SCSI-2 disk

Sun Ultra 2 Model 1400

Order Number	Description
A14-UJC1-9L-256AH	Dual-processor 400-MHz UltraSPARC-II, 2-MB cache, Creator3D Series 3 Graphics, 256-MB memory, 9-GB fast/wide SCSI-2 disk
A14-UJC1-9M-256AH	Dual-processor 400-MHz UltraSPARC-II, 2-MB cache, Sun Elite3D m6 Graphics, 256-MB memory, 9-GB fast/wide SCSI-2 disk
A14-UJC1-9L-512AH	Dual-processor 400-MHz UltraSPARC-II, 2-MB cache, Creator3D Series 3 Graphics, 512-MB memory, 9-GB fast/wide SCSI-2 disk

Sun Ultra 2 Model 2400

Order Number	Description
A14-UJC2-9L-256AH	Dual-processor 400-MHz UltraSPARC-II, 2-MB cache, Creator3D Series 3 Graphics, 256-MB memory, 9-GB fast/wide SCSI-2 disk
A14-UJC2-9M-256AH	Dual-processor 400-MHz UltraSPARC-II, 2-MB cache, Sun Elite3D m6 Graphics, 256-MB memory, 9-GB fast/wide SCSI-2 disk
A14-UJC2-9L-512AH	Dual-processor 400-MHz UltraSPARC-II, 2-MB cache, Creator3D Series 3 Graphics, 512-MB memory, 9-GB fast/wide SCSI-2 disk

Expansion Options

Below is a partial list of system expansion, networking, graphics, and multimedia options available for Sun Ultra™ 2 workstations. Refer to the Sun Price Book for complete option listings, configuration notes, and ordering information.

Note: *Options listed in italics are supported by the Ultra 2 workstation, but are no longer available for purchase from Sun.*

Order Number	Option Description	Comments
CPU		
X1191A	300-MHz, UltraSPARC™-II CPU Module with 2-MB external cache	
X1193A	400-MHz, UltraSPARC-II CPU Module with 2-MB external cache	
X1188A	*200-MHz UltraSPARC-I CPU Module with 1-MB external cache*	
Memory		
X7002A	64-MB, 60-ns DIMM memory expansion (2 x 32 MB)	These are pairs of DIMM units—order two of each
X7003A	128-MB, 60-ns DIMM memory expansion (2 x 64 MB)	
X7004A	256-MB, 60-ns DIMM memory expansion (2 x 128 MB)	
X7001A	*32-MB 60-ns DIMM memory expansion (2 x 16 MB)*	
Internal Mass Storage		
X5229A	9.1-GB, 7200-rpm UltraSCSI	
X6212A	14-GB, 8-mm tape internal	
X6282A	12-GB, to 24 GB, 4-mm DDS-3 tape internal	
X6003A	3.5-inch, 1.44-MB, internal floppy drive with cable	
X6167A	32X CD-ROM drive with cable	
X3860A	Fast/wide SCSI-2 cable	
X5214A	*4.2-GB ,7200-rpm internal fast/wide SCSI-2 disk*	
X5153A	*2.1-GB, 7200-rpm internal fast/wide SCSI-2 disk*	
X6156A	*644-MB internal SunCD™ 4 CD-ROM drive with cable*	
X6105A	*2.5-GB QIC tape internal with cable*	

Order Number	Option Description	Comments
External Mass Storage: Sun StorEdge™ MultiPack		
SG-XDSK020A-8G	8.4-GB (2 x 4.2-GB), 7200-rpm MultiPack	1
SG-XDSK020A-18G	18.2-GB (2 x 4.2-GB), 7200-rpm MultiPack	1
SG-XDSK020B-36G	36.4-GB (2 x 18.2-GB), 7200-rpm MultiPack	1
SG-XDSK040A-16G	16.8-GB (4 x 4.2-GB), 7200-rpm MultiPack	1
SG-XDSK040A-36G	36.4-GB (4 x 9.1-GB), 7200-rpm MultiPack	1
SG-XDSK040B-72G	72.8-GB (4 x 18.2-GB), 7200-rpm MultiPack	1
SG-XDSK060A-25G	25.2-GB (6 x 4.2-GB), 7200-rpm MultiPack	1
SG-XDSK060A-54G	54.6-GB (6 x 9.1-GB), 7200-rpm MultiPack	1
SG-XDSK060B-109G	54.6-GB (6 x 9.1-GB), 7200-rpm MultiPack	1
SG-XLIBDLT1-280G	280-GB to 560-GB L280 tape autoloader	1
X5511A	*4.2-GB (2 x 2.1 GB), 7200-rpm fast/wide SCSI-2 MultiPack*	
X5512A	*12.6-GB (6 x 2.1 GB), 7200-rpm fast/wide SCSI-2 MultiPack*	
X5513A	*25.2-GB (12 x 2.1 GB), 7200-rpm fast/wide SCSI-2 MultiPack*	
X5514A	*8.4-GB (2 x 4.2 GB), 7200-rpm fast/wide SCSI-2 MultiPack*	
X5515A	*25.2-GB (6 x 4.2 GB), 7200-rpm fast/wide SCSI-2 MultiPack*	
X5516A	*50.4- GB (12 x 4.2 GB), 7200-rpm fast/wide SCSI-2 MultiPack*	
X5504A	*18.2-GB (2 x 9.1 GB), 7200-rpm fast/wide SCSI-2 MultiPack*	
X5505A	*36.4-GB (4 x 9.1 GB), 7200-rpm fast/wide SCSI-2 MultiPack*	
X5506A	*54.6-GB (6 x 9.1 GB), 7200-rpm fast/wide SCSI-2 MultiPack*	
External Mass Storage: Sun StorEdge UniPack	*The following UniPack options come with a 68 pin-to-68 pin SCSI cable:*	
SG-XTAPMLR-310A	25-GB to 50-GB MLR drive in a UniPack desktop enclosure	2
SG-XTAPSLR-010A	4-GB to 8-GB SLR drive UniPack	2
SG-XTAP4MM-011A	12-GB to 24-GB, 4-mm DDS-3 in a UniPack desktop enclosure	2
SG-XTAP8MM-010A	7-GB to 14-GB, 8-mm drive in a UniPack desktop enclosure	2
SG-XTAP8MM-011A	20-GB to 40-GB, 8-mm drive in a UniPack desktop enclosure	2
X6157A	SunCD 12X UniPack	
X5151A	*2.1-GB, 7200-rpm, fast/wide SCSI-2 disk UniPack*	
X5209A	*4.2-GB, 7200-rpm, fast/wide SCSI-2 disk UniPack*	
X5253A	*9.1-GB, 7200-rpm, fast/wide SCSI-2 disk UniPack*	
X6208A	*14-GB, 8-mm tape UniPack*	
X6230A	*20-GB to 40-GB, 8-mm tape UniPack*	
X6101A	*2.5-GB QIC tape UniPack*	
X6151A	*SunCD 4X UniPack*	
X6261A	*4-GB to 8-GB, 4-mm, DDS-2 tape UniPack*	
X6280A	*12-GB to 24-GB, 4-mm, DDS-3 tape UniPack*	

Order Number	Option Description	Comments
External Mass Storage: Sun StorEdge FlexiPack	*The following FlexiPack options come with a 68 pin-to-68 pin SCSI cable:*	
SG-XTAPMLR-320A	25-GB to 50-GB MLR drive in a FlexiPack desktop enclosure	
SG-XTAPSLR-020A	4-GB to 8-GB SLR drive in a FlexiPack desktop enclosure	
SG-XTAP4MM-021A	12-GB to 24-GB, 4-mm DDS-3 in a FlexiPack desktop enclosure	
SG-XTAP4MM-031A	72-GB to 144-GB, 4-mm DDS-3 autoloader in a FlexiPack desktop enclosure	
SG-XTAP8MM-020A	7-GB to 14-GB, 8-mm drive in a FlexiPack desktop enclosure	
SG-XTAP8MM-021A	20-GB to 40-GB, 8-mm drive in a FlexiPack desktop enclosure	
SG-XTAPDLT-020A	20-GB to 40-GB, DLT™ 4000 drive in a FlexiPack desktop enclosure	
SG-XTAPDLT-021A	35-GB to 70-GB, DLT 7000 drive in a FlexiPack desktop enclosure	
X6290A	*72-GB to 144-GB, 4-mm DDS-3 autoloader tape FlexiPack*	
X6232A	*20-GB to 40-GB, 8-mm tape FlexiPack w/additional open half-height expansion bay*	
X6210A	*14-GB, 8-mm tape FlexiPack with additional open half-height expansion bay*	
X6284A	*12-GB to 24-GB, 4-mm DDS-3 tape FlexiPack w/additional open half-height expansion bay*	
X6263A	*4-GB to 8-GB, 4-mm DDS-2 tape FlexiPack w/additional open half-height expansion bay*	
X6159A	*SunCD 12x FlexiPack w/additional open half-height expansion bay*	
	Expansion Drives for FlexiPacks:	
X6265A	*4-GB to 8-GB, 4-mm DDS-2 internal tape for FlexiPack*	
X6236A	*20-GB to 40-GB, 8-mm internal tape for FlexiPack*	
X6161A	*SunCD 12X internal CD-ROM for FlexiPack*	
SBus Options		
X1008A	Serial parallel controller (SP/C)	
X1012A	SunISDN™ expansion kit, card, certification labels, and enabling kit	
X1014A	Token ring interface/SBus (SunTRI/S™) for Solaris™ 2.x	
X1018A	SunSwift™ 100BASE-T fast/wide SCSI bus adapter	
X1019A	High-speed serial interface/SBus (SunHSI/S™) for Solaris 2.x	
X1025A	SunFDDI™ 5.0 single-attach SBus adapter (SAS)	
X1026A	SunFDDI 5.0 dual-attach SBus adapter (DAS)	
X1030A	PCMCIA interface/SBus card	
X1049A	SBus Quad FastEthernet 2.0 card (SQE)	
X1053A	SBus fast SCSI-2/buffered Ethernet card (FSBE/S)	
X1055A	SBus SCSI host adapter	
X1059A	SunFastEthernet™ 10/100 SBus adapter 2.0	
X1060A	SunATM™-155/MFiber SBus adapter 2.0	
X1061A	SunATM-155/UTP5 SBus adapter 2.0	
X1062A	SBus fast/wide differential intelligent SCSI-2 host adapter (DWIS/S)	
X1063A	SBus single-ended fast/wide intelligent SCSI-2 host adapter (SWIS/S)	
X1064A	SunATM-622/MFiber SBus adapter	
X1065A	SBus Ultra differential F/W intelligent SCSI host adapter	
X1129A-4.2-P	SunPC™ 133-MHz 5x86 card, and SunPC 4.1 software	
X1140A	Sun GigabitEthernet SBus adapter 2.0	
X1054A	*SBus SCSI/buffered Ethernet card (SBE/S)*	
X1058A	*SBus quad Ethernet controller (SQEC)*	
X1021A	*SBus Prestoserve NFS™ accelerator*	

Order Number	Option Description	Comments
SunVideo and Multimedia		
X1085A	*SunVideo™ real-time video board, and documentation*	
X488A-EU	*Multimedia kit, SunVideo, camera, and documentation (Continental Europe)*	
X488A-O	*Multimedia kit, SunVideo, camera, and documentation (Japan logoless)*	
X488A-UK	*Multimedia kit, SunVideo, camera, and documentation (U. K.)*	
X488A	*Multimedia kit, SunVideo, camera, and documentation (U. S.)*	
X486A-EU	Color video camera (Continental Europe)	
X486A-O	Color video camera (Japan logoless)	
X486A-UK	Color video camera (U. K.)	
X486A	Color video camera (U. S.)	
Monitors and Graphics Accelerators		
X7103A	17-inch color monitor	
X7119A	19-inch color monitor	
X7121A	21-inch color monitor	
X7124A	24-inch color monitor	
X3655A	TurboGXplus™ frame buffer	
X3667A	Elite3D m6, 24-bit color, double buffered graphics accelerator, LP	
X3671A	Creator3D, Series 3, 24-bit color, double-buffered graphics accelerator, horizontal board-orientation, and cable	
X3872A	HD15-pin video output (for 17-inch and 19-inch monitors)	
X470A	Video cable adapter 13W3F to HD15M	
X7110A	*TurboGX™ frame buffer*	
X3653A	*Creator, Series 1, 24-bit color, single-buffered graphics accelerator, horizontal board orientation, and cable*	
X3657A	*Creator3D, Series 2, 24-bit color, double-buffered graphics accelerator, horizontal board-orientation, and cable*	
X3661A	*Creator3D, Series 3, 24-bit color, double-buffered graphics accelerator, horizontal board-orientation, and cable*	
X3675A	*Creator3D, Series 2, 24-bit color, double-buffered graphics accelerator, horizontal board-orientation, and cable*	
X3666A	*Sun Elite3D m6, 24-bit color, double-buffered graphics accelerator, horizontal board-orientation, and cable*	
Input Devices		
X180A	SunButtons™ 32-key function I/O device	
X190A	SunDials™ 8-dial interactive graphics I/O device for 3-D	

Sun Ultra™ 2 Workstation Upgrades

Sun upgrades offer customers superior investment protection for their existing Sun equipment. Upgrading a SPARCstation™ 20 or Ultra™ 1 workstation is as easy as swapping the existing chassis, system board, and module for a next-generation Sun Ultra 2 workstation chassis and system board. By migrating existing memory, graphics, disks, and all external devices, Sun provides customers outstanding value for their existing investments.

Please refer to the Sun Price Book for updated information about upgrades and upgrade prices.

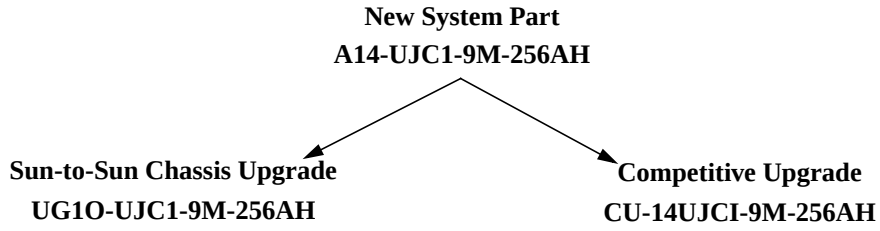
Key Messages

- Sun offers customers a variety of flexible upgrade paths to the most popular Sun systems.
- Choose from module-only to full-system upgrades.
- Sun upgrades allow as many components to be carried forward as possible, to protect the hardware investment of the customer.
- Existing investments in non-Sun hardware can be preserved by upgrading to Sun through competitive full-system upgrades.
- SPARCstation 20, SPARCstation 5, and SPARCstation 4 workstation upgrades offer superior value by allowing the migration of memory, disks, and graphics to Sun Ultra 2 workstation and UltraServer™ 2 systems.

Sun Ultra 2 Workstation Model Upgrade Paths

Upgrade	Receive	Return
Any SPARCstation (including 1/1+, SPARCclassic™, SLC™, IPC™, IPX™, LX, 2, 4, 5, and 10)	New chassis including graphics, memory, and disk	Chassis including CPU, frame buffer, memory, and disk
SPARCstation 20	New chassis including graphics, without memory or disk	Chassis including CPU and frame buffer
Sun Ultra 1 Model 140 or Model 170	New chassis including graphics, without memory or disk	Chassis including CPU and frame buffer
Sun Ultra 1 Model 170E or 200E, or Sun Enterprise™ 1	New chassis no graphics, without memory or disk	Chassis including CPU
Sun Ultra 2 Models 1170, 1200, or 1300	New faster CPU module	Existing CPU module
Competitive system	Ultra 2 workstation including graphics, memory, and disk	Complete competitive system including all components

Marketing Upgrade Numbering Scheme



- Differences between the upgrade and new system part numbers lie in the first few characters; the remainder of the 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.

Graphics Upgrades to Creator3D and Sun Elite3D m6

Order Number	Description
UG-FFB-FFB3-DB-1-H	Graphics upgrade from Creator to Creator3D Graphics
UG-FFB-AFB-M6-H	Graphics upgrade from Creator/Creator3D to Sun Elite3D m6 Graphics

Module Upgrades

Order Number	Description
UG-M1XXX-M1300	Module upgrade from Ultra 2 Model 1170 or Model 1200 to Model 1300
UG-M1XXX-M1400	Module upgrade from Ultra 2 Model 1170, 1200, or 1300 to Model 1400

Upgrades to Sun Ultra 2 Workstation Model 1300

Order Number	Description
UGSS2UEC1-9L-128AH	Full system upgrade from any SPARCstation with Creator3D Graphics Series 3, 128-MB memory, 9-GB internal SCSI-2 disk
UGSS2UEC1-9M-128AH	Full system upgrade from any SPARCstation with Sun Elite3D m6 Graphics, 128-MB memory, 9-GB internal SCSI-2 disk
UG10-UEC1-9L-128AH	Chassis upgrade from SPARCstation workstation 10 with 128-MB memory, 9-GB internal disk, Creator3D Graphics Series 3

UG10-UEC1-9M-128AH	Chassis upgrade from SPARCstation workstation 10 with Sun Elite3D m6 Graphics, 9-GB internal disk, 128-MB memory
UG20-UEC1-9L-000NN	Chassis upgrade from SPARCstation 20 workstation with Creator3D Graphics Series 3, no memory, no disk
UG20-UEC1-9M-000NN	Chassis upgrade from SPARCstation 20 workstation with Sun Elite3D m6 Graphics, no memory, no disk
UA11-UEC1-9M-000NN	Chassis upgrade from Ultra 1 workstation Model 140 or Ultra 1 workstation Model 170 with Sun Elite3D m6 Graphics, no memory, no disk
UA12-UEC1-9N-000NN	Chassis upgrade from Ultra 1 workstation Model 140 or Ultra 1 workstation Model 170 with no graphics, no disk, no memory
CU-14UEC1-9L-128AH	Competitive upgrade with 128-MB memory, 9-GB internal disk, Creator3D Graphics
CU-14UEC1-9M-128AH	Competitive upgrade with 128-MB memory, 9-GB internal disk, Sun Elite3D m6 Graphics

Upgrades to Sun Ultra 2 Workstation Model 2300

Order Number	Description
UGSS2UEC2-9L-512AH	Full system upgrade from any SPARCstation workstation with 512-MB memory, 9-GB internal disk, Creator3D Graphics Series 3
USS2-UEC2-9M-256AH	Full system upgrade from any SPARCstation workstation with 256-MB memory, 9-GB internal disk, Sun Elite3D m6 Graphics
UG10-UEC2-9L-128AH	Chassis upgrade from SPARCstation workstation 10 with 128-MB memory, 9-GB internal disk, Creator3D Graphics Series 3
UG10-UEC2-9M-128AH	Chassis upgrade from SPARCstation workstation 10 with 128-MB memory, 9-GB internal disk, Sun Elite3D m6 Graphics
UG20-UEC2-9L-512AH	Chassis upgrade from SPARCstation workstation 20 with 512-MB memory, 9-GB internal disk, Creator3D Graphics Series 3
UG20-UEC2-9M-512AH	Chassis upgrade from SPARCstation workstation 20 with 512-GB memory, 9-GB internal disk, Sun Elite3D m6 Graphics

UA11-UEC2-9M-000NN	Chassis upgrade from Sun Ultra 1 workstation with no memory, no disk, Sun Elite3D Graphics
UA12-UEC2-9N-000NN	Chassis upgrade from Sun Ultra 1 workstation with no memory, no disk, no frame buffer
CU-14UEC2-9L-256AH	Full system upgrade from Sun-3™, Sun386*i*™, or any competitive system with 256-MB memory, 9-GB fast internal disk, Creator3D Graphics Series 3
CU-14UEC2-9M-256AH	Full system upgrade from Sun-3, Sun386*i*, or any competitive system with 256-MB memory, 9-GB internal disk, Sun Elite3D m6 Graphics

Upgrades to Sun Ultra 2 Workstation Model 1400

Order Number	Description
UGSS2UJC1-9L-256AH	Full system upgrade from any SPARCstation with Creator3D Graphics Series 3, 256-MB memory, 9-GB internal SCSI-2 disk
UGSS2UJC1-9M-256AH	Full system upgrade from any SPARCstation with Sun Elite3D m6 Graphics, 256-MB memory, 9-GB internal SCSI-2 disk
UG10-UJC1-9L-256AH	Chassis upgrade from SPARCstation workstation 10 with 256-MB memory, 9-GB internal disk, Creator3D Graphics Series 3
UG10-UJC1-9M-256AH	Chassis upgrade from SPARCstation workstation 10 with Sun Elite3D m6 Graphics, 9-GB internal disk, 256-MB memory
UG20-UJC1-9L-000NN	Chassis upgrade from SPARCstation 20 workstation with Creator3D Graphics Series 3, no memory, no disk
UG20-UJC1-9M-000NN	Chassis upgrade from SPARCstation 20 workstation with Sun Elite3D m6 Graphics, no memory, no disk
UA11-UJC1-9L-000NN	Chassis upgrade from Ultra 1 workstation Model 140 or Ultra 1 workstation Model 170 with Creator3D Graphics Series 3, no memory, no disk
UA11-UJC1-9M-000NN	Chassis upgrade from Ultra 1 workstation Model 140 or Ultra 1 workstation Model 170 with Sun Elite3D m6 Graphics, no memory, no disk
UA12-UJC1-9N-000NN	Chassis upgrade from Ultra 1 workstation Model 140 or Ultra 1 workstation Model 170 with no graphics, no disk, no memory

CU-14UJC1-9L-256AH	Competitive upgrade with 256-MB memory, 9-GB internal disk, Creator3D Graphics
CU-14UJC1-9M-256AH	Competitive upgrade with 256-MB memory, 9-GB internal disk, Sun Elite3D m6 Graphics

Configuration Guidelines

- **Memory**
  - All SIMMs supported in SPARCstation 20 workstation and Sun Ultra 1 workstations are also supported in the Sun Ultra 2 workstation desktop system.
  - Sun Ultra 2 workstation requires memory to be installed in like groups of four per bank. If additional memory is required, order SPARCstation 20 or Sun Ultra 1 workstation memory X-options to obtain additional like SIMMs.
- **Disk**
  - Internal single-connector fast SCSI-2 disks from the SPARCstation workstation 20 are supported in the Sun Ultra 2 workstation but require a shift of the plastic bracket. Two plastic brackets come with the upgrade kit.
  - Disk performance is limited by the performance of the transferred disk(s).
  - The internal floppy drive can be moved to the new system from a SPARCstation 20 workstation or Sun Ultra 1workstation.
- **AUI**
  - Sun Ultra 2 workstation has an MII connector in place of the AUI connector. Customers need to order an MII-AUI adapter if the environment requires connection to an external transceiver through an AUI connection (see “Options” in the “Ordering” section).

- **Monitor**
  - Monitors are not included with any Ultra 2 workstation upgrades.
  - Sun branded 17-inch and 20-inch monitors migrate from previous generation Sun systems.
  - If a monitor is needed, order an X-option or refer to the monitor upgrade section in the pricebook.
  - Older 19-inch monitors may need the default resolution setting changed when used with the Creator or Creator3D Graphics (see the Creator Graphics Installation Manual for instructions).
- **SCSI**
  - The Sun Ultra 2 has a wide SCSI-2 connector (68-pin). Customers need to order a wide-to-narrow SCSI adapter cable if external narrow SCSI devices are to be connected to the system (see “Options” in the “Ordering” section).
- **CD-ROM and tape devices**
  - The internal CD-ROM and tape devices from Sun Ultra 1 systems can be moved to the Sun Ultra 2 system.
- **Graphics**
  - Creator and Creator3D Graphics cards can be moved from Sun Ultra 1 to Sun Ultra 2 system but use a slower-speed SRAM. Graphics performance may be slightly degraded.
  - ZX graphics cards are supported with the Solaris™ 2.5.1 operating environment software.
- **Keyboards**
  - Type 4 keyboard is not supported on Ultra 2 system.
  - Type 5 keyboard can migrate to Ultra 2 system.
  - Type 6 keyboard can migrate to Ultra2 system.

Service and Support

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. SunSpectrum programs provide 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 it represents. Customers should check with their local Sun Enterprise™ Services representative for program/feature variance and availability in their area.

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℠ Mission-critical Support	SUNSPECTRUM GOLD℠ Business-critical Support	SUNSPECTRUM SILVER℠ Systems Support	SUNSPECTRUM BRONZE℠ Self Support
Enhanced Support Features				
Mission-critical support team	Yes	Yes	No	No
Sun Vendor Integration Program (SunVIP℠)	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

100BASE-T	100-Mbit Ethernet. Also called FastEthernet.
24-bit color	The ability to render objects using 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.
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.
CDRS	A standardized benchmark for OpenGL®. Represents the mean performance of several commonly used 3-D graphics operations.
Depth cueing	A technique that selectively varies image intensity to create an illusion of depth in a 3-D model. Accomplished in hardware through the use of a Z-buffer.
DIMM	Dual 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.
Double-buffering	Additional frame buffer memory that allows smooth continuous motion of objects moving on the screen. Two buffers: one for rendering and updating, the other for display.
FastEthernet	IEEE standard for 100-Mbit Ethernet.
Gouraud shading	A means of rendering images composed of multifaceted polygons, enabling smoothly shaded surfaces.
NFS™	Sun’s distributed computing file system.
OpenGL®	The 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.

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 standardized 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, crossbar-oriented, packet-switched motherboard interconnect.
V9	Version 9 of the SPARC™ architecture.
VIS™	Visual instruction set. A set of instructions implemented in the UltraSPARC CPU and aimed at handling visual or partitioned data.
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 will be available on SunWIN except where noted otherwise.

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Powerpack				
– *Ultra™ 2 Workstation: Just the Facts*	Reference Guide for Ultra 2 Workstation	Training Sales Tool	SunWIN, Reseller Web	48288
– *Sun's Workstation Overview Presentation*	Customer Presentation	Sales Tool	SunWIN Reseller Web	66715, 66720, 66725, 66730
References				
– *Sun Product Intro—Ultra 2 Workstations, 1/98*	Introduction E-mail	Sales Tool	SunWIN, E-mail	77894
– *Ultra 2 Workstation Architecture*	White Paper	Training	SunWIN, Reseller Web	49575
– *Sun Elite3D: Just the Facts*	Reference Guide for Sun Elite3D	Training Sales Tool	SunWIN, Reseller Web	75245
– *Creator Graphics: Just the Facts*	Reference Guide for Creator Graphics, Series 3	Training Sales Tool	SunWIN, Reseller Web	75246
Presentations				
– *Technical Computing*	Customer Presentation (Golden Pitch)	Sales Tool	SunWIN Reseller Web	75248
– *Graphics Product Presentation*	Customer Presentation on Graphics Products, with Emphasis on Sun Elite3D (with slide notes)	Sales Tool	SunWIN, Reseller Web	75254
Quick Reference Cards				
– *Quick Reference Card—Sun Workstation Product Line Overview*	Quick Reference Card	Sales Tool	SunWIN, First Resort, Reseller Web	10826
– *Quick Reference Card—Sun Workstation Graphics Products Overview*	Quick Reference Card	Sales Tool	SunWIN, First Resort, Reseller Web	24507
– *Quick Reference Card—Competitive Summary Workstations*	Quick Reference Card	Sales Tool	SunWIN, First Resort, Reseller Web	12259
– *Quick Reference Card—Upgrade Paths*	Quick Reference Card	Sales Tool	SunWIN, First Resort, Reseller Web	24513

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Product Literature				
– *Ultra 2 Workstation Datasheet*	Datasheet	Sales Tool	SunWIN, Reseller Web, COMAC	54327 DE629-3
External Web Sites				
– *Sun Home Page*	`http://www.sun.com/desktop`			