Sun Blade™ 1000 Workstation

Just the Facts

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Figure 1: Sun Blade™ 1000 workstation

Introduction

The Sun Blade™ 1000 workstation is Sun's first UltraSPARC™–III processor–based platform. It can be configured as either a single– or dual–processor workstation, and offers the user outstanding system performance through superscalar processor technology, a high–performance system interconnect, high–bandwidth I/O, and accelerated graphics.

The Sun Blade 1000 workstation is an outstanding solution for customers who require high–performance and high–capacity computing. The workstation can expand to up to two CPUs, two 36–GB FC–AL disks, 8–GB RAM, and two high–performance UPA graphics accelerators. The generous expansion capacity in the Sun Blade 1000 workstation allows customers to tailor a solution directly for their needs.

Several graphics accelerators are available including Sun™ Creator3D, Sun Elite3D m6, and Sun Expert3D graphics. These graphics accelerators range from the very affordable, PGX32™ graphics to the high–performance 3–D acceleration of Sun Elite3D m6 graphics, to the very high–performance, hardware–based texture mapping acceleration of Sun Expert3D graphics. A number of dual–monitor configurations are possible.

The Sun Blade 1000 workstation introduces three new industry–standard interfaces to Sun's power workstations that enable the use of Sun's and third–party peripherals. They are:

- A universal serial bus (USB) for low–speed devices (such as a keyboard and a mouse)
- An IEEE 1394 interface for digital video use
- A Fibre Channel arbitrated loop (FC–AL) interface to enable high–speed disk access

All Sun Blade 1000 workstations also include an external 40 MB/second UltraSCSI interface and 100–Mb/second Fast Ethernet.

This workstation's new tower enclosure is designed for ease of expansion and service. Memory, CPU modules, PCI cards, disk drives, and removable media peripherals are all independently accessible. The

Sun Blade 1000 workstation also offers exceptional power–management features. These enable various subsystems to independently enter and exit a low power state depending on activity levels, while maintaining an active network connection.

Please note that the Sun Blade 1000 workstation supports only the Solaris™ 8 Operating Environment (Hardware: 10/00) and beyond. There is no support for earlier versions of the Solaris Operating Environment; however, the workstation maintains full binary compatibility with applications compiled on previous versions of the operating environment.

Product Family Placement

The Sun Blade 1000 workstation is Sun's current flagship workstation. The 8–GB RAM capacity, 18– or 36–GB disks, and two–way multiprocessing capability make the Sun Blade 1000 workstation an excellent fit for customers who use demanding technical applications such as EDA or oil and gas customers.

Sun Blade and Ultra™ systems have several things in common, including:

- The SPARC™ processor
- 100 percent binary compatible from the low end to the high end, including Sun's server family
- Scalable from the low–end uniprocessor systems to the 64–way Sun Enterprise™ 10000 (Starfire™) server
- Modular–easy–to–swap components

Workstation	**Target Users and Markets**
Ultra 5 and Ultra 10	Designed as low–cost desktop solutions, Ultra 5 and 10 systems appeal to customers looking for a low–price system offering accelerated graphics, expandability, fast application performance, and investment protection. Target markets include software development, financial, government, telecommunications, manufacturing, and education.
Ultra 60 and Ultra 80	The Ultra 60 and Ultra 80 workstations are designed for technical users who require high performance and multiprocessing capability. They also addresses the needs of graphics–intensive users and continue to support and build upon the upgradability features to which Ultra workstation users have grown accustomed. With the 450–MHz UltraSPARC–II processor with 4 MB of Level 2 cache, these workstations are on the high–performance end of Sun's workstation family. The target customer is the traditional "power desktop" user who has performance and expansion requirements that exceed the capabilities of the Ultra 5 and Ultra 10 systems.
Sun Blade 1000	The Sun Blade 1000 workstation has a high–performance architecture that allows users to perform complex tasks far beyond the current Ultra 60 workstations. From a CPU clock rate standpoint, the UltraSPARC–III CPU is about twice as powerful as the previous UltraSPARC–II processor. The system includes the ability to expand to two CPUs providing multithreaded applications with maximum throughput. The Sun Blade 1000 workstation is the right system for 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–III CPU and dual–headed high–performance graphics.

Key Messages

- **High–performance 600–, 750–, or 900–MHz UltraSPARC–III CPU processor module**
  - 64–bit SPARC version 9 technology

  - 4–MB L2 Ecache in 600–MHz models; 8–MB L2 Ecache for 750– and 900–MHz models
  - 100 percent binary compatibility with current Solaris Operating Environment
  - Runs 32–bit applications unmodified from the Solaris 2.5.1, 2.6, 7, and 8 Operating Environments
  - 64–bit applications supported from the Solaris 7 and 8 Operating Environments
- **Exceptional throughput**
  - UPA provides a crossbar–oriented interconnection establishing a 144–bit wide, ECC–protected data path to the CPU
  - Clocked at up to 120 MHz, the UPA crossbar gives a peak throughput of over 1.9 GB/second
  - Memory subsystem offers a 576–bit–wide memory path
  - Architecture allows memory to be installed in banks of four DIMMs to take advantage of 576–bit–wide memory path
  - FC–AL is integrated on the motherboard for high–speed disk access
  - A UltraSCSI channel is also integrated into the motherboard, allowing external devices to be connected to separately, further improving I/O throughput
- **Innovative tower system design provides modularity for easy expansion and maintenance**
  - The Sun Blade 1000 workstation offers the flexibility of starting with a single CPU and adding another CPU later as compute needs grow
  - Memory capacity to 8 GB maximum (eight slots using 128–MB, 256–MB, or 1–GB DIMMs)
  - Supports 18– and 36–GB drive options (supports 1.0–inch high, 3.5–inch, 10000–rpm FC–AL disk drives); up to 72 GB of internal drive space
  - Two UPA graphics slots able to support two Sun Creator3D or Sun Elite3D m6 boards
  - Three removable media bays for options such as 4–mm tape drive, DVD–ROM drive, or floppy drive
- **One of the industry leaders for networking, connectivity, and I/O performance ratings**
  - 100–Mbps Fast Ethernet through twisted pair is a standard feature on all Sun Blade 1000 workstations, but the system also maintains connectivity with 10 Mbps networking technology through an autosensing speed switch feature
  - Advanced networking options include FDDI and additional Fast Ethernet ports through industry–standard PCI option cards
  - Innovative multiple–channel industry–standard PCI I/O bus provides sustained high throughput on all four PCI slots
- **Support for high–power graphics accelerators provides high–end graphics for a mid–range price**
  - Sun Expert3D graphics is Sun's high–end, hardware–accelerated, texture mapping option
  - Sun Elite3D m6 graphics is Sun's high–power, high–end 3–D graphics option
  - Sun Creator3D graphics is Sun's mid–range 3–D graphics option

Availability

- General availability is scheduled for October 25, 2000.

- 900–MHz models are scheduled to ship in limited quantities in December 2000 and in volume in Q1CY01.

Target Users

The target customer is the user who requires maximum computer resources in a deskside tower. There are new alternative solutions involving compute farms from Sun and competitors. While these compute farms provide one alternative, there are customers who require the local compute power of maximum capability provided by the Sun Blade 1000 workstation.

Target Markets

Designed for the power user who requires high–performance, multiprocessing capability, high–end graphics, and large amounts of expansion capacity, the Sun Blade 1000 workstation meets the needs of users in a number of disciplines:

- Electronic design automation (EDA)
- Mechanical design (MCAD/MCAE)
- Financial modeling
- Medical imaging
- Earth resources/GIS (oil and gas)
- Visualization and simulation
- Research and development

With the Sun Expert3D graphics card, the Sun Blade 1000 workstation can perform complex DCC operations for visual/simulation applications, and texture memory operations for intense graphics use. Its two–way CPU capability is ideal for financial services applications that perform simultaneous financial simulations and trading activities.

Industry	Key Features to Highlight
Digital Content Creation (DCC)	• Maximum RAM for large datasets • High–performance CPUs for complex graphics rendering • Dual CPU to handle simultaneous tasks
Electronic Design (EDA) • Chip designers, board designers • System houses • Telco	• High–performance CPUs • High–memory capacity • Availability of applications
Financial • Stock and commodity traders • Banks	• High performance • Compact design • Multimedia capabilities • Multi–headed display capability
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
Oil and Gas • 2–D, 3–D, and 4–D seismic analysis • Production engineering • Reservoir engineering	• High–performance CPUs • High–end performance and functionality for both graphics and imaging operations • Dual–headed monitor capability • 3D support for 24–inch displays
Publishing and Imaging • Newspapers • Magazines • Image banks • Advertising agencies	• High–performance CPUs • High–end performance and functionality for both graphics and imaging operations • Dual graphics monitor capability
Research and Development • In–house development • Research institutions	• High computing performance • Feature–rich Solaris Operating Environment
Software Development (CASE) • ISVs • In–house development at large organizations	• High–performance Solaris Operating Environment • Availability of applications • Multithreaded application development
Visualization and Simulation • Scientific visualization • Technical simulation	• High–performance CPUs • High–end performance and functionality for both graphics and imaging operations • Sun Expert3D graphics with high–end texture mapping • Dual–monitor capability

Selling Highlights

Compatibility

The Sun Blade™ 1000 workstation runs the Solaris™ 8 Operating Environment (Hardware: 10/00). It can also run 64−bit applications unmodified from the Solaris 7 Operating Environment, as well as 32−bit applications from previous versions of the Solaris Operating Environment making these systems compatible with previous systems and software.

Market Value Propositions

- As a result of 8−GB memory capacity and high−performance Sun™ Fireplane interconnect customers will notice a significant improvement in application performance and user productivity.
- As a result of the functionality and higher performance of Sun Elite3D graphics product families as well as the ability to use dual Sun Elite3D or Sun Expert3D graphics accelerators to display multiple graphics−intensive applications simultaneously, the customer can be more productive and have shorter turn−around times while using interactive graphics applications.
- As a result of the multiprocessor capabilities of the Sun Blade 1000 workstation, the customer can use all the performance capabilities of Solaris Operating Environment software’s multithreaded application base.

Enabling Technologies

UltraSPARC™–III Processor

The Sun Blade™ 1000 workstation is a shared–memory, multitasking system built around the UltraSPARC™–III microprocessor. The UltraSPARC–III processor is Sun's latest generation of the SPARC™ processor family and the second generation of 64–bit UltraSPARC chips. The Sun Blade 1000 workstation comes with 600–, 750– or 900–MHz versions of this processor.

- As a member of the UltraSPARC family of CPUs, full binary compatibility is provided.
- Modules have the 64–bit SPARC V9 architecture.
- Systems have up to 8 MB of Ecache per CPU.
- An on–chip memory controller is included for reduced latency.

New I/O Interfaces

The Sun Blade 1000 workstation introduces two new I/O interfaces to Sun workstations, which greatly increases customers' access to peripherals.

- **USB interface**

  Universal serial bus (USB) support is provided for low–speed devices. Initially devices such as the Sun™ Type–6 keyboard and mouse are supported along with USB hubs. Sun Blade 1000 workstation has four (Type A) USB connectors on the rear panel.
- **IEEE 1394 interface**

  IEEE 1394—also known in the industry as FireWire®—has emerged as a new standard for medium–speed devices such as digital cameras and digital video cameras. IEEE 1394 interfaces provide an isochronous service that provides latency along with delivering a 400–Mbps bandwidth that is required for transferring large images and other multimedia data. The Sun Blade 1000 workstation has two IEEE 1394 (6–pin) connectors on the rear panel.

Fiber Channel Arbitrated Loop (FC–AL)

Sun has been an early and aggressive adopter of Fiber Channel arbitrated loop (FC–AL) technology in its higher end systems and disk array technologies, with over 2000 terabytes of FC–AL storage already in the hands of Sun customers (as of October 2000). The Sun Blade 1000 workstation marks the debut of this exciting high–bandwidth (1 Gbit/second) technology in desktop systems, offering considerable performance advantage and deployment flexibility over the slower UltraSCSI technology. Only FC–AL disk drives are supported for internal disk storage in the Sun Blade 1000 workstations.

Graphics Variety and Power

The Sun Blade 1000 workstation provides access to Sun's most popular and most powerful graphics boards. All of the following products are supported:

- PGX32™ graphics (as X–option)
- Sun Creator3D series 3 graphics

- Sun Elite3D m6 graphics
- Sun Expert3D graphics (as X–option)

The most powerful of these graphics products are Sun Elite3D and Sun Expert3D graphics.

Sun Elite3D Graphics Series 2

Sun Elite3D graphics represents a high–powered graphics subsystem for the 3–D graphics market. Sun Elite3D graphics retains the basic underlying architecture of Sun Creator graphics while maintaining full API layer compatibility and transparent acceleration of 3–D graphics APIs. Like the Sun Creator graphics, Sun Elite3D graphics incorporates the visual instruction set (VIS™ instruction set). Sun Elite3D graphics comes in two models: Sun Elite3D m3 graphics offers users twice the performance of Sun Creator3D graphics while Sun Elite3D m6 graphics can provide four to five times the performance of Sun Creator3D graphics.

Sun Elite3D graphics 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 graphics accelerates 2–D objects that meet X11 rules. Fast 8–bit and 24–bit window system and imaging performance are provided. Sun Elite3D graphics systems provide 96–bit planes, including full 24–bit double–buffer planes required for smooth animation. A 28–bit Z–buffer is included to provide hardware assistance for hidden surface removal and dynamic rendering for 3–D objects. Sun Elite3D graphics accelerates 2–D objects, fast 8–bit and 24–bit windowing and imaging performance, along with acceleration for decompression and display of compress digital video.

Sun Elite3D graphics systems utilize 3D–RAM technology. This technology is responsible for implementing fast, inexpensive 3–D frame buffers. In addition, Sun Elite3D graphics has three (m3) or six (m6) on–board floating–point processors that speed up floating–point–intensive operations such as transformations, clip tests, face determinations, and lighting.

Sun Expert3D Graphics

Sun Expert3D graphics is Sun's latest high–end graphics product. It complements Sun Elite3D graphics, adding hardware–accelerated texture mapping required by many 3–D graphics applications in all of Sun's technical markets. The Sun Expert3D frame buffer provides Sun's most complete acceleration of the OpenGL® API to date, including 2–D and 3–D texture mapping, image processing, the Sun™ OpenGL® for Solaris™ 1.2.1 API, and a significant number of extensions beyond this API.

The Sun Expert3D frame buffer has similar geometry performance to Sun Elite3D m6 graphics, but its 64 MB of texture memory and hardware texture mapping provide up to seven times the performance of Sun Elite3D graphics in rendering 25–pixel, trilinear–textured, Z–buffered, and Gouraud–shaded triangles. The 64 MB of frame buffer memory allow high–resolution (1920 x1200), double–buffered displays and 1280 x 1024 stereo displays. Sun Expert3D frame buffer hardware supports full–scene antialiasing, but software support for this feature is not part of the initial release. Wide lines and polygon offset are fully accelerated by the hardware.

The Sun Expert3D frame buffer is a PCI 64–bit/66–MHz graphics card. The bus interface ASIC provides the host bus (64–bit PCI) interface for the graphics card. A geometry accelerator ASIC performs transform, clipping, and lighting, and a rasterization engine ASIC performs 2–D and 3–D rasterization, 2–D and 3–D texturing, pixel transfers, imaging, and fragment processing.

System Architecture

Technology Overview

Sun Blade™ 1000 workstation architecture was designed to provide high−performance multiprocessing power, scalability, reliability, and flexibility in a balanced package that does not compromise economy. The very high levels of integration achieved with Sun workstations through the use of application−specific integrated circuits (ASICs) have 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.

An architectural block diagram of the Sun Blade 1000 workstation board is shown in the figure below.

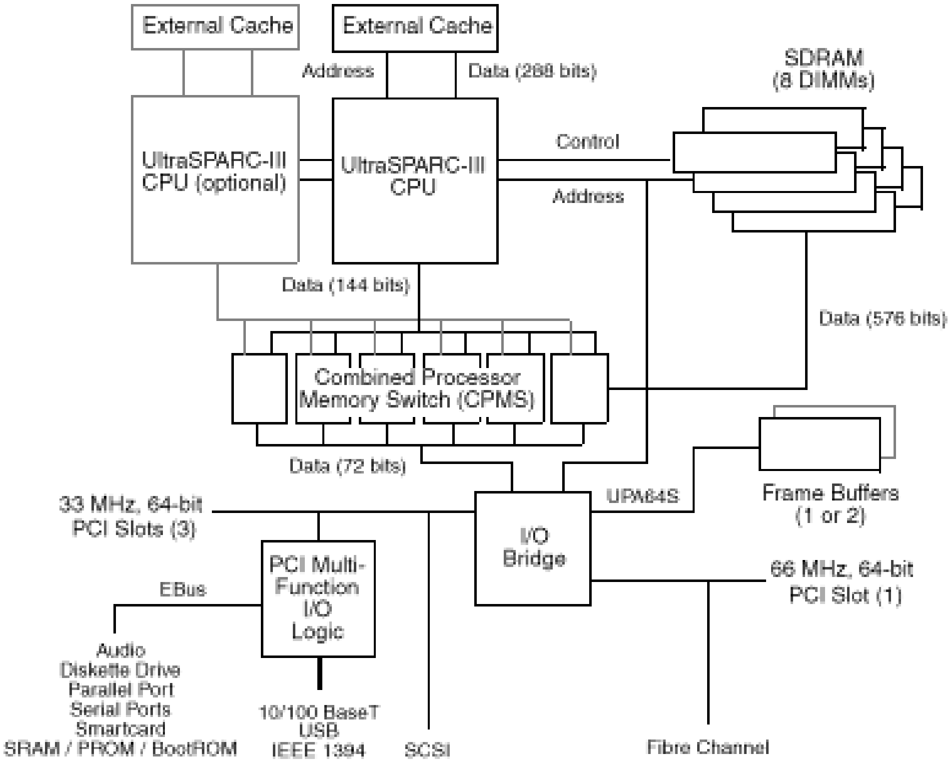

Figure 2: Architecture of the Sun Blade 1000 system

The Sun Blade 1000 workstation is designed for balanced system performance, accelerating applications at every step. Faster I/O and networking, together with the Sun™ Fireplane interconnect, allow fast data fetching. This new interconnect is based on a packet−switched, crossbar architecture. The Sun Blade 1000 workstation has nine buffered crossbar−switched processors that allow the memory and the graphics to interconnect. This architecture provides supercomputing power, and moves data through the interconnect at high speed.

Technical Fact Summary

- Sun's fastest performance uniprocessor and multi–processor Sun workstation; uses a 600–, 750– or 900–MHz UltraSPARC™–III processor
- High–performance system bus provides fast access to memory and graphics
- Flexible hard disk expandability
  - Up to two internal 36–GB FC–AL disks
  - Up to 72–GB of total disk storage
- High–performance memory subsystem
  - Up to 8 GB for configurations (using 8 x 1–GB DIMMs)
- Balanced system design
  - High performance interconnect at 150 MHz or nearly than 4.8 GB/second peak throughput.
  - Matching performance enhancement in I/O, networking, and memory access
    - Internal FC–AL interface for disk access
    - Innovative high–performance PCI I/O bus offering dual independent PCI buses, plus 66–MHz PCI support
- High–end graphics functionality and performance at mid–level prices with Sun Elite3D and Sun Expert3D graphics
- Expansion to advanced networking
  - Fast Ethernet, 100BASE–T, autosensing, and autoswitching to 10BASE–T for backward compatibility
  - PCI networking options include Gigabit Ethernet, ATM, token ring, and FDDI

UltraSPARC–III Processor

Sun Blade 1000 workstations are powered by up to two UltraSPARC–III processors with either 4 MB of external cache operating at 600 MHz or 8 MB of external cache operating at 750 or 900 MHz. Binary compatible with all Sun SPARC™ processor–based systems, the all–new UltraSPARC–III provides very high integer and floating–point performance to address the needs of the most computationally demanding applications. Capable of 64–bit data and addressing, UltraSPARC–III processors have a number of important features to improve operating system and application performance:

- Larger cache, improved branch prediction, lower cache latency, and higher clock rates all combine to double the performance of the UltraSPARC–III
- 6–way superscalar issue, no–stall 14 stage pipeline
- Enhanced VIS™ instruction set with three new instructions for high performance on multimedia and networking applications
- High–efficiency trap management
- Four–way associative on–chip 64–KB data and 32–KB instruction cache, with up to 8 MB of external level–two cache through integrated controller
- Integrated DRAM controller with support for up to 8 GB of memory can transfer data at up to 2.4 GB/sec.

Sun Fireplane Interconnect

In recent years, processor technology has moved so quickly that memory systems and interconnects have been hard−pressed to keep up. As a result, many designs fail to deliver the data bandwidth that modern processors are capable of. With the updated system interconnect, Sun Microsystems continues the tradition of providing superior memory and I/O bandwidth on its desktop systems.

Features of the new system interconnect include:

- Fast 150−MHz operating frequency offers greatly increased performance over previous designs
- Low latency memory access
- Completely separate address/control and data paths for flexible implementation
- Out−of−order transaction processing enables multiple "in−flight" transactions on the bus at one time.
- More economical implementation through distributed control (no central memory controller required)
- Integrated support for multiprocessor configurations
- 4.8 GB/sec. peak data bandwidth
- Separate address and data paths, so no ordering on data and better load balancing
- Distributed arbitration for address control; no need for central arbiter
- Boot bus provides alternate path for booting and diagnostic
- EnergyStar mode built−in
- ECC on data, parity on private data bus, parity on address control

The new Sun Fireplane interconnect directly connects the two UltraSPARC−III processors and the I/O bridge. The address bus runs at half the speed of the data paths, and utilizes DTL signaling. One of the major architectural innovations of this new interconnect is the ability to combine the simplicity of a single bus with the high bandwidth normally associated with a switch−based interconnect. This is accomplished with the complete separation and independence of address and data paths. The address and data paths in most computer systems are very closely related, especially in their low−level sequencing, forcing a strong coupling between the transport of addresses and data between system components. The system interconnect breaks away from this traditional methodology by completely separating the address and data paths—both at the topological level and in low−level sequencing.

Memory

The Sun Blade 1000 workstation supports up to 8 GB of 50−ns, 168−pin, 5−volt, dynamic RAM memory. Memory is organized into two banks of four DIMMs. DIMMs are added in groups of four.

Storage

Internal data storage for the Sun Blade 1000 workstation is provided by up to two , 18− or 36−GB, 3.5−inch, FC−AL disk drives. These 10000−rpm drives offer a peak data transfer rate of 100 MB/second.

In addition to its internal and external high−speed fixed storage capabilities, the Sun Blade 1000 workstation provides three removable media bays that support DVD−ROM, 1.44−MB, 3.5−inch manual−eject floppy, or 4−mm tape for software installation and system management.

Networking and I/O

All Sun Blade 1000 workstation models provide standard 100−Mbps Fast Ethernet which can autosense and drop to 10 Mbps operation. In addition, a wide range of serial I/O options are supported, bringing new capabilities and levels of performance to desktop workstations:

- **USB interface**

  Universal serial bus (USB) support is provided for low−speed devices. Initially devices such as the Sun Type−6 keyboard and mouse are supported along with USB hubs. The Sun Blade 1000 workstation has four USB connectors on the rear panel.

- **IEEE 1394 Interface**

  IEEE 1394—also known as FireWire® —has emerged as a new standard for medium speed devices such as digital cameras and digital video cameras. IEEE 1394 interface provides an isochronous service which helps ensure latency along with providing the needed 400 Mbps bandwidth for transferring large images and other multimedia data. The Sun Blade 1000 workstation has two IEEE 1394 connectors on the rear panel.

- **Fiber Channel arbitrated loop (FC−AL)**

  Sun has been an early and aggressive adopter of Fiber Channel arbitrated loop (FC−AL) technology in its higher end systems and disk array technology. The Sun Blade 1000 workstations mark the debut of this exciting high−bandwidth (1 Gbit/second) technology in desktop systems, offering considerable performance advantage and deployment flexibility over slower UltraSCSI. Only FC−AL disk drives are supported for internal storage in Sun Blade 1000 workstations.

- **SCSI**

  Sun Blade 1000 workstations still support 40−MB/second UltraSCSI (Fast−20) for support of internal removable media devices and legacy external SCSI devices. UltraSCSI is completely compatible with earlier fast (10 MB/second) and standard 8−bit (5 MB/second) SCSI peripherals. A standard external 68−pin connector is provided.

- **Terminal/modem interface**

  Two serial ports are provided, both supporting synchronous communication. The maximum baud rate is 384−Kbaud synchronous and 460.8−Kbaud asynch. Both RS232 and RS423 standards are supported via a software setting. The default configuration will be RS423. Connection is via two DB25 standard connectors.

Sun Creator3D Graphics Series 3 Overview

Sun Creator3D graphics series 3 is the latest generation of the Sun Creator graphics family of accelerators. With one architecture it can accelerate and support diverse types of graphic needs ranging from 8−bit and 24−bit windowing to high−end 3−D graphics.

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

Key Messages

- **Solid graphics performance**

  Sun Creator3D graphics performance is based upon the Sun Creator approach to designing graphics. In series 3, the Sun Creator graphics technology is enhanced, with up to 50 percent graphics performance improvement over series 1.

  – UltraSPARC CPU

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

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

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

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

  – Sun Creator–rendering ASIC (FBC2)

  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 Sun Creator3D graphics takes advantage of general system performance enhancements and will scale up with increases in CPU clock rate, making it unnecessary to upgrade graphics as new generations of CPUs become available.

- **More standard functionality**

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

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

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

- **Fully compatible with existing APIs**

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

Sun Elite3D Graphics Overview

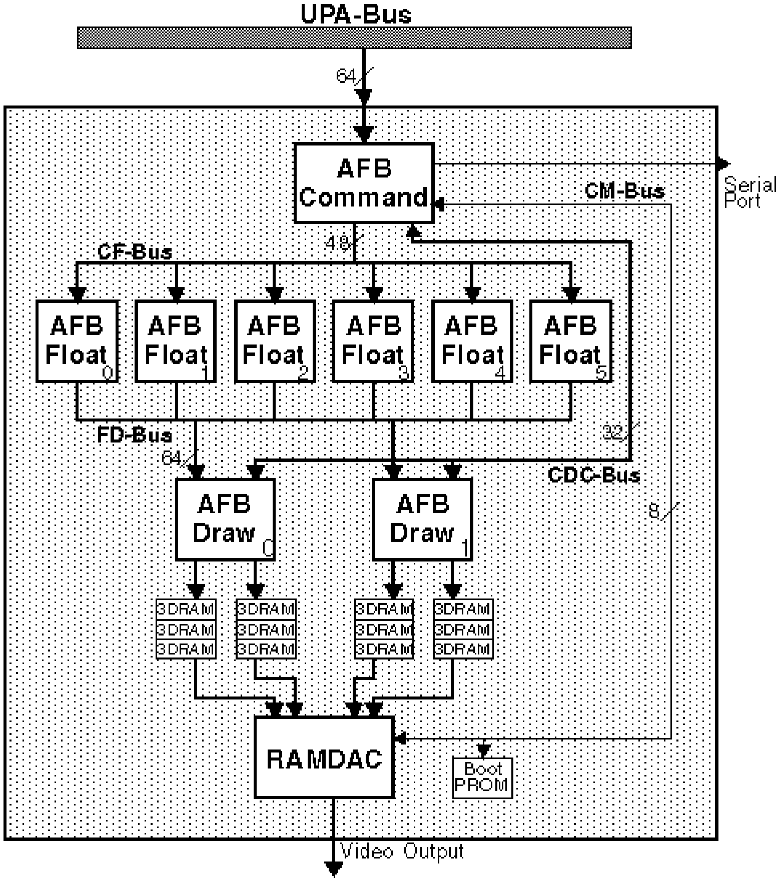

Figure 3: Sun Elite3D m6 graphics chip–level diagram

Sun Elite3D graphics greatly accelerates the rendering of 3–D triangles, vectors, and texture maps over what is possible with Sun 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 Sun Creator3D graphics. The 96–bit pixels support two 24–bit color buffers, an 8–bit pseudo–color overlay buffer and a 28–bit Z buffer, plus some miscellaneous control planes.

Sun Elite3D graphics has a highly parallel and efficient graphics pipeline. The Sun Elite3D graphics 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 Sun Creator ASIC chip. The additional functionality supports rendering of model space geometry. The main change is to allow the most important bits to be packaged up into single–header words that can be passed down with the geometric data without stopping the pipeline. Additional functionality includes complete binary compatibility with the register set and functions of Sun Creator3D graphics and support for the OpenGL platform.

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 systems are available in two models, the m3 and the m6. Both models are supported on the Sun Blade 1000 workstations. Sun Elite3D m6 graphics provides a high level of performance with six high−performance, floating−point processors. Sun Elite3D m3 graphics reduces this number to three processors, providing greater economy.

The Sun Elite3D m6 graphics accelerator comes as part of some of the standard Sun Blade 1000 configurations. It provides significantly higher levels of performance and functionality than the m3 model including:

- Standard 24−bit color, 1280 x 1024 resolution, MPEG playback acceleration at 30+ frames per second, greater than 4.7 million 2−D vectors per second, greater than 8.2 million 3−D vectors per second, over 5.9 million triangles per second, and on−board image acceleration functions.
- 88−bit planes, including full 24−bit double−buffer planes for smooth animation. A 28−bit Z−buffer is included to provide support for hidden surface removal and dynamic rendering of 3−D objects.
- Support for a wide array of important graphics functions, including Bresenham lines; polygons; fonts; accelerated dots, lines, triangles, and quadrilaterals; antialiasing of dots and lines; Gouraud shaded triangles; specular lighting; hardware per−pixel depth cueing; transparency; texture map support; compressed 3−D geometry decompression; viewport clipping; flexible blending operations; and a full set of Boolean operations.
- Sun/Mitsubishi developed 3D−RAM to improve 3−D graphics rendering performance
- Exploits the high floating−point performance and VIS instruction set of the UltraSPARC−III processor
- High speed RAMDAC can display 8−bit and 24−bit images simultaneously, and features a programmable video timing generator for multiple resolution support
- Completely compatible with existing Sun graphics APIs, including X11, XGL, and XIL graphics libraries. Also compatible with the OpenGL API, a vendor−neutral 2−D and 3−D graphics API In line with its philosophy of uninhibited expansion potential, the Sun Blade 1000 workstation has two UPA64S slots to allow "dual−headed" (two monitor) Sun Elite3D graphics operation.

Sun Elite3D Graphics 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, allowing virtually seamless integration and manipulation of windows
• Gouraud shading	• Allows smooth shading of solid geometry
• Acceleration for geometry decompression	• Allows complex compress geometry to be decompressed at hardware rates
• Alpha blending and screen door transparency	• Simulates transparent materials such as glass
• Line and big dot antialiasing	• Needed in MCAD and visualization for better visual quality

Features	Benefits
• Per–pixel depth cueing	• More accurate depth cueing or fog
• Per–pixel alpha interpolation	• Variable transparency
• 4–bit stencil support with hardware acceleration of OpenGL API stencil functions	• Enables hardware acceleration for OpenGL API
• Accelerated lighting	• More lights can be turned on for enhanced visual display without encountering large performance penalties
• Four 8–bit color maps	• Dynamic color map segment allocation when running 8–bit window systems should eliminate color flashing problems
• Adjustable gamma correction	• Allows users to gamma–correct visuals for enhanced visual quality
• NTSC/PAL video timing support	• Supports frame buffer to video timing
• Stereo 960 x 680 at 112 Hz supported with 21–inch monitor	• With frame buffer, monitor, and window systems support for stereo, users can see better representation of 3–D data
• 1280 x 1024 at 76–Hz resolution standard	• High–resolution display quality
• Two serial–port connectors	• For VR peripherals
• Dual–headed support: two Sun Elite3D m6 frame buffers and/or two Sun Creator3D frame buffers	• For users who need to be able to do multiple things simultaneously, such as command and control applications, 3–D and video playback for animators, design and analysis for engineers, and so on
• Sun™ OpenGL® for Solaris™ 1.2.1, XGL 3.0, XIL, X, and Java 3D™ API support	• A choice of APIs
• Binary compatibility with Sun Creator graphics product family	• Interoperability with existing applications and users

Sun Expert3D Graphics Overview

The Sun Blade 1000 workstation configurations with Sun Expert3D graphics offer a high–performance graphics adapter with on–board texture mapping memory. This PCI graphics adapter provides an outstanding and affordable high–performance graphics solution for demanding 2–D and 3–D graphics applications that specifically require hardware–based texture mapping acceleration.

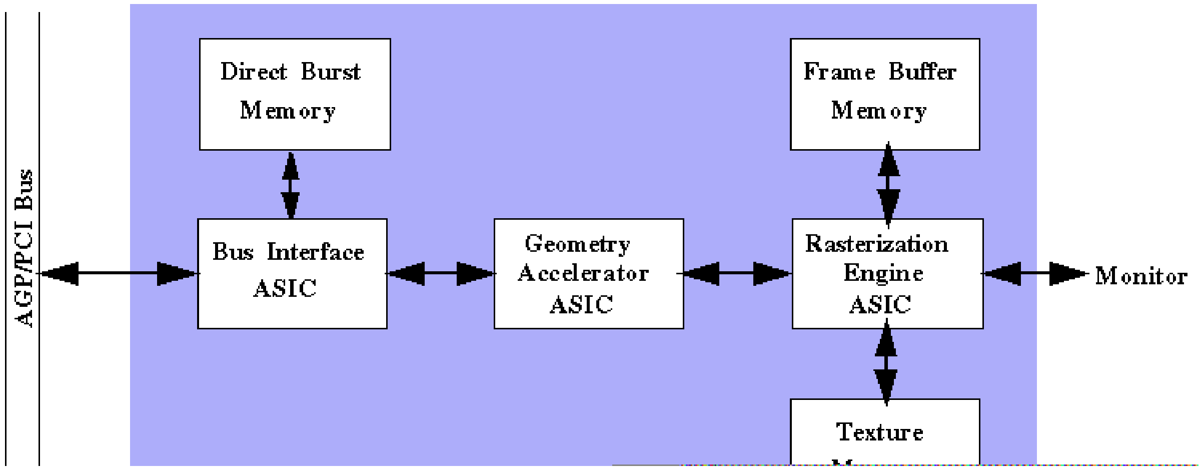

Figure 4: Sun Expert3D graphics schematic

For demanding applications in geothermal, high–end MCAD, digital content creation, visualization and simulation—where hardware–based texture mapping is essential—the Sun Blade 1000 workstations support the Sun Expert3D graphics accelerator. Sun Expert3D graphics presents a high–performance, affordable solution with the following features:

- 128 MB total on–board memory with 64 MB for accelerated texture–mapping performance for acceleration of complex 2–D and 3–D textures
- True–color 3–D double and Z–buffering at very high resolutions for large screen HDTV monitor support as well as stereo–mode graphics for enhanced realism at high resolutions.
- On–board geometry accelerator delivers up to six million triangles per second with up to 3.2 Gigaflops of floating point performance.
- On–board rasterization engine performs triangle setup, texture processing, and pixel operations at up to 143 Mpixels per second fill rate.
- Compatibility with Sun's graphics APIs including the Sun OpenGL for Solaris API version 1.1.2 or later and Java 3D API. The Sun Expert3D accelerator can be installed in one of the Sun Blade 1000 workstation's PCI slots and up to two Sun Expert3D accelerators can be installed per system.

Other features of the Sun Expert3D frame buffer include double–buffering/Z–buffering (3–D) support at super high resolutions of 1920 x 1200, stereo–video mode support at 1280 x 1024, and hardware support for 3–D SuperScene antialiasing.

The Sun Expert3D frame buffer is ideal for Sun customers and resellers in the technical marketplace. The Sun Blade 1000 workstation configurations with Sun Expert3D graphics are especially appropriate for customers working with CAD wire–frame models or highly textured seismic data, such as in the oil and gas industry.

Sun Expert3D Graphics Features and Benefits

Features	Benefits
solution	Allows customers to display 3- D data in stereo mode at higher resolutions, providing enhanced realism for immersive applications
Supports SuperScene antialiasing	Improves rendered image quality
Graphics framelock support	Enables multiple graphics frame buffers to be used in a a single or multiple systems to render to very high- screen resolutions

Up to two Sun Expert3D cards can be installed in the Sun Blade 1000 workstations. Implemented as a full- length PCI graphics card, Sun Expert3D graphics features internal I/O ports for multi- viewing and external I/O ports for ext

Sun Blade 1000 Workstation Graphics Performance

600–MHz Sun Blade 1000 Workstation Benchmarks

Benchmarks	PGX32	Sun Cre

Sun Blade 1000 Workstation Graphics Performance

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Sun Blade 1000 Workstation Graphics Performance

600–MHz Sun Blade 1000 Workstation Benchmarks

Benchmarks	**PGX32**	**Sun Cre**

Sun Blade 1000 Workstation Graphics Performance

600–MHz Sun Blade 1000 Workstation Benchmarks

Benchmarks	PGX32	Sun Cre

Sun Blade 1000 Workstation Graphics Performance

600–MHz Sun Blade 1000 Workstation Benchmarks

Benchmarks	**PGX32**	**Sun Creator3D**	**Sun Elite3D m6**	**Sun Expert3D**
Xmark93	12.1	37.2	44.5	22.6
2–D Vectors per sec.	897 K	4.8 M	5.8 M	7.9 M
3–D Performance				
• 3–D vectors/second	521 K	3.7 M	8.8 M	10.5 M
• 3–D tris/second	—	1.5 M	5.8 M	6.0 M
• 3–D quads/second	—	698 K	2.1 M	2.7 M
• 3–D texture fill pixels/second	—	9.1 M	55 M	118 M
ViewPerf 6.1.1				
• ProCDRS–02	—	9.2	21.0	29.1
• DX–05	—	14.7	29.5	38.5
• AWadvs–03	—	14.2	18.2	53.0
ViewPerf 6.1.2				
• ProCDRS–03	—	5.2	11.5	17.1
• DX–06	—	4.3	8.2	10.5
• AWadvs–04	—	13.5	16.0	54.2

750–MHz Sun Blade 1000 Workstation Benchmarks

Benchmarks	**PGX32**	**Sun Creator3D**	**Sun Elite3D m6**	**Sun Expert3D**
Xmark93	12.1	42.2	44.5	27.9
2–D Vectors per sec.	897 K	4.9 M	5.8 M	7.9 M
3–D Performance				
• 3–D vectors/second	521 K	3.7 M	8.8 M	10.5 M
• 3–D tris/second	—	1.5 M	5.8 M	6.0 M
• 3–D quads/second	—	698 K	2.1 M	2.7 M
• 3–D texture fill pixels/second	—	11 M	56 M	118 M
ViewPerf 6.1.1				
• ProCDRS–02	—	10.3	23.3	28.7
• DX–05	—	16.5	32.3	38.9
• AWadvs–03	—	17.1	21.4	61.8
ViewPerf 6.1.2				
• ProCDRS–03	—	5.7	12.2	17.1
• DX–06	—	5.1	9.9	12.3
• AWadvs–04	—	16.5	18.4	54.2

900–MHz Sun Blade 1000 Benchmarks

Benchmarks	PGX32	Sun Creator3D	Sun Elite3D m6	Sun Expert3D
Xmark93	12.1	44.7	47.9	29.8
2–D Vectors per sec.	897 K	4.9 M	6.1 M	7.9 M
3–D Performance				
• 3–D vectors/second	521 K	3.7 M	8.8 M	10.5 M
• 3–D tris/second	—	1.5 M	5.9 M	6.0 M
• 3–D quads/second	—	698 M	2.1 M	2.7 M
• 3–D texture fill pixels/second	—	13 M	56 M	118 M
ViewPerf 6.1.1				
• ProCDRS–02	—	10.8	24.1	29.2
• DX–05	—	17.6	34.8	39.0
• AWadvs–03	—	19.6	24.3	65.1
ViewPerf 6.1.2				
• ProCDRS–03	—	6.0	12.6	17.2
• DX–06	—	5.4	10.6	12.8
• AWadvs–04	—	18.9	20.6	55.2

Note: *Configuration for timing includes the Solaris™ 8 Operating Environment and OpenGL 2.1 performance data collected in September 2000. Performance data is subject to change. See Sun's web site at http://www.sun.com/desktop/ for latest performance numbers.*

Metrics defined:

- 2–D vectors are 10 pixels long, X11 perf numbers
- 3–D vectors are 10 pixels long, depth cued, clip tested, perspective projection, solid line through the OpenGL API
- 3–D triangles: 25 pixel triangle mesh, one light source
- 3–D quads: 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 via the OpenGL API

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 Elite3D m6 graphics utilize a new connector for stereo viewing synchronization, a 7–pin mini–DIN style of connector. (StereoGraphics Corporations sells a cable adapter for connecting the old and new styles of connectors. It can be ordered from them using the part number ESUN.)

System Configuration

Feature	**Specification**
Dimensions	45.5 cm x 25.6 cm x 61.0 cm (H x W x D) 17.9 inches x 10.1 inches x 24.0 inches
Weight	31.1 kg (70 lb.)
CPU and UPA	
• Architecture	UltraSPARC™–III superscalar, 64 bit, V9
• Clock rate	600, 750, or 900 MHz
• Processor slots	2
• Cache on chip	64–KB D–cache 32–KB I–cache
• External cache	4 MB (600–MHz models) 8 MB (750– and 900–MHz models)
• Sun™ Fireplane system interconnect speed	150 MHz
• UPA	Two 120–MHz graphics slots
Memory	
• Memory type	ECC
• Number of slots	8
• Capacity	512 MB to 8 GB
• DRAM speed	50 ns
• Bus width	576 bits
• DIMMs	128–MB, 256–MB, and 1–GB SDRAM DIMMs
I/O Interfaces	
• UltraSCSI	68–pin Ultra Wide SCSI (40 MB/sec.)
• Serial ports	Two RS–232C/RS423 serial ports, 384K Baud sync/460.8K Baud asynch (DB25–F). Industry–standard USB port IEEE 1394
• Parallel port	Centronics compatible; one DB25 connector
• UPA graphics	Two UPA slots
• Internal disk access	FC–AL access for mass storage
• PCI I/O bus	Three full–size and one half–size PCI slots (version 2.1): Three at 33 MHz; one at 33 or 66 MHz
Graphics, Imaging, and Video	
• Graphics supported in PCI slots	PGX32™ Sun Expert3D

Feature	**Specification**
• Graphics supported in UPA slot	Sun Creator3D Sun Elite3D m3 and m6
• Monitors supported	17–, 19–, 21–, and 24–inch color monitors; 18–inch flat panel
• Digital media	SunVideo Plus™ card and camera Sun 1394 Visual Collaboration Kit
Networking Ports	10/100BASE–T autosensing Fast Ethernet
Internal Storage	
• Disks	Up to two 10000–rpm, FC–AL disks Capacity 18 or 36 GB
• Three front–access, removable media bays: one 5.25 x 1.6 inch, one 3.5 x 1.0 inch, and one bay that accommodates a device of either size	1.4–MB triple–density manual–eject floppy 4–mm tape drive 48–X DVD–ROM Smart card reader standard
External Storage	
• Tape/optical	Automated tape products Sun StorEdge™ UniPack and MultiPack systems
• Disk, via FC–AL interface	FC–AL MultiPack
Solaris™ Operating Environment Support	Solaris™ 8 (Hardware: 10/00)
Input Devices	
• USB keyboard	Sun Type 6 (USB interface). Third–party USB keyboards are not supported
• USB mouse	Opto–mechanical, 3–button
• Microphone	SunMicrophone™ II

Requirements and Specifications

Environment

Temperature	
• Operating	5 to 35°C with removable media 5 to 40°C without removable media
• Nonoperating	−40°C to 60°C
Humidity	
• Operating	20 to 80% RH, max. wet bulb of 27°C with internal tape media installed
• Nonoperating	5 to 93% RH noncondensing at 40°C
Altitude	
• Operating	3,000 meters (70KPa)
• Nonoperating	12,000 meters (19.3KPa)
Shock	
• Operating	5G for 11 msec. half−sine, wave form
• Nonoperating	30G for 11 msec.
Vibration	
• Operating	0.2 G peak, three mutually perpendicular axes, 5 to 500 Hz
• Nonoperating	1.0 G peak, all axes, 5 to 500 Hz
Acoustic	
• Operating	5.64 bels
• Idle	4.77 bels
Drop and Topple	50−mm drop height

Regulations

Safety	UL 1950, CSA 950, TUV EN60950 with Nordic deviations, CB Scheme
RFI/EMI	FCC Class B, CRF 47 Part 15, 6dB margin below the limit ICES−003 Class B (for Canada) EN55022 Class B (for the European Union) EN61000−3−2 (for the European Union as of 01JUN98 or 01JAN01) VCCI Class B (for Japan) GOST−R Class B (for Russia) EZU Class B (for Czech Republic) EZU Class B (for Slovakia) RRL Class B (for Korea) BCIQ Class B (for Taiwan) AS/NZS 3548 Class B (for Australia & New Zealand)
Immunity	EN 50082−1 SUN 990−1151−01 Rev A
X−ray	DHHS 21 Subchapter J PTB German X−ray Decree
Environmental	Enhanced EnergyStar Network aware in low power mode
Monitors and Keyboards	TCO95

Power

Some Sun Blade™ 1000 configuration are EnergyStar compliant under the Solaris™ 8 Operating Environment and meet EPA guidelines *without* check−pointing and restoring the system. An innovative approach to power management enables Sun Blade 1000 workstations to remain network−aware−even in low−power mode.

AC power	100−240 VAC, 47−63 Hz, 0.8 KVA
Power supply output	670 Watts max.
Power control	Front panel on/off switch

Advanced Power Management

The Sun Blade 1000 workstation comes equipped with a single 670−Watt power supply providing all the power needed for internal expansion options. With the Sun Blade 1000 workstation, Sun has gone beyond the need for environmentally−sensitive construction and provides an innovative approach to EPA EnergyStar compliance when running the Solaris 8 Operating Environment. Power management software on Sun Blade 1000 workstations allows the system to enter a "low−power" mode after a programmed period of time. Rather than completely pausing the system (checkpoint−and−resume), power management software detects idle subsystems and brings them to a low−power, but operational state. For instance, selected Sun Blade 1000 workstations remain network−aware, even when running in low−power mode. To support this power management model, the various subsystems within Sun Blade 1000 workstation are designed to enter a low−power state independently, for example:

- Processors and other internal ASICs including those which operate the Sun™ Fireplane system interconnect reduce their power consumption by running at a lower internal clock frequency.

- The 33−MHz PCI bus frequency is reduced to 1 MHz. When activity is pending, the bus clock is returned to full frequency.
- The USB, IEEE 1394, and Ethernet subsystems are set in their lowest power−consuming modes.
- The audio module is disabled.

The graphics subsystem is configured for lowest DC power consumption The checkpoint−and−resume approach to power management is still available and can be configured by power management software. The Solaris Operating Environment allows users to quickly resume work in progress before the shutdown.

Reliability, Availability, and Serviceability (RAS)

Reliability

The Sun Blade™ 1000 workstation supports the following features to help ensure data integrity and reliable operation of the system:

- End–to–end ECC on all memory transfers (SEC–DED–S4ED) to the CPUs and to the I/O subsystems (except UPA64S)
- The ECC code detects and correct all single bit errors. It also detects all double, triple, and quadruple bit errors that occur in the same nibble. The Sun Blade 1000 workstation implementation allows detection of SDRAM chip failures due to a customized routing of the memory bus.
- ECC protection on external cache
- ECC or parity on all major data buses
- Parity protection on interconnect address/command bus, all interconnect miscellaneous signals, PCI and EPCI, major data buses, and cache RAM
- Internal error detection and reporting on all ASICs
- Generation of reset on fatal error by BBC (as much state as possible is preserved in processor and ASICs for analysis)
- Checksum on BootPROM
- Extensive power on self–test (POST)
- Power–down of subsystems when not in use

In addition to supporting the above features, reliability will be designed in by:

- Extensive signal integrity analysis
- Providing adequate decoupling
- Extensive EM susceptibility and interference analysis/design
- Software memory scrubbing

Availability

Hardware, software, and diagnostic features that support availability include:

- Deconfiguration of faulty memory DIMM banks
- Deconfiguration of faulty I/O boards
- Thermal sensors controlling fan speed and cooling
- Thermal faults detected by software result in customer alerts and system shutdown to protect components
- SunVTS™ diagnostics can run at scheduled times to periodically validate system functionality
- Automatic reboot of the system on fatal errors

Serviceability

Features that help minimize downtime include the following:

- Simple enclosure layout
- All FRUs can be accessed independently; that is, each FRU can be serviced without needing to remove any other FRU
- Minimal internal cabling
- Action−oriented diagnostic messages indicating failed FRUs (at the POST and SunVTS diagnostic levels)
- JTAG scan support on ASICs, processor module and frame buffers and EPCI connector
- No configuration jumpers
- Modular components include the motherboard, disks, memory DIMMs, graphics options, processor modules, and power supply
- Common fasteners used throughout for easy servicing

FRUs and Serviceability Details

- **Motherboard**

  The motherboard FRU is removed by disconnecting all cables, removing daughtercards (PCI, frame buffer, audio), removing three screws from the rear panel, and sliding the board forward and directly upward.
- **Hard disk drives**

  All internal hard drives plug directly into the internal FC−AL backplane. No drive jumpering or configuration is required. Drives are secured with the "spud bracket" which provides the necessary shock and vibration isolation, drive−to−chassis grounding, and chassis mounting/locking features.
- **Power supply**

  The power supply is secured to the chassis by six loose screws. Supply removal is accomplished by removing the side cover, disconnecting cables from the motherboard, removing the power supply screws, sliding the supply back, and lifting it out of the chassis.
- **DIMMs**

  Accessible by removing the top panel. A built in ejector facilitates removal and installation of the memory DIMMs.
- **Side cover**

  The side cover may be removed by hand, without the use of tools.
- **Chassis bottom housing**

  The chassis provides securing points for the power supply, motherboard, and disk drives. The motherboard and power supply drop into securing hooks or slides and are secured with screws. Hard disk drives slide into brackets in the chassis and are secured by latches on the drives themselves. Removable media devices are secured to a bracket with common (M3) Phillips screws.

System Management

Software

The Sun Blade™ 1000 workstation run Solaris™ 8 Operating Environment (Hardware: 10/00) or later versions. There are four key software deliverables:

- **Solaris Operating Environment kernel software**

  The OS kernel, modified to work with the new UltraSPARC™–III CPU.
- **Solaris I/O software**

  The software for the I/O subsystem, extended to support the new USB, IEEE 1394, and FC–AL buses, as well as DVD–ROM devices and smart card.
- **Power management software**

  The software that implements support for the EnergyStar program, extended to provide network friendliness (sustaining a network presence even when the system is in low–power mode).
- **OpenBoot PROM firmware**

  The firmware that supports booting the system with its new buses and devices.

System Administration

Sun Blade 1000 workstations deliver the power and graphics needed by the customers who use heavy compute–intensive applications. Customers who run these compute–intensive applications require a system like the Solaris Operating Environment that can provide a highly reliable, available, fast and safe desktop computing environment. Built into the Solaris Operating Environment are systems management and security features that help deliver the computing environment demanded by these customers. Sun also offers unbundled systems management products that will supplement the systems management features in the Solaris 8 Operating Environment. Together, the Solaris Operating Environment management features and Sun's unbundled systems management products create one the most stable and available desktop computing environment in the industry.

Solstice AdminTools™ Software

Solstice AdminTools™ software is a set of GUI–based administration tools that have been shipping since the Solaris 2.2 Operating Environment release and can be used to provide local systems administration. Solstice AdminTools software can be used to manage user accounts, groups, hosts, printers, serial ports, and installation/removal of software.

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.

Solaris Web Start Software

Solaris Web Start software is an easy–to–use Java™ technology–based application that guides users through the installation of both the Solaris Operating Environment and copackaged application software with a single on–screen button. Its graphical user interface facilitates file system configuration. It also features a built–in suite of on–line information and answers questions about the product itself, the software it installs, and the hardware platform it supports.

Solstice Enterprise Agents™ Software

Solstice Enterprise Agents™ software allows the workstation to be managed from simple network management protocol (SNMP)–based system/network management tools. Solstice Enterprise Agents software is based on the new extensible agent technology or manager/subagent technology. The Manager agents receive and respond to SNMP or desktop management interface (DMI) requests. After retrieving the appropriate values from the respective subagents, responses are sent. The subagents manage information bases (MIBs or MIFs) designed for specific components and applications.

Solaris Desktop Extensions Software

Solaris Desktop Extensions software features ideal systems management tools for those non–UNIX platform users who want to quickly view processes and system resources. The process manager in Solaris Desktop Extensions software is a GUI–based tool that enables users to quickly identify, sort, suspend, and eliminate processes based on attributes such as CPU consumption and time elapsed.

Solaris Desktop Extensions software also features a GUI–based performance monitor, enabling users to quickly monitor some of the key system resources such as CPU, load, disk, page, context, job swaps, interrupts, packets, collisions, and errors.

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

ShowMe How™ software is a documentation system that presents information in a highly understandable multimedia format. Installation and service tutorials as well as reference information provide users with comprehensive, easy–to–use instruction. ShowMe How software streamlines installation and maintenance to help lower service costs and maximize system uptime. Some of the features of this tool are:

- Distributed on CD–ROM
- Movies of installation and replacement procedures played through ShowMe TV™ software packaged with application
- Photo sequences with narrated installation and replacement procedures
- Text–based instructions can be viewed on–line and printed, excerpted from standard Sun documentation
- Photos with active callouts link to more detailed photos and text–based reference information

The Solaris 8 Operating Environment

Sun Blade 1000 systems are supported by the Solaris 8 Operating Environment (Hardware: 10/00). The Solaris 8 Operating Environment is the latest release of one of the industry's leading enterprise operating environments. The Solaris 8 Operating Environment contains the complete functionality required for all supported Sun Workstation™ systems. The Solaris 8 Operating Environment is a solid, scalable 64–bit operating environment that also supports 32–bit applications. The Solaris 8 Operating Environment includes:

- Reliable, Internet–ready operating environment for 32– and 64–bit SPARC™ processor–based platforms and Intel platforms
- Enhanced ease of use and PC–interoperability features
- Integrated, high–performance Java™ technology and tools
- Robust software developer environment
- Advanced, standards–based networking
- Improved systems installation and management tools
- Enterprise–class directory services
- Enhanced desktop tools, I/O standards, and security

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.

Solaris Operating Environment Features and Benefits

Features	Benefits
• 100 percent binary compatibility	• Software investment protection—all of today's Solaris Operating Environment–certified 32–bit applications continue to run on Solaris 8 Operating Environment without modification
• Reliability, availability, and serviceability (RAS)	• Less downtime, more productivity, and faster project completion
• 64–bit computing	• Higher performance, capacity, and precision on 64–bit SPARC processor–based systems and Intel systems with 32–bit binary compatibility • Compliant with UNIX® 98 and Aspen Group LP64 standards
• 64–bit compilers	• Quickly develop and certify 64–bit applications for SPARC and IA–64 processors using Solaris Operating Environment APIs, 64–bit C/C++ and FORTRAN compilers, and ABI certification tools
• Java 2 SDK	• Provides a high–performance, scalable Java virtual machine • Offers improved memory management, optimized JIT compiler and faster Java thread synchronization
• IPv6/IPsec/Mobile IP	• Helps increase addressing range, provides better authentication and privacy, and enables new quality of service capabilities. Mobile IP permits intermittent connection to the Internet with no data loss.
• Scale from 1 to 512 processors per node	• Helps increase compute resources as a customer's needs grow. Expand to four processors on the desktop, or use up to 64 processors per server, with up to eight servers per cluster.

Features	Benefits
• LDAP directory services	• High–speed, enterprise–class directory service, using the Solaris 8 Operating Environment LDAP client and the iPlanet™ Directory Server, supports complex, data intensive network applications. Includes Microsoft Active Directory support.
• System management tools	• Helps reduce the time spent on system administration duties using Web–based wizards and Java technology–powered graphical interfaces.
• Desktop management and productivity tools	• Helps increase productivity with intuitive Desktop, Printer, PDA sync, HotKey, and CDE 1.4 control panel tools. The StarOffice™ productivity suite easily handles Microsoft Office documents, and creates complex documents, spreadsheets, and presentations. Use PC Launcher and the SunPCi™ card to run Windows, Lotus 1–2–3, and AutoCAD applications on Sun workstations.
• Extended device and support	• I/O Connect with Sun, using the customer's favorite devices, including DVD, ZIP and JAZ drives, and USB, 1394, SCSI, UPA, and PCI buses.
• Internationalization	• The Solaris 8 Operating Environment is a comprehensive global product that supports 37 languages and over 90 locales, the euro currency symbol, and complex text formats for the Arabic, Thai, and Hebrew languages. New language installation tools, expanded Unicode support, and improved data interoperability utilities greatly simplify the development and testing of applications for international markets.
• X11R6.4	• Runs X applications in a browser and provides single logical screen across multiple display devices
• Real Time application	• Offers scalable, fixed–priority, and fully preemptive scheduling using multiple high–resolution, per–CPU interval timers. Provides priority inheritance for synchronization by multi–threaded realtime applications, such as simulation, telemetry, data acquisition, signal processing, and video–on–demand.
• Enhanced security features	• Increased support for security protocols and new technologies including IPSec, AMI, Kerberos v5, and smart cards reduce the chance of security–related downtime

Solaris 8 Operating Environment Features

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

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

Key Features in the Solaris 8 Operating Environment

- **Productivity features**

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

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

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

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

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

  Allows the customer to apply scarce system expertise remotely across the enterprise.
- **File system logging**

  Logging file system features and parallel SCSI probes make rebooting faster.
- **Live Upgrade**

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

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

Graphics Software Interfaces

The Sun Blade 1000 system supports all Solaris 8 graphics and window system APIs, including OpenGL® and Display PostScript™. A large number of Sun and third–party graphics APIs are also supported, including IRIS GL, OpenGL, GKS, HOOPS, and Java 3D™ software. Industry–standard X–extension libraries, such as Xlib and PEXlib, are available.

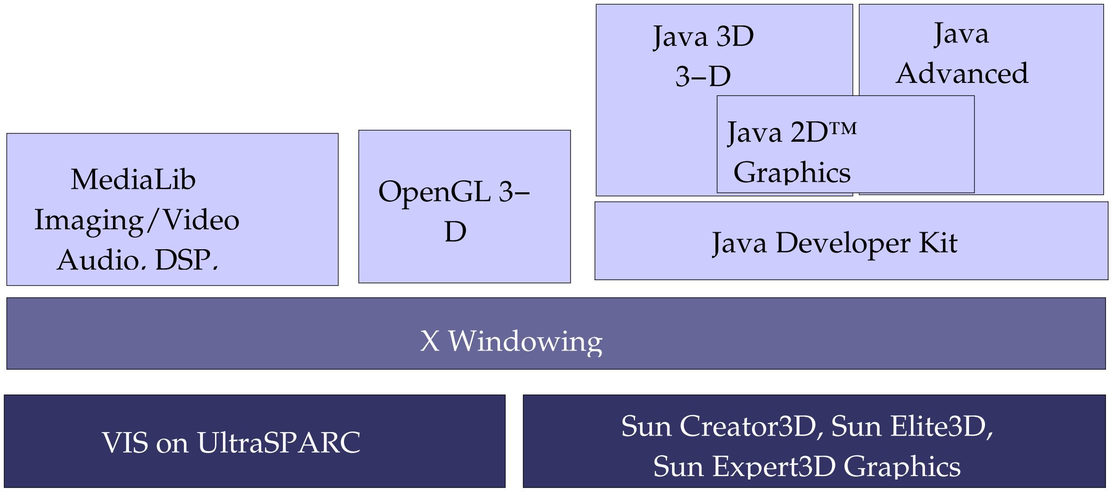


Figure 5: Graphics software interfaces

The Solaris Operating Environment System Requirements

Disk Space	
• End user • Developer	25 MB 40 MB (runtime binaries and header files)
Memory	
• Minimum • Typical	1 GB 2 GB (for serious applications)

Note: *Required disk space will vary based on OS packages selected, desktop or server use, desired swap tmp space, localization or translations, online documentation, and applications installed.*

The Solaris Operating Environment Licensing and Usage

Under the Free Solaris Binary License Program program, Sun is making the binary (runtime) version of its Solaris 8 Operating Environment available to everyone who accepts the terms of the Solaris 8 Binary Code License (BCL) and the Free Solaris Binary License Program. There are no fees for the right to use the software on computers with a capacity of eight or fewer processors; just a small charge for the media kit.

Refer to `http://www.sun.com/software/solaris` for current licensing details. Some features of the Solaris Operating Environment license include the following:

- No longer a distinction between desktop and server licenses

- Free binary (runtime) license for all systems of 8 or fewer CPUs for customers who accept the terms of the Solaris 8 Binary Code License and the free Solaris Binary License Program
- Solaris 8 Operating Environment software is provided via the Solaris 8 Media Kit available for purchase on–line at `http://www.sun.com/solaris/binaries`
- Single Solaris Media Kit can be used to install multiple systems
- Solaris Media Kit contains additional bundled software:
- Solaris Supplemental CD of bundled user and system management tools
- Oracle 8i Enterprise Edition (with development license)
- StarOffice 5.2 productivity suite
- Solaris Software Companion CD of popular freeware
- iPlanet Advantage Software (with development licenses)

Sun™ OpenGL® for Solaris™ 1.2.1 Software

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

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

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

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

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

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

Features and Benefits

Sun OpenGL for Solaris 1.2.1 software provides the following features:

Features	Benefits
• Multiscreen rendering for super–high resolution 3–D visualization (Xinerama)	• Users no longer need to rewrite their 3–D applications to take advantage of the multiple screens
• 64–bit OpenGL library support	• Allows OpenGL applications to take advantage of the full 64–bit addressing in the Solaris Operating Environment
• New interface imaging and 3–D texturing	• Offers a more portable interface for imaging operation during 3–D texture mapping
– Texture level of detail control	– Offers better texture memory utilization
– BGRA and packed–pixel formats	– Supports more file– and hardware–data types
– Texture specular color	– Allows more realistic lighting effects with texturing
– Texture edge clamping	– Avoids blending border and image texels during texturing
– Constant texture data extension	– Helps reduce texture mapping memory utilization and loading time
• General performance improvements	
– Improved drivers	– 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
– 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
• New extensions	
– Triangle list primitive	– Allows multiple triangle strips or fans to be specified within a single `glBegin` `glEnd` pair; improves performance
– Vertex extension	– Allows applications to specify all vertex data (color, normal, coordinates, and so on) in a single function call; saves function call overhead
– Global alpha extension	– Allows applications to specify an alpha component which can be applied globally to all primitives; useful for cases where many vertices share the same alpha value because the application does not have to send an alpha component for each vertex

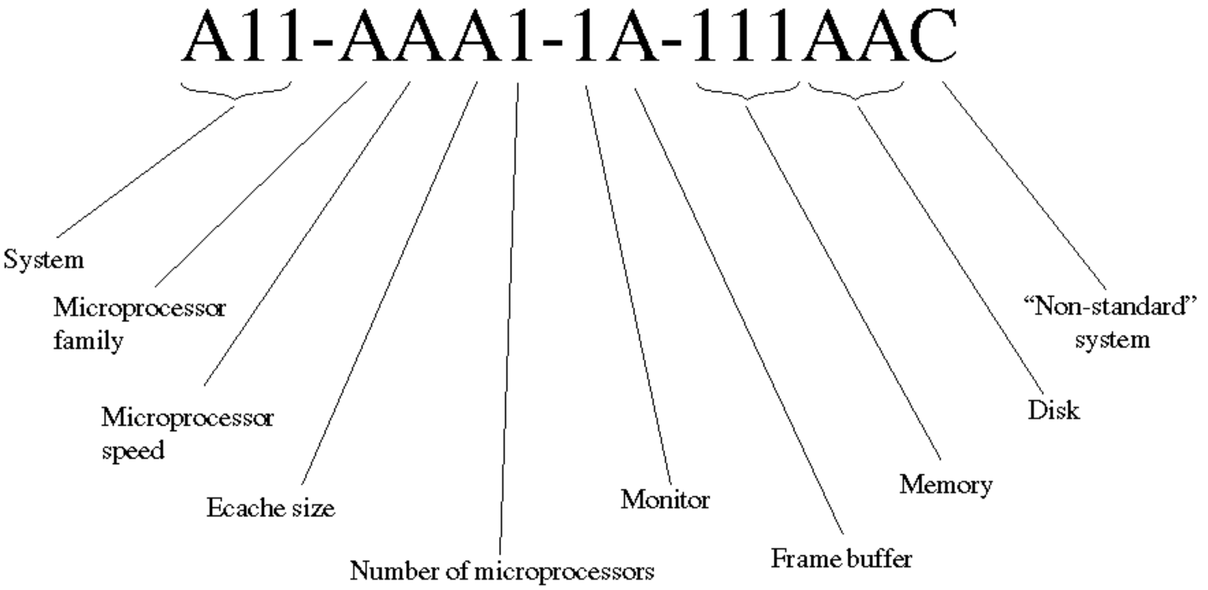
Sun OpenGL for Solaris 1.2.1 Software Tech Facts

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

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

Ordering Information

The Sun Blade™ systems use a marketing part number scheme that is designed to provide greater flexibility and expandability. This page explains how to read the part numbering scheme.



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

Model Key (Subset of Part Number Definitions)

System A28 = Sun Blade 1000 **Microprocessor Family** U = UltraSPARC™ **Microprocessor Speed** R = 600–MHz UltraSPARC–III N = 750–MHz UltraSPARC–III S = 900–MHz UltraSPARC–III	**Ecache Size** D = 4 MB F = 8 MB **Monitor** 9 = No monitor configured	**Frame Buffer** L = Sun™ Creator3D Z = Sun Elite3D m6 **Memory** 512 = 512 MB 1024 = 1 GB 4096 = 4 GB 8192 = 8 GB	**Disk** JA = 18.2 GB JB = 36 GB

Sun Blade 1000 Workstation

Part Number	**Description**
Available by Auction Only	Sun Blade 1000 workstation with 600–MHz CPU, 4–MB L2 cache, Sun Creator3D series 3 graphics, 512–MB memory, 18–GB 10000–rpm FC–AL disk drives, Solaris™ 8 Operating Environment preinstalled
A28–UNF1–9L–D512JA	Sun Blade 1000 workstation with 750–MHz CPU, 8–MB L2 cache, Sun Creator3D series 3 graphics, 512–MB memory, 18–GB, 10000–rpm FC–AL disk drives, Solaris 8 Operating Environment preinstalled
A28UNF1–9Z–D1024JA	Sun Blade 1000 workstation with 750–MHz CPUs, 8–MB L2 cache, Sun Elite3D m6 series 2 graphics, 1–GB memory, 18–GB 10000–rpm FC–AL disk drives, Solaris 8 Operating Environment preinstalled
A28–UNF2–9L–D1024JB	Sun Blade 1000 workstation with 2 x 750–MHz CPUs, 8–MB L2 cache, Sun Creator3D graphics, 1–GB memory, 36–GB disk 10000–rpm FC–AL disk drives, smart card reader, Solaris 8 Operating Environment preinstalled
A28USF1–9L–D1024JB	Sun Blade 1000 workstation with 900–MHz CPU, 8–MB L2 cache, Sun Creator3D graphics, 1–GB SDRAM, 36–GB 10000–rpm FC–AL disk drives, Solaris 8 Operating Environment preinstalled

Ordering Guidelines and Notes

- **The 600–MHz models are available only by auction through `http://www.sun.com/auctions`.**
- **Memory**
  - The Sun Blade 1000 workstation supports 8 GB of main memory. This architecture currently accepts 128–MB, 256–MB, and 1–GB memory modules.
  - The Sun Blade 1000 workstation can accommodate up to 8 DIMM modules in increments of four. DIMM modules within each set *must* be of the same type. DIMM module sets of four may be mixed.
- **Graphics**
  - The Sun Blade 1000 workstation supports the PGX32™ PCI graphics for non–3D applications, as well as Sun Elite3D m3 and Sun Expert3D high–performance 3–D graphics.
  - The Sun Blade 1000 workstation has two UPA graphics slots that support the Sun Creator3D and Sun Elite3D m6 graphics accelerators. A customer can mix and match any of these accelerators within the Sun Blade 1000 workstation.
- **Monitors**
  - Monitors are not included with any Sun Blade 1000 systems.
  - The customer can choose among the 17–, 19–, and 21–inch color monitor, or the 18–inch flat–panel display.

- **SCSI**
  - The internal SCSI host controller operates in Fast–20 (UltraSCSI) mode by default. Installation of non–FAST–20 devices, although allowed, will decrease overall SCSI performance.
  - The total combined SCSI cable length must not exceed three meters for Fast/Wide operation or 1.5 meters for Fast–20 (UltraSCSI) operation.
  - To achieve Fast–20 speeds on all devices on the bus, it is recommended that:
    - A maximum of two Sun StorEdge™ UniPack systems using Fast–20 cables be connected to the external connector.
    - All devices on the SCSI bus should be Fast–20 devices. (Non–Fast–20 devices may cause the internal devices to run at Fast/Wide speeds, but are supported.)
- **Keyboard**
  - Type 6 USB keyboards are supported on the Sun Blade 1000 workstation.

Options

Below is a comprehensive list of system expansion, networking, graphics, and multimedia options that are supported by Sun Blade™ 1000 systems. 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
Processors			
X6899A	600–MHz UltraSPARC™–III module	2	
X6990A	750–MHz UltraSPARC–III module	2	
Mass Storage: Internal			
X6728A	18.2–GB, 10000–rpm FC–AL disk	2	
X6724A	36–GB, 10000–rpm FC–AL disk	2	
Mass Storage: Removable Media			
X6006A	3.5–inch, 1.44–MB manual–eject floppy drive (triple density)	1	
X6168A	DVD–ROM 10X speed	1	
X6282A	12–GB to 24–GB, 4–mm DDS–3 tape drive	1	
External Tape Options: Sun StorEdge™ FlexiPack and UniPack Systems			
X6540A	Dual–channel SE SCSI		
X5010A	Single–channel SE SCSI		
X1032A	SE SCSI – Fast Ethernet		
Mass Storage: Sun StorEdge UniPack (68–pin SCSI)			
SG–XTAP4MM–012A	20–GB, 4–mm DDS–4 tape drive in a UniPack desktop enclosure	2	
SG–4MMDDS410	4–mm DDS–4 tapes, 10 pack		
SGXMEDDLTCIV–10	SLT Type IV tapes, 10 pack		
SG–XMED4MMCL–10	DDS–4 tape cleaners, 10 pack		
SG–XMEDDLTCL–10	SLT tape cleaners, linear, 10 pack		
SG–XDSK010C–9G	9.1–GB, 7200–rpm UniPack	4	
SG–XDSK010C–18G	18.2–GB, 7200–rpm UniPack	4	

Part Number	Option Description	Maximum Number Supported	Comments
SG–XDSK010C–36G	36.4–GB, 10000–rpm UniPack	4	
SG–XTAP4MM–011A	12–GB, 4–mm DDS–3 tape drive UniPack desktop enclosure	2	
SG–XTAP8MM–010A	7–GB, 8–mm drive in a UniPack desktop enclosure	2	
SG–XTAP4MM–012A	20–GB, 4–mm DDS–4	2	
SG–XTAP8MM–011A	20–GB, 8–mm drive in a UniPack desktop enclosure	2	
Mass Storage: Sun StorEdge FlexiPack			
	The following FlexiPack options come with a 68 to 68 pin SCSI cable:		
SG–XTAPDLT–021A	35–GB, DLT 7000 tape, desktop, full height	2	
SG–XTAP4MM–021A	12–GB, 4–mm DDS–3 tape FlexiPack, half height	2	
SG–XTAP4MM–031A	72–GB, 4–mm DDS–3 tape FlexiPack, desktop autoloader	2	
SG–XTAP8MM–020A	7–GB, 8–mm tape FlexiPack, half height	2	
SG–XTAP8MM–021A	20–GB, 8–mm tape FlexiPack, desktop, half height	2	
X6166A	SunCD™ 32X internal CD–ROM expansion drive		
X6168A	DVD–ROM, 10X internal		
X6212A	7–GB 8–mm DDS–3 internal tape expansion drive		
X6236A	20–GB, 8–mm internal tape for FlexiPack		
X6282A	12–GB DDS–3 tape drive		
Mass Storage: Sun StorEdge MultiPack			
SG–XDSK020C–18G	18.2–GB (2 x 9.1–GB) 10000–rpm MultiPack	1	One Sun StorEdge MultiPack is supported per SCSI channel
SG–XDSK020C–36G	36.4–GB (2 x 18.2–GB) 10000–rpm MultiPack	1	
SG–XDSK020C–72G	72.8–GB (2 x 36.4–GB) 10000–rpm MultiPack	1	
SG–XDSK040C–36G	36.4–GB (4 x 9.1–GB) 10000–rpm MultiPack	1	
SG–XDSK040C–72G	72.8–GB (4 x 18.2–GB) 10000–rpm MultiPack	1	
SG–XDSK040C–144G	145.6–GB (4 x 36.4–GB) 10000–rpm MultiPack	1	
SG–XDSK060C–54G	54.6–GB (6 x 9.1–GB) 10000–rpm MultiPack	1	
SG–XDSK060C–109G	109.2–GB (6 x 18.2–GB) 10000–rpm MultiPack	1	
SG–XDSK060C–218C	218.6–GB (6 x 36.4–GB) 10000–rpm MultiPack	1	
X5234A	9–GB UltraSCSI 10000–rpm drive		
X5237A	18–GB UltraSCSI 10000–rpm drive		
X5242A	36–GB UltraSCSI 10000–rpm drive		

Part Number	Option Description	Maximum Number Supported	Comments
Mass Storage: Sun StorEdge A1000 Arrays			
SG–XARY144A–36G	36–GB Sun StorEdge A1000 tabletop array (4 x 9.1–GB, 10000–rpm disks)		One array can be connect to each channel of the X6541A controller card or three Sun StorEdge A1000 arrays daisy–chained per channel.
SG–XARY144A–109G	109–GB Sun StorEdge A1000 tabletop array (12 x 9.1–GB, 10000–rpm disks)		
SG–XARY151A–72G	72–GB Sun StorEdge A1000 tabletop array (4 x 18–GB, 10000–rpm disks)		
SG–XARY151A–218G	218–GB Sun StorEdge A1000 tabletop array (12 x 18.2–GB, 10000–rpm disks)		
SG–XARY170A–145G	145–GB Sun StorEdge A1000 tabletop array (4 x 36.4–GB, 10000–rpm disks)		
SG–XARY161A–291G	291–GB Sun StorEdge A1000 tabletop array (8 x 36.4–GB, 10000–rpm disks)		
SG–XARY170A–436G	436–GB Sun StorEdge A1000 tabletop array (12 x 36.4–GB, 10000–rpm disks)		
SG–XARY146A–36G	36–GB Sun StorEdge A1000 rackmountable array (4 x 9.1–GB, 10000–rpm disks)		
SG–XARY155A–72G	72–GB Sun StorEdge A1000 rackmountable array (4 x 18–GB, 10000–rpm disks)		
SG–XARY171A–145G	145–GB Sun StorEdge A1000 rackmountable array (4 x 36.4–GB, 10000–rpm disks)		
SG–XARY155A–218G	218–GB Sun StorEdge A1000 rackmount array (12 x 18.2–GB, 10000–rpm disks)		
SG–XARY171A–436G	436–GB Sun StorEdge A1000 rackmount array (12 x 36.4–GB, 10000–rpm disks)		
Mass Storage: Sun StorEdge D1000 Arrays			
SG–XARY145A–36G	36–GB Sun StorEdge D1000 tabletop array (4 x 9.1–GB, 10000–rpm disks)		System accepts max. one array per X6541A controller card Sun StorEdge D1000 arrays cannot be daisy–chained.
SG–XARY153A–72G	72–GB Sun StorEdge D1000 tabletop array (4 x 18–GB, 10000–rpm disks)		
SG–XARY145A–3109G	1409–GB Sun StorEdge D1000 tabletop array (12 x 9.1–GB, 10000–rpm disks)		
SG–XARY172A–145G	145–GB Sun StorEdge D1000 tabletop array (4 x 36.4–GB, 10000–rpm disks)		
SG–XARY153A–218G	218–GB Sun StorEdge D1000 tabletop array (12 x 18.2–GB, 10000–rpm disks)		
SG–XARY163A–145G	145–GB Sun StorEdge D1000 tabletop array (4 x 36.4–GB, 10000–rpm disks)		
SG–XARY172A–436G	436–GB Sun StorEdge D1000 tabletop array (12 x 36.4–GB, 10000–rpm disks)		

Part Number	Option Description	Maximum Number Supported	Comments
SG–XARY147A–36G	36–GB Sun StorEdge D1000 rackmountable array (4 x 9.1–GB, 10000–rpm disks)		
SG–XARY154A–72G	72–GB Sun StorEdge D1000 rackmountable array (4 x 18–GB, 10000–rpm disks)		
SG–XARY173A–145G	145–GB Sun StorEdge D1000 rackmountable array (4 x 36.4–GB, 10000–rpm disks)		
SG–XARY154A–218G	218–GB Sun StorEdge D1000 rackmount array (12 x 18.2–GB, 10000–rpm disks)		
SG–XARY173A–436G	436–GB Sun StorEdge D1000 rackmount array (12 x 36.4–GB, 10000–rpm disks)		
Sun StorEdge A5X00 Arrays			
X6729A	S/B PCI FC–AL single–loop host adapter		
SG–XARY540A–127G	127–GB Sun StorEdge 5200 tabletop array (7 x 18.2–GB, 10000–rpm disks)	2	
SG–XARY540A–400G	400–GB Sun StorEdge 5200 tabletop array (22 x 18–GB, 10000–rpm disks)	2	
SG–XARY560A–254G	254–GB Sun StorEdge 5200 tabletop array (7 x 36–GB, 10000–rpm disks)	2	
SG–XARY560A–800G	400–GB Sun StorEdge 5200 tabletop array (22 x 36–GB, 10000–rpm disks)	2	
Sun StorEdge T3 Arrays			
XT3WG–TT–11–163	163–GB (9 x 18–GB) tabletop single array	2	Cannot mix Sun StorEdge T3 with A5X00 on a single system
XT3ES–TT–22–327	327–GB (9 x 18–GB) tabletop dual array	2	
XT3WG–TT–11–327	327–GB (9 x 36–GB) tabletop single array	2	
XT3ES–TT–22–655	655–GB (9 x 36–GB) tabletop dual array	2	
XT3WG–TT–11–1310	1310–GB (9 x 73–GB) tabletop single array	2	
XT3ES–TT–22–2620	2620–GB (9 x 73–GB) tabletop dual array	2	
XT3WG–RR–11–163	163–GB (9 x 18–GB) rackmount single array	2	
XT3ES–RR–22–327	327–GB (9 x 18–GB) rackmount dual array	2	
XT3WG–RR–11–327	327–GB (9 x 36–GB) rackmount single array	2	
XT3ES–RR–22–655	655–GB (9 x 36–GB) rackmount dual array	2	
XT3WG–RR–11–1310	1310–GB (9 x 73–GB) rackmount single array	2	
XT3ES–RR–22–2620	2620–GB (9 x 73–GB) rackmount dual array	2	
External Tape Autoloaders and Libraries			
SG–XAUTODLT8D–L9	360–GB Sun StorEdge L9 autoloader, desktop	1	
SG–XRACKIT–L9	Rackmounting kit for Sun StorEdge L9 autoloader		
SG–XLIBDLT71–L20	700–GB Sun StorEdge L20 library, desktop	1	
SG–XLIB180–Base	3.5–TB Sun StorEdge L180 tape library	1	

Part Number	Option Description	Maximum Number Supported	Comments
SG−XLIB9840−Drv	3.5−TB Sun StorEdge L180 tape library with 9840	1	
SG−XLIBDLT7−Drv	3.5−TB Sun StorEdge L180 tape library with DLT	1	
SG−XLIBDLT1−1TB−2	1−TB Sun StorEdge L1000 tape library	1	
X6079A	3.5−TB Sun StorEdge L3500 tape library		
PCI Expansion Cards			Universal
X1033A	10BASE−T Sun FastEthernet PCI adapter with MII interface	3	
X1034A	Sun Quad FastEthernet™ PCI Card (QFE)	4	
X1141A	Sun GigabitEthernet PCI adapter 2.0	4	
X1152A	SunFDDI™ single−attach PCI bus interface adapter 2.0	4	
X1153A	SunFDDI dual−attach PCI bus interface adapter 2.0	4	
X1155A	High−speed serial interface PCI adapter 2.0	4	
X1157A	SunATM™−155/MFiber PCI adapter 4.0	4	
X1158A	SunATM−155/UTP PCI adapter 4.0	4	
X1159A	SunATM−622/MFiber PCI adapter 4.0	2	
X2069A	FC−AL/Gigabit Ethernet for Solaris™ 8 Operating Environment	2	
X2154A	Token ring interface for Solaris 8 Operating Environment	4	
X2156A	Serial asynchronous interface PCI adapter 3.0 for Solaris 8 Operating Environment	4	
X1032A	PCI UltraSCSI SE with Ethernet	1	
X5010A	Single−channel SCSI	1	
X6540A	Dual−channel, single−ended UltraSCSI controller	2	
X6541A	Dual−channel, differential UltraSCSI controller	2	
X6726A	FC−AL dual−loop adapter	2	
X6729A	S/B PCI FC−AL single−loop host adapter	2	
X1089A	SunVideo Plus™ 3.1 video/audio capture	1	
X499A−EU	PCI multimedia Kit, SunVideo Plus 1.3, a PAL SunCamera™ II, Sun Microphone™ II, and documentation (Continental Europe), supports SunForum™ 3.0	1	
X499A−UK	PCI multimedia Kit, SunVideo Plus 1.3, a PAL SunCamera II, Sun Microphone II, and documentation (U.K), supports SunForum 3.0	1	
X499A	PCI Multimedia Kit, SunVideo Plus 1.3, a NTSC SunCamera II, Sun Microphone II, and documentation (U.S.), supports SunForum 3.0	3	
X1089A	Real−time video/audio capture and compression	3	
X1131A−64.2	SunPCi™ I coprocessor card with 300−MHz processor and 64−MB memory	1	
X7041A	64−MB DIMM memory expansion for SunPCi I	2	
X7035A	128−MB DIMM memory expansion for SunPCi I	2	

Part Number	Option Description	Maximum Number Supported	Comments
X1132A	SunPCi II coprocessor card with 600–MHz processor and 64–MB memory, 3.3–5 volts	1	
X7042A	128–MB DIMM memory expansion for SunPCi II	2	
X7045A	256–MB DIMM memory expansion for SunPCi II	2	
Graphics and Imaging			
X3668A	PGX32™ 8– and 24–bit color graphics PCI adapter frame buffer, CD, and cable	3	
X3670A	Sun Creator3D series 3 graphics card	2	
X3677A	Sun Elite3D m3 series 2 graphics accelerator	2	
X3679A	Sun Elite3D m6 series 2 graphics accelerator	2	
X3678A	Sun Expert3D graphics board	2	
X3682A	Sun 1392 Visual Collaboration Kit	1	
Monitors			
X7143A	17–inch color monitor		
X7127A	18.1–inch TFT LCD color monitor		
X7135A	19–inch flat screen color Trinitron monitor		
X7136A	21–inch flat screen color Trinitron monitor		
X7124A	Widescreen 24–inch color monitor		
Miscellaneous Options			
X5681A	Smart card reader for serial or USB port		
X1400A	Extra cards for smart card reader, 25 pack		
Type6 Country Kits			
X3531A	US/Canada Universal	1	Except for "Z" Country Kit Codes, the Country Kit contents are included with every Sun Blade configuration. Refer to the "Choice of Country Kit" sub–section (above) for ordering details.
X3532A	French	1	
X3533A	German	1	
X3534A	Swiss–French	1	
X3535A	Swiss–German	1	
X3536A	Swedish	1	
X3537A	United Kingdom	1	
X3538A	US UNIX	1	
X3554A	Taiwanese	1	
X3555A	Korean		
X3556A	Japanese	1	
X3558A	United Kingdom UNIX	1	
X3559A	European UNIX		
X3560A	Norwegian	1	
X3561A	Portuguese	1	
X3562A	Spanish	1	
X3563A	Danish	1	
X3564A	Italian	1	

Part Number	Option Description	Maximum Number Supported	Comments
X3565A	Dutch (Netherlands)	1	
X3566A	Australian	1	
X3567A	Finnish	1	
X3582A	Chinese	1	
X3583A	European cordless	1	

Upgrades

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

Key Messages

- Sun offers customers a variety of flexible upgrade paths to the most popular Sun™ systems
- Choose from chassis–only to full–system upgrades
- Sun upgrades allow as many components as possible to be carried forward, to protect the customer's hardware investment
- Existing investments in non–Sun hardware can be preserved by upgrading to Sun through competitive full–system upgrades

Sun Upgrade Allowance Program (Sun UAP)

Sun UAP offers customers a simple, flexible, and easy–to–understand way of ordering desktop workstation upgrades. Sun UAP is a new percentage–based upgrades model. This new model simplifies the upgrades process by providing a trade–in value as a percentage allowance. This percentage allowance can then be applied to the list price of a regular Sun system configuration.

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

Allowance codes can be found in the September 2000 pricebook. Please note that allowance codes apply to configured systems and CANNOT be applied to X–options (Monitor upgrades are an exception. See ordering notes below)

Allowance Code Numbering Scheme

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

Allowance code = ALW–15–T–D–A28–P2

- **ALW** = Upgrade Identifier
- **15** = Percentage discount – This is the allowance that is subtracted from the list price of the new product.(15 equals 15% off of list, 08 equals 8% off of list, and so on. (Note: Any other discounts such as volume discounts should also be taken off the list price and not the net of the above)
- **T** = Desktop Upgrade, "S" for Server upgrades, and "D" for Storage upgrades
- **D** = Acceptable trade–ins by Sun—for reporting purposes
- **A28** = Product Family which identifies what the customer is upgrading to
- **P2** = Promotions used for tracking corporate sponsored and other promotions

How to Apply Allowance Code

- Select the system that the customer has
- Select the platform the customer would like to upgrade to
- Choose the allowance code that pertains to the platform customer is upgrading to
- Subtract the allowance percentage from the list price

Upgrade Ordering Notes

- Memory, internal disks, and controllers do not migrate.
- CPU modules from Ultra workstations do not migrate.
- PGX32™, Sun Creator3D, and Sun Elite3D m6 graphics cards do migrate.
- Selected SCSI arrays and PCI cards migrate. See Options sections for details.
- Monitors
  - Monitors are not included with any Sun Blade 1000 system upgrades.
  - Sun branded 17–inch and 20–inch monitors migrate from previous generation Sun systems.
  - For some monitors, a video adapter may be required. Please order correct adapter (for example, 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)
  - If a monitor is needed, order an X–option or refer to monitor upgrade section of price book.
- Country kits do not migrate.
  - Type 4 and Type 5 keyboards are not supported on the Sun Blade 1000 workstation. Only USB keyboards are supported.

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. 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
Local customer support management	No	Yes	No	No
Personal technical account support	Yes	Yes	Option	No
SunStart℠ installation service	Yes	No	No	No
Account support plan	Yes	Yes	No	No
Software release planning	Yes	No	No	No
On−site account reviews	Monthly	Semiannual	No	No
Skills assessment	Yes	No	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	Option
7−day/24−hour on−site coverage	Yes	Option	Option	N/A
7−day/12−hour on−site coverage	No	Option	No	No
5−day/24−hour on−site coverage	No	Option	No	No

FEATURE	SUNSPECTRUM PLATINUM Mission–critical Support	SUNSPECTRUM GOLD Business–critical Support	SUNSPECTRUM SILVER Systems Support	SUNSPECTRUM BRONZE Self Support
Coverage / Response Time (cont.)				
Customer–defined priority setting	Yes	Yes	Yes	Option
• 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/

™

FEATURE	SUNSPECTRUM PLATINUM Mission–critical Support	SUNSPECTRUM GOLD Business–critical Support	SUNSPECTRUM SILVER Systems Support	SUNSPECTRUM BRONZE Self Support
Coverage / Response Time (cont.)				
Customer–defined priority setting	Yes	Yes	Yes	Option
• 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
2–hour on–site response	Yes	Option	Option	N/A
Additional contacts	Option	Option	Option	Option
Premier Support Features				
Mission–critical support team	Yes	For urgent problems	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
Hardware Support Delivery				
Replacement hardware parts	On–site technician	On–site technician	On–site technician	Courier
Two day parts delivery	N/A	N/A	N/A	Yes
Overnight parts delivery	N/A	N/A	N/A	Option
Same–day parts delivery	Yes	Yes	Yes	Option
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 Operating Environment 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

SunClient℠ Support Program

The SunClient℠ support program is a suite of offerings that is separate, yet complementary to the SunSpectrum program. This program helps reduce hardware and software support costs for the Sun Blade™ 1000 workstations. SunClient support program provides:

- A 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., Monday–Friday telephone coverage	*	*	*
9 a.m.–5 p.m., Monday–Friday on–site coverage	*†‡	*‡	—
Response times (phone/onsite)	4 hour callback/next business day response	4 hour callback/second business day response	4 hour callback
Centralized on–site repair of multiple units	—	*	Not Applicable
Patches	Not Applicable	Not Applicable	*
SunSolve license	Not Applicable	Not Applicable	*
SunSolve EarlyNotifier Service	Not Applicable	Not Applicable	*
Software updates	Not Applicable	Not Applicable	Not Applicable

* Can only be sold as an option to SunClient Maintenance or SunClient Central Maintenance.

† Next business day on–site response requires that the request for service be received by 3:00 p.m. If the call is received after 3:00 p.m., service will be provided on the second business day.

‡ Customers located more than 50 miles from an authorized service provider or reseller will be charged an additional fee for service activity.

Features and Benefits of the SunClient Program

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

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

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	*See* Fast 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	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.
Fast Ethernet	IEEE standard for 100–Mb Ethernet. This technology supports a data transfer rate of 100 megabits per second over special grades of twisted–pair wiring.
NFS	Sun's distributed computing file system.
ODBC	Open database connectivity.
OpenGL®	The de facto standard software interface for graphics hardware that allows programmers to create interactive 3–D applications. The OpenGL API provides a full–featured, network–transparent application programming interface.
PCI	Peripheral component interconnect. A industry standard for connecting peripherals such as disk drives, tapes drives, and other devices used in the PCs.
UPA	Ultra™ port architecture. A high–speed, crossbar–oriented, 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.

Materials Abstract

All materials are available on SunWIN except where noted otherwise.

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
PowerPack				
– *Sun Blade™ 1000 Workstation: Just the Facts*	Reference Guide for Sun Blade 1000 Workstation (this document)	Training Sales Tool	SunWIN, Reseller Web	124808
– *Sun Blade 1000 Workstation Customer Presentation*	Presentation with Slide Notes	Sales Tool	SunWIN, Reseller Web	124810
Product Literature				
– *Sun Blade 1000 Workstation Architecture White Paper*	Technical White Paper	Sales Tool	SunWIN, Reseller Web	124809
– *Literature – Sun Blade 1000 Workstation Data Sheet*	Data Sheet	Sales Tool	SunWIN, Reseller Web	121205 DE1211–0
– *Graphics Solution Guide*	Graphics Overview	Sales Tool	SunWIN	75271
References				
– *Sun™ Creator3D Graphics: Just the Facts*	Reference Guide for Sun Creator3D Graphics	Training Sales Tool	SunWIN, Reseller Web	75246
– *Sun Elite3D Graphics: Just the Facts*	Reference Guide for Sun Elite3D Graphics	Training Sales Tool	SunWIN, Reseller Web	75245
– *Sun Expert3D Graphics: Just the Facts*	Reference Guide for Sun Expert3D Graphics	Training Sales Tool	SunWIN, Reseller Web	114214
– *Sun Elite3D Graphics White Paper*	Technical Brief	Sales Tool	SunWIN, Reseller Web	75265
– *SunVideo Plus™ Subsystem: Just the Facts*	Reference Guide for SunVideo Plus	Training Sales Tool	SunWIN, Reseller Web	75247
Quick Reference Cards				
– *Quick Reference Card: Sun Workstation™ Product Line Overview*	Quick Reference Card	Sales Tool	SunWIN, Reseller Web	10826
– *Quick Reference Card Competitive Summary Workstations*	Quick Reference Card	Sales Tool	SunWIN, Reseller Web	12259
– *Quick Reference Card: Sun Workstation Graphics Products Overview*	Quick Reference Card	Sales Tool	SunWIN, Reseller Web	24507
– *Quick Reference Card: Upgrade Paths*	Quick Reference Card	Sales Tool	SunWIN, Reseller Web	24513

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Presentations				
– *Sun in EDA Customer Presentation*	Presentation	Sales Tool	SunWIN, Reseller Web	59078, 59260
– *Sun in MCAD/MCAE Customer Presentation*	Presentation	Sales Tool	SunWIN, Reseller Web	59074, 59263
– *Sun in Software Development Customer Presentation*	Presentation	Sales Tool	SunWIN, Reseller Web	59375
– *Sun in Oil and Gas Customer Presentation*	Presentation	Sales Tool	SunWIN, Reseller Web	60292, 60297
– *Sun in Entertainment Customer Presentation*	Presentation	Sales Tool	SunWIN, Reseller Web	75241, 75242
– *Graphics Overview Presentation*	Presentation	Sales Tool	SunWIN, Reseller Web	75254, 75255
External Web Sites				
– *General Information on Sun's Desktop Line*	`http://www.sun.com/desktop`			
– *Detailed Information on the Sun Blade 1000 Workstation*	`http://www.sun.com/desktop/products/`			
– *SunStore*	`http://www.sun.com/sunstore`			
– *Auction Site*	`http://www.sun.com/auction`			