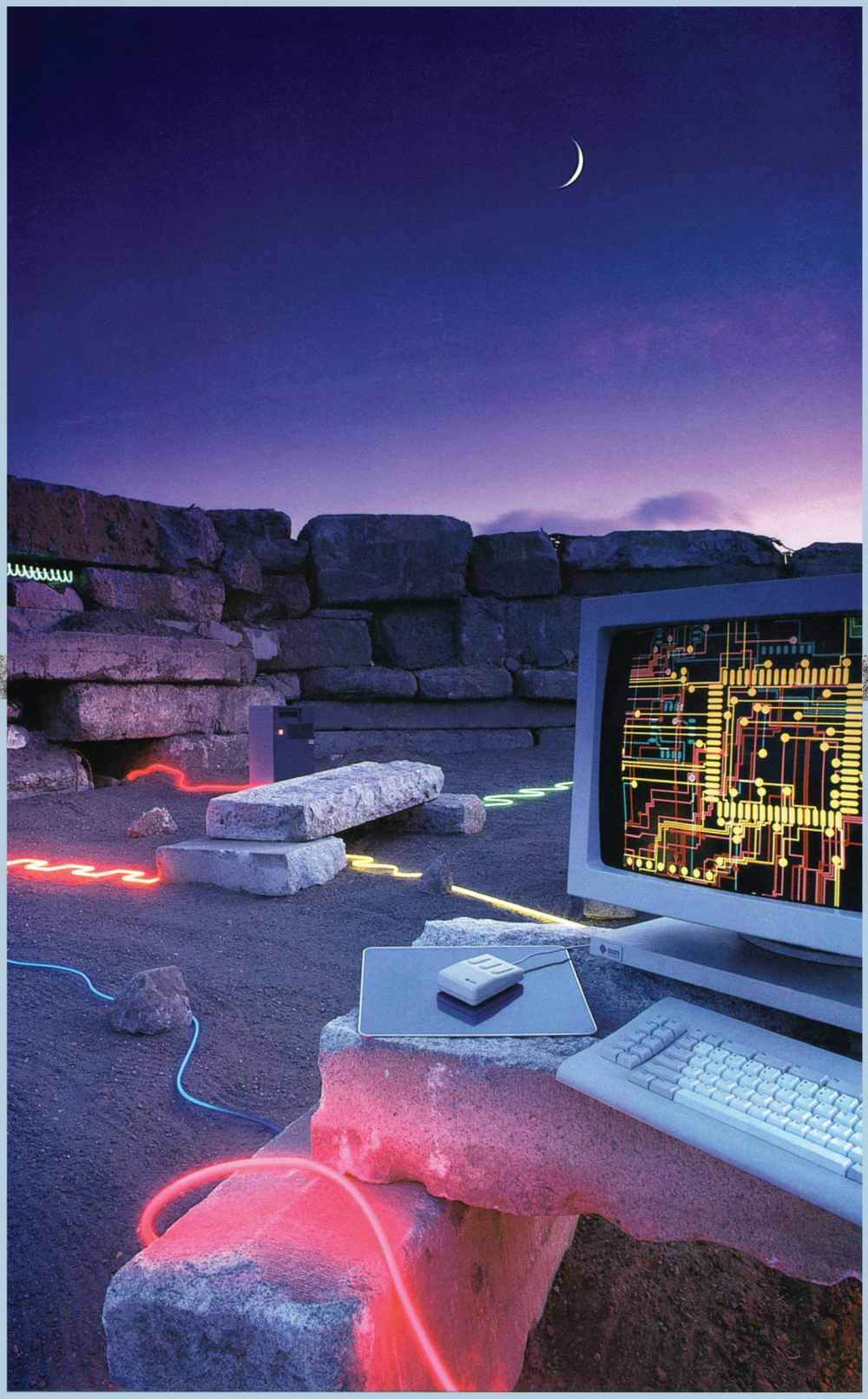
Sun-4/200 Series 10-MIPS Processing Power



Sun-4/200 Series 10-MIPS Processing Power

The Sun-4/200 computers are the first members of Sun's new generation of supercomputing workstations and servers. Their impressive processing power is derived from a new 32-bit RISC (Reduced Instruction Set Computer) microprocessor architecture, the Scalable Processor ARChitecture (SPARC™).

The Sun-4/200 Series of workstations and servers delivers 10-MIPS performance in affordable deskside or cabinet packaging. They are designed to meet the most demanding requirements of engineers and technical professionals in a variety of applications, including mechanical and electronic design and analysis, artificial intelligence, earth resources, image and signal processing, and computational chemistry.

Standard Sun-4/200 Features

- 16.67-MHz (60 ns), 32-bit SPARC architecture CPU
- CPU contains two high-speed 20K CMOS gate-array VLSI chips based on 1.5 micron technology:
  —the SF9010IU Integer Unit
  —the SF9010FPC Floating-Point Control Unit
- Weitek 1164/1165 floating-point arithmetic units
- 128-Kbyte virtual-address, write-back cache memory
- 8-Mbyte ECC main memory boards based on 256 Kbit DRAMS or 32-Mbyte ECC main memory boards based on 1 Mbit DRAMS
- MMU support of 16 register-resident processes, each with 1-Gbyte virtual address space
- 32-bit VMEbus
- 12-slot card cage
- Ethernet controller
- Two RS-423 ports
- 19-inch landscape high-resolution monochrome monitor (1600 x 1280 pixels)

Options

- Memory expansion to 128 Mbytes with 32-Mbyte boards
- 19-inch landscape color or grayscale monitors (1152 x 900 pixels)
- Graphics Processor and Graphics Buffer boards
- Second Ethernet controller
- Double-height VME board adapter
- SunIPC™ board for IBM PC/AT™ applications software
- 16-Channel Asynchronous Line Multiplexer (ALM)
- High-speed 280-Mbyte or 575-Mbyte ESMD disks
- 60-Mbyte ¼-inch tape cartridge, 1600-bpi or 6250/1600-bpi ½-inch tape subsystems

SPARC Architecture Features	*Benefits*
Large virtual address architecture	Facilitates coding, support, execution of large programs
Single-cycle execution for most 89 SPARC instructions	Simplifies CPU design; speeds overall system performance
32-bit, word-aligned, fixed-format instructions	Simplifies instruction decoding logic for simple design and fast throughput
Load/store, register-register design with 120-register windowed register file	Reduces references to main memory; ensures fast system throughput
Delayed control transfer	Virtually eliminates "wasted" CPU cycles
Four-staged pipelined implementation	Delivers fast throughput, efficient design
Coprocessor support	Accommodates flexible design implementations

Cover photo: The crisp, clear displays of the Sun-4/200 Series put ECAD and other applications into sharp perspective.

Sun-4/200 Implementation

The Sun-4 CPU consists of an Integer Unit (IU) chip, a Floating-Point Controller (FPC) chip, two floating-point arithmetic processors, and a large high-speed cache, all connected by a high-speed bus. Both the IU and FPC chips are implemented in 20K-gate VLSI gate-array chips and are available on the open market.

The 128 Kbyte virtual-address, write-back data and instruction cache augments the CPU for maximum throughput. This high-speed write-back cache feature delivers practically 100% cache hits. The cache delivers one instruction to the processor for every CPU cycle and is completely transparent to programmers.

Using a parallel addressing path, the CPU accesses the cache, main memory, and Memory Management Unit (MMU) simultaneously. If the data is not resident in the cache, the MMU automatically translates the address to main memory. Sun's sophisticated MMU facilitates rapid switching between multiple processes and assures fast main memory cycle time whenever data moves in or out of the cache.

For demanding applications such as those in earth resources, Sun-4/200 supercomputing workstations and servers incorporate the SPARC architecture to cost effectively deliver 10-MIPS performance.

The Sun-4 SPARC processor performs four-stage pipeline operations to optimize instruction execution: *fetch, decode, execute,* and *write.* As soon as execution control transfers from one stage to the next, a new instruction is delivered. The majority of instructions are executed in a single cycle while the cache performs single-cycle reads. This rapid execution maximizes pipeline efficiency and yields unsurpassed workstation performance.

To enhance reliability, the main memory for the Sun-4/200 Series uses Error Checking and Correction (ECC) codes. With ECC, the system detects and corrects 1-bit-per-byte errors and detects and reports 2-bit errors. Two sizes of memory boards are available for Sun-4 systems: 8-Mbyte boards based on 256-Kbit DRAMs and 32-Mbyte boards based on 1-Mbit DRAMs. These boards can be mixed for a maximum capacity of 128 Mbytes.

An on-board 256-Kbyte frame buffer drives the high-resolution (2-million pixel) monochrome display at Sun's standard 66-Hz non-interlaced refresh rate.

All Sun-4/200 Series electronics are contained on triple-height, quad-depth Eurocard boards. The 32-bit VMEbus offers sustainable I/O access at 8 Mbytes/sec. Mechanical support of additional double-height VME boards is available with an optional card adapter.

Like all Sun Workstation® systems, the Sun-4/200 Series has an open architecture and uses industry standards. The Sun-4™ architecture employs the industry-leading 32-bit VME bus, which is compatible with a large number of board-level components. For its disk interface, it uses the SCSI and ESMD standards, which are compatible with a wide range of mass-storage devices. For data communication, Sun-4/200 workstations use Ethernet and RS-423 interfaces and protocols that are compatible with international, industry, and de facto standards. At the software level, Sun supplies optimizing C, FORTRAN, and Pascal compilers; the UNIX® operating system; the Network File System (NFS™); the X.11/NeWS (Network-extensible Window System); and other standard software interfaces.

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Sun-4/200 Series Versatility

The Sun-4/200 Series can be configured as standalone systems with disk and tape backup, as extremely powerful diskless nodes, or as high-performance servers.

Sun-4/200 Configurations

The Sun-4/200 Series can be configured several ways. As a standalone workstation with disk, operating either independently or as part of a network, the Sun-4/260 gives users the ultimate speed and power for even the most demanding, compute-intensive applications.

Without a disk subsystem, the same Sun-4/260 operates as a powerful system on a network, sharing file and printer resources with other network nodes.

As fileservers, Sun-4/260S and Sun-4/280S systems deliver optimal-performance file sharing for diskless nodes. A single Sun-4/200 server can bolster a network with up to 2.3 Gbytes of high-speed mass storage.

Up to 50 terminals can be connected to a Sun-4/280S acting as a high-speed terminal server. The Sun-4/200 servers can also function as high-speed communication gateways to offload communication-related tasks from other systems.

Servers

Sun-4/200 Model	*260S*	*280S*
Function	Deskside SunServer™	Data Center SunServer
Card Cage	12-slot	12-slot
Disk Drives	280 Mbytes to 1.1 Gbytes	280 Mbytes to 2.3 Gbytes
Serial Ports	18 max.	50 max.
Tape Backup	60 Mbyte, ¼-inch	60 Mbyte, ¼-inch or 6250/1600 bpi, ½-inch

Workstations

Sun-4/200 Model	*260HM*	*260C*	*260G*
Function	Deskside monochrome workstation	Deskside color workstation	Deskside grayscale workstation
Display			
Type	19-inch high-resolution monochrome	19-inch color	19-inch grayscale
Resolution	1600 x 1280	1152 x 900	1152 x 900
Dots per inch	115	81	81
Refresh Rate	66 Hz	66 Hz	66 Hz
Card Cage	12-slot	12-slot	12-slot
Disk Drives	280 Mbytes to 1.1 Gbytes	280 Mbytes to 1.1 Gbytes	280 Mbytes to 1.1 Gbytes
Tape Backup	60 Mbyte, ¼-inch	60 Mbyte, ¼-inch	60 Mbyte, ¼-inch

High-Performance Display Options

The Sun-4/260HM 19-inch monochrome monitor displays clear, crisp images with two mega-pixel resolution arranged in 1600 columns by 1280 rows. The display enhances the clarity of images and fonts because of its 115-dpi (dots per inch) pixel density.

The Sun-4/260C delivers 8-bit color on an 1152 x 900 resolution, 19-inch monitor, simultaneously showing 256 colors of the over-16-million-color palette.

The Sun-4/260G can display 256 shades of gray on an 1152 x 900 resolution, 19-inch grayscale monitor.

For those applications requiring even higher graphic processing performance, optional graphics processors and buffers are available for state-of-the-art transformations, clipping, scaling, and rendering functions.

Mass Storage Subsystems

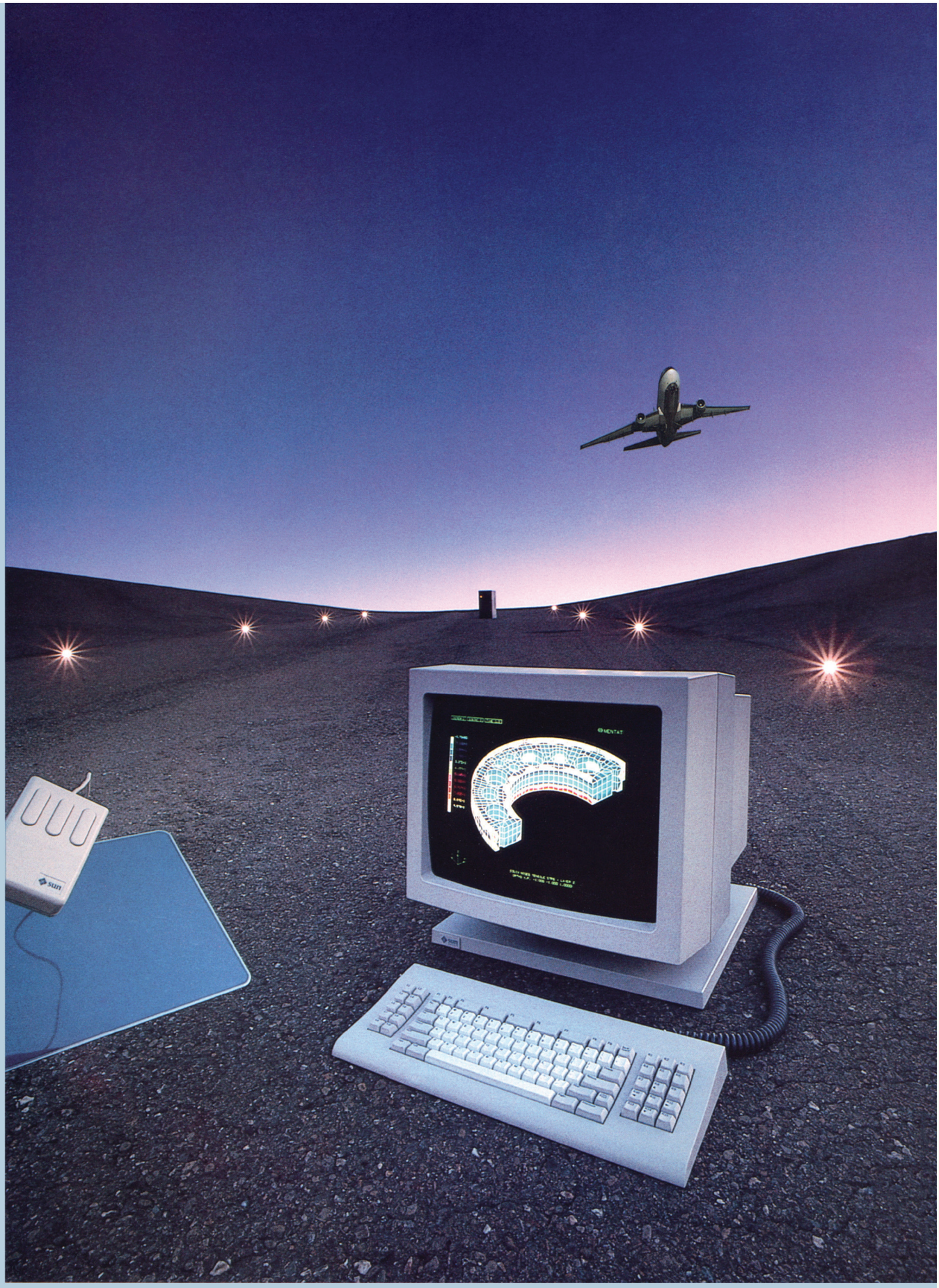
	Disk Drives		*Tape Drives*	
	10½-inch	**8-inch**	**½-inch**	**¼-inch**
Capacity	575 Mbytes	280 Mbytes	150 Mbytes	60 Mbytes
Access Time	18 msec	20 msec	N/A*	N/A
Disk Transfer Rate	2.4 Mbyte/sec	2.4 Mbyte/sec	N/A	N/A
Interface	ESMD	ESMD	Pertec	SCSI
Tape Density	N/A	N/A	6250/1600 bpi	10,000 bpi
Tape Speed	N/A	N/A	75 ips Streaming 25 ips Start/Stop	90 ips Streaming Cartridge
Sun-4 System	280S only	all 260s	280S only	all

*N/A = not applicable

Mass-Storage Options

By adding a high-speed 280-Mbyte disk subsystem with a 60-Mbyte, ¼-inch streaming cartridge backup tape, you can configure a Sun-4/260 as a standalone workstation. A second 280-Mbyte disk puts 560 Mbytes in the companion pedestal.

The Sun-4/260S network server can accommodate up to four 280-Mbyte disks, while the Sun-4/280S can hold up to four 575-Mbyte disks. For disk backup, you can use a 60 Mbyte, ¼-inch cartridge tape or up to two 6250/1600 bpi ½-inch tape drives.



For mechanical and civil engineers, the high performance of the Sun-4/200 Series helps tie all the pieces of your design together.

The Sun-4 Environment

The Sun-4 family of computers is based on industry standards, making the Sun-4/200 Series compatible with the other members of the Sun-3™ and Sun-2™ product lines. Even though the Sun-4 family is based on a powerful new architecture, Sun has maintained 100% source-code compatibility with Sun-2 and Sun-3 product families. Most existing software applications require only a recompilation to migrate to and take advantage of the supercomputing performance that the Sun-4/200 Series delivers.

All of Sun's software offerings are available on the Sun-4 systems. In addition, more than 900 software packages are available through the Sun Catalyst Third Party Program.

Sun's Open System Network (OSN™) is the realization of a true heterogeneous, distributed computing environment. OSN includes the Open Network Computing (ONC™) environment, the SunLink™ data communication products, and the merged NeWS™ and X Window System.™ ONC comprises NFS, Yellow Pages, and Remote Execution (REX), for transparent access to file structures over the network, even to other vendors' computers with different operating systems or architectures.

Sun has extensive data communication links over both local and wide areas, and across a variety of vendors' systems. Sun provides a link to IBM mainframe systems through the SunLink SNA 3270, BSC 3270, X.25, BSC RJE, LU6.2, Channel Adapter, and OSI options. The SunLink DNI and TE100 products put your system in touch with DEC® and other systems running DECnet™ VAX protocols.

The Sun PC-NFS™ and SunIPC products provide a link to IBM PCs. PC-NFS brings NFS capability to IBM PCs on a local area network. SunIPC puts PC-DOS application software in a window on a Sun workstation.

All Sun systems use Sun's implementation of the UNIX operating system, which combines Berkeley 4.2BSD and AT&T System V versions into the powerful Sun Operating System (SunOS). Sun enhanced the UNIX systems for networked workstations and added the SunPro™ software programming environment; the SunView™ window-management and interface development system; the SunCore,® SunCGI,™ and SunGKS™ graphics libraries; as well as C, VMS FORTRAN, Pascal, Sun Common Lisp, and Modula-2.

To ease migration of code to and from Sun-2, Sun-3, and Sun-4 systems, a 68010/68020-to-SPARC and SPARC-to-68010/68020 cross-compiler is optionally available. Sun protects your software investment by ensuring compatibility among existing and future Sun systems and by encouraging the integration of new technologies with existing resources.

Sun-4 Applications

The Sun-4/200 Series comprises general-purpose engineering workstations and servers with especially enhanced performance for integer and floating-point arithmetic, graphics, and I/O-intensive applications. The Sun-4/200 Series systems are particularly well suited for ECAD logic simulation, IC and PCB layouts, design and electrical rules check applications, and for MCAD finite element analysis, solids modeling, and thermal and stress analysis applications. The Sun-4/200 Series' unsurpassed power and speed provide the ideal platform for AI software development, signal and image processing, and general education and research environments.

With expanded mass storage, Sun-4/200 workstations and servers become extremely cost-effective, powerful integrated software development environments. These systems, when networked as file-servers with multiple Sun-3 diskless nodes, can maximize performance for all applications, ultimately reducing the cost-per-seat over the highest-performance distributed network.

Why RISC?

RISC architecture maximizes performance and speed by performing infrequent functions in software, including in hardware only those features that yield a net performance gain. RISC improves performance by providing the building blocks that can synthesize high-level functions without the overhead of general, yet time-consuming instructions. RISC architectures eliminate complicated instructions requiring excessive microcode support, such as elaborate subroutine calls and text-editing functions. However, RISC architectures retain floating-point functions because these compute-intensive procedures are handled more efficiently in hardware than in software.

RISC designs begin with a necessary and sufficient instruction set. Typically a few simple instructions account for most computation, so these instructions must execute very fast; most SPARC instructions execute in a single CPU cycle. Currently, RISC architectures are about three to seven times faster than traditional CPU architectures.

Because RISC architectures are easy to implement, they are more portable than traditional architectures, permitting the rapid integration of new technologies. Users will benefit as architectural portability speeds improvements in the cost-performance of computing. With mere recompilation, programs that run on VAX® or 68000-based systems will run much faster on RISC machines.

With the SPARC architecture, Sun has optimized RISC technology. By using the most advanced computer architecture, chip, memory and cache technologies, the Sun-4 family cost-effectively achieves unsurpassed processing power. The Sun-4 workstations and servers address application areas that previously required special-purpose computer architectures or large, expensive mainframe- or supercomputer-level systems.

Sun-4/200 Series Specifications

Central Processor
- Type: SF9010IU, 16.67 MHz

Floating Point
- Type: SF9010FPC, 16.67 MHz Weitek 1164/1165 IEEE standard 754
- Precision: 32-bit (single), 64-bit (double)

Memory Management
- Type: Sun-4 MMU
- Virtual Memory: 1 Gbyte per process
- Contexts: 16 in hardware
- I/O Interface: DVMA™

Main Memory
- RAM: 8 Mbytes or 32 Mbytes ECC standard
- Expansion RAM: 8-Mbyte boards (256 Kbit) 32-Mbyte boards (1 Mbit)
- Maximum RAM: 128 Mbytes
- Memory to Cache Bus Width: 64 bits
- Cache to Processor Bus Width: 32 bits

Memory Cache
- Type: Sun-4 Virtual Address Cache
- Size: 128 Kbytes
- Organization: Direct map, write-back
- Cycle Time: 60 ns

Ethernet Interface
- Media Type: Coaxial cable
- Data Rate: 10 Mbits/sec

System Bus
- Type: VMEbus
- Address Bus Width: 32 bits
- Data Bus Width: 32 bits

Display Options

High-Resolution Monochrome
- Monitor Format: 19-inch landscape
- Resolution: 1600 (h) x 1280 (v) pixels (115 pixels/inch)
- Pixel Aspect Ratio: 1:1
- Refresh Rate: 66-Hz non-interlaced
- Frame Buffer: 256 Kbytes
- Bandwidth: 200 MHz
- Controls: Brightness, on/off

Color and Grayscale
- Monitor Format: 19-inch landscape
- Resolution: 1152 (h) x 900 (v) pixels (81 pixels/inch)
- Pixel Aspect Ratio: 1:1
- Colors Displayed: 256
- Color Palette: 16.7 million
- Refresh Rate: 66-Hz non-interlaced
- Frame Buffer: 1 Mbyte
- Bandwidth: 93 MHz
- Controls: Brightness, degauss, on/off (color) Brightness, contrast, on/off (grayscale)

Keyboard
- Type: 94-key, low-profile

Mouse
- Type: Optical, 3-button

Software
- Operating System: Converged UNIX (4.2BSD and AT&T System V)
- Languages: C, FORTRAN, Pascal, Assembler Modula-2, Sun Common Lisp
- Communications: Ethernet, Network File System, TCP/IP
- Graphics: SunCore, SunCGI libraries, SunGKS
- User Interfaces: SunView, X.11/NeWS
- SunLink Communication: SNA3270, BSC RJE, BSC 3270, Local 3270, SNA Peer-to-Peer, TE100, DNI, Internetwork Router, X.25, OSI, DDN
- Database: SunINGRES,™ SunUNIFY,™ SunSimplify™
- Office Automation: SunAlis*

Serial I/O
- I/O Ports: Two RS-423 serial (RS-232C compatible) standard
- Optional Asynchronous Controller: 16-channel for terminals, printers
- Optional Multiprotocol Communication Processor (Synchronous): 4-channel for high-speed communications and offloading CPU. Used with SunLink software

Disk Options
(up to four drives on two controllers)
- Formatted Capacity: 280 Mbytes
  - Unformatted Capacity: 337 Mbytes
  - Average Access Time: 20 msec
  - Data Rate (ESMD): 2.4 Mbytes/sec
- Formatted Capacity: 575 Mbytes
  - Unformatted Capacity: 689 Mbytes
  - Average Access Time: 18 msec
  - Data Rate (ESMD): 2.4 Mbytes/sec

Tape Options
- ¼-inch Cartridge Tape Drive
  - Capacity: 60 Mbytes/cartridge
  - Format: QIC-24
- ½-inch Reel Tape Drive
  - Capacity: 150 Mbytes/reel
  - Format: GCR
  - Density: 6250/1600 bpi

Environment
- Temperature
  - Operating: 0° to 40°C (32° to 104°F)
  - Nonoperating: −20° to 75°C (−4° to 167°F)
- Humidity
  - Operating: 20 to 80%, noncondensing @ 40°C
  - Nonoperating: 95%, noncondensing @ 40°C

Regulations
- Meets or exceeds the following requirements:
- Safety: UL 478, CSA 154, TUV (VDE 0806, IEC 380)
- RFI/EMI: FCC Class A, VDE 0871
- X-ray Emissions: DHHS Rule 21 (Subchapter J), PTB
- Static Discharge: 15 KV—no hard errors

Ergonomics
- Industrial Design: ZH 1/618 Standards

Electrical
- AC Voltage: 90-132 or 180-264 VAC
- AC Frequency: 47.5 to 66 Hz
- Power: 1450 VA to system

Dimensions and Weights
- 19-inch High-Resolution Monochrome and Grayscale Monitors
  - Height: 44.5 cm (17.5 inches)
  - Width: 46.0 cm (18.1 inches)
  - Depth: 40.4 cm (15.9 inches)
  - Net weight: 24.8 kg (54.5 lbs.)
  - Shipping weight: 27.7 kg (61 lbs.)
- 19-inch Color Monitor
  - Height: 44.2 cm (17.4 inches)
  - Width: 46.7 cm (18.4 inches)
  - Depth: 52.3 cm (20.6 inches)
  - Net weight: 34.1 kg (75 lbs.)
  - Shipping weight: 37.1 kg (81.5 lbs.)
- 12-slot Pedestal
  - Height: 71.1 cm (28 inches)
  - Width: 32.5 cm (12.8 inches)
  - Depth: 59.7 cm (23.5 inches)
  - Net weight: 84.1 kg (185 lbs.)
  - Shipping Weight: 90.9 kg (200 lbs.)
- Keyboard
  - Height: 4.1 cm (1.6 inches)
  - Width: 46 cm (18.1 inches)
  - Depth: 19.8 cm (7.8 inches)
  - Shipping weight: 6.8 kg (15 lbs.)

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