SiliconGraphics
Computer Systems

O2™ Visual Workstation

Product Guide

COMBINING WORKSTATION PERFORMANCE WITH THE POWER OF ADVANCED DIGITAL MEDIA CAPABILITIES

Performance

The innovative O2 visual workstation combines Silicon Graphics performance with advanced digital media capabilities. O2 desktop systems give you the industry-leading CPU and graphics performance you need plus breakthrough video and imaging features you never expected to have, especially at such an affordable price. With this combination of performance and outstanding multimedia capabilities, you'll accomplish more on the desktop than you ever imagined possible.

O2 STANDARD FEATURES

- MIPS® RI2000®, RI0000®, or R5000® processor
- IRIX® 6.5 operating system
- Web-integrated user environment
- 32-bit double-buffered graphics
- Hardware-accelerated texture mapping
- Hardware-accelerated z-buffer
- Image processing engine
- Video compression engine
- 64MB or 128MB base system RAM
- 4GB or 9GB* system disk
- 10Base-T/100Base-TX Ethernet networking
- Two Ultra Fast/Wide SCSI buses
- Stereo audio
- 64-bit PCI expansion slot
- CD-ROM
- 17-inch monitor (1280x1024)

**9GB disk available only on RI0000 and RI2000 versions.*

IRIX 6.5

Built on UNIX® SVR4 with Berkeley Extensions 4.3, IRIX conforms to every major UNIX standard as well as a variety of cross-platform standards:

- Motif 1.2.4
- X11R6
- POSIX 1003.1/1003.2
- FIPS 151.2
- Display PostScript®
- Tooltalk
- Triteal CDE (through Triteal)
- AppleTalk®
- XFS™
- NFS™

Powering Your Organization

Designed for the critical path, the O2 visual workstation suits professionals—the creative and engineering teams that drive a company's competitive edge in the sciences, manufacturing, entertainment, and other demanding industries. O2 systems merge leading compute performance with the industry's first high-performance Unified Memory Architecture (UMA) to deliver incredible internal bandwidth and accelerate graphics and compute-intensive applications. The UMA design has allowed Silicon Graphics to make this level of performance available at an affordable price.

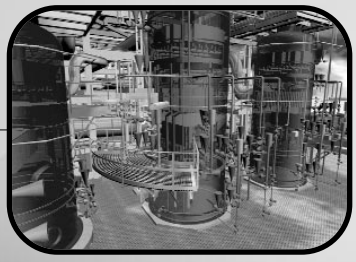
Interactive Graphics, Video, and Image Processing

The Unified Memory Architecture enables stunning 3D graphics, powerful image processing, and real-time video processing far beyond any other machine available in its class. These features make the O2 visual workstation the ideal platform for scientific visualization, CAD modeling, animation, imaging, and visual simulation. Standard compression hardware and bundled digital media software transform any user into a video editor, while providing the quality that video professionals demand.

The Power Path

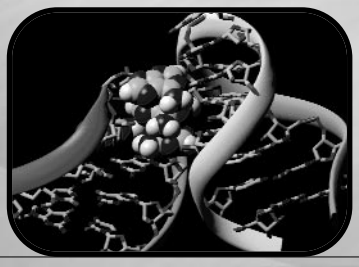
Transcending other workstation designs, the O2 system delivers extraordinary system throughput and a strong growth path. Unlike other workstations, O2 visual workstations enable users to easily migrate their applications to higher-performance Silicon Graphics® systems such as the OCTANE™ power desktop and Onyx2™ graphics supercomputer. Users can create 3D models or designs on the O2 visual workstation and move them to higher performance systems when the data sets grow or if they require more sophisticated capabilities such as real-time rendering or virtual fly-throughs. Users gain the ultimate power path.

DIGITAL STYLING



REAL-TIME PLANT DESIGN

MOLECULAR MODELING



GEOGRAPHIC TERRAIN VISUALIZATION

Power

With the O2 visual workstation, Silicon Graphics has created the industry's first high-performance Unified Memory Architecture. UMA transcends inflexible workstation designs that constrain performance with distributed graphics, imaging, and video memory. O2 systems deliver extraordinary performance by integrating powerful compute resources—video, compression, graphics, image processing, and I/O—via a high-bandwidth, low-latency memory system.

KEY CPU FEATURES

R5000 CPU
- MIPS IV instruction set
- 2-way superscalar 64-bit architecture
- 32KB instruction cache
- 32KB data cache
- 1MB fast secondary cache

RI0000/RI2000* CPU
- MIPS IV instruction set
- 4-way superscalar 64-bit architecture
- Out-of-order instruction execution
- 32KB instruction cache
- 32KB data cache
- 128-bit dedicated secondary cache bus
- 5 separate execution units
- 1MB fast secondary cache

**RI2000 provides larger branch target cache and larger branch prediction table*

KEY ARCHITECTURE FEATURES
- 2.1GB/sec memory bandwidth
- 1GB memory capacity
- Memory subsystem uses commodity synchronous DRAMS
- ECC memory protection for high memory integrity

High-Performance Unified Memory Architecture

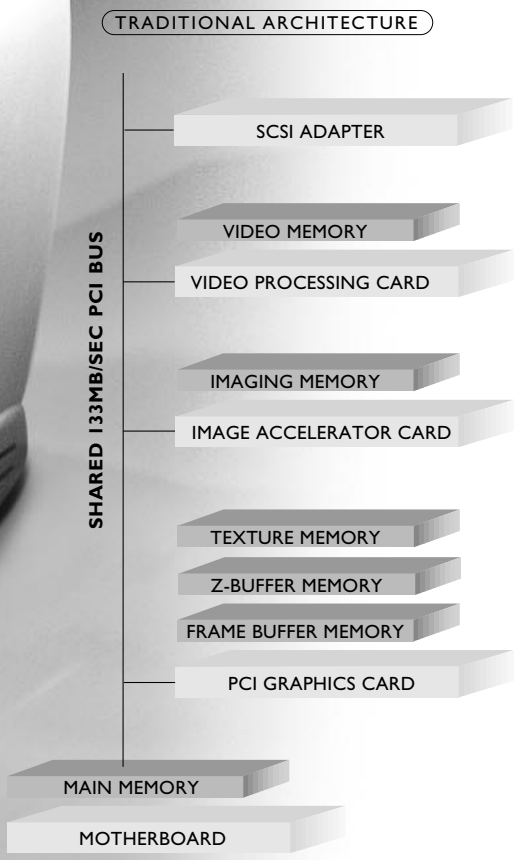
All O2 data resides in main memory, where every computing engine has direct, fast access to it. System memory, frame buffer, z-buffer, texture memory, rendering memory, image memory, and video memory are all the same. Without dedicated pools of proprietary memory, graphics and imaging data can be more flexibly manipulated and shared, and application performance can be optimized. Unlike traditional workstation architectures that require data to be transferred across narrow buses and between separate boards, the O2 design accommodates simultaneous flows of data in and out of the system for high-speed processing. Higher quality products can be generated on the O2 system by creatively combining graphics, images, and video data.

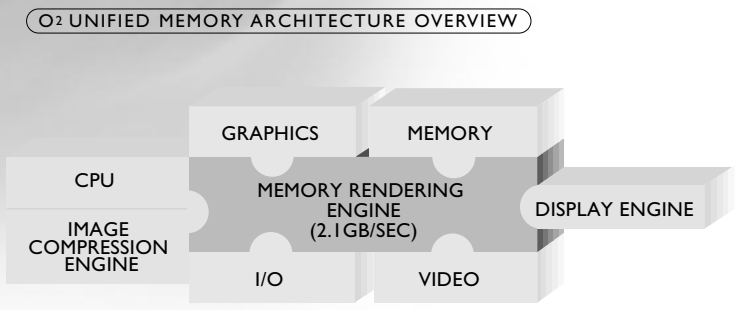
High-Bandwidth I/O

The O2 I/O engine maximizes performance by removing the bandwidth bottlenecks that would otherwise starve even the fastest system components. O2 systems deliver peak performance on 10Base-T/100Base-TX Ethernet networks, a dual Ultra Fast/Wide SCSI implementation, a 64-bit PCI expansion bus, and several other standard I/O options.

Leading Processing Power

The O2 visual workstation is powered by either the 64-bit MIPS RISC R5000, R10000, or R12000 processor, delivering industry-leading application performance. With the R5000 processor, users get a true price/performance leader, a CPU that delivers excellent compute, graphics, and application performance. The R10000 processor provides leading compute power for more demanding applications, and the evolutionary design of the R12000 processor uses the industry's latest fabrication process to deliver the highest level of performance available on the O2 platform.





A Flexible Modular Design

The elegant O2 system has a five-piece modular design to simplify upgrades and maintenance—disk drives, system module, and PCI cards can be easily accessed from the rear of the system. This simplicity is also reflected in the O2 system administration tools, which guide users through simple maintenance and configuration functions. Further servicing is available through a series of warranty options and online support systems.

Interactivity

The O2 visual workstation's industry-leading 3D graphics and image processing embody everything you've ever heard about Silicon Graphics performance and realism. Built upon a native OpenGL® graphics subsystem and Unified Memory Architecture, the O2 system delivers a level of interactivity not available with any other machine in its class. These remarkable capabilities are standard with every configuration, giving you all the graphics and image-processing performance you need, right out of the box.

GRAPHICS FEATURES

- 1280x1024 at 75 Hz (also supports VGA, SVGA, and XGA)
- Up to 32-bit RGBA double-buffered standard
- Native OpenGL graphics subsystem
- Hardware z-buffer
- Triangle rasterization in hardware
- Texture mapping in hardware
- Hardware image mapping support
- Hardware stencil planes
- Hardware anti-aliasing
- Source plus destination alpha in hardware
- Fast Xline performance

For applications requiring additional screen space, the O2 workstation supports the Dual Display option board.

Advanced Graphics Features

With standard 32-bit double-buffered graphics and advanced features accelerated in hardware, O2 systems bring power and high quality within the reach of every user. Accelerated features include texture mapping, z-buffer, and anti-aliased points and lines, as well as stencil, fog, and color space conversions.

High-Performance Texture Mapping

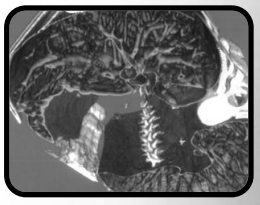
The O2 workstation's hardware-accelerated texture mapping capabilities bring a new level of realism and interactivity to the desktop. In CAD and animation, texture mapping allows users to visualize their models with a level of realism that surpasses traditional shaded models. Unlike traditional graphics boards that set a limit on texture memory, the flexible Unified Memory Architecture allows an unlimited amount of memory to be allocated for textures.

Consistent Feature Set across the Silicon Graphics Product Line

Implementing key OpenGL hardware features of the higher-end Silicon Graphics Onyx2 InfiniteReality® systems, O2 systems now allow users to choose the level of graphics power at the price that best meets their needs.

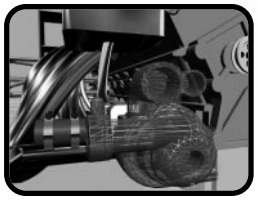
First-Class Image Processing

O2 systems deliver high-performance image-processing capabilities via hardware-accelerated OpenGL image-processing extensions and texture mapping. Implemented in hardware, these extensions allow users to manipulate large, high-resolution image data sets in real time—making it as easy to manipulate a 200MB image as a 2MB image. Delivering the most powerful performance in its class, the O2 system raises the standard of image-processing power in a desktop workstation.

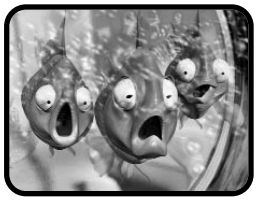


MEDICAL

DEFENSE



CAD



ENTERTAINMENT

SILICON GRAPHICS 1600SW™ FLAT PANEL MONITOR OPTION

The revolutionary Silicon Graphics 1600SW flat panel monitor brings stunning visual quality to the O2 workstation. The only high-resolution, pure-digital flat panel monitor on the market, Silicon Graphics 1600SW offers the resolution and image quality that satisfy the needs of the most demanding digital content creation, imaging, CAD, and desktop publishing professionals.

SILICON GRAPHICS 1600SW DISPLAY FEATURES

- **High-resolution LCD monitor (1600x1024)**
- **Large screen size (17.3 inches diagonal)**
- **Unique SuperWide™ screen format that displays two full pages of information**
- **Ultrafine dot pitch (110 dpi) for professional-quality image editing**
- **Fast pixel response for video playback at up to 30 frames per second**

Creativity

The O2 visual workstation is truly a native digital media machine—the first system to integrate video, audio, and real-time compression technologies as fundamental components of its architecture. The flexible O2 architecture allows digital media to be brought directly into memory as a standard data type. Once there, the graphics, image-processing, and compute engines can access and manipulate the data in real time.

STANDARD VIDEO FEATURES

- Real-time video capture to disk using two independent SCSI channels
- Selectable genlock source: video input, internal clock, external, specified source
- Synchronization of audio and video; field and sample accurate
- Real-time, JPEG compression/decompression
- Bundled video control and software
- Alpha channel output support for switching and keying
- Real-time video effects using OpenGL, video, and mip-map generation
- Two-way conversion, nonsquare to square pixel, for I/O
- Real-time color space conversion
- Dual-input video stream DMA

STANDARD AUDIO FEATURES

- Analog audio sample rates: 8 KHz to 48 KHz
- High-quality 78 dB signal-to-noise ratio
- Audio and video clock sync and sample-accurate time stamping

SUPPORTED VIDEO FORMATS

- QuickTime®
- Cinepak
- JPEG
- MPEG-1
- AVI file formats
- Uncompressed

Flexible Video Processing

With every engine able to access all data residing in main memory, the O2 system delivers video manipulation capabilities never before available in this class. Applications can decode a compressed video source and use it as a texture map or utilize the image-processing hardware to blur or distort a live video stream in real time. Users view video in its native format due to the O2 visual workstation's ability to display nonsquare video pixels.

Professional Video Capabilities and Tools

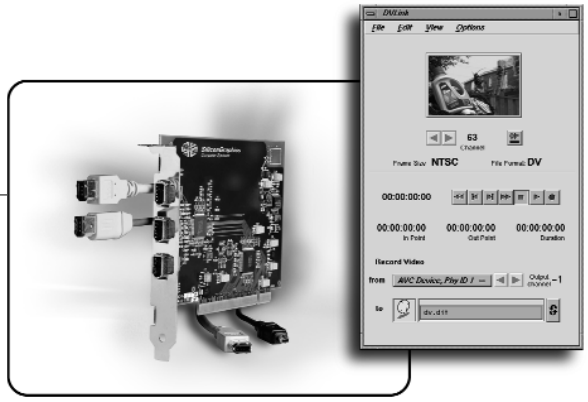
The O2 system is the first desktop workstation to include real-time JPEG compression and decompression hardware in every system. Supporting compression ratios of up to 4:1, the O2 system delivers a level of quality that meets the needs of the video post-production market. Each O2 system provides the option for two channels of simultaneous input and one channel of output for D1 and analog video. The bundled digital media tools give any user the ability to easily develop compelling digital media content that incorporates video, audio, and 3D graphics. Independent audio can be synchronized to video data.

Cross-Format Video Output

In addition to real-time capabilities, O2 systems implement a wide range of video compression algorithms through software, including industry standards such as QuickTime, AVI, and Cinepak. These built-in capabilities allow users to create and edit video on the O2 system and then distribute video via the Web to any computer for playback.

Capturing the Screen Display as Video

The O2 system turns your application into a video source by allowing any portion of the screen to be recorded directly to disk in real time. You can also directly output the screen recording to an external video device via the optional composite video, S-Video, or serial digital interfaces.



THE COMPLETE IEEE 1394 DIGITAL VIDEO SOLUTION

Silicon Graphics DVLink provides a complete IEEE 1394 Digital Video solution for creative professionals working with visual and digital media content. The widely accepted IEEE 1394 standard makes it extremely simple and cost-effective to produce high-quality video on the desktop. By coupling the inherent advantages of the IEEE 1394 standard with an architecture that has been designed for digital media, the O2 workstation gives you a full-function IEEE 1394 digital video solution on your desktop.

DVLINK CAPABILITIES

- **Import and export real-time, frame-accurate digital video clips, including support for multiple digital video I/O streams**
- **Preview digital video footage in real time**
- **Output video back to IEEE 1394-enabled digital video devices**

Versatility

The complete, easy-to-use O2 desktop environment helps users accelerate workflow and enhance productivity. Silicon Graphics expertise in graphics and system architectures—combined with a flexible, high-performance operating system, high-bandwidth I/O, and support for the most strategic and demanding applications—makes the O2 system the ideal solution in industries for which reliability, scalability, and serviceability are key requirements.

O2 BUNDLED SOFTWARE

COLLABORATION
- Outbox
- InPerson®
- IRIS Annotator™
- IRIS Showcase™
- Netscape Communicator® 4.05
- Cosmo™ Player
- Cosmo™ Create
- Netscape® FastTrack Server
- Adobe® Acrobat Reader™
- InfoSearch
- SGI Meeting
- Teleffect

CONNECTIVITY
- XFS
- ISDN/PPP support
- Novell NetWare™ Client
- Xinet AppleTalk
- Samba

DIGITAL MEDIA
- SoundEditor
- MovieMaker
- ImageWorks
- SoundTrack
- FX Builder
- MediaRecorder
- MediaPlayer
- CD/DAT Player
- Audio Panel
- Video Panel
- Synth Panel
- Media Convert

Ease of Integration

As mixed computing environments become more prevalent, users need a way to easily integrate new systems into their existing work environments. Each O2 system includes connectivity software that makes it easy to blend the workstation into heterogeneous environments. With built-in applications such as XFS, ISDN/PPP support, Novell NetWare Client, Xinet AppleTalk, and Samba, O2 systems can instantly network with PC and Mac® systems. The O2 systems also ship with a number of collaboration applications that allow users to easily share files across multiple operating systems. These include SGI Meeting, a data conferencing tool that enables distributed users to collaborate with each other regardless of what operating system they are using. SGI Meeting lets users team up with professionals on systems that use Microsoft® Windows®, Sun™ Solaris™, Apple® Macintosh®, or any system on which an International Telecommunications Union (ITU) T.120 compliant tool is used, including Microsoft NetMeeting and SunForum.

Professional-Quality Media Tools

O2 visual workstations ship standard with a host of digital media software. Tools such as MediaRecorder enable users to take screen captures of CAD models, 3D animations, simulations, or any other applications they have on their desktops. These files can then be imported into MovieMaker, where users can add titles, transitions, and custom effects. With Outbox, finalized files can be published to a personalized Web site so that other team members or clients can view the work. The O2 workstation gives users in any market the ability to easily enhance designs with compelling digital media content and create impressive Web pages that incorporate video, audio, and 3D graphics.

Maximize Your Visual Area

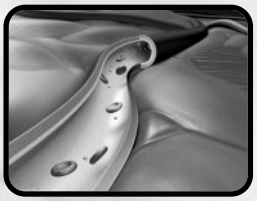
The Silicon Graphics O2 Dual Display Option brings cost-effective dual-monitor capabilities to the visualization markets. With a single add-in board, users can drive double the display area for enhanced viewing and workspace management. The Dual Display board outputs the O2 graphics channel to two monitors, automatically splitting the images between both screens. The O2 Dual Display Option creates an ideal solution for industries such as energy, entertainment, and defense imaging, where added screen real estate is especially important.

O2 RackMount: Cost-Effective Processing Power

A unique combination of power and system throughput makes the O2 RackMount system the preferred solution for many rendering, imaging, Web serving, and custom embedded applications. Users can dedicate an O2 RackMount solution to a group or a task and easily upgrade or reconfigure the system to accommodate changes in the environment or application. The unique architecture and scalable configuration mean that increased I/O, memory, rendering, and processing demands can be handled with economical upgrades and add-ons, maximizing the returns on your system investments. An optional shelf allows two system units to sit side by side in a standard 19-inch industrial rack. Shelves can be mounted two deep in a rack so that four systems can be mounted on each level for maximized use of space.

VISUAL SIMULATION

The O2 Unified Memory Architecture enables access to nearly unlimited texture capacity. This feature, combined with its affordability, makes O2 the ideal modeling station for real-time visual simulation applications.



MEDICAL

With high-performance texturing, volume visualization capabilities, and high bandwidth for large data set manipulation, O2 is the platform of choice for medical imaging professionals.

DEFENSE

The ability of O2 to handle large, complex data sets allows users to easily manipulate images in real time while maintaining high-quality resolutions. Its unique form factor and modular design make O2 the ultimate field-deployable workstation. In addition, ruggedized versions of O2 are available through third-party vendors.

ENTERTAINMENT

In the entertainment industry, creative professionals can take advantage of the O2 support for compressed or uncompressed video, excellent compositing performance, and the ability to create high-quality fully textured 3D models.

O2 Visual Workstation

Technical Specifications

BASE SYSTEM FEATURES

Processor Support	1 MIPS RISC 64-bit R12000 1MB L2 cache
	1 MIPS RISC 64-bit R10000 1MB L2 cache
	1 MIPS RISC 64-bit R5000 1MB L2 cache
Memory Capacity	64MB–1GB synchronous DRAM (SDRAM)
System Graphics	Resolutions (with double-buffered 32-bit color):
	• 1280x1024 at 75 Hz
	• 1600x1024 at 60 Hz (optional Silicon Graphics 1600SW flat panel)
	Formats: • 8-bit + 8-bit double buffer format
	• 16-bit + 16-bit double buffer format
	• 32-bit + 32-bit double buffer format
Graphics Features	Texture mapping in hardware, native OpenGL graphics subsystem, hardware z-buffer, triangle rasterization in hardware, hardware image mapping support, hardware stencil planes, hardware anti-aliasing, source plus destination alpha in hardware, fast Xline performance
Storage and I/O	Internal single-ended SCSI controller
	External single-ended SCSI controller
	2 internal 3.5" storage bays (R5000)
	1 internal 3.5" storage bay (R10000, R12000)
Communication	Single 10Base-T/100 Base-TX port
	Single 100Base-TX port
	Dual serial RS422/RS423 DB-9 ports
	Single IEEE 1284C parallel port
	Two audio I/O ports
Display Options	17" color monitor standard
	20" color monitor optional
	17.3" Silicon Graphics 1600SW flat panel monitor option
	O2 Dual Display Option

DIGITAL MEDIA FEATURES

Analog Audio (Standard)	Mono-microphone, 1 16-bit stereo input channel and 1 16-bit stereo output channel, stereo headphone output, stereo external speaker system output
Video Compression (Standard)	Variable-rate single-stream real-time motion-JPEG encode/decode, software-based MPEG-I, Cinepak encode/decode, and full QuickTime support
Digital Audio I/O (Optional)	8 channels 24-bit ADAT optical I/O
	2 channels 24-bit AES-3id I/O
	AES11 synchronization
Video I/O (Optional)	S-Video, composite, Silicon Graphics digital video input and output for NTSC and PAL standards; real-time graphics to video output (includes standard audio features)
Digital Video I/O (Optional)	Two 8- or 10-bit SMPTE 259M (CCIR 601) serial digital video inputs or outputs for NTSC and PAL (includes standard audio features), real-time graphics to video output

EXPANSION OPTIONS

PCI	Single-port Ultra SCSI
	Single-port Fibre Channel
	Single-attached FDDI
	Dual-attached FDDI
	Digital audio
Networking	Second 100Base-TX Ethernet
	ISDN basic rate interface

STORAGE OPTIONS

Internal	4GB Ultra Fast/Wide drive (R5000)
	9GB Ultra Fast/Wide drive (R10000, R12000)
	32X CD-ROM
External	4GB Ultra Fast/Wide
	9GB Ultra Fast/Wide
	3.5" floppy drive
	12GB 4 mm DAT drive
	Digital linear tape

BUNDLED SOFTWARE

Collaboration	Outbox
	InPerson
	IRIS Annotator
	IRIS Showcase
	Netscape Communicator 4.05
	Cosmo Player
	Cosmo Create
	Netscape FastTrack Server
	Adobe Acrobat Reader
	InfoSearch
	SGI Meeting
	Teleffect
Connectivity	NFS
	ISDN/PPP support
	Novell NetWare Client
	Xinet AppleTalk
	Samba
Digital Media	SoundEditor
	MovieMaker
	ImageWorks
	SoundTrack
	FX Builder
	MediaRecorder
	MediaPlayer
	CD/DAT Player
	Audio Panel
	Video Panel
	Synth Panel
	Media Convert
Run-Time Libraries	OpenGL
	OpenGL image extensions

PHYSICAL ENVIRONMENT

System	9" W x 12" H x 10.5" D
	22 lb
	17" monitor:
	17" H x 15.9" W x 16.5" D
Voltage and Frequency	100-132/200-264 VAC
Heat Dissipation	<900 BTU/hour
Ambient Temperature	+10°C to +35°C (operating)
	-40°C to +65°C (nonoperating)
Relative Humidity	10% to 80% operating, no condensation
	5% to 95% nonoperating, no condensation
Altitude	10,000 ft operating
	40,000 ft nonoperating
Vibration	0.1" displacement with all axes
	0.25G, 5-380-5 Hz (operating)
	0.5G, 5-380-5 Hz (nonoperating)

REGULATORY AGENCIES

Electromagnetic Emission	FCC Part 15, Class A
	Canada DOC Class A
	CISPR22: 1993/EN 55022: 1988 Class A
	VCCI Class 1
	EN 50082-1:1992
	EN 61000-4-2:1995/IEC 1000-4-2:1995 ESD
	IEC 1000-4-3:1995 Radiated RF
	EN 61000-4-4:1995/IEC 1000-4-4:1995 EFT

O2 is part of the Silicon Graphics visual workstation product family, which includes the O2, OCTANE, and Onyx2 systems for UNIX and the Silicon Graphics 320™ and Silicon Graphics 540™ workstations for Windows NT.

SiliconGraphics
Computer Systems

Corporate Office
2011 N. Shoreline Boulevard
Mountain View, CA 94043
(650) 960-1980
www.sgi.com

U.S. 1(800) 800-7441
Europe (44) 118-925.75.00
Asia Pacific (81) 3-54.88.18.11
Latin America 1(650) 933.46.37

Canada 1(905) 625-4747
Australia/New Zealand (61) 2.9879.95.00
SAARC/India (91) 11.621.13.55
Sub-Saharan Africa (27) 11.884.41.47

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