



Power Mac G5

Technology Overview
July 2003



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The World's Fastest Personal Computer

The Power Mac G5 opens up a wealth of computing opportunities:

- Graphic designers can manipulate Adobe Photoshop images for print, web, and animation more than two times faster than on the fastest PC.¹
- Video producers can manipulate multiple streams of DV and SD content in real time.
- Musicians and audio producers can process an unprecedented number of audio tracks, all with complex filters and digital effects.
- Scientists can execute high-precision math on extremely large 64-bit numbers and return results faster than ever.
- Artists, game developers, architects, and researchers can model and render complex 3D visualizations at remarkable speeds.

The success of today's creative professionals depends on their ability to crunch increasing quantities of data quickly and efficiently. They need vast amounts of RAM to handle memory-intensive applications and enormous media files. They need superfast, sophisticated graphics capabilities to visualize complex 3D models and manipulate high-resolution images. And they need comprehensive input and output options to connect to a myriad of industry-specific peripherals.

Enter the all-new Power Mac G5: the world's fastest personal computer, ready to meet the high-performance, no-compromise requirements of creative professionals everywhere.² At the center of this revolutionary system is the PowerPC G5, the world's first 64-bit desktop processor, developed in collaboration with IBM and produced using state-of-the-art IBM process technology. Combine this advanced processor with the industry's fastest frontside bus, a high-bandwidth architecture, and plenty of high-speed memory—and the Power Mac G5 outperforms even the fastest Pentium 4-based desktop computers.³ And since the G5 processor runs 32-bit code natively, your favorite Mac OS X applications will run faster on the new Power Mac, with no optimization or upgrades required.

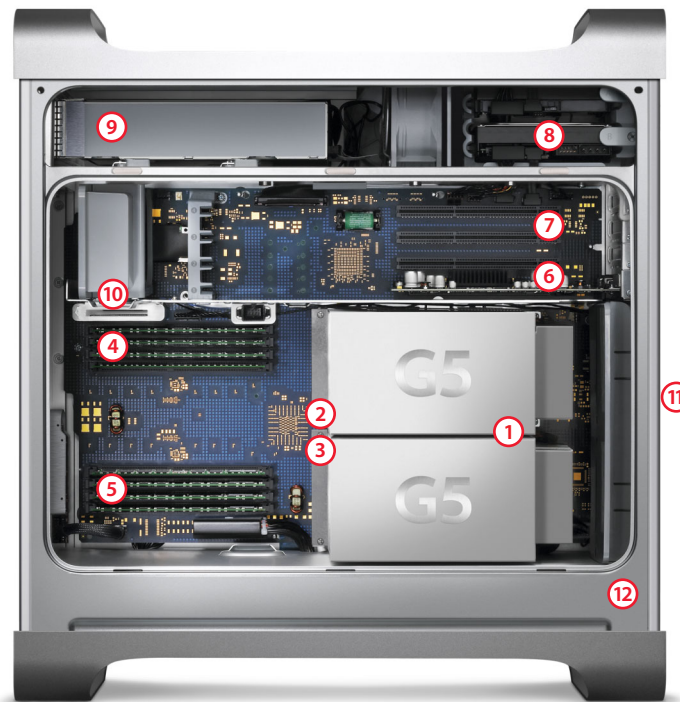
The Power Mac G5 also introduces a host of leading-edge standards to the Mac platform, making digital production, scientific solutions, and everyday work dramatically faster and more manageable. High-speed PCI-X slots allow you to connect to external devices using industry-leading expansion technology.⁴ Serial ATA enables fast access to up to 500GB of internal storage⁵ for huge databases and media assets, and an AGP 8X Pro graphics controller supports the next generation of graphics cards for eye-popping 2D and 3D visuals. What's more, the new Power Mac features an efficient cooling system based on superquiet, low-speed fans—all packed into an anodized aluminum chassis with easy access to internal components.

Whether you're a film director, a musician, a graphic artist, or a scientist, the Power Mac G5 is your path to enhanced creativity and unparalleled productivity. Discover how you can accomplish things you never dreamed possible.

Key Features

The groundbreaking Power Mac G5 sets a new standard for desktop computing. It's the industry's first personal computer with a 64-bit processor; and it has the industry's fastest frontside bus, fastest memory, and latest I/O technologies—all packed into an amazingly quiet enclosure.

Inside the Power Mac G5



- 1 Dual 64-bit PowerPC G5 processors.**⁴ The world's first 64-bit desktop processor—with clock speeds up to 2GHz, an optimized Velocity Engine, and two floating-point units—accelerates all types of creative applications.
- 2 Frontside bus up to 1GHz.** The industry's fastest frontside bus maximizes processor performance by transferring instructions and data at rates up to 8 GBps.
- 3 Dual independent 1GHz frontside buses.** In dual PowerPC G5 systems, each processor has its own dedicated frontside bus—another industry first—for an extraordinary combined throughput of up to 16 GBps.
- 4 400MHz DDR SDRAM.** A superefficient 128-bit memory bus speeds data in and out of main memory at up to 6.4 GBps.
- 5 Up to 8GB of addressable memory.** Today's Power Mac G5 supports system memory up to 8GB,⁴ ideal for manipulating high-resolution multimedia files and enormous data sets.
- 6 AGP 8X Pro.** The latest 533MHz, 32-bit graphics interface supports next-generation graphics cards for stunning 2D and 3D images and animations.
- 7 133MHz PCI-X.** The industry's fastest PCI-X slots allow you to connect to high-performance devices using advanced expansion technology.⁴
- 8 Serial ATA.** Serial ATA is the latest ATA mass storage technology. The Power Mac G5 has two independent channels of 150-MBps Serial ATA for fast access to high-capacity hard drives, providing up to 500GB of internal storage.⁵
- 9 SuperDrive.** A versatile DVD-R/CD-RW optical drive supports fast data archiving and media authoring.
- 10 Wireless connections.** Add an AirPort Extreme Card to network wirelessly⁶—or the Bluetooth module to connect to cell phones, PDAs, or printers.
- 11 High-performance I/O.** Fast ports make it easy to connect to the latest industry-standard solutions: Gigabit Ethernet networks, FireWire 800 and USB 2.0 peripherals, and optical digital audio equipment.
- 12 Quiet enclosure.** The Power Mac G5 sports an innovative new chassis designed to cool system components efficiently for the quietest possible operation.

The World's First 64-Bit Desktop Processor



The Power Mac G5 marks the arrival of a 64-bit architecture to the personal computer market. An all-new implementation of the PowerPC architecture, the G5 processor is based on the execution core of IBM's 64-bit POWER4 processor. Apple has teamed with IBM to leverage this industry-leading design for the next generation of personal computing.

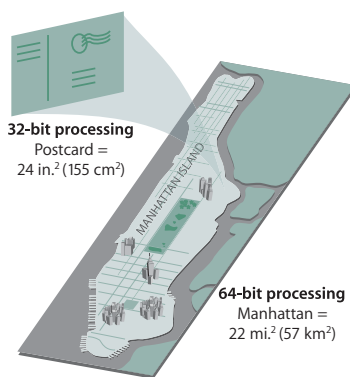
The result? The revolutionary PowerPC G5, with clock speeds up to 2GHz, puts enormous, seemingly infeasible tasks within easy reach. In addition to a highly parallel execution core, it uses 64-bit data paths and registers to perform huge integer calculations and highly precise floating-point math in a single clock cycle—dramatically accelerating audio, video, graphics, and scientific workflows.

An Exponential Leap in Computing Power

The label “32-bit” or “64-bit” characterizes the width of a microprocessor's data stream, which is a function of the sizes of its registers and the internal data paths that feed the registers. A 64-bit processor moves data and instructions along 64-bit-wide data paths, compared with the 32-bit-wide paths in 32-bit processors, such as the Pentium 4. In addition, 64-bit processors have wide registers that can store 64-bit numbers as well as 32-bit numbers.

The leap from 32-bit to 64-bit processing represents an exponential advance in computing power. With 32-bit registers, a processor has a dynamic range of 2^{32} , or 4.3 billion—which means it can express integers from 0 to 4.3 billion. With 64-bit registers, the dynamic range catapults to 2^{64} , or 18 billion billion—4.3 billion times larger than the range of a 32-bit processor. In addition, 64-bit processors enable personal computers to address massive amounts of main memory. Since a memory address is a special kind of integer and each address points to one byte in memory, the 64-bit G5 processor can theoretically address 18 exabytes (18 billion billion bytes) of virtual memory—or an amazing 4 terabytes of physical memory.

More practical and still unprecedented for a personal computer, the Power Mac G5 can be configured with 8GB of addressable memory⁴—four times more than a typical PC supports. Such large quantities of memory enable the system to contain a complex 3D model, a scientific simulation, or a sequence of video entirely in RAM—drastically reducing the time to access, modify, and render the data and making it feasible to tackle gigantic projects on a desktop system.



4.3 billion times bigger

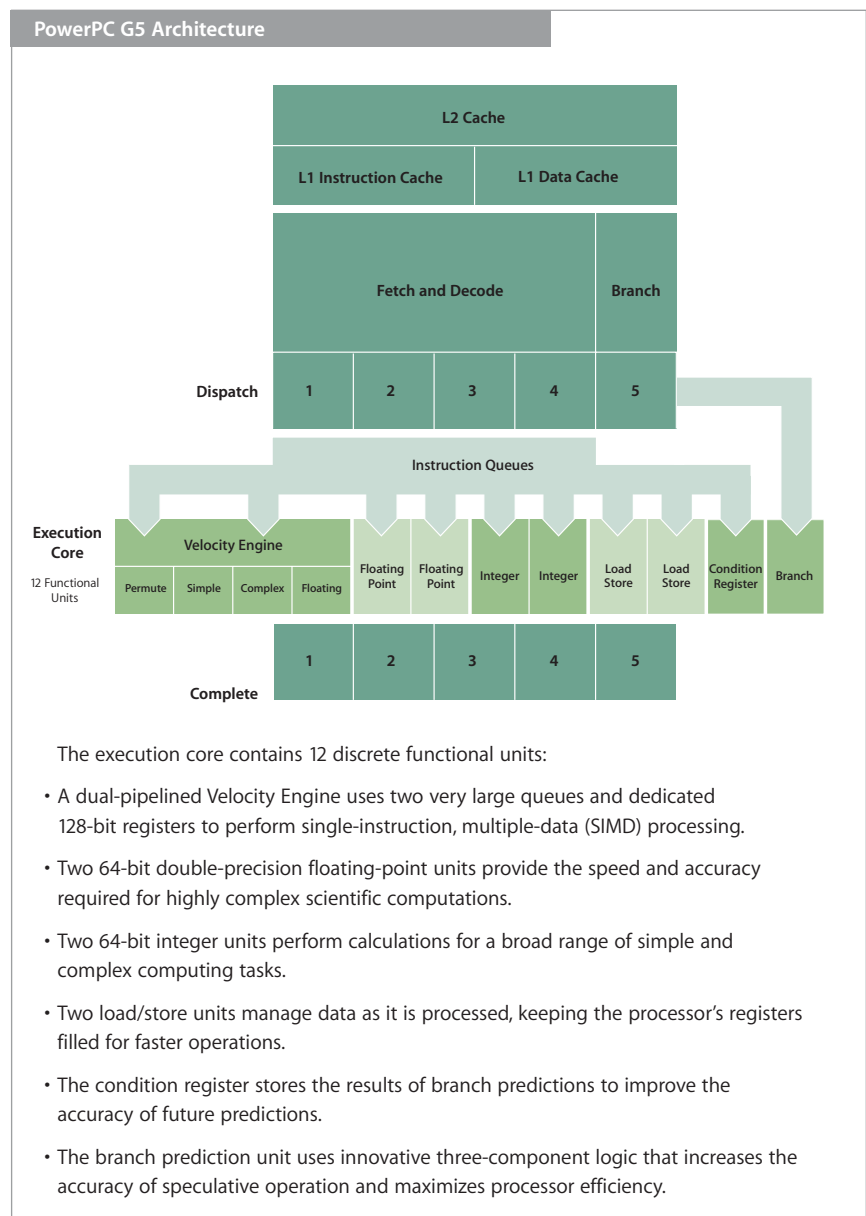
To grasp the exponential leap from 32-bit to 64-bit processing, imagine equating the range of numbers a processor can express with a two-dimensional area. A 32-bit processor can express a range of integers equal to the size of a postcard, while a 64-bit processor can express a range of integers larger than the island of Manhattan.

Next-Generation PowerPC Architecture

The design of the PowerPC G5 is based on the execution core of IBM's 64-bit POWER4 processor—recipient of the *Microprocessor Report's* 2001 Analyst's Choice Award for Best Workstation/Server Processor, which recognizes excellence in semiconductor technology innovation, design, and implementation. With two double-precision floating-point units, advanced branch prediction logic, and support for symmetric multiprocessing, the POWER4 drives IBM's top-of-the-line pSeries 690 servers.

Apple and IBM leveraged this industry-leading design to introduce the world's first 64-bit desktop processor. The development of the PowerPC G5 builds on previous PowerPC designs, combining an optimized Velocity Engine with a superscalar, super-pipelined execution core that supports up to 215 simultaneous in-flight instructions. This high-bandwidth core has over 12 discrete functional units that can process instructions in parallel.

For more information about the PowerPC G5 architecture, see www.apple.com/g5.





IBM is a worldwide leader in processor fabrication technologies, with a new \$3 billion, state-of-the-art facility in East Fishkill, New York.

Native Compatibility with 32-Bit Application Code

On other platforms, switching to a 64-bit computer requires migrating to a 64-bit operating system (and purchasing 64-bit applications) or running a 32-bit operating system in a slow emulation mode. With the PowerPC G5, the transition to 64-bit performance is seamless: Current 32-bit code—such as existing Mac OS X and Classic applications—runs natively at processor speed, with no interruptions to your workflow and no additional investment in software.

Unlike competing instruction sets, the PowerPC architecture was designed from the beginning to run both 32-bit and 64-bit application code. This enables the G5 processor to run Mac OS X natively for an immediate performance boost. In addition, as applications are optimized and as Mac OS X is further enhanced for the PowerPC G5, performance gains will be even greater.

State-of-the-Art Process Technology from IBM

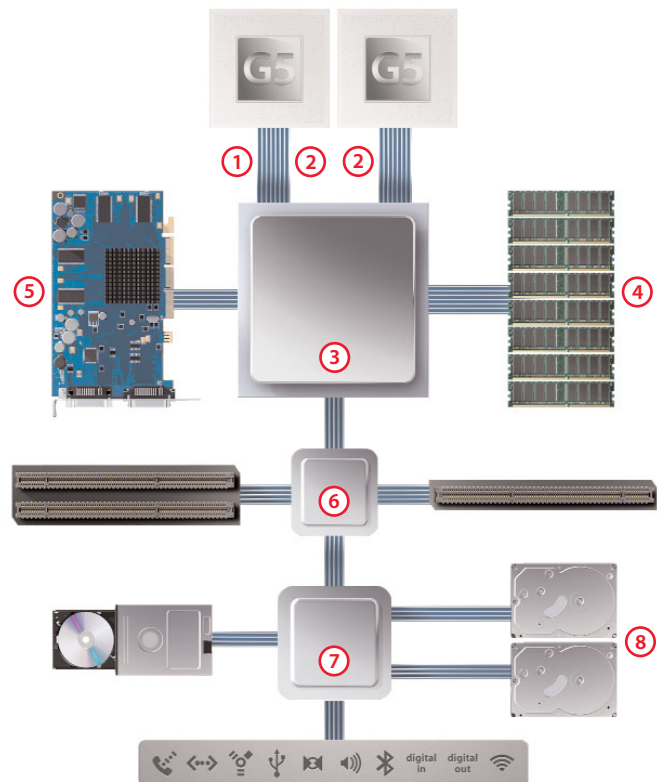
The PowerPC G5 is fabricated in one of IBM's world-class semiconductor manufacturing facilities. It uses 130-nanometer circuitry with more than 1130 feet of ultrathin wiring—nearly 800 times thinner than a human hair. With more than 58 million transistors, a high-performance silicon-on-insulator (SOI) process for faster operation, and eight layers of copper interconnects for improved conductivity, this scalable design contributes to clock speeds up to 2GHz.

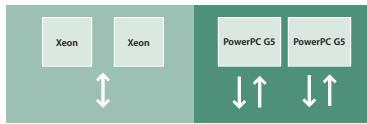
High-Bandwidth System Architecture

The Power Mac G5 matches the advanced technology of the PowerPC G5 with a new high-bandwidth system architecture. It begins with a 1GHz frontside bus⁴—one on each processor in dual processor systems—for maximum throughput to and from the PowerPC G5. A point-to-point system controller allows data to move directly between all subsystems, without impacting the processor. Bandwidth is further optimized by a 400MHz, 128-bit memory bus,⁴ an AGP 8X Pro graphics bus, and a HyperTransport interface that connects the PCI-X controller and the I/O subsystems to the system controller. The result is phenomenal throughput for tackling the most intensive image editing, media production, and scientific computing tasks—alleviating the limitations and bottlenecks of the traditional PC.

System Architecture

- ① **Frontside bus up to 1GHz.** Provides up to 8-GBps bandwidth between the processor and the rest of the system.
- ② **Dual independent 1GHz frontside buses.** Provides up to 16-GBps aggregate bandwidth in dual processor systems.
- ③ **Advanced system controller.** Uses a point-to-point architecture to enable data to pass directly between subsystems.
- ④ **400MHz memory.** Supports high-speed PC3200, 128-bit DDR SDRAM.⁴
- ⑤ **AGP 8X Pro graphics bus.** At 533MHz, doubles the throughput of AGP 4X and provides added power for high-end graphics cards.
- ⑥ **133MHz PCI-X expansion.** Supports advanced high-performance PCI devices, providing total throughput of up to 2 GBps.⁴
- ⑦ **High-performance I/O.** Integrates hard disk drives, SuperDrive, and FireWire 800, USB 2.0, networking, and optical digital audio ports.
- ⑧ **Serial ATA storage.** Supports 150-MBps Serial ATA drives for up to 500GB of fast internal storage.⁵





The bidirectional frontside bus allows data to travel to and from the PowerPC G5 processor at the same time. On dual processor systems, each PowerPC G5 has its own dedicated interface to maximize throughput—compared with dual Xeon-based systems, which force the processors to share a single bus.

Frontside Bus up to 1GHz

To harness the power of the G5 processor, a 64-bit bidirectional Double Data Rate (DDR) frontside bus maximizes throughput between the processor and the rest of the system. Unlike conventional processor interfaces, which can carry data in only one direction at a time, the PowerPC G5 features two dedicated, unidirectional 32-bit data paths (64 bits total): one traveling into the processor and one traveling from the processor. This enables data to move in opposite directions simultaneously—a dramatic improvement over previous processor interfaces, because there is no delay while the processor and the system controller negotiate which will use the bus or while the bus switches direction. In addition, the data streams integrate clock signals along with the data, allowing the frontside bus to work at speeds up to 1GHz for an industry-leading 8 GBps of bandwidth.

Dual processor systems get an even greater performance boost. Each G5 processor has its own 1GHz bidirectional interface to the system controller, for an astounding 16 GBps of total bandwidth, well over twice the 6.4-GBps maximum bandwidth of Pentium 4-based systems. In addition to providing fast throughput to main memory, this high-performance frontside bus architecture enables each PowerPC G5 to discover and access data in the other processor's caches—further increasing bandwidth on dual processor systems.

Advanced System Controller

A new system controller is central to the overall performance of the Power Mac G5. This revolutionary application-specific integrated circuit (ASIC)—one of the industry's fastest—is built using the same state-of-the-art IBM 130-nanometer process technology as the PowerPC G5 processor. A superefficient point-to-point architecture provides each primary subsystem with dedicated throughput to main memory, so massive amounts of data can traverse the system without contention for bandwidth. In contrast, subsystems that share a bus, as on other PCs, must deal with time-consuming arbitration while they negotiate for access and bandwidth across a common data path.

Memory up to 400MHz

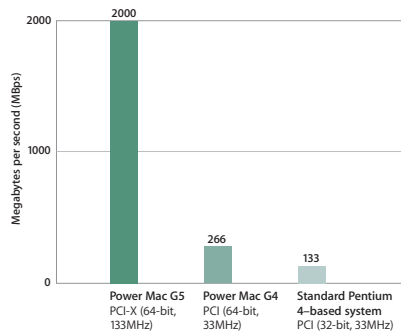
The Power Mac G5 features a memory controller supporting 400MHz, 128-bit DDR SDRAM.⁴ DDR memory allows the system to read and write data on both the rising and falling edge of each clock cycle. By combining fast DDR memory with a wider 128-bit interface that can address two banks of SDRAM at a time, the Power Mac G5 can reach a memory throughput of up to 6.4 GBps—more than double the throughput of the Power Mac G4. For even greater performance, direct memory access (DMA) works with the point-to-point system controller to give each subsystem—such as PCI and graphics slots—its own 6.4-GBps interface to main memory, without needing to interact with the processor.

With the 64-bit G5 processor, the Power Mac G5 can address more memory than any previous Macintosh and many other desktop PCs. The dual processor system can hold up to eight DIMMs for up to 8GB of memory. This high-speed, high-capacity memory architecture enables graphics, video, audio, and scientific applications to run radically faster. Enormous files and data sets can be loaded into RAM for rapid processing by the PowerPC G5—without having to access system storage. Data is transferred to memory 40 times faster than to the hard drive. In fact, accessing the first critical word of data from memory is 60,000 times faster than from a hard drive, so manipulation and analysis of data can be performed at remarkable speeds.

AGP 8X Pro Graphics Bus

The Power Mac G5 integrates the latest graphics interface, AGP 8X Pro, for next-generation gaming and advanced graphics production. Compared with the AGP 4X interface in previous Power Mac systems, the new specification doubles the maximum transfer rate and doubles the amount of data transferred in a single AGP bus cycle. The 32-bit, 66MHz AGP 8X Pro bus strobes eight times per clock cycle, resulting in a 533MHz data rate and a maximum bandwidth of 2.1 GBps. This increased performance enables graphics-intensive applications to achieve higher resolutions with improved complexity and texturing, for a more immersive visual experience.

The “Pro” component of the new AGP specification is designed to deliver additional electrical power to the graphics card. The Power Mac G5 uses High Power AGP, delivering 75 watts to support advanced, higher-powered graphics cards, such as the optional ATI Radeon 9800 Pro.



PCI-X versus PCI

The Power Mac G5 with PCI-X slots provides bandwidth up to 2 GBps for PCI devices, eight times more than a Power Mac G4 and sixteen times more than a Pentium 4-based system.

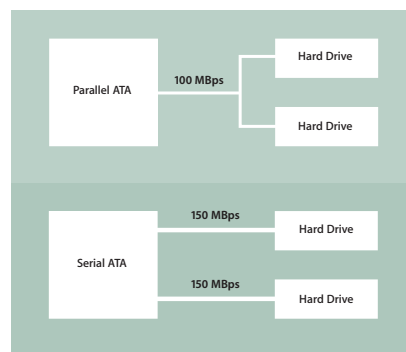
133MHz PCI-X Expansion

The Power Mac G5 introduces Macintosh users to PCI-X. This advanced expansion protocol addresses the need for higher-performance PCI devices, increasing the speed from 33MHz to 133MHz and throughput from 266 MBps to 2 GBps. PCI-X also operates more efficiently than PCI, resulting in more usable bandwidth at any clock frequency—ideal for high-bandwidth applications. The PCI-X specification uses 3.3V signaling and is designed for compatibility with legacy 3.3V and Universal cards.⁷

High-Performance I/O

The Power Mac G5 architecture uses the HyperTransport protocol to integrate the I/O subsystems and connect them to the system controller. Serial ATA, Gigabit Ethernet, FireWire, USB 2.0, optical digital audio, and analog audio are all integrated through two bidirectional 800MHz HyperTransport interconnects for a maximum throughput of 1.6 GBps.

For more information about the many expansion and I/O options available on the Power Mac G5, see the section “Leading-Edge Expansion.”



Serial ATA versus Parallel ATA

Serial ATA Storage

Serial ATA is the next-generation industry-standard storage interface, replacing the Parallel ATA interface. Designed to keep pace with the demands of digital video creation and editing, audio storage and playback, and other data-intensive applications, Serial ATA supports 1.5-Gbps throughput per channel (equivalent to a data rate of 150 MBps).

The Power Mac G5 can hold two internal Serial ATA drives for a total capacity of up to 500GB of storage.⁵ Each drive is on an independent bus, so there’s no competition for drive performance as with Parallel ATA. Performance is improved even further when drives are striped using software RAID in Mac OS X.

A Giant Leap over the Power Mac G4

The Power Mac G5 represents a huge leap over its predecessor. With the 64-bit G5 processor, high-bandwidth architecture, and leading-edge expansion options, Power Mac G5 users will realize performance gains in media streaming, video editing, real-time effects, audio synthesis, image processing, 3D rendering, numerical analysis, and physical modeling.

Compare the top-of-the-line dual 1.4GHz Power Mac G4 with the dual 2GHz Power Mac G5:

	Power Mac G4	Power Mac G5
Processor	32-bit PowerPC G4	64-bit PowerPC G5
Clock speed	1.4GHz	2GHz
Frontside bus	167MHz	1GHz per processor
Frontside bus bandwidth	1.3 GBps	8 GBps
Dual processor interface	One shared bus	Two independent buses
Dual processor bandwidth	1.3 GBps	16 GBps
Maximum memory	2GB	8GB
Memory	333MHz, 64-bit DDR SDRAM	400MHz, 128-bit DDR SDRAM
Memory bandwidth	2.7 GBps	6.4 GBps
Graphics	AGP 4X	AGP 8X Pro
PCI expansion	33MHz, 64-bit PCI	133MHz, 64-bit PCI-X
PCI throughput	266 MBps	2 GBps
ATA storage	100 MBps shared	150 MBps per channel

Superfast Graphics and All-Digital Displays

The Macintosh is the premier platform for processing digital media of all types. The Power Mac G5 features a powerful AGP 8X Pro graphics interface and the latest in high-performance graphics cards from NVIDIA and ATI. For crystal-clear viewing, Apple's gorgeous all-digital displays are the perfect complement to the world's most powerful personal computer. And support for dual displays—including two Apple LCD displays—is built into every system.⁸



AGP 8X Pro Graphics Options

3D graphics, modeling, animation, and visualization and the latest generation of games require the fastest graphics cards available. That's why the Power Mac G5 includes AGP 8X Pro, the industry-leading specification for high-bandwidth graphics and high-powered graphics cards.

Every Power Mac G5 system is built with a graphics card installed in the 533MHz AGP 8X Pro slot. Standard configurations feature the NVIDIA GeForce FX 5200 Ultra or the ATI Radeon 9600 Pro, both with 64MB of video SDRAM. The GeForce FX 5200 Ultra uses the CineFX engine and NVIDIA's advanced Lightspeed Memory Architecture II for photorealistic 3D graphics in today's games and design applications. The Radeon 9600 Pro kicks performance up a notch with a quad-pipe architecture, SmartShader 2.0 technology, and the HyperZ III+ memory architecture—for ultrarealism in gaming and visualization applications.

For the ultimate graphics experience, you can order a system with the ATI Radeon 9800 Pro with 128MB of SDRAM. This advanced card has the industry's first 8-pixel pipeline architecture and a superfast 256-bit memory interface—enabling incredible 3D rendering, sophisticated real-time effects, and unsurpassed image quality. A generous 128MB frame buffer supports large textures in the latest games and design applications, delivering a truly cinematic visual experience.

Graphics card options

	NVIDIA GeForce FX 5200 Ultra	ATI Radeon 9600 Pro	ATI Radeon 9800 Pro
Memory architecture	Lightspeed II	HyperZ III+	HyperZ III+
Memory interface	128-bit	128-bit	256-bit
Effects engine	CineFX 2.0	SmartShader 2.0	SmartShader 2.1
Frame buffer memory	64MB	64MB	128MB
Triangles per second	75 million	185 million	350 million
Fill rate (texels per second)	1.2 billion	1.5 billion	3 billion
Memory bandwidth	8.8 GBps	9.6 GBps	21 GBps

Apple Flat-Panel LCD Displays

Apple offers a lineup of pure-digital flat-panel displays that provide superior image quality, vivid color, and the industry's best wide-viewing technology—all at today's affordable prices. With a compact footprint to fit neatly in your work environment, Apple displays deliver the benefits of thin and light LCD technology, with twice the brightness, twice the sharpness, and twice the contrast of a standard CRT display. They can be calibrated for color-managed workflows and will maintain consistent color and quality without frequent recalibration.

For more information about Apple displays, visit www.apple.com/displays.

Apple Displays



Choose from these flat-panel displays:

- 17-inch Apple Studio Display (1280 by 1024)
- 20-inch Apple Cinema Display (1680 by 1050)
- 23-inch Apple Cinema HD Display (1920 by 1200)



Two Apple Cinema Displays in extended desktop mode provide an extra-wide viewing area.⁸

Support for Dual Displays

All Power Mac G5 systems are equipped with an Apple Display Connector (ADC) for connecting an Apple display and a DVI connector for a second digital display—with support for both extended desktop and video mirroring modes. Extended desktop mode lets you distribute work across two displays, allowing more room for viewing rich content and complex applications that use floating palettes and long timelines. For example, Final Cut Pro users can view the application interface on the primary display while watching the final video output on the other. In contrast, video mirroring outputs identical information on both displays, enabling you to control a presentation on one display while the audience watches it on a second display or projected image.

A DVI to VGA adapter is included for connecting to VGA displays, such as CRTs or projectors. The optional Apple DVI to ADC Adapter enables you to connect your Power Mac to two Apple displays, including two Apple Cinema HD Displays for an amazing 3840-by-1200-pixel resolution, or more than 4.5 million pixels. For even more flexibility, you can order the Apple DVI to Video Adapter to connect to S-video and composite devices, such as TVs, VCRs, or overhead projectors with S-video or RCA (composite) connectors.

Leading-Edge Expansion

The Power Mac G5 is packed with leading-edge technologies, making it easy to expand the capabilities of your system as your projects grow and your workflow evolves. A removable side panel provides quick access to slots and bays, so you can add memory, a second hard drive, or an AirPort Extreme Card—all without tools. Ports on the front and back panels allow you to plug in a variety of industry-standard input and output devices, including optical digital audio components, high-bandwidth FireWire devices, and USB 2.0 peripherals.



With the removable side panel, DIMM slots are easy to access.

Up to 8GB of Main Memory

The Power Mac G5 has four or eight DIMM slots that use ultrafast PC2700 or PC3200 DDR SDRAM. This high-performance memory operates at speeds up to 400MHz for a throughput of up to 6.4 GBps. Standard configurations come with 256MB or 512MB of RAM; memory is scalable up to 8GB,⁴ so you can add RAM as your application and workflow requirements increase.

PCI-X Expansion Slots

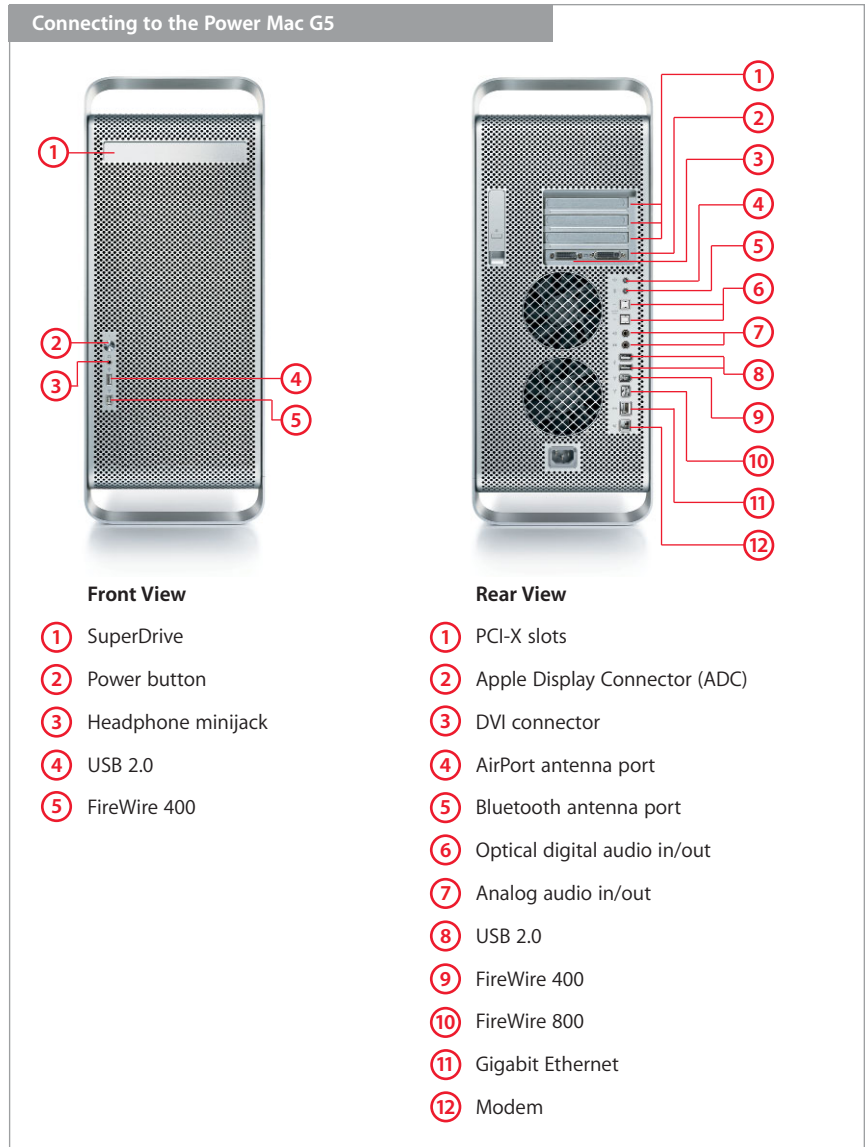
The use of PCI cards or higher-performance PCI-X cards enables the Power Mac G5 to perform specialized tasks, such as video acceleration or audio digital signal processing (DSP). For massive system storage, you can add a Fibre Channel PCI card to connect to Xserve RAID, Apple's high-performance storage system.

Systems can be configured with PCI or PCI-X expansion technology: Three 64-bit PCI-X slots allow you to add one card running at 133MHz and two cards running at 100MHz; or three 32-bit PCI slots allow you to add three 33MHz cards. PCI-X is designed to support 3.3V signaling and Universal 33MHz and 66MHz PCI cards.⁷

Up to 500GB of Internal Storage

The Power Mac G5 has two Serial ATA hard drive bays for up to 500GB, or half a terabyte, of fast internal mass storage⁵—ideal for video, audio, and high-resolution graphics. Built-in software RAID allows you to stripe the two drives for increased performance or mirror them for high reliability.

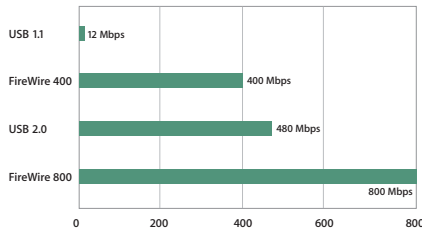
What's more, it's easy to add storage as your needs grow. Single-drive systems come with the cabling to connect a second hard drive, and the easy-to-remove side panel allows you to insert a new drive yourself, completely without tools.



Versatile SuperDrive

Every Power Mac G5 ships with an internal SuperDrive, a combination DVD-R and CD-RW optical drive, for reading and writing to DVDs and CDs. Disc burning is integrated into Apple applications such as DVD Studio Pro, iDVD, and iTunes—making it easy to author CDs and DVDs for use in most professional and consumer players. The SuperDrive is also ideal for backup. CDs can hold up to 700MB of data; DVDs can store 4.7GB of data, the equivalent of about seven CDs, 18 Zip 250 disks, or 3200 floppy disks. With Mac OS X, you can archive data to CD and DVD directly from the Finder.

The industry-standard SuperDrive reads dozens of standard CD and DVD formats, and the latest model burns discs twice as fast as before. It writes DVD-R discs at up to 4x speed, reads DVDs at up to 8x speed, writes CD-R discs at up to 16x speed, writes CD-RW discs at up to 10x speed, and reads CDs at up to 32x speed.



FireWire 800 versus USB 2.0

Due to the speed and efficiencies of FireWire 800, in many cases the effective bandwidth is more than twice that of USB 2.0.

Industry-Standard FireWire and USB 2.0

FireWire is one of the fastest peripheral standards ever developed, making it easy to connect high-bandwidth devices such as DV cameras, hard drives, and digital music players. And since FireWire cables carry power, the Power Mac G5 can recharge your portable device’s batteries, even while you’re using the device.

All Power Mac G5 systems have one FireWire 400 port on the front and one on the back of the enclosure, as well as a next-generation FireWire 800 port on the back. FireWire 800 doubles the throughput of the original FireWire 400, from 400 to 800 Mbps.⁹ In addition, FireWire 800 works over distances of up to 100 meters, making it ideal for operation in larger facilities.

Three USB 2.0 ports, one on the front and two on the back—plus two USB 1.1 ports on the keyboard—connect to printers, scanners, graphics tablets, keyboards, microphones, speakers, joysticks, and other industry-standard input and output devices.

For more information, see www.apple.com/firewire and www.apple.com/usb.

Wired and Wireless Networking

Gigabit (10/100/1000BASE-T) Ethernet is built into every Power Mac G5, and the autosensing port makes it easy to connect to the network. Wireless networking is just as simple using the optional 54-Mbps AirPort Extreme Card and AirPort Extreme Base Station.⁶ The optional Bluetooth module and antenna allow you to connect wirelessly to a range of digital devices, such as cell phones, personal digital assistants, and printers.

For more information on AirPort Extreme, see www.apple.com/airport. For more information on Bluetooth, see www.apple.com/bluetooth.

Optical Digital Audio

The Power Mac G5 features a comprehensive set of audio capabilities not commonly found in personal computers. State-of-the-art optical digital audio in and out ports use the S/PDIF (Sony/Philips Digital Interface) protocol over Toslink cables for connecting to devices such as decks, receivers, digital instruments, and even 5.1 surround sound speaker systems. Because optical digital audio transmits data as impulses of light rather than electrical signals, it enables true noise-free, pristine sound, eliminating troublesome ground loops.

Optical digital audio specifications¹⁰

	Input	Output
Data format	S/PDIF (IEC60958-3)	S/PDIF (IEC60958-3)
Connector type	Toslink optical (IEC60874-17)	Toslink optical (IEC60874-17)
Sample rates:		
– External clock mode	32kHz, 44.1kHz, or 48kHz	32kHz, 44.1kHz, or 48kHz
– Internal clock mode	16kHz to 96kHz	
Bits per sample	16 or 24	16 or 24
Signal-to-noise ratio:		
– External clock mode	Greater than 130 dB	Greater than 130 dB
– Internal clock mode	Less than –110 dB	
Total harmonic distortion:		
– External clock mode	Less than 0.00001 percent	Less than 0.00001 percent
– Internal clock mode	Less than 0.0003 percent	

Analog Audio

Completing the audio features of the Power Mac G5 are high-quality, analog stereo audio line in and line out ports; and a convenient minijack on the front panel that makes it easy to plug in headphones.

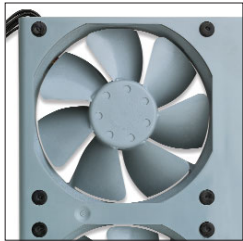
Analog input specifications¹⁰

	Line input
Sample rates	32kHz, 44.1kHz, or 48kHz
Bits per sample	16 or 24
Jack type	3.5 mm stereo
Input impedance	Greater than 47K ohms
Maximum input voltage	2.2V _{rms} (+8 dBu)
Frequency response	20Hz to 20kHz, +0.5 dB/-3 dB
Total harmonic distortion	Less than 0.006 percent

Analog output specifications¹⁰

	Line output	Headphone jack
Sample rates	32kHz, 44.1kHz, or 48kHz	32kHz, 44.1kHz, or 48kHz
Bits per sample	16 or 24	16 or 24
Jack type	3.5 mm stereo	3.5 mm stereo
Output impedance	24 ohms	24 ohms
Output voltage	1.4V _{rms} (+4 dBu)	1.4V _{rms} (+4 dBu)
Frequency response	20Hz to 20kHz, +0.5 dB/-3 dB	20Hz to 20kHz, +0.5 dB/-3 dB
Total harmonic distortion	Less than 0.01 percent	Less than 0.01 percent
Output power (into 32 ohms)		20 mW
Load	100K ohms	100K ohms

Innovative Enclosure Design for Quiet Operation



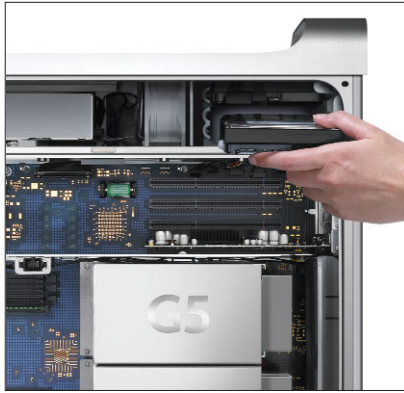
An industry-leading system demands an exceptional enclosure design. The Power Mac G5 features a modern chassis constructed of anodized aluminum. Inside, an efficient cooling system uses low-speed fans for superquiet operation—twice as quiet as a Power Mac G4.

Intelligent Cooling System Using Low-Speed Fans

The new Power Mac enclosure is divided into four discrete thermal zones, compartmentalizing the primary heat-producing components: processor, PCI, storage, and power supply. This allows the system to increase or decrease the temperature of a single zone without affecting the others—and without unnecessary cooling. The front panel is 35 percent perforated, so cooler outside air can enter, flow over the heat-producing components, and exhaust out the perforations in the rear panel. For added cooling efficiency, an internal air deflector channels airflow over the processor heat sinks and the PCI slots.

Each thermal zone is equipped with its own fans. Apple has engineered seven of the nine fans to spin at very low speeds for minimum acoustic output. Mac OS X constantly monitors component temperatures in each zone and dynamically adjusts individual fan speeds to the appropriate levels, achieving the quietest possible operation.





Easy Access and Usability

The removable side panel unlatches for fast access to the slots and bays inside the Power Mac G5. Expansion is simple: For example, you can add or remove the optical drive or an AirPort Extreme Card without tools. Easy-to-use drive guides are included, so you can add high-capacity hard drives as your requirements grow. An ingenious locking mechanism is integrated into the design of the panel latch, giving you a convenient and elegant way to keep the components inside your computer safe from tampering.

It's also easy to connect devices to the Power Mac G5. In addition to ports on the back, the front panel has FireWire 400 and USB 2.0 ports, as well as a headphone jack. For even more convenience, handles allow you to lift and move your Power Mac securely.

To install a new hard drive, just attach the drive guides and slide the drive onto the tracks until it clicks into place.

Mac OS X: System Software for the Power Mac G5



Built on open standards

Mac OS X is built on open standards, integrating seamlessly with Windows, Linux, and other UNIX systems—thanks to support for common network platforms, standard file formats, and cross-platform UNIX and Java applications. Also included in Mac OS X are innovative, industry-leading applications and core technologies, such as Quartz Extreme, Rendezvous, and QuickTime Pro.

Mac OS X combines the power and stability of UNIX with Apple's legendary ease of use. The Power Mac G5 ships with the latest version of Mac OS X v10.2 "Jaguar." Unlike other 64-bit platforms, no special 64-bit version is required; the same operating system runs on all your Mac computers.

Because it's fully compatible with 32-bit PowerPC application code, the Power Mac G5 eases the migration to 64-bit computing and protects your investment in software. Mac OS X doesn't revert to a slow 32-bit emulation mode, as is typical on other 64-bit platforms. Existing Mac OS X application code, as well as Classic applications, runs at full processor speed with no upgrades required. This seamless transition is possible because the PowerPC architecture, unlike competing instruction sets, was designed from the beginning to run both 32-bit and 64-bit application code.

In addition, Mac OS X v10.2.7 (G5) has been enhanced to leverage the capabilities of the 64-bit Power Mac G5.

- Built from the ground up for symmetric multiprocessing and multithreading, Mac OS X enables peak performance on dual PowerPC G5 systems.
- Mac OS X takes full advantage of the 8GB memory capacity of the Power Mac G5: It can now allocate up to 4GB of memory per process to easily fit memory-intensive applications into RAM.
- The math and vector libraries have been tuned to take full advantage of the PowerPC G5 processor's 64-bit integer and floating-point math capabilities and its optimized Velocity Engine.

While existing 32-bit applications benefit from the faster processor and high-bandwidth architecture of the Power Mac G5, performance gains will be more dramatic with PowerPC G5-optimized applications. Look for upcoming announcements from developers of popular professional applications.

Industry-Leading Performance

With 64-bit computing power and a high-bandwidth architecture, the groundbreaking Power Mac G5 opens up a wealth of creative possibilities. All this performance starts with the PowerPC G5, the first 64-bit desktop processor, running at clock speeds up to 2GHz. The industry's fastest frontside bus, an advanced system controller, and high-speed, high-capacity memory combine with advanced processing to make the Power Mac G5 the world's most powerful personal computer.

How fast is it? Apple tested the new systems using industry-standard SPEC benchmarks, as well as real-world applications. Take a look at the results.

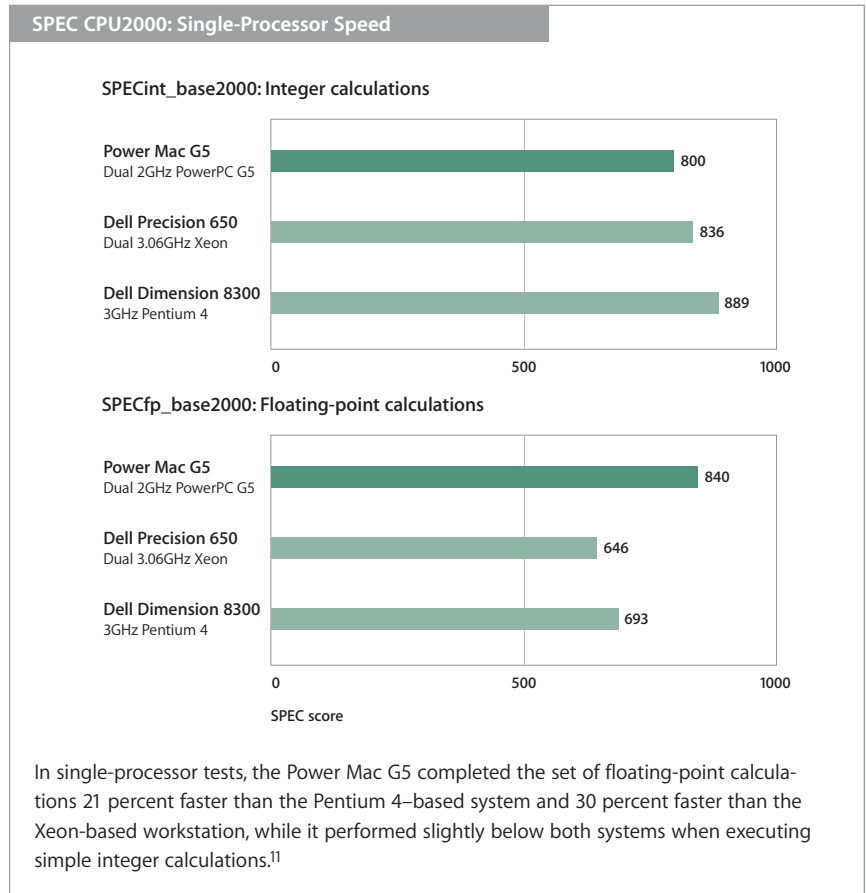
System Throughput

The Standard Performance Evaluation Corporation (SPEC) CPU2000 benchmark suite is the recognized industry standard for assessing processing performance. SPEC is a nonprofit organization of hardware and software vendors, universities, and consultants. They developed the SPEC CPU2000 benchmarks based on actual end-user applications. These tests depend on processor, memory subsystem, and compiler performance when executing integer and floating-point computations. For more information on the benchmarks, see www.spec.org.

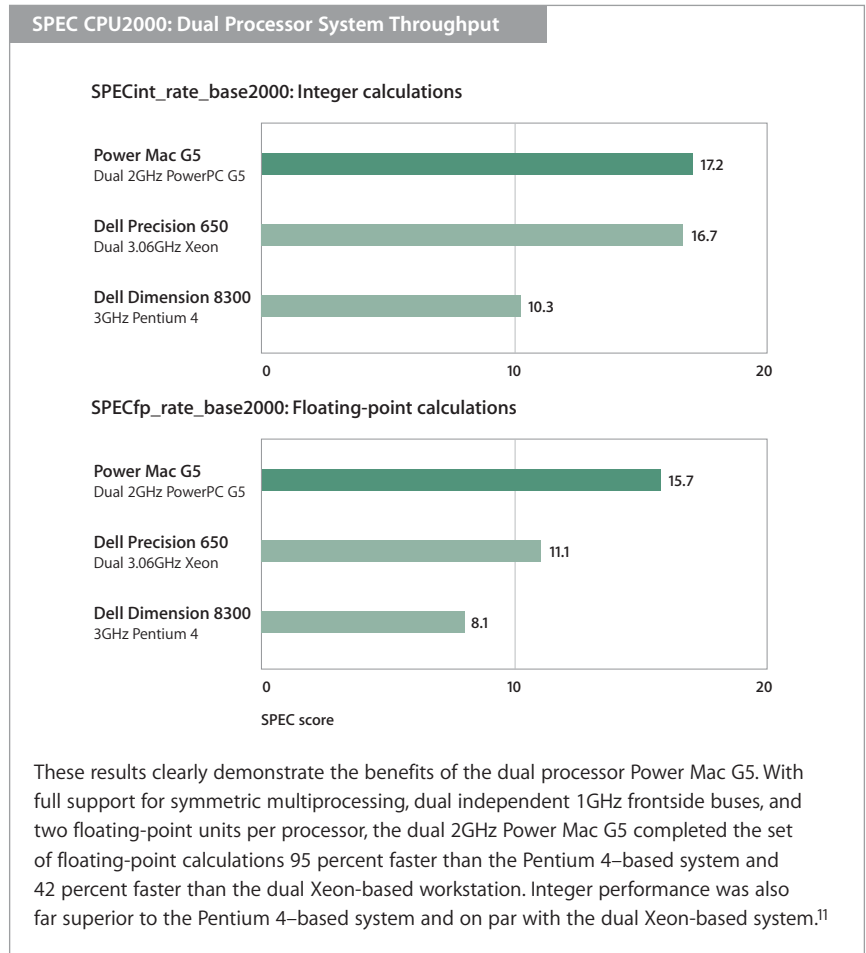
Apple hired an independent laboratory, VeriTest, to conduct the SPEC CPU2000 benchmark tests and provide documented results. Since SPEC CPU2000 measures the performance of both the hardware and the compiler, VeriTest normalized the compiler on both platforms to allow for a direct comparison of hardware performance alone. VeriTest used GCC—an open source compiler popular with programmers around the world—with similar settings on all systems. (Even though GCC cannot automatically generate Velocity Engine code for the PowerPC G5, settings included automatic generation of optimized SSE/SSE2 code for the Pentium 4 and the Xeon.) The Power Mac G5 used Mac OS X v10.2.7 (G5), and the Intel-based systems used Red Hat Linux 9.0.

The SPEC CPU2000 benchmark suite comprises four metrics—SPECint_base2000, SPECfp_base2000, SPECint_rate_base2000, and SPECfp_rate_base2000—to represent different performance characteristics of the system.

SPECint_base2000 and SPECfp_base2000 measure the speed of a single task—either an integer calculation or a floating-point calculation—executing on a single processor. Each test measures how long the processor takes to complete the benchmark set of single tasks relative to a SPEC-defined baseline score. SPECint_base2000 is composed of eleven C and one C++ benchmark applications, including a chess program, a data compression utility, and a place-and-route simulator. SPECfp_base2000 consists of six Fortran-77, four Fortran-90, and four C benchmark applications, including shallow-water modeling, neural-network simulation, and computational chemistry.



For comparisons that more accurately demonstrate the performance of a dual processor system, VeriTest used the “SPEC rate” metrics, which recognize multiple processors. With SPECint_rate_base2000 and SPECfp_rate_base2000, the benchmark code is compiled and multiple copies are run concurrently, allowing both processors to work in parallel. SPEC rate tests determine the number of times a system can complete the benchmark per hour, also referred to as system throughput.



For a detailed report of SPEC CPU2000 test results, see www.veritest.com.

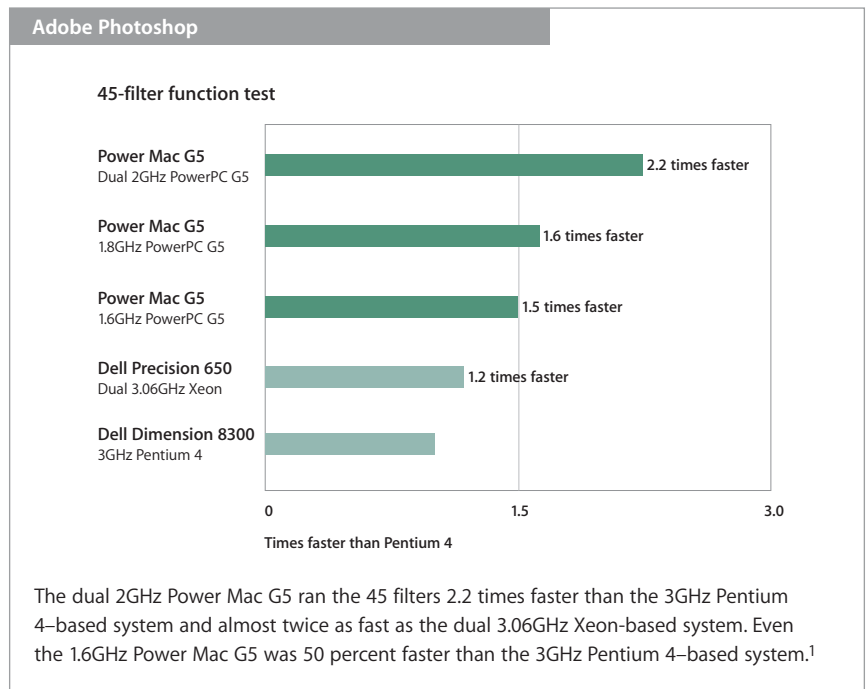


A new Adobe Photoshop 7.0 plug-in and software enhancements—available free of charge in August 2003—are designed to maximize performance on the Power Mac G5.

Design and Print

The Power Mac G5 provides the performance leap that design and publishing professionals have been waiting for. More system memory and a faster memory architecture make it possible to manipulate massive images and layouts entirely in RAM reducing the need to access the hard drive. Other hardware features accelerate design and print workflows: integrated Gigabit Ethernet, DVD burning, and fast Serial ATA hard drives.

As always, Mac OS X is the industry's most graphics-friendly operating system: ColorSync ensures consistent, accurate color; AppleScript makes it easy to handle repetitive tasks consistently across your workflow; and powerful font management features are built in. And since Mac OS X is designed for multitasking and memory management, designers can work in more applications than ever before. What's more, QuarkXPress 6 and Adobe Photoshop 7.0, the latest versions of the industry's most popular design applications, take full advantage of the underlying strengths of Mac OS X.

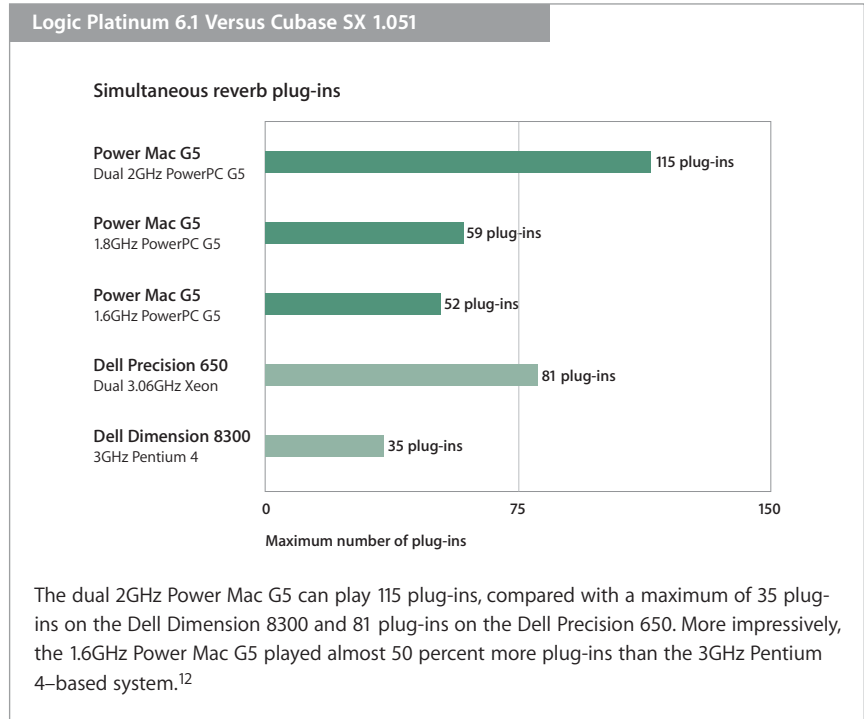




Logic Platinum from Emagic unites digital audio recording, digital signal processing, MIDI sequencing, and notation into a single, comprehensive software package.

Music and Audio

The Power Mac G5 supports more tracks and more plug-ins than any previous Power Mac—giving the audio pro a wealth of creative options all in a native environment. In addition, Mac OS X Core Audio offers a scalable platform supporting 32-bit high-resolution audio, a plug-in called Audio Units for DSP and Virtual Instruments, and plug-and-play connectivity for modern and legacy audio gear. And the built-in optical S/PDIF connects to other audio equipment for pristine sound quality without troublesome ground loops.

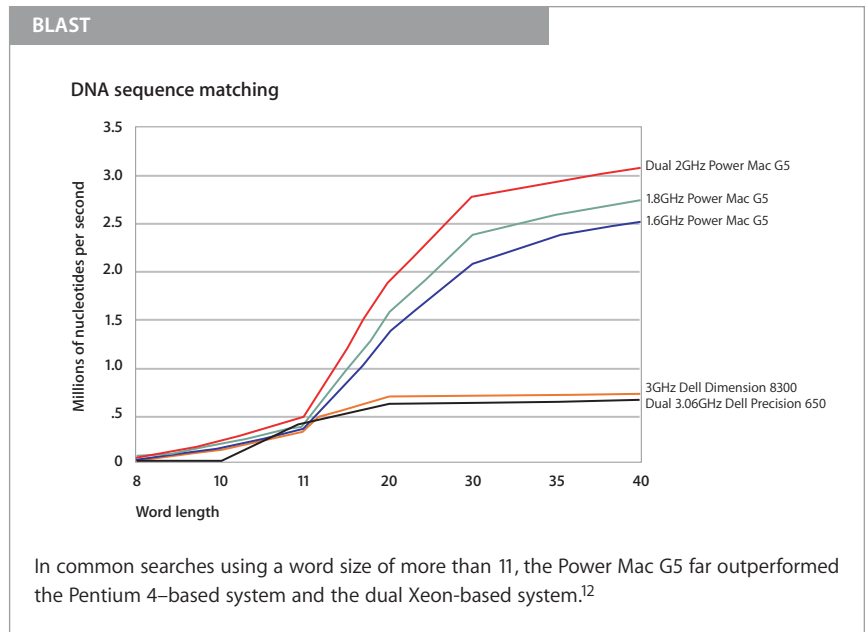


A/G BLAST

A/G BLAST is the PowerPC G5–optimized version of NCBI BLAST developed by Apple in collaboration with Genentech. For more information about A/G BLAST and the Power Mac G5 in science and technology, visit www.apple.com/scitech.

Science and Technology

High-speed data analysis and visualization are within easy reach on the 64-bit Power Mac G5. With an optimized Velocity Engine and two floating-point units, the PowerPC G5 performs huge computations dramatically faster. High-capacity, high-speed memory enables scientists to manipulate large models and data sets quickly and efficiently. And since Mac OS X is UNIX based, it's easy for them to run UNIX software—such as A/G BLAST, HMMer, and more—on the same system as their office and productivity applications.



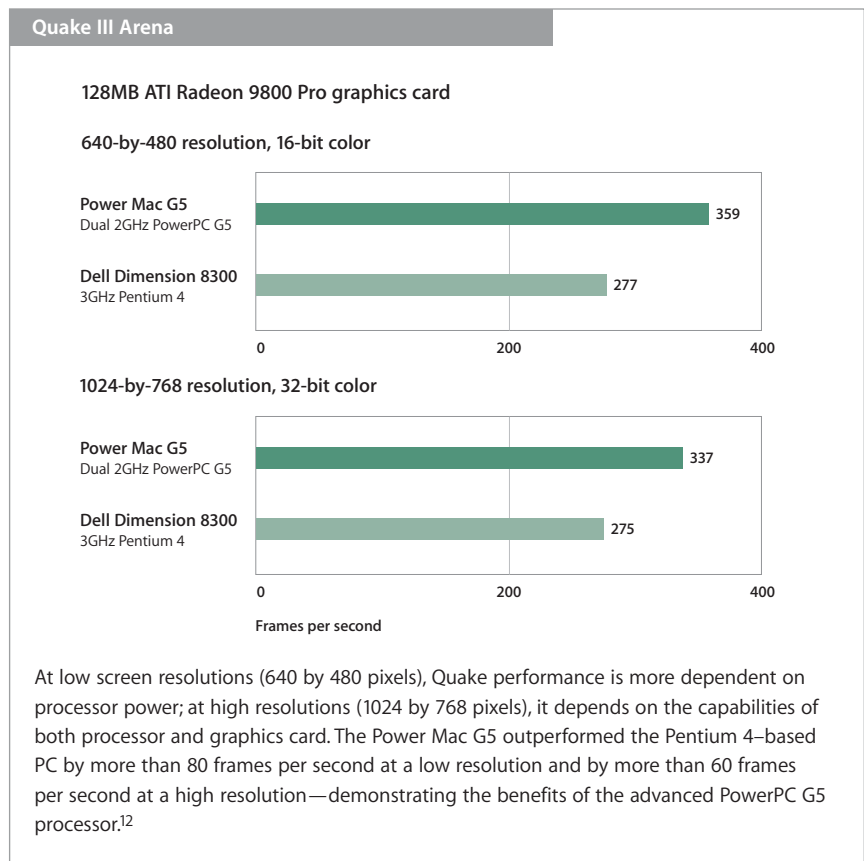


The ATI Radeon 9800 Pro features the industry's first 8-pixel pipeline architecture and a superfast 256-bit memory interface—enabling incredible 3D rendering, sophisticated real-time effects, and unsurpassed image quality. A 128MB frame buffer supports large textures in the latest games and design applications, delivering a truly cinematic visual experience.

3D Gaming

3D gaming involves complex visualizations and rapid movements that require maximum processor performance and top-of-the-line graphics capabilities. The Power Mac G5 provides a robust platform that not only supports the latest in 3D technology, but also delivers a great gaming experience.

An avid gamer understands that every frame per second counts when trying to survive in the gaming arena. With the addition of the latest graphics interface, AGP 8X Pro, the Power Mac G5 doubles the maximum data transfer rate over AGP 4X, and the amount of data transferred in a single AGP bus cycle also doubles. This advanced AGP technology combines with the superfast PowerPC G5 processor to deliver more frames per second at higher resolutions and with improved complexity and texturing.



For details about these and other performance tests, see www.apple.com/powermac/performance.

Product Configurations and Options

Why buy a Power Mac G5?

- The 64-bit PowerPC G5 accelerates all types of applications, thanks to clock speeds up to 2GHz, an optimized Velocity Engine, and two floating-point units.
- With the industry's fastest frontside bus and high-speed, high-capacity memory, creative applications rip through work faster than ever before.
- Whether you're at work or at play, you'll enjoy eye-popping graphics, especially when viewed on one of Apple's stunning flat-panel LCD displays.
- Apple's most expandable Mac provides high-bandwidth connections for a full range of industry-standard, high-performance peripherals.
- An innovative enclosure design uses a superefficient thermal zone scheme and low-speed fans to stay cool and quiet.
- Mac OS X and 32-bit application code run natively at processor speed, so you can keep using the world's most advanced operating system and all your favorite software.

Standard Configurations

Apple offers Power Mac G5 systems to meet the needs of creative professionals, media producers, educators, researchers, and businesspeople. The following standard configurations are available through the Apple Store and Apple Authorized Resellers.

Order number	M9020LL/A	M9031LL/A	M9032LL/A
Processor	1.6GHz PowerPC G5	1.8GHz PowerPC G5	Dual 2GHz PowerPC G5
L2 cache	512K	512K	512K per processor
Frontside bus	800MHz	900MHz	1GHz per processor
Main memory	256MB of PC2700 (333MHz) DDR SDRAM; 4GB maximum	512MB of PC3200 (400MHz) DDR SDRAM; 8GB maximum	512MB of PC3200 (400MHz) DDR SDRAM; 8GB maximum
Graphics	NVIDIA GeForce FX 5200 Ultra with 64MB of DDR SDRAM	NVIDIA GeForce FX 5200 Ultra with 64MB of DDR SDRAM	ATI Radeon 9600 Pro with 64MB of DDR SDRAM
Hard drive	80GB Serial ATA ⁵	160GB Serial ATA ⁵	160GB Serial ATA ⁵
Optical drive	SuperDrive (DVD-R/CD-RW)	SuperDrive (DVD-R/CD-RW)	SuperDrive (DVD-R/CD-RW)
PCI slots	Three open full-length 33MHz, 64-bit PCI slots	Three open full-length PCI-X slots: one 133MHz, 64-bit slot and two 100MHz, 64-bit slots	Three open full-length PCI-X slots: one 133MHz, 64-bit slot and two 100MHz, 64-bit slots
Expansion	One FireWire 800 port, two FireWire 400 ports (one on front); three USB 2.0 ports (one on front), two USB 1.1 ports (on keyboard); AGP 8X Pro slot with graphics card installed, including ADC connector and DVI connector; two internal hard drive bays (one occupied)		
Audio	Optical digital audio in, optical digital audio out, analog audio in, analog audio out, front headphone minijack and speaker		
Networking	10/100/1000BASE-T Ethernet, 56K V.92 modem, ¹³ AirPort Extreme ready, ⁶ Bluetooth option		
Software	Mac OS X, Mail, iChat, Safari, Sherlock, Address Book, QuickTime, iLife (includes iTunes, iPhoto, iMovie, and iDVD), iSync, iCal, DVD Player, and Classic environment; Acrobat Reader, Art Directors Toolkit, EarthLink, FAXstf, FileMaker Pro Trial, GraphicConverter, Microsoft Office v. X Test Drive, OmniGraffle, OmniOutliner, QuickBooks for Mac New User Edition, and Developer Tools		
Service and support	90 days of free telephone support and one-year limited warranty		
Also included	Apple Keyboard, Apple Mouse, USB keyboard extension cable, DVI to VGA adapter, modem cable, AirPort antenna		

Build-to-Order Options

Order a custom-configured computer from the Apple Store or an Apple Authorized Reseller. Build-to-order options can include the following:

- Memory (PC2700 or PC3200 DDR SDRAM; installed in pairs): 256MB, 512MB, 1GB, 2GB, 4GB, 8GB⁴
- Hard drives (Serial ATA): 80GB, 160GB, 250GB⁵
- Optical drive: SuperDrive (DVD-R/CD-RW), Combo drive (DVD-ROM/CD-RW)
- Graphics: NVIDIA GeForce FX 5200 Ultra with 64MB of DDR SDRAM, ATI Radeon 9600 Pro with 64MB of DDR SDRAM, ATI Radeon 9800 Pro with 128MB of DDR SDRAM
- Wireless: AirPort Extreme Card, AirPort Extreme Base Station, Bluetooth module with antenna

Apple Displays and Adapters

To complete your Power Mac G5 system, you can choose from Apple's family of all-digital, flat-panel displays.

- Apple Studio Display (17-inch flat panel), order number M7649ZM/B
- Apple Cinema Display (20-inch flat panel), order number M8893ZM/A
- Apple Cinema HD Display (23-inch flat panel), order number M8537ZM/A
- Apple DVI to ADC Adapter (for connecting a second Apple display), order number M8661LL/A
- Apple DVI to Video Adapter (for connecting S-video or composite devices), order number M9267G/A

Other Products

These products are available to enhance your Power Mac G5 system.

- Audio: Apple iPod, Harman Kardon SoundSticks, Logitech Z-680 5.1 speakers, Toslink optical digital cables
- External storage: Xserve RAID and Apple Fibre Channel PCI Card
- DVD-R Media Kit

Extended Service and Support

Purchase the AppleCare Protection Plan to extend your service and support to up to three full years. The plan provides support for your Mac, the Mac OS, and many Apple consumer applications, so just one phone call can help resolve most issues. You can also enroll one Apple display for coverage, provided that your Power Mac G5 and display are purchased together. For more information, visit www.apple.com/support/products or call 800-823-2775.

Technical Specifications

Processing

- 1.6GHz, 1.8GHz, or dual 2GHz PowerPC G5 microprocessors
- PowerPC processor architecture with 64-bit data paths and registers
- Native support for 32-bit application code
- 512K on-chip L2 cache running at processor speed
- Parallel data structure supporting up to 215 simultaneous in-flight instructions
- Simultaneous issue of up to 10 out-of-order operations
- Dual-pipeline Velocity Engine for 128-bit single-instruction, multiple-data (SIMD) processing
- Two independent double-precision floating-point units
- Advanced three-component branch prediction logic
- 800MHz, 900MHz, or 1GHz 64-bit DDR frontside bus supporting up to 8-Gbps data throughput; one on each processor in dual processor systems
- Point-to-point system controller

Memory

- 128-bit data paths for up to 6.4-Gbps memory throughput
- 1.6GHz systems:
 - 256MB of PC2700 (333MHz) DDR SDRAM
 - Four DIMM slots supporting up to 4GB of main memory
- 1.8GHz systems and 2GHz systems:
 - 512MB of PC3200 (400MHz) DDR SDRAM
 - Eight DIMM slots supporting up to 8GB of main memory
- Support for the following DIMMs (in pairs):
 - 128MB DIMMs (64-bit-wide, 128- or 256-Mbit)
 - 256MB DIMMs (64-bit-wide, 128- or 256-Mbit)
 - 512MB DIMMs (64-bit-wide, 256-Mbit)
 - 1GB DIMMs (64-bit-wide, 256-Mbit)

Graphics and displays

- AGP 8X Pro graphics slot supporting up to 2-Gbps data throughput, with one of the following graphics cards installed:
 - NVIDIA GeForce FX 5200 Ultra with 64MB of DDR SDRAM
 - ATI Radeon 9600 Pro with 64MB of DDR SDRAM
 - ATI Radeon 9800 Pro with 128MB of DDR SDRAM (build-to-order option)
- Support for digital resolutions up to 1920 by 1200 pixels
- Support for analog resolutions up to 1600 by 1200 pixels
- ADC and DVI connectors; DVI to VGA adapter included
- Dual display support for extended desktop and video mirroring modes
- Support for up to two Apple flat-panel displays⁸

Storage

- Two Serial ATA controllers supporting up to 150-MBps data throughput per hard drive
- Two 3.5-inch hard drive expansion bays with drive guides for a second drive
 - One 80GB or 160GB 7200-rpm Serial ATA drive installed in standard configurations⁵
 - Support for up to two internal Serial ATA drives; 500GB maximum system capacity⁵
 - 8MB memory buffers on all hard drives
- Optical drive bay with SuperDrive (DVD-R/CD-RW) installed; writes DVD-R discs at up to 4x speed, reads DVDs at up to 8x speed, writes CD-R discs at up to 16x speed, writes CD-RW discs at up to 10x speed, reads CDs at up to 32x speed

PCI expansion

- One of the following configurations:
 - Three open full-length 33MHz, 64-bit PCI slots
 - One open full-length 133MHz, 64-bit PCI-X slot and two open full-length 100MHz, 64-bit PCI-X slots

Communications

- 10/100/1000BASE-T Ethernet connector (RJ-45)
- Built-in 56K V.92 modem (RJ-11)¹³
- Expansion slot for optional 54-Mbps AirPort Extreme Card (based on IEEE 802.11g specification; 802.11b Wi-Fi certified)⁶
- External AirPort Extreme antenna
- Optional Bluetooth 1.1 module and antenna

Peripherals and audio

- One FireWire 800 port; two FireWire 400 ports (one on front panel; 15W total power)
- Three USB 2.0 ports (one on front panel), two USB 1.1 ports on keyboard
- Front headphone minijack and speaker
- Optical digital audio in and out Toslink connectors
- Stereo audio in and out minijacks

Electrical and environmental requirements

- Meets ENERGY STAR requirements
- Line voltage: 100–125V AC or 200–240V AC
- Frequency: 50Hz to 60Hz, single phase
- Maximum current: 6.5A (low-voltage range) or 7.5A (high-voltage range)
- Operating temperature: 50° to 95° F (10° to 35° C)
- Storage temperature: –40° to 116° F (–40° to 47° C)
- Relative humidity: 5% to 95% noncondensing
- Maximum altitude: 10,000 feet

Size and weight

- Height: 20.1 inches (51.1 cm)
- Width: 8.1 inches (20.6 cm)
- Depth: 18.7 inches (47.5 cm)
- Weight: 39.2 pounds (17.8 kg)¹⁴

For More Information

For more information about the Power Mac G5, visit www.apple.com/powermac.

Internet access requires a compatible Internet service provider; fees may apply. Product contains electronic documentation. Backup copy of software is included. ¹Tests performed by Apple in June 2003 using preproduction Power Mac G5 units. The Power Mac systems ran a PowerPC G5–optimized version of Photoshop 7.0.1 including optimized AltivecCore, ACE, and BIB Carbon Libraries; the Dell Dimension ran Photoshop 7.0.1. ²“World’s fastest” based on SPEC CPU2000 benchmark results and leading professional application performance tests against 3GHz Pentium 4–based Dell Dimension 8300 and dual 3.06GHz Xeon-based Dell Precision Workstation 650. SPEC CPU2000 benchmarks run with GCC 3.3 compiler and independently tested; professional applications tested by Apple, June 2003. ³Based on SPEC CPU2000 benchmark results against 3GHz Pentium 4–based Dell Dimension 8300 and dual 3.06GHz Xeon-based Dell Precision Workstation 650, run with GCC 3.3 compiler and independently tested, June 2003. ⁴Selected models. ⁵1GB = 1 billion bytes; actual formatted capacity less. ⁶Achieving data rates of 54 Mbps requires that all users have an AirPort Extreme Card and connect to an AirPort Extreme Base Station. If any user of Wi-Fi certified 802.11b products joins the network, that user will get up to 11 Mbps and AirPort Extreme network users will get less than 54 Mbps. Actual speed will vary based on range, connection rate, site conditions, size of network, and other factors. ⁷Check with manufacturer for compatibility. ⁸Second Apple flat-panel display requires Apple DVI to ADC Adapter, sold separately. ⁹Actual rates will vary. ¹⁰Preliminary specifications based on preproduction Power Mac G5 units. ¹¹Based on SPEC CPU2000 benchmark results against 3GHz Pentium 4–based Dell Dimension 8300 and dual 3.06GHz Xeon-based Dell Precision Workstation 650m, performed by VeriTest, June 2003. ¹²Tests performed by Apple in June 2003 using preproduction Power Mac G5 units with application software optimized for the PowerPC G5. ¹³Compatible ISP and telephone services required. Your ISP may not support all V.92 features. Modem will function according to V.90 standards if V.92 services are not available. Actual modem speeds lower. ¹⁴Weight varies by configuration and manufacturing process.

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