Macintosh PowerBook G3 Series

Reviewer's Guide
June 1999

Contents

Slim. Stunning. Superfast.

We are pleased to introduce the new PowerBook G3 Series. With PowerPC G3 processors running at up to 400 megahertz, a thinner and lighter design, and up to 5 hours of battery life, the new Macintosh PowerBook G3 Series is the ultimate combination of performance and mobility.

The PowerBook G3 Reviewer's Guide will take you through the product's new features, performance benchmarks, configurations, and the advancements we've made since the last PowerBook was introduced.

Thank you for taking the time to review the new PowerBook G3.

The Macintosh PowerBook G3 Series Product Team

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Macintosh PowerBook G3 Background

In May 1998 Apple Computer introduced the PowerBook G3 Series. With its sleek design and Pentium-crushing performance, it took the notebook world by storm and set new standards in style and performance for notebook computers. One year later, Apple is proud to introduce the new PowerBook G3 Series.

Here is a brief summary of the key features of the new PowerBook G3 Series. The Reviewer's Guide goes into more depth on all of these points.

- Stunning Style—Thinner and lighter than ever before, PowerBook G3 models start at just 5.9 pounds with curves around every corner
- Outstanding Performance—The fastest performance of any notebook computer in the world with PowerPC G3 processors running at up to 400 MHz
- Longer Battery Life—Up to 10 hours of battery life with dual-battery capability
- New I/O Technology—Two USB ports and support for FireWire through CardBus for access to the latest high-speed peripherals
- Advanced Multimedia—Support for dual-display capability, brilliant DVD movie playback, and built-in VGA and S-video output ports for easy connections to an external monitor, video projector, or TV
- Integrated Communications—Built-in 10/100BASE-T Ethernet and 56K modem with V.90 support for connections to high-speed networks
- Expansion Capabilities—Add more storage, video, or networking capabilities through the integrated ports, PC Card slot, and hot-swappable expansion bay
- Build to Order—Choose a prebuilt system or configure one at the Apple Store

Target Markets

Apple's product strategy is a simple one. We build desktop and portable products designed for consumers and professionals. The PowerBook G3 is made for the professional segment and it's ideal for those who need desktop performance in a mobile design, whether they work in creative design, education, or business.

Publishing and creative professionals

These customers include graphic designers, copywriters, art directors, musicians, consultants, and video creators who work at home, on location, and at client sites. They need a mobile system to design marketing campaigns, write scripts, create web sites, write and perform music, edit video, and other creative tasks. They require advanced capabilities—including the fastest processors, largest hard drives and RAM capacity, big displays, and forward-looking I/O (input/output) technologies such as FireWire, USB, and 100BASE-T—to get their work done.

Education customers

These customers include K–12 faculty and administrators and higher education students, faculty, and administrators. They use a PowerBook to do homework, create presentations, work on lesson plans, perform research, and send e-mail. And they need all these capabilities in a system they can afford. Because it has built-in video output ports for hooking up a monitor, projection device, or TV, the PowerBook is often used as a teacher workstation for presenting information to students. Our education customers also require a portable computer that has built-in Ethernet capabilities for easy access to the Internet.

Corporate customers

These customers include marketing, sales, finance, and accounting consultants who regularly give presentations, track account activity, design spreadsheets, and travel from customer site to customer site. They require a system that is light, powerful, and communications-ready with both Ethernet and modem built in to help them accomplish their tasks while in the office or on the road.

Outstanding Performance

Performance is a big part of the PowerBook G3 story. According to our market research, customers say that performance is one of the top reasons for purchasing their PowerBook. The vast majority of those customers also noted that the PowerBook is their primary system. The new PowerBook G3 takes performance to the next level with faster PowerPC G3 processors, support for up to 384MB of memory, and the latest I/O technology, including built-in USB and support for FireWire. The new PowerBook G3 also offers customers the longest battery life ever—up to 10 hours on two batteries. Several new multimedia and communications features round out the performance story. All of these elements make the PowerBook G3 the most compelling full-featured notebook computer available today.

Processors up to 400 Megahertz

PowerPC G3 processors are at the heart of the performance story. The new PowerBook G3 features 333-MHz and 400-MHz PowerPC G3 processors. They include an integrated floating-point unit and a 64K level 1 cache (32K for data and 32K for instruction). Systems also feature a separate backside bus for level 2 cache.

These new copper-based processors are not only faster, they are smaller too—only 40 mm^2. In addition, they draw less power—about 4.5 watts on average. A 366-MHz Intel Pentium II processor draws about 9.5 watts on average. That's over twice as much as the 400-MHz PowerPC G3 processor. These new PowerPC G3 processors also run cooler. All of these features are ideal for mobile systems, and one of the direct benefits to the customer is longer battery life.

Level 2 backside cache is another feature that increases system performance. The 333-MHz processor comes with 512K of level 2 backside cache and the 400-MHz processor has 1MB. This cache dramatically increases overall system performance by allowing large amounts of data to be stored and accessed rapidly and efficiently by the microprocessor.

PowerPC G3 processors are specifically optimized for the Mac OS. Optimization designs were based on many popular Macintosh applications to ensure minimal branching and the shortest data transfer routes—resulting in a very efficient processor. With all this horsepower, customers can look forward to outstanding performance when they use applications that range from high-end graphics to Internet authoring to Windows emulation.

Performance Benchmarks

Benchmarks are a great way to illustrate performance improvements. We use subsystem-level benchmark tests as well as application testing to track performance. We've compared the new PowerBook G3 Series to its award-winning predecessor, and we've also gone head to head with Pentium-based systems to illustrate the performance advantage that Apple has over its PC competitors.

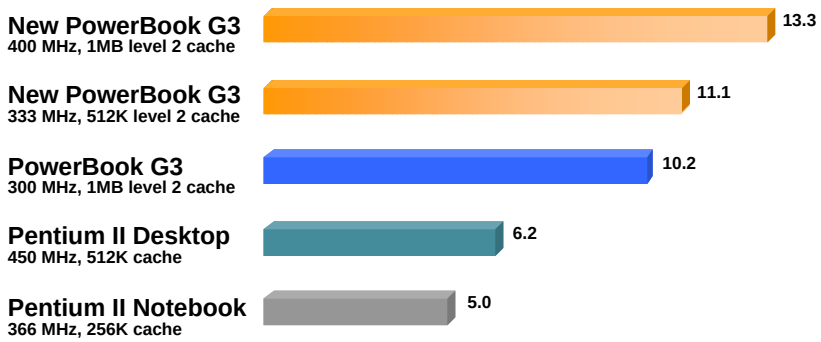
BYTEmark results

One of the first tests we perform when we get a new processor is the BYTEmark test. BYTEmark is an independently sponsored benchmark that compares raw processor performance across platforms. This test provides a clear indication as to the maximum possible performance from the processor and cache. The results below clearly show that the PowerPC G3 is a much more efficient processor than the Pentium II at equivalent processor clock speeds.

Once again, the processors in the PowerBook G3 Series are up to twice as fast as the Pentium II–based processors found in both desktop and notebook PCs. It's no wonder that customers ranging from graphic artists to engineers to marketing professionals choose the PowerBook G3 to create and present their work. It provides outstanding performance in a mobile package that easily outpaces the Pentium II–based desktop and notebook PC competition.

Performance Comparisons

BYTEmark Processor Integer Performance Comparison



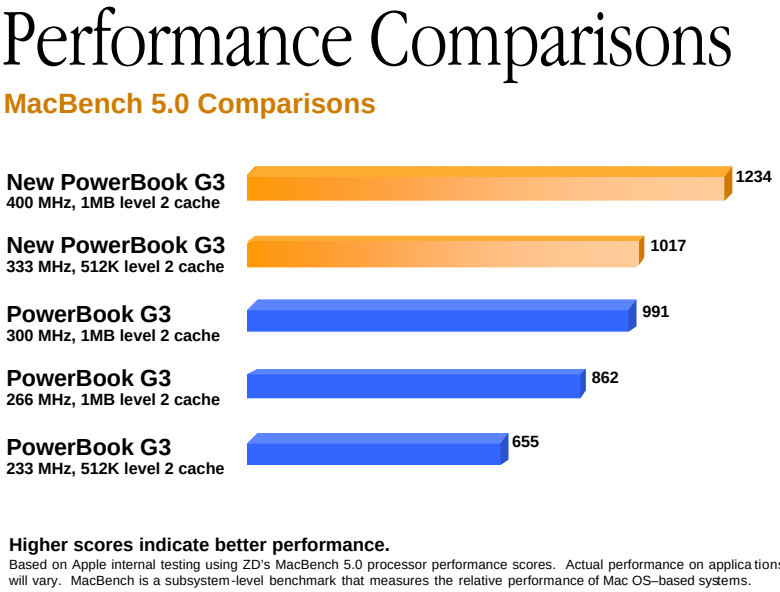
Higher scores indicate better performance.

Based on BYTEmark integer index processor scores. © McGraw-Hill.

MacBench 5.0 results

The MacBench processor test provides an excellent comparison of processor performance across different Macintosh PowerBook G3 systems. MacBench 5.0 from Ziff Davis is a subsystem-level benchmark test that measures the relative performance of Mac OS–based systems. We ran the MacBench 5.0 suite on the previous PowerBook G3 line to recalibrate the scores across the board.

As you can see, the new PowerBook G3 is a clear performance leader. Our new high-end system running at 400 MHz is 25% faster than our previous high-end processor at 300 MHz. Just to give you a perspective on how PowerBook compares to the desktop line, the new 450-MHz Power Macintosh G3 scores 1467 on the processor performance test. Our 333-MHz entry-level processor is approximately 55% faster than our previous entry-level processor running at 233 MHz with 512K of L2 cache.



Application performance

While the results of processor benchmarks are a good indication that a computer's hardware design is moving in the right direction, it's also valuable to test a system with real-world tasks. Adobe Photoshop and Macromedia Director come in both Mac and Windows versions and are ideal applications to use for performance testing because of their graphics-intensive nature. We compared the new PowerBook G3 models with a 366-MHz Pentium II–based notebook system and a 500-MHz Pentium III–based desktop system. All systems were equipped with 128MB of RAM. You can try these tests for yourself with the test files that we have provided on the accompanying CD.

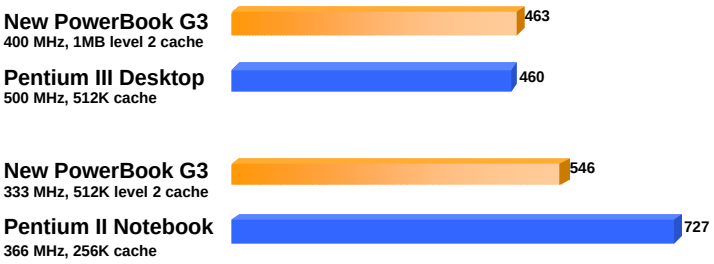
Adobe Photoshop

More customers than ever are using Photoshop on their PowerBook G3 systems. Now they can easily create and manipulate files with these high-performance systems featuring fast PowerPC G3 processors, up to 1MB of level 2 cache, and advanced multimedia capabilities. Now creative directors, web site designers, and graphic artists can create, present, and edit all their work on one system. The PowerBook G3 gives them creativity to go!

The Photoshop test that we designed consists of 16 commonly used actions including filters and blurs. The details of this test are provided in the appendix of the Reviewer's Guide. As you can see from the chart, lower scores indicate better performance. While the 500-MHz Pentium III–based desktop outperformed our 400-MHz PowerBook, it was only by 3 seconds, or approximately a 1% margin. Our 333-MHz PowerBook easily beat the 366-MHz Pentium II–based notebook. It took the Pentium notebook 33% longer to complete the tasks.

Performance Comparisons

Photoshop Performance



Lower scores indicate better performance.
16 Photoshop actions tabulated in terms of seconds to complete

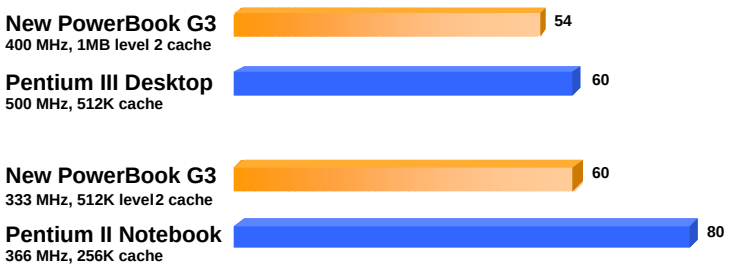
Macromedia Director

Macromedia Director is another favorite application of the design community. It allows them to combine sound, graphics, animation, text, and video to create compelling content.

In this test we ran three different Director animations, with the test scored in seconds to completion. This test protocol is provided in the appendix. Once again we put the PowerBook G3 with its 400-MHz processor up against the 500-MHz Pentium III–based desktop. This time the PowerBook beat the desktop system by 6 seconds. The 333-MHz PowerBook had a 20-second margin over the 366-MHz Pentium II–based notebook, and it even tied the Pentium III–based desktop system.

Performance Comparisons

Macromedia Director Performance



Lower scores indicate better performance.
Sum of time for 3 different Director animations

Based on these two application tests, the performance advantages are clear: The PowerBook G3 is made for creative professionals who want the ultimate combination of performance and mobility.

Memory Expansion up to 384MB

The Macintosh PowerBook G3 supports up to 384MB of SDRAM because the larger the amount of RAM in a system, the more optimal the application performance. The SDRAM is the same type used in the previous generation. There are two SO-DIMM slots in the PowerBook G3 located on either side of the processor daughter card. The top slot accommodates 2-inch cards and the bottom slot takes 1.5-inch cards. Prebuilt systems come with 64MB of RAM installed in the bottom slot of the processor daughter card. The top slot is left open for future expansion.

Battery Life up to 5 Hours

Performance is not just about working faster. It's also about being able to work longer on battery power alone. The new PowerBook G3 has a number of things working in its favor when it comes to longer battery life. As we noted before, the copper-based PowerPC G3 processor plays a big part by drawing less power and running cooler. But Mac OS 8.6 has dramatically improved power management, which also helps the system run more efficiently.

The new PowerBook G3 now boasts up to 5 hours of battery life with one lithium-ion battery and up to 10 hours on two batteries, based on normal use. Most Windows-based notebooks are rated between 2.5 and 3.5 hours. In our severe rundown test, we got up to 3 hours of run time on one battery while playing a DVD movie (most movies typically last about 2 hours). Of course, battery life will vary depending on your configuration and usage. For the best battery life possible, we recommend adjusting the Energy Saver settings from the control panel or the Control Strip module. By invoking power cycling and reducing processor speed, you'll see increased battery life. Dimming the screen brightness and spinning down the hard drive also can extend battery life.

Battery life tests

We conducted three tests that simulated real-life situations, borrowing a concept from the auto industry to show how battery life, or "mileage," may vary depending on how you use your PowerBook. We've labeled our tests "city," "highway," and "racing." Details of how to replicate these tests are located in the appendix, and a quick summary is provided below.

The "city" test is designed to replicate a typical user environment where e-mail or word processing is being done. Power-saving features such as processor cycling and reduced processor speed are engaged for this test. The test actions include opening and closing applications and typing in each of the applications. The "highway" test replicates the most economical usage pattern and involves a simple task like opening an application and allowing the battery to drain. Finally, the "racing" test represents the most aggressive power usage pattern; it involves playing a DVD movie from the DVD-ROM drive or a QuickTime movie from the hard drive until the battery is completely drained.

PowerBook battery life has never been better. Thanks to new copper-based processors and better power management in Mac OS 8.6, we went from up to 3.5 hours on the previous PowerBook to up to 5 hours on the new PowerBook G3 Series. That's a 43% increase in battery life.

Advanced Multimedia

Today's mobile professionals are doing more than ever on a PowerBook, including creating and delivering presentations, designing web sites, and editing digital video. The new PowerBook G3 has an impressive array of advanced multimedia capabilities to help them with these tasks.

Display, video RAM, video controller

The brilliant 14.1-inch active-matrix TFT display is great for presentations or simply as a large workspace. And with 8MB of video memory, you can display up to millions of colors on the built-in screen or on an external monitor. The ATI RAGE LT Pro video controller brings high-performance 2D/3D graphics acceleration to the PowerBook G3, which is important for 3D rendering and games.

Dual display and video mirroring

The most important new feature in the advanced multimedia category is the dual-display capability. Now customers can extend their workspace by connecting to an external monitor and, in essence, adding more on-screen real estate. This feature is especially helpful when working in graphics applications like Adobe Photoshop. Customers can place the image on the external monitor and leave their tools and palettes on the internal display of the PowerBook.

Video mirroring is another useful feature, especially for presenters who use a video projector. Video mirroring allows you to see your presentation or other work on the internal PowerBook display as well as the external projection device. With built-in video output, the PowerBook G3 is also an ideal teacher workstation.

Lid-closed operation

Another feature that is back in the PowerBook line is the ability to operate the system with the lid closed. In this mode, all 8MB of video memory is used to display colors on the external display. The PowerBook must be plugged in to the AC power adapter to use this feature. To start up the PowerBook with the display closed and an external monitor attached, connect an Apple USB keyboard and mouse and then press the Power button on the external keyboard. To activate the internal display again, put the PowerBook to sleep and wake it with the display open.

Video output

Adding an external monitor, video projector, TV, or VCR is easy with the built-in VGA and S-video ports that come standard on all configurations. The S-video output is also useful for connecting your PowerBook to a TV for presentations or even playing DVD videos.

Resolutions supported on external monitors

Resolution	Bits per pixel (bpp)	Number of colors
512 x 384	8 bpp	256
	16 bpp	Thousands
	24 bpp	Millions
640 x 480	8 bpp	256
	16 bpp	Thousands
	24 bpp	Millions
640 x 870	8 bpp	256
	16 bpp	Thousands
	24 bpp	Millions
800 x 600	8 bpp	256
	16 bpp	Thousands
	24 bpp	Millions
832 x 624	8 bpp	256
	16 bpp	Thousands
	24 bpp	Millions
1,024 x 768*	8 bpp	256
	16 bpp	Thousands
	24 bpp	Millions
1,152 x 870	8 bpp	256
	16 bpp	Thousands
	24 bpp	Millions
1,280 x 960	8 bpp	256
	16 bpp	Thousands
	24 bpp†	Millions†
1,280 x 1,024	8 bpp	256
	16 bpp	Thousands
	24 bpp†	Millions†

*Video mirroring mode is supported using the standard resolution.

†24-bpp color is only available on the external monitor when the PowerBook display is closed.

Latest I/O Technology

Expandability is important to PowerBook users. There are several ways to expand the capabilities of the new PowerBook G3, including the addition of external peripherals, expansion modules, and PC Cards. In addition, the new PowerBook G3 Series features support for two of the hottest peripheral technologies available today—USB and FireWire.

USB: The ultimate plug-and-play I/O

There are two USB (Universal Serial Bus) ports on the back of the new PowerBook G3. A myriad of USB-based printers, keyboards, mice, storage devices, and digital cameras can be connected to the PowerBook to expand its capabilities even further. USB devices deliver on the promise of plug-and-play convenience by eliminating the need to turn off or restart the computer when attaching a new peripheral. For example, a user producing a newsletter or illustrated report could easily swap out a digital camera for a printer without any downtime.

The benefits of USB include the following:

- Up to 12-megabit-per-second transfer rate
- Industry standardization, which eliminates need for separate hardware for each operating system (does require operating system–specific drivers)
- Hot swapping and autoconfiguration of devices
- Provision of power to certain devices, reducing the need for external power adapters
- Support for up to 127 devices at one time

For more information on USB, check out apple.com/usb. For a listing of USB peripherals, go to guide.apple.com/uscategories/usb.html.

FireWire: Fast and easy to use

FireWire is a high-performance serial input/output technology that was designed by Apple and has been adopted by the IEEE as its 1394 standard. FireWire is one of the fastest peripheral standards ever developed, which makes it great for use with multimedia peripherals such as video camcorders and other high-speed devices such as the latest hard disk drives and printers. Already the interface of choice for digital audio and video, FireWire benefits include high speed, flexible connectivity, and the ability to link as many as 63 devices. Like USB, FireWire makes it extremely easy to connect peripherals. There are no device IDs to worry about, terminators, or cumbersome connectors. For more information on FireWire and FireWire peripherals, check out apple.com/firewire/firewireproducts.html.

The PowerBook G3 Series supports connectivity to FireWire peripherals through the FireWire 2 Go card from Newer Technology (www.newertech.com). This CardBus-based card operates at up to 400 Mbps and fits into the system's PC Card slot, providing one nonpowered FireWire port. The FireWire 2 Go card is expected to be shipping in volume in July through Newer Technology's resellers around the world. It will also be available at the Apple Store. The card will also work in the previous PowerBook G3 Series.

FireWire is revolutionizing video production in particular. For the first time ever, users can create broadcast-quality video productions on a desktop or portable system at consumer prices, using a new generation of digital video (DV) camcorders that include FireWire ports. These cameras now start as low as $799, and use digital technology to create clean, crisp video that makes older analog formats pale in comparison. And because they capture video as digital data, customers can bring that video into their Macintosh computer over FireWire as a perfect copy with no conversion losses.

Once in the computer, the video can be edited with Apple's exciting new Final Cut Pro software (www.apple.com/finalcutpro). Final Cut Pro is the only affordable software that combines professional editing, compositing, and special effects capabilities in one flexible and highly productive program. By giving users the best features of other products—and more—in a single application, Final Cut Pro lets them work faster while paying less.

Imagine combining a PowerBook G3, a FireWire 2 Go card, a DV camcorder, and Final Cut Pro to create a mobile video editing solution that allows you to capture, edit, and enhance digital video. Video editors can now easily take their work with them wherever they want to go.

Integrated Communications

Integrated communications capabilities are very important to mobile users who need to send, receive, and access information as they travel around the world. The PowerBook G3 Series features three key communications tools.

Modem

The first tool is a built-in 56K modem with V.90 support. This modem can be used anywhere around the world to access an Internet service provider or to dial into the corporate network. The RJ-11 modem jack is located on the backplane with the rest of the standard I/O ports.

Ethernet

For those who work in an office or education setting, built-in 10/100BASE-T Ethernet provides for high-speed network access. This feature meets the needs of professional customers for high-performance networking, as well as home-based customers who want to access the Internet through solutions such as cable and DSL modems. The interface is autosensing, so customers simply plug in the Ethernet cable and let the interface configure itself appropriately for the type of network (10 megabits or 100 megabits).

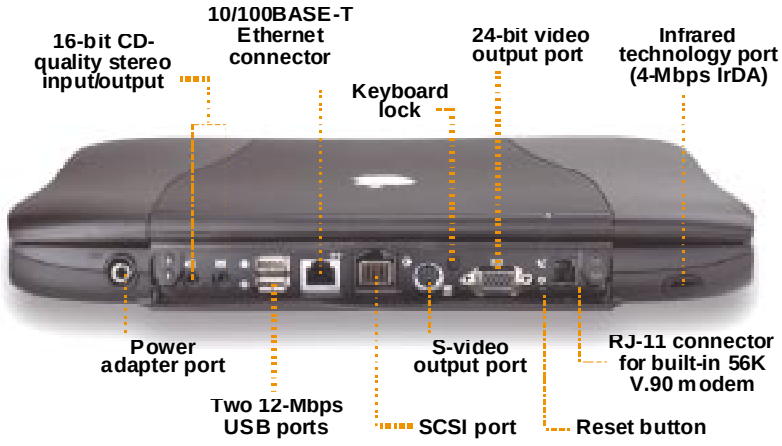
The PowerBook line pioneered the concept of having both Ethernet and modem built into a notebook computer. Most Windows-based notebook vendors require customers to purchase a PC Card for Ethernet functionality, which usually costs about $200. In some cases, customers may also have to purchase a PC Card modem, which usually costs about $100. That's an additional $300 that Windows customers have to spend to get the same functionality that is built into every PowerBook G3 system.

Infrared

The PowerBook G3 Series features wireless file transfer and LAN access capabilities with 4-Mbps IrDA. In Europe, many customers use their GSM mobile phones with the built-in infrared port to serve as an external modem when they are away from standard telephone lines, for example, while waiting in an airport lounge or riding on the train.

Ports and connectors overview

Shown below is the backplane of the new PowerBook G3. On the system, all the ports are labeled with icons next to the connector as well as on the I/O door. Note that there is a reset button next to the modem port. This replaces the key combination used in the previous generation.



Storage and Expansion Capabilities

Mass storage

The new Macintosh PowerBook G3 models offer up to an amazing 10 gigabytes of internal hard disk capacity. All hard drives are standard 2.5-inch ATA/IDE drives, already formatted with the Mac OS Extended file format for efficient data storage. The drive is removable for easy servicing and protection of valuable data from unauthorized access.

Standard PowerBook models are available with 4 or 6 gigabytes of storage. Customers can also configure a system with a 10-gigabyte hard drive at the Apple Store (www.apple.com/store).

CD-ROM/DVD-ROM drive

Macintosh PowerBook G3 systems come standard with either a CD-ROM drive or a DVD-ROM drive that supports DVD-Video playback.

Apple's 24x-speed (maximum) CD-ROM drive provides fast, smooth playback of the latest multimedia applications, clip-art archives, audio CDs, reference materials, and 3D games.

The 2x-speed (maximum) DVD-ROM drive plays DVD-Video movies and DVD-ROM discs as well as CDs. With up to 25 times the capacity of CD-ROM discs, DVDs can combine hours of video, audio, music, and computer data (including games) all on a single disc.

PowerBook G3 users can typically watch up to three hours' worth of movies on one fully charged battery. They can easily connect a TV and watch their movies on a bigger screen using the computer's S-video output. DVD playback is simple and intuitive with the included Apple DVD Player software. Apple DVD Player also supports the built-in navigation features of many DVD-Video titles, such as menus that let viewers jump to a specific scene.

Note: DVD decode is done through a hardware decode chip on the main logic board. A prebuilt system equipped with a CD-ROM drive cannot play DVD movies because it does not have the requisite DVD hardware decode chip.

Expansion bay

Each Macintosh PowerBook G3 computer includes a hot-swappable expansion bay that accepts any of the following Apple or third-party accessories:

- CD-ROM drive
- DVD-ROM drive
- Lithium-ion battery
- Weight-saving expansion bay module
- SuperDisk drive
- Zip drive
- Hard disk drive

Note: Expansion bay modules from the previous PowerBook G3 Series do not fit into the expansion bay of the new PowerBook G3 Series due to the new thinner design.

PC Card and CardBus

The PowerBook G3 features one PC Card slot that accepts either PC Card (16-bit) or CardBus (32-bit) cards in Type I or Type II format. The FireWire 2 Go card from Newer Technology can be used in this slot. The slot is Zoom Video ready and can accept cards such as the Partec CapSure card for video input. The ejection mechanism is manual rather than software driven as it has been in previous PowerBook lines.

Stunning Style

Thinner and lighter

Probably the most striking feature of the new PowerBook G3 Series is its new thin and light design. It's nearly 20% thinner and almost 2 pounds lighter than the previous PowerBook G3 and starts at just 5.9 pounds with CD-ROM drive and battery installed. It can weigh as little as 5.7 pounds if you replace the CD-ROM or DVD-ROM drive with the handy weight-saving module that ships with every system. This weight-saving module is shaped just like a battery and can be slipped into the right or left bay to reduce travel weight. Configurations with DVD-ROM drive and battery weigh approximately 6.3 pounds.

The new PowerBook G3 has also slimmed down to 1.7 inches (43 mm). The 1.7-inch measurement is made at the highest point on the system. Overall the system is about 1.5 inches high. Our design and engineering teams made a concerted effort to shave inches and pounds from the new PowerBook G3. But you'll notice that the new PowerBook G3 didn't give up any of its design features in order to become thinner and lighter.

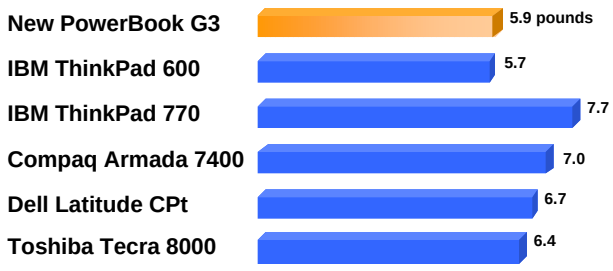
Weight comparison

We compared the new PowerBook G3 with five of the best-selling, full-featured PC notebooks to see where it stacks up from a weight perspective. All the systems have a CD-ROM and battery installed. Each one also features a 14.1-inch screen except the IBM ThinkPad 600, which has a 13.3-inch screen.

As you can see, the IBM ThinkPad 600 at 5.7 pounds is the only one that weighs less than the PowerBook G3. The ThinkPad 770 comes in at 7.7 pounds with CD-ROM and battery. The Compaq Armada is 7 pounds, but it still has a very boxy look. Compaq advertises its systems as lightweight, yet they start at 6.3 pounds and go up to 7 pounds. And don't be fooled by the new Dell Latitude CPt. You'll see it advertised for 5.9 pounds, but that's with a battery and weight-saving module installed. With the CD-ROM and battery, it weighs 6.7 pounds. Finally, the Toshiba Tecra, known as Toshiba's breakthrough design product, weighs in at 6.4 pounds with CD-ROM and battery installed.

Lighter

Competitive Overview



Lower numbers indicate lighter weight

New accent colors

Design changes didn't just stop with the size and weight of the new PowerBook. We also made some changes to its color scheme. Apple once again proves that computers don't have to be boring, utilitarian-looking devices. The new PowerBook G3 sports a new translucent bronze-colored keyboard, trackpad, trackpad button, and power-on button. We've also transitioned to the white Apple logo on the inside of the case.

The little touches

We've made a number of other little touches and refinements to the new PowerBook G3. For example, the soft-touch grip on both the top and bottom of the case helps ensure that the system won't slip out of your hands as you move it from your desk into your briefcase or backpack. We also improved the scratch resistance on this part of the system.

Another refinement is the placement of all of the ports and connectors on the backplane of the system. All the ports are behind the I/O door except for the power port. As before, helpful icons are mirrored on the backplane and the door, giving you a guide for plugging in devices no matter which way you approach the system.

Finally, make sure that you look at the top case when the system is on. You'll notice that the Apple logo is lit up. When you close the lid to put the system to sleep, the light is extinguished. We've allowed the light from the display to shine through the back of the system, thereby illuminating the logo.

Flip-up keyboard and lock

We still provide easy access to the memory slot and the removable hard drive through the flip-up keyboard. But we've changed how the keyboard opens. Two tabs release the keyboard when you pull them toward you. These tabs are located between the Escape and F1 keys and the F8 and F9 keys at the top of the keyboard. Once the keyboard pops up, simply flip it back on the palm rests. Next remove the heat shield, and you'll see the RAM slot on the processor daughter card. Simply pull a tab to lift up the hard drive to disconnect it from its cable connection to the main logic board.

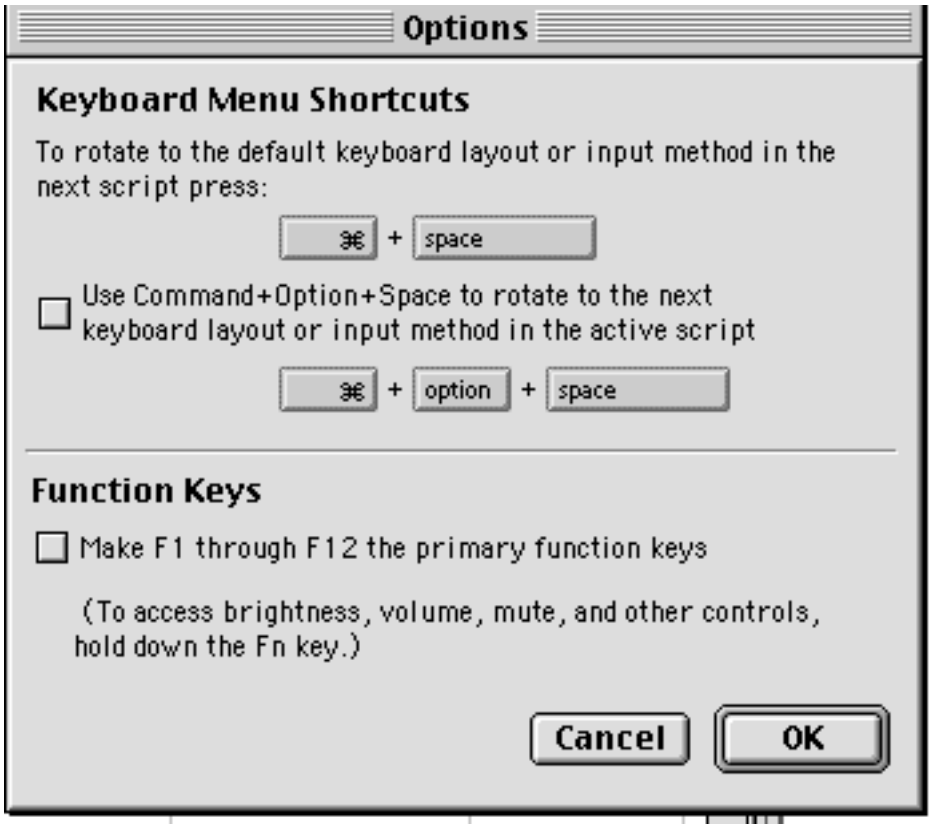
Another new feature is the keyboard lock mechanism, which is located on the backplane. It's a small hole with a flathead screw in it. When tightened, the screw locks the keyboard down. This helps prevent casual theft of memory or the hard drive.

Expansion bay and dual-battery capability

Another refinement is the feel of the eject levers for the hot-swappable expansion bay and battery bay. The eject levers now have a quieter and smoother movement. Note that only the right bay accepts storage devices like CD-ROM or Zip drives now, as opposed to the previous PowerBook G3, which had dual expansion bays. When talking with customers, we found that most people were using one storage device at a time. However, both right and left bays accept batteries in order to maximize battery life.

Brightness, volume, and mute controls

The brightness, volume, num lock, and mute buttons are now located on the function keys F1 through F6 respectively. The function keys are not active unless you press the Fn key in conjunction with a particular function key, for example, F1. However, you can change the function keys to be active in a primary state via the options section of the Keyboard control panel, as shown in the accompanying graphic.



Configurations and Custom Solutions

Configurations

Two prebuilt models of the new PowerBook G3 computer are available.

Order no.	**M7304LL/A**	**M7308LL/A**
Display	14.1-inch TFT	14.1-inch TFT
PowerPC G3 processor speed	333 MHz	400 MHz
Backside level 2 cache	512K	1MB
Backside bus speed	133 MHz	160 MHz
Memory (SDRAM)	64MB	64MB
Video memory (SDRAM)	8MB	8MB
Video controller	ATI RAGE LT Pro	ATI RAGE LT Pro
Hard disk drive	4GB IDE drive	6GB IDE drive
CD-ROM drive module	Yes	—
DVD-ROM drive with DVD-Video playback	—	Yes
Ethernet	Built-in 10/100BASE-T	Built-in 10/100BASE-T
Modem	Built-in 56K (supports V.90)	Built-in 56K (supports V.90)
S-video output	Yes	Yes

All models also include a built-in keyboard and trackpad; modem cable; power adapter; S-video to composite adapter; VGA-to-Macintosh adapter; Mac OS 8.6; third-party software (Microsoft Internet Explorer, Microsoft Outlook Express, Netscape Communicator, and FAXstf); complete setup, learning, and reference documentation; and limited warranty.

Build-to-order options

In addition to choosing from Apple's prebuilt systems, you can order a custom-configured PowerBook computer from your local reseller or the online Apple Store. This allows you to select the processor speed, amount of RAM, hard disk capacity, and a CD-ROM or DVD-ROM drive. You can also order an additional lithium-ion battery and third-party peripherals such as VST Technologies Zip and SuperDisk drive expansion modules or a FireWire CardBus card (July availability). The chart below highlights the options.

Build-to-order Options




Processor and Cache	Memory	Hard Disk	CD/DVD
333 MHz – 512K	64MB	4GB	CD-ROM
400 MHz – 1MB	128MB	6GB	DVD-ROM
	256MB	10GB	
	384MB		

Third-Party Expansion

FireWire CardBus card from Newer Technology
Zip and SuperDisk expansion bay modules from VST Technologies

PowerBook G3 Summary

The new PowerBook G3 Series. It's slim, stunning, and superfast, making it the ultimate combination of performance and mobility for those in creative design, education, and business. Here are a few things to remember about the new PowerBook G3 Series:

- Stunning Style—With its new thin and light design that starts at just 5.9 pounds, it's not only lighter than the major PC competition but also the most beautifully designed, full-featured notebook computer.
- Outstanding Performance—With PowerPC G3 processors running up to 400 MHz, it's up to twice as fast as Windows-based notebook and desktop systems with Pentium II–based processors.
- Longer Battery Life—With up to 5 hours of battery life, the PowerBook G3 has longer battery life than comparable IBM, Compaq, Dell, or Toshiba notebooks.
- New I/O Technology—With USB and FireWire support, it can connect to the latest high-speed peripherals and expand its capabilities even more.
- Advanced Multimedia—Support for dual displays, brilliant DVD movie playback, and built-in VGA and S-video output ports for easy connections to an external monitor, video projector, or TV all enhance the mobile multimedia experience.
- Integrated Communications—Built-in 10/100BASE-T Ethernet and 56K modem with V.90 support for connections to high-speed networks make it easy to communicate anywhere around the world.
- Expansion Capabilities—With a hot-swappable expansion bay, full complement of I/O connectors, and a PC Card slot, it's easy to add more storage, video, or networking devices.
- Build to Order—At the Apple Store, you can choose a prebuilt system or configure a PowerBook G3 to meet your needs with a faster processor, more RAM, or larger hard drive.

Design Enhancements Summary

The new PowerBook G3 Series is a combination of the successful elements from the previous generation along with new design enhancements.

Carryover features

These features were all successful design elements that we carried over from the previous PowerBook G3 Series.

- 14.1-inch TFT active-matrix screen
- 66-MHz system bus (same as PowerBook G3 introduced in September 1998)
- Two SO-DIMM memory slots (the same memory can be used)
- 45-watt power adapter
- Built-in 56K modem
- Embedded numeric keypad
- Dual-battery support through expansion bays

Design enhancements

We've listed design enhancements in "new vs. previous generation" format below.

New design—nearly 20% thinner and almost 2 pounds lighter

- "Z" dimension—1.7 inches vs. 2.0 inches
- Weight—5.9 pounds vs. 7.8 pounds with CD-ROM and battery installed
- Weight-saving module reduces system weight to 5.7 pounds

Battery life

- Up to 5 hours vs. 3.5 hours
- Lithium-ion battery rating—50 watt hours vs. 49 watt hours

I/O technology

- Two built-in USB ports; removed ADB and serial ports
- Built-in Ethernet: 10/100BASE-T vs. 10BASE-T
- Built-in 56K modem port on the backplane vs. the left side of the system
- Sound input and output ports behind the I/O door vs. outside corner
- Reset button on the backplane vs. keyboard combination of Ctrl, Fn, Shift, Power

Keyboard and hard drive removal

- Release tabs located on function key row vs. expansion bay release tabs
- New pull tab for hard drive removal
- New bronze-colored keyboard, trackpad, and mouse clicker
- Brightness, volume, mute buttons moved to the function keys

Expansion bay

- Eject levers refined—now quieter and smoother movement
- Expansion bay no longer supports PCI expansion module

PC Card/CardBus

- One slot supports Type I or II cards vs. two slots supporting Type III cards
- Manual eject vs. software eject

Multimedia

- Dual-display capability vs. IX MICRO Road Rocket card
- DVD support on the main logic board vs. DVD PC Card

Appendix A: Performance Tests

Adobe Photoshop Test Protocol

1. Install Adobe Photoshop 5.0
   - Copy Photoshop Test folder to hard drive
2. System setup:
   - AppleTalk off (disconnect Ethernet cable)
   - Control Strip off
   - File Sharing off
   - Extensions System Basic
   - Disk Cache 4MB
   - VM ON
   - RAM Disk off
   - Monitor (note setting, but does not affect testing)
3. Set Photoshop
   - Do Get Info on Photoshop application
   - Set as follows:

CPU RAM	PS Mem	Use file
≥128	100	20

   - Open Photoshop and close all windows
   - Open Preferences and select "Beep when done"
   - Quit Photoshop
4. Test protocol
   - Restart PowerBook
   - Open Photoshop
   - First filter run (untimed)
     Select Filter, check settings, run filter
     Revert (previously: close file)
   - Test filter (repeat for each filter)
     Start timer when you press CMD-F †
     Stop timer when:
     a. Watch goes away
     b. Filter inverse in menu bar ends
     c. Photoshop beeps
     Revert
     Wait 10 sec (Bike20; 5 sec for Bike11 and 3 sec for Bike 5)*
     (repeat)
   - Do not collect data from first run
   - Collect data from runs 2–6 and record
   - Quit Photoshop
   - Average time for each filter
   - Sum averages for total time

Filters tested:

Subset	Filter	Settings
Blur	Gaussian Blur	5.0 blur
Blur	Radial Blur	10 Spin (good)
Blur	Radial Blur	10 Zoom (good)
Art	Colored Pencil	PW 4, 8, PB 25
Art	Film Grain	4, 0, 10
Art	Paint Daubs	8, 7, simple
Art	Smudge Stick	2, 0, 10
Art	Watercolor	9, 1, 1
Brush	Sumi-e	10, 2, 16
Noise	Dust and Scratches	1, 0
Sketch	Plaster	20, 2, top
Sketch	Graphic Pen	15, 50, right
Stylize	Glowing Edges	2, 6, 5
Texture	Mosaic Tiles	12, 3, 9
Dist	Polar Coordinates	rect to polar
Image	RGB to CMYK	

* Using close/open file or undo gives different times because of Photoshop architecture. Open creates scratch disk; Revert reallocates buffers, and Redo does none of these, so it's faster.

† Using the Filter menu to do the action precomputes part of the image, resulting in significant time savings; it's very important to ONLY time filter runs started by CMD-F.

Director Test Protocol

1. Install Director 6.0
   - Copy files Snailk05.dir, Steamroller50, and Flyjk.dir to hard drive
2. System setup:
   - AppleTalk off
   - Control Strip off
   - File Sharing off
   - Extensions System Basic
   - Disk Cache 1M
   - VM off
   - RAM Disk off
   - Monitor 1024 x 768 x thousands for PowerBook;
     800 x 600 x thousands for desktops (16 bit or "high color" for PCs)

   NOTE: Director is very sensitive to screen settings; they should be as close as possible for PC and Mac.
3. Set Director
   - Do Get Info on Director application
   - Set to 34MB
   - Hide all windows (from Windows menu) except Control Panel
4. Test protocol
   - Restart PowerBook
   - Double-click on file to open file
   - Run multiple tests

     For Snailk05 and Steamroller50 play them to preload cast, then time for click
     For Snailk05 stop timer when "Think different" appears
     For Steamroller50, stop timer when "Think different" appears
     For FLYJK, stop timer when "stop" frame appears.

     (NOTE: Be sure the loop/non-loop selector in the Control Panel is set to non-loop)
   - To restart, click "beginning" button in Control Panel
   - Collect data from runs 1–3 and record
   - Restart, reopen Director, and rerun 3 runs
   - Repeat sequence for next file
   - Quit Director

Appendix B: Battery Tests

Testing Protocols

"City" test

A "real life" test is perceived as representing the battery life a user can expect. The difference in power usage between a system that is idle and one with which the user is working in a productivity application (such as AppleWorks, Excel, or Outlook Express) is approximately 20%. Our tests resulted in 4 to 4.5 hours of battery life.

"City" cycle (Screen brightness at three quarters. Power cycling off. Disk spin down 2 minutes.)

- Start Outlook Express
- Wait 10 minutes
- Quit Outlook Express
- Start AppleWorks
- Wait 5 minutes
- Open test file (~2MB)
- Wait 5 minutes
- Save document
- Quit AppleWorks
- Start Internet Explorer
- Wait 5 minutes
- Open locally stored web page (~2MB)
- Wait 5 minutes
- Quit Internet Explorer
- Repeat cycle

In this protocol we intentionally suggested not having power cycling enabled, because it represents the user pecking away at the keyboard. This test can be performed cross-platform and gives a real-world set of results with a reasonable workload.

"Highway" cycle

The maximum life cycle test is designed to inform users of their maximum expectation of battery life. Our tests resulted in approximately 5 hours of battery life.

- Maximum life test (screen brightness low, no hard disk spin down)
- Start computer (with AC)
- Start application such as AppleWorks
- Disconnect AC
- Wait for shutdown

"Racing" test

This test is designed to drain the battery as fast as possible and give people a realistic minimum time they can expect their PowerBook to last. Our tests resulted in 3 hours of battery life.

"Racing" test (screen brightness high, hard disk spin down after 2 minutes)

- Start computer (with AC)
- Start MoviePlayer or Apple DVD Player
- Start large (>memory size) movie playing from hard disk or DVD-ROM
- Disconnect AC
- Wait for shutdown

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