



Universal Serial Bus

The new industry standard for connecting peripherals.

A little background

Apple's commitment to making powerful technology simple and accessible means that we're constantly on the lookout for new ways of enhancing our products. Recently, this search led us to adopt a technology that we believe will significantly improve every aspect of our customers' experience with attaching peripherals—providing easier connection, higher performance, and greater expandability, as well as a wider selection of devices from which to choose. Called Universal Serial Bus (USB), this latest advance is designed for use with numerous devices, including printers, digital cameras, game pads, joysticks, keyboards and mice, and storage devices.

USB technology is the result of an industry consortium effort. It combines all of the advantages of a multiplatform industry standard—including decreased cost, increased compatibility, and a greater number of available peripherals—with the more specific advantages of a very “Apple-like” blend of advanced functionality and flair. In short, USB meets Apple's key criteria for technology adoption: It's easy, fun, and powerful—and it provides our customers with multiple benefits.

The USB story

USB is a nonproprietary standard that has already been adopted by hundreds of peripherals vendors. Its acceptance by personal computer manufacturers is even more impressive. The USB standard has been formally adopted by both Apple and Microsoft, a combination that represents almost the entire personal computer industry. This nearly universal enthusiasm has a very simple explanation: USB was designed expressly to provide the features most requested by personal computer users. Here's how it works:

- **Increased ease of connection.** USB peripherals deliver on the promise of “plug-and-play convenience,” by eliminating any need to turn off or restart the computer when attaching a new peripheral. This true “hot-pluggable” and “hot-unpluggable” capability allows users to connect USB peripherals on an as-needed basis. For example, a user engaged in producing a newsletter or illustrated report could easily swap out a digital camera for a printer—without experiencing any inconvenient downtime.

But that's only the beginning. Connecting a USB device really does simply mean plugging it into a USB port on your computer. USB connections require no terminators, memory addresses (interrupt settings), or ID numbers. They also use a new kind of cable—small, simple, inexpensive, and easy to attach—designed to put an end to the dizzying array of twisted wiring and bulky cabling that users currently face. In fact, USB makes attaching a peripheral to a computer a virtually mistake-proof process; there's only one style of cable (USB A-B), with distinctly different connectors at each end, so they can't be plugged in incorrectly.

When a USB peripheral is first attached, the user installs a device driver (a small piece of software that allows the computer to interact with the device) by dragging its icon onto the System Folder or by running a simple installer application. This only needs to be done once. And Apple systems that feature USB, such as the iMac computer, will also feature preinstalled USB drivers for certain devices, so no device driver installation is necessary. USB support for dynamically loading drivers eliminates any need for users to worry about troubling technical issues they may currently associate with peripherals connection.

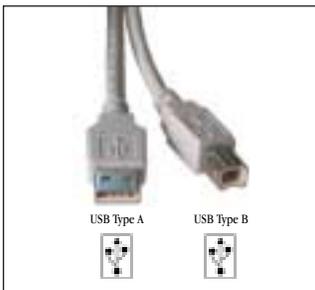
- **Higher performance.** Designed to improve on the performance of previous serial ports, USB offers data transfer rates of up to 12 megabits per second. This connection speed is significantly faster than the 10 kilobits per second provided by Apple Desktop Bus ports and the 230 kilobits per second of traditional Apple serial ports.

For users, faster connections offer a very simple, yet compelling, benefit: better performance. As an example, a user viewing input from a video camera attached via a USB connection, rather than through a traditional serial port, will note two obvious results of the increased bandwidth that USB provides: a significant increase in available image size, and the increased clarity that comes with the

Without USB



With USB

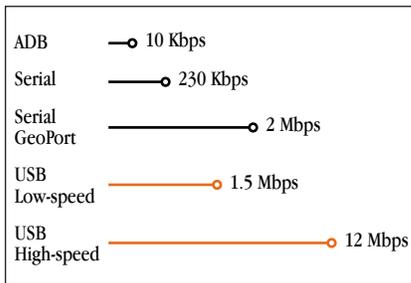


This kind of thoughtful design is an outstanding example of how USB supports Apple's focus on reducing complexity so users can do more with their computers, more easily.



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Connection speed comparisons can be hard to understand through words alone. That's because the capabilities of earlier technologies are usually expressed in kilobits per second (Kbps) rather than in the 1,000-times-faster megabits per second (Mbps) used to measure more recent technologies. The chart above clearly shows the relationships between the performance of past connection technologies and that of USB.

capacity to display frames more rapidly than was previously possible. In fact, since increased bandwidth enables more data to travel more quickly, all USB-connected peripherals can work faster—even in situations that involve simultaneous use of multiple devices.

- **Greater expandability.** Apple's focus on ease of use has always enabled Macintosh users to do more, faster. USB supports and extends this advantage through its support for hot-pluggable connections, which lets users add a device easily, anytime they need to, with no downtime. And for those times when it's not a question of having the necessary peripheral connected, but the ability to work with several devices at the same time, USB supports up to 127 simultaneous connections. When a computer's ports fill up, users simply attach a device called a hub, which provides additional ports (usually four or seven), and keep on plugging in more peripherals—and hubs—as needed.

Why USB

Apple is committed to using USB in future products for these reasons—and because of one more, very important advantage: the increased choice of peripherals that USB will provide to our customers. As an open connectivity specification designed expressly to meet today's challenges and adapt to those of tomorrow, USB is the multiplatform standard for the personal computer industry. It effectively eliminates previous platform distinctions between peripherals, allowing users to choose from a much wider range of devices with complete confidence that they are making a safe investment—even if they decide to share devices with users of other platforms. It also enables organizations that support multiplatform computing environments to purchase peripherals solely on the basis of needed functionality, freeing them from the need to carve up budgets according to platform percentages.

For peripherals manufacturers, USB provides the same safety and freedom: Developers can meet the needs of every potential customer with the same hardware product regardless of platform. (All they have to do is provide the appropriate small driver application or ensure that one has been preinstalled on the system.) With these advantages, it's easy to understand why USB has already been endorsed by hundreds of vendors, including some of the biggest names in peripherals. In addition, their lowered development and production costs—coupled with the increased market competition that will result from the removal of platform barriers—will contribute to the very best user benefit: a much wider selection of increasingly powerful and varied devices from which to choose.

Apple continues to innovate by introducing great new technologies in our products. When we find existing standards that exemplify Apple values—our belief that using a computer should be easy, productive, and fun—we eagerly adopt them. When no such standards exist, we create them. In the case of USB, Apple is adopting an industry standard that's true to the Apple spirit and that supports Apple's central goal: to deliver features, simplicity, and choice that enhance the value that Macintosh offers our customers.

For more information on USB products available for the Mac OS, visit the web site at www.macsoftware.apple.com, or look for the Mac OS compatibility logo together with the USB logo on USB product packaging. For more details about the USB specification, visit www.usb.org on the World Wide Web.



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Additional Information on iMac Connectivity and USB Peripherals

Although USB clearly offers outstanding advantages over the long term, some current iMac owners and potential iMac customers remain unclear about issues of more immediate import—such as the system's connectivity capabilities and the availability of USB-compatible devices for the Mac OS. The following questions and answers are designed to address these concerns, as well as to indicate additional informational resources.

How can I transfer data between an iMac and my existing Macintosh or other computer?

The iMac offers a number of easy-to-implement data exchange options:

- You can use the iMac system's built-in high-speed modem (or an external modem) to exchange files and e-mail messages with others via online services, private dial-in networks, or the Internet.
- You can take advantage of its Fast Ethernet connector to transfer data at up to 100 megabits per second in settings that support this capability, including many offices and educational institutions. Ethernet-to-LocalTalk gateways can also be used to integrate iMac systems into existing LocalTalk and PhoneNET networks, as can Farallon's iPrint LT cabling solution. In addition, five-port Ethernet hubs are currently available for as little as US\$50, making it feasible for even home users to create a high-performance network that connects multiple systems and devices.
- For the lowest-cost (about US\$15) high-speed data exchange option between two computers, you can purchase a standard 10BASE-T Ethernet "crossover" cable and simply connect the computers directly—without using a hub.
- Several third-party developers have also indicated that they intend to provide USB-compatible removable storage devices, which will provide another easy way to exchange data between the iMac and other Mac OS–based systems or PCs running Windows. (More specific information can be found in the Storage section of this document.)

How can I connect my current peripherals to an iMac?

The iMac comes with a USB-compatible keyboard and mouse, as well as the appropriate USB cabling for both devices, so connecting existing non-USB input devices is not necessary. To connect non-USB peripherals such as printers and scanners to an iMac, you will need to use one of the networking options mentioned above, or opt for a third-party solution that enables the iMac to make a serial or SCSI connection. Products include Farallon's iPrint SL, a hardware solution that enables the iMac to connect directly to the serial port of an Apple StyleWriter printer, and Stalker Software's PortShare Pro and SCSI Share software (for more information about these solutions, visit www.farallon.com and www.stalker.com). (Note: Although adapting existing peripherals such as printers and scanners is clearly possible, it is not always desirable—especially as increasing numbers of advanced, affordable USB peripherals become available for the Mac OS.)

What USB products are now—or will soon be—available for the iMac?

Following is a partial listing by category along with a brief description. For information on shipping dates and pricing, see the chart at the end of this section.

Printers, Cameras, and Scanners

- Epson America is offering the Epson Stylus Color 740, a high-quality ink-jet printer that takes advantage of Epson's advanced Micro Piezo technology to provide laser-quality black text and printed color images that look even better than their resolution of 1,440 dots per inch (dpi) would indicate. The company is also offering a cable adapter kit for the Epson StylusColor 600 printer that will enable iMac users to print in full color at resolutions of up to 1,440 dpi.
- Hewlett-Packard is offering a cable adapter kit designed to connect the iMac to the HP DeskJet 670C and DeskJet 690C printers. A USB-compatible printer is also slated for release within the next few months.



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- ALPS Electric (USA) has announced a USB adapter kit for its ALPS MD-1300 photo-quality color printer, which will enable iMac users to produce 8- by 10-inch dye sublimation prints that are waterproof, smearproof, and fadeproof.
- Kodak is offering two digital cameras that incorporate USB ports and cabling: the Kodak Digital Science DC 220 and DC 260. These advanced cameras feature megapixel resolution, autofocus 3x zoom lens, multipicture burst, time lapse, and audio recording. A software kit that will enable users to send images to the iMac via USB is slated for the near future.
- UMAX Technologies is offering the Astra 1220U, a USB scanner designed for home, home office, and small office use. It provides professional-quality, 36-bit color output, and features an optical resolution of 600 by 1,200 dpi, expandable to 9,600 by 9,600 dpi.

Storage

- Imation is offering the USB SuperDisk drive. This external floppy disk drive will store up to 120 megabytes of data per disk and can read from and write to both Mac OS—and Windows-for-matted 1.4-megabyte disks.
- Iomega has announced a USB Zip drive, bringing the benefits of its popular 100MB disk format to iMac users. The new drive, which will feature a native USB connector, will read from, write to, and format traditional 100-megabyte Zip disk cartridges.
- Newer Technology has announced that it is developing an external floppy disk drive—the iFloppy—a standard USB floppy disk drive designed specifically for the iMac. It will include a version with two Macintosh serial ports as well as two USB ports.
- Syquest has announced the Syquest SparQ 1 gigabyte removable cartridge hard disk drive, which will provide iMac users with a high-capacity storage solution for hard disk backups and data transfer.
- LaCie has announced that it will soon begin shipping external, USB-compatible IDE hard disk drives, as well as a DVD drive.

Input Devices

- ThrustMaster is offering the Top Gun USB joystick—the first in a projected USB product lineup slated to include racing wheels, joysticks, game pads, and high-end flight controllers.
- CH Products has announced the GameStick and FlightStick Pro—two joysticks designed to enhance the game-playing experience for iMac owners.
- Mac Ally is offering three USB-compatible input devices: a keyboard, a mouse, and a trackball.
- Gravis has announced the GamePad Pro USB, a USB version of its best-selling game pad.
- Mouse Trak has announced that it will offer a USB-compatible trackball.
- Ariston has announced that it will offer a USB-compatible joystick.

Hubs and Cables

- Entrega is offering both four- and seven-port USB hubs, for flexible connection of USB-compatible peripherals.
- Peracom is offering the Peracom USB Quad Hub kit, which features four downstream ports for peripherals and one upstream port for a computer or another USB hub.
- Newer Technology is also offering both four- and seven-port USB hubs, as well as a USB-to-serial solution.
- Belkin Components has announced the ExpressBus, a convenient four-port USB hub.



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The following chart lists current and anticipated USB products for the Mac OS by company name, with anticipated availability and pricing where possible.

Company	Product	Ship date	Suggested retail price
Printers, Cameras, and Scanners			
ALPS	MD-1300 color printer	October	
Canon (Japan)	Printer for Japan	October	
Connectix	QuickCam VC	Available now	\$99
Epson	Stylus Color 740 color printer	Available now	\$279
Epson	USB printer adapter	Available now	\$39
Farallon	iPrint Adapter LT	Available now	\$99
Farallon	iPrint Adapter SL	Available now	\$99
Hewlett-Packard	USB printer	November/December	\$349
Hewlett-Packard	USB printer adapter	Available now	\$49
Kodak	DC 220 still camera	October	\$600
Kodak	DC 260 still camera	October	\$900
UMAX	Astra 1220U scanner	September	\$179
Storage			
Imation/Panasonic	SuperDisk floppy disk drive	Available now	\$149
Iomega	USB Zip drive	November/December	\$149
LaCie	USB DVD-ROM drive	November	
LaCie	USB IDE hard disk drive	November	
Newer Technology	iFloppy floppy disk drive	October	\$89
Syquest	SparQ 1GB hard disk drive	December	
Input Devices			
Ariston	Joystick	October	
CH Products	FlightStick Pro joystick	November/December	
CH Products	GameStick joystick	November/December	
Gravis	Gamepad Pro USB game pad	October	
Mac Ally	Keyboard	October	\$69
Mac Ally	Mouse	October	\$49
Mac Ally	Trackball	October	\$59
Mouse Trak	Trackball	October	\$90
Thrustmaster	Top Gun joystick	Available now	



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Company	Product	Ship date	Suggested retail price
Hubs and Cables			
Belkin	ExpressBus 4-port hub	October	
Entrega	4-port hub	Available now	
Entrega	7-port hub	Available now	
Interex	4-port hub	Available now	\$99
Momentum	USB-to-serial cable	October	\$99
Newer Technology	4-port hub	October	
Newer Technology	7-port hub	October	
Peracom	USB Quad Hub Kit 4-port hub	Available now	
Philips	Hubs	October	

For more information

The following resources offer additional USB-related information:

- Apple's USB page is located at www.apple.com/usb.
- A listing of compatible third-party USB devices can be found at www.macsoftware.apple.com (select USB Devices from the Hardware menu).
- Apple's public iMac pages list a sampling of available USB devices; to explore them, go to www.apple.com/imac/usb1.html.
- In stores, customers interested in USB products for the Mac OS can look for the Mac OS-compatible and USB logos. Products that display the USB logo only may also work; however, customers should contact the manufacturer for additional details about Mac OS compatibility.