



# FireWire

Fast. Easy. Expandable. Nothing's as hot as FireWire.

## What is FireWire?

Apple has introduced the next generation of Power Macintosh G3 computers—now with built-in FireWire technology. FireWire is a high-speed serial input/output (I/O) technology for connecting peripherals to a computer. Originally developed by Apple, FireWire is now an official industry standard (IEEE 1394).

FireWire is one of the fastest peripheral standard ever developed, which makes it great for use with multimedia peripherals such as video camcorders and other high-speed devices like the latest hard disk drives and printers. New Power Macintosh G3 systems include two FireWire ports that operate at up to 400 megabits per second.

## Key features

FireWire is like Universal Serial Bus (USB) in many ways, and the two technologies coexist on Macintosh systems. While USB is great for lower-speed input devices such as keyboards, mice, and joysticks, FireWire is aimed at higher-speed multimedia peripherals such as video camcorders, music synthesizers, and hard disks. Both I/O technologies offer incredible convenience through their “hot plug” capability, eliminating any need to turn off or restart the computer when attaching a new peripheral. For additional ease of use, they also feature automatic configuration, no device IDs or terminators, and simple-to-use cables. USB can support up to 127 devices per computer, and FireWire up to 63 devices. Both technologies provide their own bus power, enabling peripherals to be even simpler. And both technologies are cross-platform industry standards.

## Benefits of FireWire

FireWire revolutionizes video on desktop computers. In addition to being easy to use, FireWire lets you create broadcast-quality video at consumer prices for the first time ever. This is due in large part to a new generation of digital video (DV) camcorders that include FireWire ports. These cameras now start as low as \$850, yet because they use digital technology, they produce clean, crisp video that makes older analog formats pale in comparison. And because they capture video as digital data, you can bring that video directly into your Macintosh computer over a FireWire connection as a perfect digital copy, with no conversion losses.

Combine those benefits with powerful yet easy-to-use video editing software such as Apple's new Final Cut Pro, and you have a true paradigm shift in multimedia. The last time two powerful technologies came together like this, Apple launched the desktop publishing industry. Now we're transforming desktop video production.





## Technology Fact Sheet

### FireWire

2

In addition to offering new FireWire devices, third-party peripheral manufacturers have announced products that convert older analog video equipment for use over FireWire. This means you don't need to buy new video gear until you're ready; even your original camcorder from a decade ago will work great over FireWire.

Finally, FireWire is a peer-to-peer technology, which means you can connect other Macintosh systems on the same FireWire bus. This enables a whole new world of shared peripherals. Two or more computers can share the same FireWire video camera or scanner when they are "daisy chained" on the FireWire bus.

#### **Why Apple is using FireWire**

FireWire is the future of computer I/O technology. Together, FireWire and USB radically simplify I/O connections for the user. The age of SCSI, dedicated serial and modem ports, Apple Desktop Bus (ADB), and analog video is fast coming to a close.

Consistent with Apple's mission, USB and FireWire bring new ease of use to Macintosh owners. Attaching a hard disk to your computer is now as easy as plugging in a telephone.

Apple is the audio/video and multimedia leader. By including built-in FireWire, Apple has established that all Power Macintosh computers are now professional audio/video systems.

As we move into the future, FireWire will allow for interoperation with new digital consumer electronics devices such as televisions, VCRs, and set-top boxes. In fact, manufacturers of all these devices have already announced support for FireWire as their interface of choice.

#### **Available and upcoming FireWire peripherals**

Despite its relatively recent introduction, FireWire has already been adopted by leading manufacturers of video, photographic, storage, printing, and other peripheral devices.

- *Digital video (DV) camcorders and decks.* This class of devices is well established and products have been shipping since 1995. The digital format provides a perfect copy of the original video, with no dropped frames or conversion losses.

Digital camcorders, whose internal electronics are all digital, store the incoming audio and video on tape in a digital format called DV rather than in an analog format such as High 8. DV produces full-size, full-motion video of 720 by 480 pixels at 30 frames per second. With FireWire, bringing DV into a Macintosh computer is nothing more than a simple file transfer between the camera and the computer at 3.5 megabytes per second.

Digital camcorders vary in price from \$850 to \$5,000 and up. Most cameras use a single charge-coupled device (CCD, the electronic device that captures the image) to digitize the incoming light; higher-end cameras employ three CCDs, one each for red, green, and blue. Higher-end cameras generally work better with low light conditions, and often have interchangeable lenses.



## Technology Fact Sheet

### FireWire

3

FireWire enhances video editing on the Macintosh by providing:

- Lower cost, higher-quality video capture accessible to everyone, not just professionals
- Perfect copies of the original digital video
- Remote control of the camera even during video capture
- Frame-accurate capture and editing

- *Digital still cameras.* Digital still cameras are one of the fastest-growing peripherals segments in computing. They allow you to capture high-quality still images and transfer them digitally to your Macintosh system. This all-digital process eliminates the need to develop pictures and scan them in.

FireWire provides a means for transferring images from the camera to the computer that is much faster and more convenient than other connections such as serial, parallel, or even USB. USB-based digital still cameras will continue to be available, but FireWire-based cameras will offer higher quality and greater speed.

FireWire connections appeared first on higher-end cameras, which generally have larger file sizes (for higher-quality images) and sell at higher prices. These cameras are pushing the state of the art in CCD technology, with the ability to capture up to 6 million pixels with a single shutter click. When printed out on high-quality color photo printers, the images from these cameras are often indistinguishable from traditional photos at first glance.

FireWire enhances digital still image capture on the Macintosh by providing:

- Higher-speed transfer of image files from the camera
- Support for ever larger image sizes, currently from 5 to 90 megabytes per picture
- Remote control of the camera
- The ability to plug in and unplug the camera without restarting applications or the computer

- *Printers.* Printers will be one of the next available classes of FireWire devices. Like still cameras, the first FireWire printers are expected to be higher-end professional products with higher prices than their USB counterparts. USB printers are aimed at the cost-conscious home user, while FireWire printers will be professional workplace products at first.

FireWire enhances printing on the Macintosh by providing:

- Faster direct connections to high-quality color printers
- The ability to free up Ethernet network bandwidth
- The ability to share printers within small FireWire-equipped workgroups

- *Mass-storage devices.* Mass-storage devices will be the type of peripherals most radically transformed by the adoption of FireWire. Ease of use will take on new meaning as you mount external hard disk drives with the simplicity of connecting a single plug. FireWire eliminates all the complexity and restrictions associated with using SCSI mass-storage devices. FireWire can further simplify these peripherals by providing the DC power required to drive the device, rather than requiring users to plug it into an AC outlet.

FireWire-based mass-storage devices communicate with the computer in an asynchronous mode using the Serial Bus Protocol-2 (SBP-2). This protocol allows for high-speed data transfers and should scale up as FireWire itself and FireWire hard disks get faster.



## Technology Fact Sheet

### FireWire

4

Mass-storage devices on FireWire will include hard disk drives, magneto-optical drives, high-capacity removable drives, tape drives, and CD/DVD products, including both read-only and read/write drives.

- *Analog-to-digital YUV video converter:* This converter lets you use existing analog camcorders, TVs, and VCRs with a FireWire-based Macintosh system. Instead of taking up a PCI slot, it handles analog-to-digital conversion through a small external box connected to a FireWire port on the computer. The resulting video files are QuickTime movies in the raw video format—they are not DV, MPEG, M-JPEG, or Sorenson format until you choose to convert them to a specific format using QuickTime.
- *Analog-to-DV converter:* This product converts incoming analog audio and video to a DV-compressed digital stream before sending it to your Macintosh system over FireWire. The conversion happens in real time and essentially makes all analog audio/video products appear to the computer as DV devices with high-quality video streams. It also allows for the export of DV video to analog video.

## For More Information

For more information about FireWire, visit  
[www.apple.com/firewire](http://www.apple.com/firewire).

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