

FireWire Second Generation

USB 2 vs. FireWire b

USB 2 performs at 480 Mbit/sec. It is 80 Mbit/sec faster than the current implementation of FireWire. At the end of 2002, a new specification was released to the market, IEEE 1394b. The new specification is much faster than USB 2, but its initial speed is perhaps the least important of the new innovations of the second-generation FireWire. The new FireWire has been designed so it can support up to 3.2 Gb/s without any important modifications. This is its maximum potential.

FireWire 1394b has overlapped, pipelined arbitration and a hybrid bus operation for backward compatibility. The maximum distance between hops is now 100 meters versus the original distance of 4.5 meters. The new FireWire beta also has lower emissions than the original FireWire or USB 2.

The new specification keeps the most important characteristics of FireWire, including the peer to peer connection model, the logical bus model, and asynchronous and isochronous transmissions. Everything above the second OSI layer remains the same. However, a great deal has changed below the link layer,

There are now three possible modes of operation: alpha or legacy mode, beta mode which requires new devices and bilingual mode, a mixture of the two. In bilingual mode, the bus negotiates with the peer for the optimum mode of operation. Beta mode has higher speed capabilities, a longer run distance and improved efficiency. The maximum speed was initially limited to 800 Mb/sec. The speed will increase to 1600 Mb/sec, followed by 3200 Mb/sec, the ultimate for FireWire beta and the theoretical performance ceiling.

FireWire beta continually transmits data in dual simplex. This should mean the speed never varies, a crucial requirement for streaming video. Beta mode is simpler and more efficient than its predecessor. Another unique aspect of FireWire beta is it has no packet startup latency and is ideal for optical transmission.

There is one disadvantage shared with USB 2. FireWire needs clock recovery.

The concept of beta clouds allows FireWire to keep all devices on the bus to operating at their maximum speeds. Devices are cluster together on a logical level in a cloud. The cloud operates as a single block at 800 Mb/sec. The borders of these clouds are where legacy devices are connected, operating normally. Each device operates at its highest speed.

FireWire connectors have also been improved. They are better shielded and a 4 pin type connector carries power to each peripheral instead of the current 6 pin design. It should be noted the longer distances do require new media. UTP, Cat-5 cable with a simpler connection scheme is used for connecting devices. This design allows FireWire beta to better recover from bad connection types, and the signal integrity is better than Ethernet. Plastic Optical Fiber can be used for longer hops up to 200 meters, providing a speed of 400 Mb/sec. Higher speeds require, Multi-mode Glass Fiber.