

## FireWire versus USB



### A Comparison of PC Interface Technologies

In law enforcement, the quality of captured fingerprint and palm print images is of the utmost importance. Image quality is mainly determined by two factors—the technical and the human factor. Technically, a livescan unit needs to provide the highest image scanning resolution possible and transfer data as fast as possible to a PC. The higher the image resolution, the higher the amount of data to be transferred, and the higher the performance required of the interface between the scanner and the PC. The officer needs to have full control of the capturing process at any time in order to limit repeating scans and ensure the highest image quality.

That means a “live stream” of data is required and the livescan system and the PC have to ensure:

- No loss of image data during transfer from scanner to PC, particularly for rolled fingerprints
- Real-time live display during capturing
- Uninterrupted data transfer, regardless of how many other peripherals are connected to other software applications running in parallel on the same PC.

The only PC interface with a 100 percent guarantee on this live stream is the FireWire (or IEEE 1394) interface. The FireWire interface is especially designed to guarantee high speed data transfer and is typically used by professionals who need to ensure a data transfer without any losses. The following table shows the typical transfer data of a professional HD video camera and a Cross Match livescan system.

	<i>Transferring video data from a professional HD video camera to a PC</i>	<i>Transferring rolled fingerprints from the livescan system to a PC at 1000 ppi image resolution</i>
<b>Capturing device</b>		
<b>Resolution</b>	1920 x 1080 pixel	1500 x 1600 pixel
<b>Pixel/frame</b>	2.1 megapixel	2.4 megapixel
<b>Frame rate</b>	50 frames per second	25 frames per second
<b>Required data rate</b>	100 MByte per second	60 MByte per second

In order to best serve the professional needs of our law enforcement customers, Cross Match Technologies uses FireWire instead of a USB 2.0 interface.

# FireWire vs. USB interfaces

## FireWire Interface

### Interface architecture

- There is no hierarchy between PC and peripherals
- The peripheral controls the data transfer without any participation of the CPU
- No other connected device can delay or interrupt the transmission
- No other software running parallel has any impact on the transmission of data

### Isochronous transmission for continuous data stream

- Data streams between the device and the host in real-time with guaranteed bandwidth and no error correction
- A device can request that the host computer allocate enough bandwidth for it to send uncompressed data in real-time to the computer
- In isochronous mode, a device can send data in a steady flow to the computer without anything disrupting the process



The architecture and transmission mode of the FireWire interface guarantee that the data is transferred completely and without any loss.



## USB Interface

### Interface architecture

- Architecture between peripherals and PC is based on master-slave design
- CPU is the master: all peripherals are slaves
- Complete data transfer is controlled by the CPU (host controller) only
- The peripheral can only transmit data if the CPU has requested it ("speak-when-spoken-to" protocol)
- If other peripherals are connected, the bandwidth is shared among them
- If other software runs in parallel, the CPU performance is slowed

### Different transmission modes for different tasks

- Depending on the type of data, USB provides four different transmission modes (bulk mode, isochronous mode, interrupt mode and control mode)
- There is no control over what data will be given priority
- USB networks use a "First-come-first-serve" approach, which leads to delays or even data loss



Due to the master and slave architecture and the various transmission modes, there is no 100 percent guarantee of continuous data transfer, and in the worst case data can get lost!

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