

IEEE 1394 Technology

First introduced by Apple® with the name "FireWire®", the IEEE 1394 digital connection standard has been applied with growing success in consumer video and in broadcast. Under the name "i.LINK®*1", Sony began integrating the IEEE 1394 interface into its industrial color camera range in 1996 to bring a new dimension to its imaging technology. Much more than just a new connection standard, the IEEE 1394 interface is, for Sony, a major opportunity to re-invent the video camera for industry and multimedia applications. It overcomes most of the traditional limitations related to connection, format, modulation standards, speed, grabbing techniques, accuracy and processing.

Last year Sony launched two high-resolution monochrome IEEE 1394 cameras that featured industrial high-speed asynchronous shuttering and scalable output format. Sony also has introduced two high-resolution color versions, with electronic pan/tilt as an additional feature, as well as a stand-alone, ready-to-operate Digital Imaging Station designed for picture storage and network transmission, and which also provides live monitoring of a Sony IEEE 1394 camera on a TV monitor.

The IEEE 1394 standard

IEEE*2 1394 is a high-speed, non-proprietary, scalable digital serial bus that transports data at current rates of 100, 200 and 400 Mb/s. Its definition, development, compliance and application promotion are supported by more than 180 companies, grouped in the 1394 Trade Association*3. The IEEE 1394 standard includes a specific industrial protocol for IEEE 1394 digital industrial cameras that has now been adopted by several industrial camera manufacturers.

The current version of this protocol released by the IEEE 1394 camera working group is V1.30.

What are the differences between i.LINK equipment and IEEE 1394-based digital cameras?

In consumer and broadcast equipment with an i.LINK interface, DV-standard based video signals are transmitted, combined with audio, time code and commands like 'play', 'stop' and 'rewind'. The picture has fixed resolution, aspect ratio (4:3 or 16:9) and frame rates (PAL/NTSC), and is compressed with the audio through the AVC protocol, typically at 33 Mb/s bandwidth.

For industrial video data, the camera is assumed to have any resolution or frame rate, to transmit pure data without any compression, and to be remotely controllable for DSP functions. Therefore, adopting IEEE 1394 for industrial cameras has provided a huge opportunity to overcome previous limitations by using a specific protocol:

"1394-based Digital Camera Specification", issued by the DC working group of the 1394 Trade Association.

The IEEE 1394-based Digital Camera

With IEEE 1394, a camera becomes a Plug-and-Play computer peripheral, using a generic, low-cost and high-performance connecting standard. PAL or NTSC concepts are not applicable anymore. Pure CCD data is directly transmitted to computer RAM, with direct pixel to byte(s) equivalence.

Absence of any degradation due to conversion, modulation, transport or re-sampling gives an accuracy that has never been possible with analog technologies. Geometrical, sub-pixel, luminance and color measurements are improved. A frame grabber board is not required, a generic IEEE 1394 host adapter card connects the computer to the network. The camera has only one 6-pin connecting cable (four IEEE 1394 wires, plus ground and power).

*1 i.LINK is a trademark of Sony used only to designate that a product contains an IEEE 1394 connector. All products with an i.LINK connector may not communicate with each other. Please confirm interoperability with third party manufacturers. For more information contact Sony at 1-800-686-7669.

*2 IEEE (Institute of Electrical and Electronic Engineering) has standardized the IEEE 1394 serial bus.

*3 More information on IEEE 1394 can be obtained from the 1394 Trade Association at <http://www.1394ta.org>