

A Byte About Bi-directional Parallel Protocol

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A Review of the IEEE-1284 Standard

The Hewlett-Packard® Bi-directional parallel protocol has long been the defacto standard for bi-directional, asynchronous parallel communication. This informal standard has been formalized as IEEE-1284. Space does not permit a full explanation of IEEE-1284, but we can give you a brief overview.

The Big Picture

Standard Parallel communication sends data (in parallel) in one direction. So a host can send data to a printer, but the printer cannot send data back to the host. The only way the printer can communicate vital feedback to the host ("out of paper", "buffer full", etc.) is to raise or lower a control pin. That works acceptably for a simple transaction such as "stop sending data". But if the printer wants to say "here are all the fonts I have in memory", it cannot do that in a normal parallel setup.

The IEEE-1284 Standard, on the other hand, outlines methods by which the printer can receive data from the host and communicate data back to the host-- not just raise or lower control pins. This is called a reverse channel capability. With both forward and reverse channels an IEEE-1284 interface facilitates much more intelligent communication between printer and host. And it does so without the inherent speed limitations of standard RS-232 serial connections. That is the apparent goal of the IEEE-1284 interface: to combine the advantages of serial and parallel communications, while minimizing their inherent drawbacks. How is this done?

Modes (a la mode)

The IEEE-1284 Standard describes five modes of parallel communication: Compatible, Nibble, Byte, ECP and EPP. These modes are divided into specific cycles and phases that allow bi-directional communication to take place. Here is a brief definition of each mode.

Compatible Mode is the baseline, and is simply forward channel parallel communication as implemented in the "classic" 36-pin Centronics® format.

Nibble Mode is reverse channel communication using the four status lines of the parallel interface. Data is sent from the printer to the host in this mode, under the control of the host. Since only four lines are used, instead of the eight commonly required for parallel data, the byte is segmented into two 4-bit pieces and sent sequentially down the line. The byte therefore becomes two "nibbles" (and we're forced not to take this whole Standards thing too seriously!).

Byte Mode is reverse channel communication using the data lines of the parallel interface to send 8-bit wide data bytes. The control/status lines are used for handshaking.

ECP (Extended Capabilities Port) Mode incorporates both forward and reverse channels. It sends data bi-directionally in 8-bit wide data bytes, and uses

interlocking handshaking.

EPP (Enhanced Parallel Port) Mode, like ECP, incorporates both forward and reverse channels and sends data bi-directionally in 8-bit wide data bytes. However, separate address and control cycles are used, instead of interlocking handshaking.

Not all IEEE-1284 devices support all the above modes. The most basic IEEE-1284 level is Compliant. A Compliant device will support Compatibility and Nibble Modes (see figure 1, below). Since Compatibility mode only allows forward data transfer, and Nibble Mode only allows reverse data transfer, a Compliant device must toggle between these two modes to achieve bi-directional communication. Byte Mode is also unidirectional, and must work in conjunction with Compatibility mode to achieve bi-directional communication. ECP and EPP Modes, on the other hand, are in themselves bi-directional. Devices capable of supporting ECP or EPP Modes have the potential for greater efficiency than merely Compliant devices.

Applications

Patton is very excited about the possibilities of the IEEE-1284 interface. One big reason is that both Hewlett-Packard and DEC have standardized on the IEEE-1284 interface (and specifically the EPP mode) for their new high- end printers. There will soon be excellent opportunities for Patton Distributors to sell the Model 2030 (and subsequent Patton converters) into applications where backward compatibility of serial devices with IEEE-1284 printers and plotters is required. Opportunities also exist in industrial environments, where the IEEE-1284 interface is used in CNC/PC applications. Good Hunting!



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