

Background information:

USB Interface

Home / Product Locator

Product overview
USB interfaces

Basics

The Universal Serial Bus is a bus system which was developed in 1995 by a consortium of leading companies in the computer industry. The goal was to be able to connect any peripheral associated with a PC workstation through a single uniform interface: up to 127 peripheral devices with baud rates of up to 480 Mbit/s.

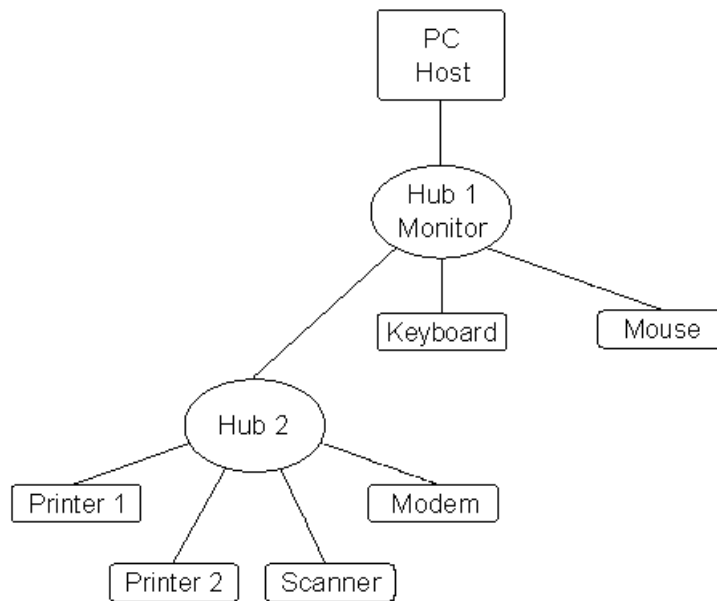
Other key advantages for the user include plug-and-play capability of the USB devices as well as the fact that all modern operating systems regardless of platform support USB (current Windows versions, Mac OS, Linux) and that no changes to the computer hardware are necessary in order to expand the computer.

Universal Serial Bus is based on a master/slave architecture with a USB host and a maximum of 127 USB slave devices. As is usual in such systems, every instance of data transfer is triggered by the host.

Topology

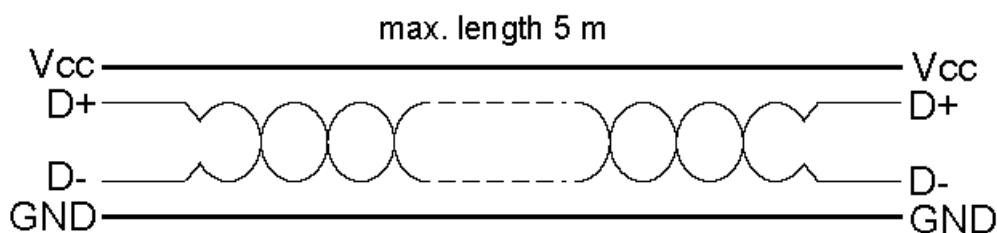
USB is designed as a star topology bus system. By cascading USB hubs, however, it is also possible to construct a tree topology. The maximum cable length of a cable segment between the hub port and a connected terminal device is 5m. In practice, USB devices such as keyboards and monitors often themselves provide the function of a hub.

The hub represents the central component in the topology. It is responsible for routing the data as well as detecting connected devices and reporting this to the host PC.



Signals and Connectors

The devices are connected to the hub through a 4-pin USB connector using 4-conductor, 1:1 cable. The actual data transmission takes place on a twisted-pair. The two other wires are used for supplying power to the connected stations.



Physical method of transmission

The data for sending and the associated clock are carried using NRZI coding on the same pair of wires (D+ / D-). Data are sent in packets preceded by a Sync field for synchronization with the receiver. The data are sent as a differential signal at a rate of 1.5 MBit/s (low speed), 12MBit/s (full speed) or 480 MBit/s (high speed) in half-duplex. All possible bit rates can be used, even mixed, in a bus system.

Typical low-speed devices include keyboards and mice, whereas printers, scanners and audio devices belong at least in the full-speed category. Cameras, external hard drives and DVD burners are almost necessarily high-speed devices due to the volume of data transferred.

Supply Voltage

The supply voltage for USB devices can be provided either by the 5V supply in the bus cable or by an external power supply. In general, the ports on the host as well as those on a hub are able to provide the supply voltage for connected devices. Traditional devices supplied through the bus cable include mice and keyboards as well as USB interfaces for connecting Centronics printers, for example.



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