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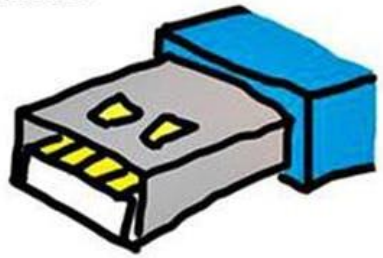
Hillingdon Computer Club

All you need to Know about USB Connections

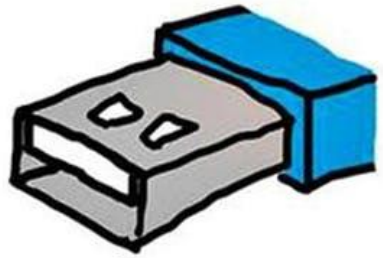
May 2025

It is a well known fact that you must spin a USB three times before it will fit. From this, we can gather that a USB has three states.

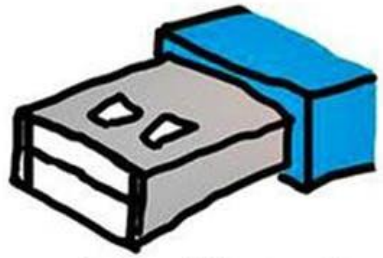
Up position



Down position



Superposition



Until the USB is observed it will stay in the superposition. Therefore it will not fit until observed - except for in cases of USB tunelling.

A USB Quiz

Name the Connector

Connector 1

Connector 1

USB A

Connector 2

Connector 2

USB B

Connector 3

Connector 3

USB Micro

Connector 4

Connector 4

USB Mini

Connector 5

Connector 5

USB C

Connector 6

Connector 6

USB Micro B

Connector 7

Connector 7

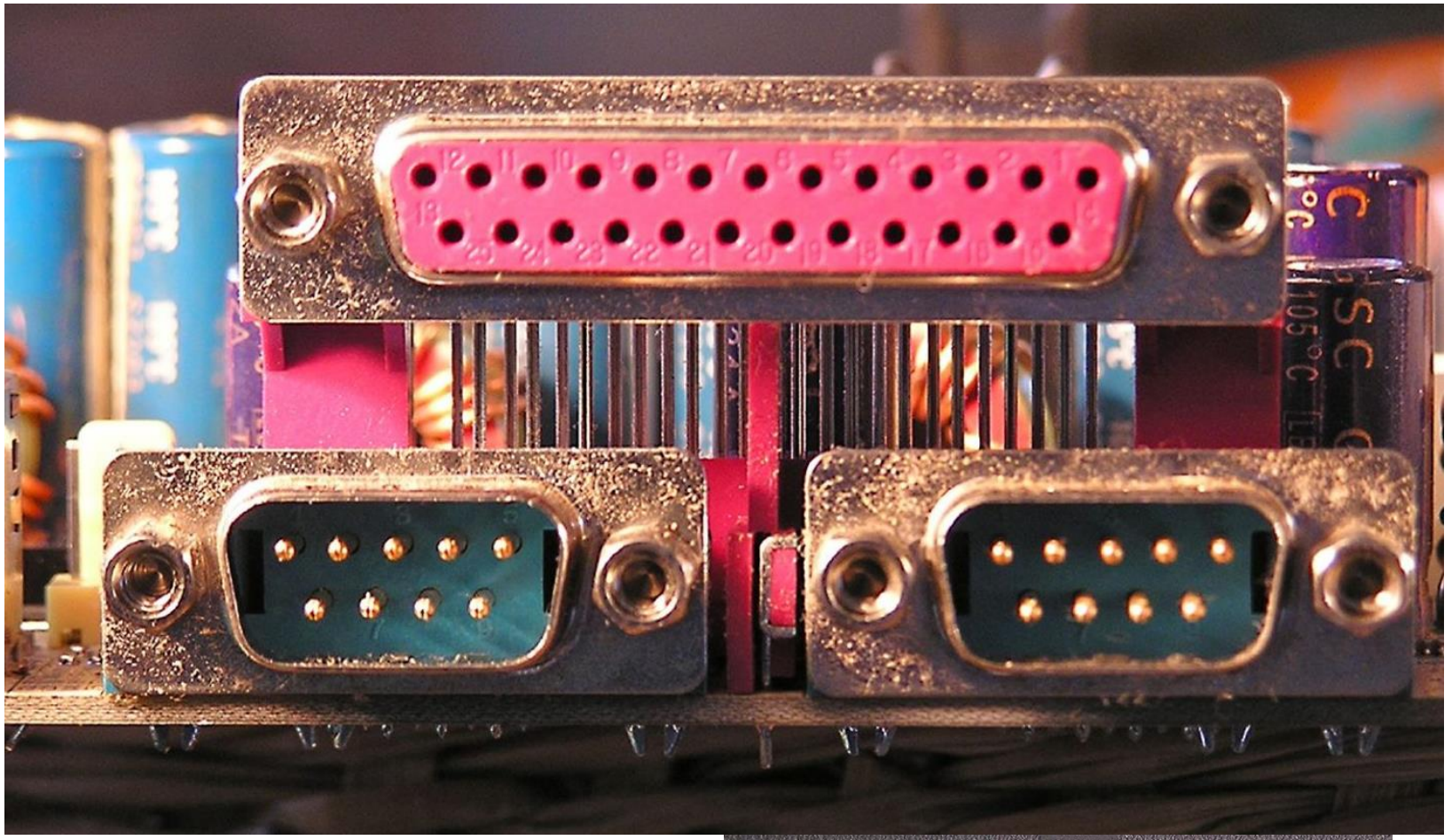
Thunderbolt 4

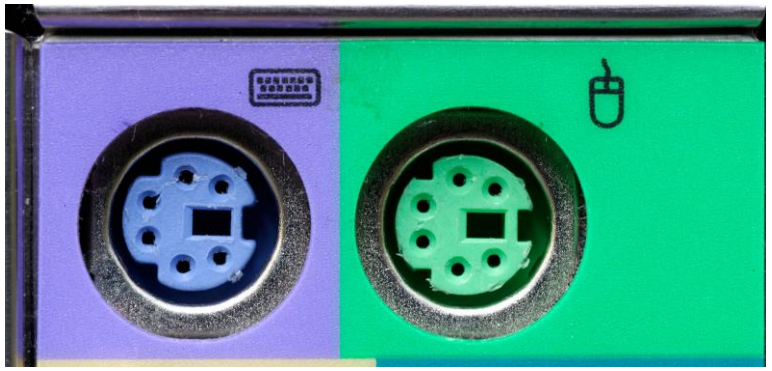
The History of the USB

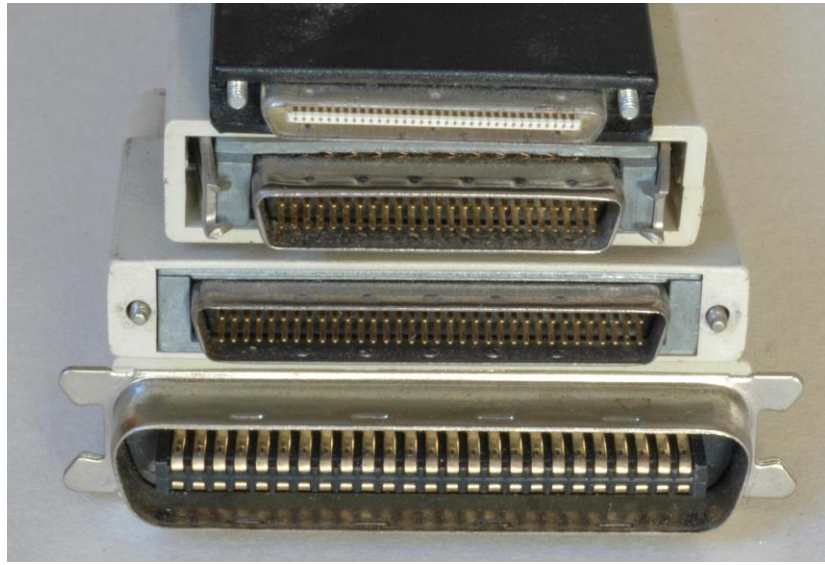
USB or Universal Serial Bus

With so many different connectors on PC's in the early 80's and these needing special drivers and cards, the industry realised the need for a single, versatile connector that could be used across a wide range of devices. – A Plug and Play design

What came before







The History of the USB

USB or Universal Serial Bus

The concept came from Ajay Bhatt who led a team at Intel in 1994

In 1995, this led to the USB-IF, a consortium of 7 companies who all had an interest;
Intel, Compaq, DEC, IBM, Microsoft, NEC, and Nortel.

They produce working versions 0.8 & 0.9 but were never released commercially.

In 1996 USB 1.0 released – 1.5 Mbps

In 1998 USB 1.1 released – 12Mbps This is the version that made the world see it's potential

The History of the USB

Firewire

Before USB in the late 80's, Apple wanted a high speed Serial Bus.

It became IEEE 1394, first called Firewire 400 (400 Mbps) and released in 1995

Primarily used to connect digital video, printers, scanners & external drives

It was Plug & Play & Hot swappable

Faster than USB 1 & USB 2 speeds

Firewire 800 came in 2002

Went on to become Thunderbolt

USB Explained

How Does it Work

When a USB device is connected to a Computer, the computer detects kind of device it is.

The device classes are :

- **HID (Human Interface Device)** – Keyboards, mice, gamepads, joysticks
- **Mass Storage** – USB flash drives, external hard drives, memory card readers
- **Communications** – Modems, networking adapters
- **Audio** – Headsets, microphones, speakers
- **Printer** – Printers, scanners
- **Video** – Webcams
- **CDC (Communication Device Class)** – Ethernet adapters, modems

It also sends the manufacturer, serial number,

With all this, it automatically loads the driver to make it work.

Data is then transferred between the two devices in small amounts know as 'packets'

USB Versions

Version	Speed	SuperSpeed Name	Speed Name	Connectors
1.1 / 1.0	12 Mbps	-	-	Type-A, Type-B
2.0	480 Mbps	Hi-Speed USB	-	Type-A, Type-B Mini A/B, Micro A/B
3.0 / 3.1 Gen 1 / 3.2 Gen 1	5 Gbps	SuperSpeed USB	USB 5 Gpbs	Type-A, Type-B, Type-C,Micro
3.1 Gen 2 / 3.2 Gen 2	10 Gbps	SuperSpeed USB 10 Gbps	USB 10 Gbps	Type-A, Type-C
3.2 Gen 2x2	20 Gbps	SuperSpeed USB 20 Gbps	USB 20 Gbps	Type-C
USB4 (aka USB 4)	20 / 40 Gbps		USB 20 Gbps / USB 40 Gbps	Type-C
USB4 Version 2	80 Gbps			Type-C

USB Color Specs Compared

	Color	Standard	Speed	Special Feature
	White	USB 1.x	1.5 Mbps - 12 Mbps	None
	Black	USB 2.0 Hi-Speed	480 Mbps	None
	Blue	USB 3.0 SuperSpeed	Up to 5 Gbps	None
	Red	USB 3.1 Gen 2 & USB 3.2	10 Gbps - 20 Gbps	Usually Always On
	Yellow	USB 2.0 & USB 3.0	480 Mbps - 5 Gbps	Always On, Passive Power Delivery
	Orange	USB 3.0	Up to 5 Gbps	Always On, Passive Power Delivery

USB Explained

USB-C or Type C

First released in 2014

Designed for;

- Reversability – It can be plugged in either way, no ‘wrong way up’
- Universal Compatability – true universal to carry data , video & power on a single cable
- Speed and Power – USB 3.1 & above, delivers fast data speeds and higher power (for charging)
- Smaller Footprint – compact design for more versatile device use

- Supports USB standards & data transfer speeds USB2 up to USB4
- The standard is for the connector design not the use. It can be used for data transfer, power and display.
- EU has pushed to make this the standard for all devices
- Apple including in phones from iPhone 15 on

USB Explained

Flash Drives

Multiple claims for the invention but a patent was granted in November 2000

A rewritable plug-and-play storage device, only possible due to USB design.

First commercial device was 8MB and made by a Singaporean company Trek Technology in 2000
They sold it through IBM in a distribution deal. It had a 1Mb/sec speed
and cost $29 (£40 at todays prices)

18 million flash drives were sold in 2003 & over 100 million flash drives were sold in 2004
By 2004, a 1GB drive was available and price fell to $20 per drive. This made it more attractive than floppy disks.
1GB could hold over 200 floppy disks worth of data

Largest available today is 2TB Cost 41650

USB Explained

Hubs and Adapters

You may need to plug in multiple device but don't have enough ports.

Hubs – 2 types Powered – where they plugged into a electricity socket
Unpowered – where the use the power from a laptop or computer

Adapters

Many types available
Choose the connector ends
Check Suitable for use
i.e. Data & speed
Video Spec
Power requirements

USB Explained

*Marketing names as of 2022.09.02

Specifications / Marketing names									
Previous	USB 1.0	USB 2.0	USB 3.0 USB 3.1 Gen 1 USB 3.2 Gen 1	USB 3.1 USB 3.1 Gen 2 USB 3.2 Gen 2	USB 3.2 USB 3.2 Gen 2x2	USB4® 20Gbps	USB4® 40Gbps	USB4® Version 2.0
Newer*	**USB 1.0** (no change)	**USB 2.0** (no change)	**USB 5Gbps**	**USB 10Gbps**	**USB 20Gbps**	**USB 20Gbps**	**USB 40Gbps**	**USB 80Gbps**
Maximum transfer rate	12 Mb/s	480 Mb/s	5 Gb/s	10 Gb/s	20 Gb/s	20 Gb/s	40 Gb/s	80 Gb/s