

USB connector information

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Introduction

The **USB** interface is one of the most used interfaces at this moment to connect peripheral equipment to computers. Although the **USB** interface itself is standard, and you should be able to connect every device to a **USB** enabled computer if the appropriate driver exists, problems may arise to find the right cable. This is because especially for smaller equipment like cameras different models of **USB** connectors have been defined. This document contains information about all known **USB** connector types and will help you to find the right cable to connect equipment to your computer.

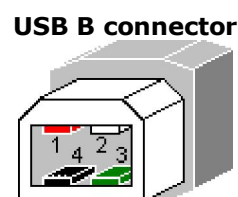
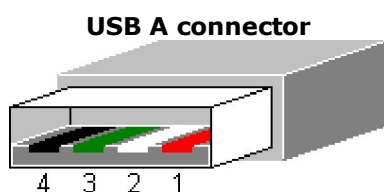
Basic design concepts of USB connectors

Much effort has been put in the design of the several **USB** connectors to make them useful for their purpose. The old [Centronics connectors](#) for parallel printers were bulky and needed clips to connect them securely to the devices. The DB9 and DB25 connectors which are used for [RS232 ports](#) and parallel ports on computers often have problems with connection bolts falling out of the computer case if someone has accidentally tightened the screws of the connector to far. People who have often disconnected and reconnected their [VGA cable](#) might have experienced that these densely populated connectors have very thin pins which bend easily.

Another problem with bad connector design is that you may accidentally connect them wrong. This is something which can happen for example with flat cable connectors and power connectors inside computers. As **USB** can power devices over the cable it is not only necessary that an **USB** connector can not be connected in the wrong orientation, but the design must also not allow that two power providing **USB** devices are connected with each other as this may cause one or both power supplies to be damaged.

Standard A and B USB connectors

Because of all these reasons, two **USB** connectors have been defined for basic use, the **USB A connector** which must be used on devices which provide power (mostly computers), and the **USB B connector** used on devices which receive power like most peripheral devices.

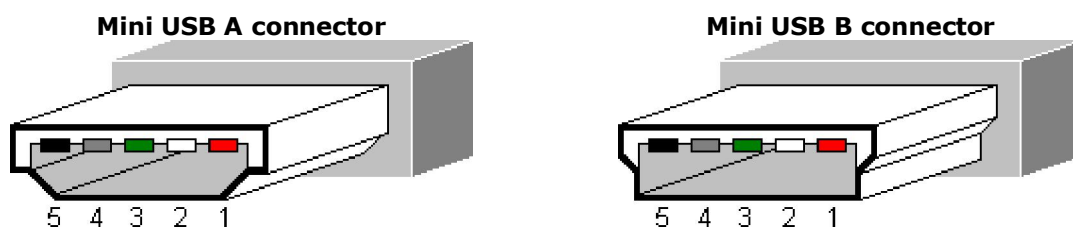


In the standard **USB A** and **B** connectors specified in the [USB 1.1 and USB 2.0 specification](#), four pins are defined. Two pins are used for power and two pins are used for differential data transmission. If you look carefully at the connector you will see that the pins for the power connection (pin **1** and **4**) are slightly longer. This is done on purpose to first connect the power supply when connecting a **USB** device, and only afterwards establish the data connection. With this sequence the chance that the driver or receiver ports of the data connection receive awkward and possible dangerous voltages is lowered substantially.

Standard USB A and B connector pin names			
Pin	Name	Color	Function
1	Vcc	Red	+5V supply voltage
2	D-	White	Data- signal line
3	D+	Green	Data+ signal line
4	GND	Black	Supply ground

Mini USB A and B connectors

The good thing of a **USB** connector standard is that it is possible to design devices without need to think how that device should be connected to other devices. The **USB A** and **B** connectors proofed their usability with devices like printers, modems and scanners, but when the faster **USB 2.0** was released and **USB** became not only a way to connect slow and bulky equipment but also faster and smaller devices like photo camera's and mobile telephones, especially the standard **USB B** connector was just too big to fit nicely on these smaller equipment. An update to the **USB 2.0** specification was posted with the name *Mini-B connector engineering change notice* which defined a smaller version of the **B** connector. There has also existed a **mini USB A** connector for some time, but as the **USB A** connector is used on the power sourcing side—mostly a larger piece of equipment like a computer—that connector was withdrawn from the standard and no new devices will receive certification any more if they contain such a connector. In practice you won't find the **mini USB A** connector any more.



Besides the size, the main difference between the standard **USB A** en **B** connectors and the **mini USB A** and **B** versions is the extra pin which is called **ID**. In the mini connector series this pin is normally not connected. It has been added for future enhancements of the **USB** standard.

Mini USB A and B connector pin names			
Pin	Name	Color	Function

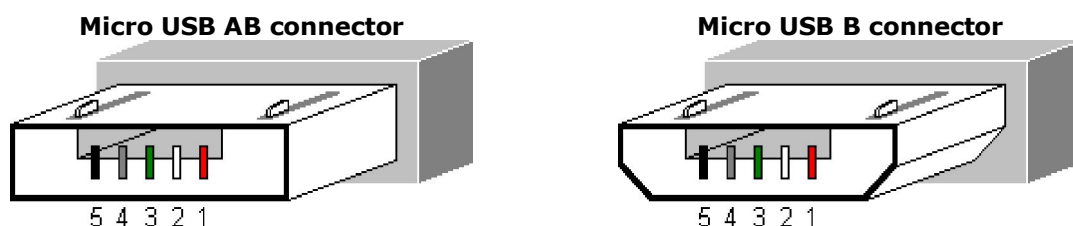
1	Vcc	Red	+5V supply voltage
2	D-	White	Data- signal line
3	D+	Green	Data+ signal line
4	ID	-	not connected
5	GND	Black	Supply ground

Micro USB AB and B connectors

In the modern world small is never small enough and the **mini USB B** connector soon was too large for new equipment like cell phones. Therefore in January 2007 the **micro USB connector** was announced which could be easier integrated in thin devices than the **mini USB** version. Although the **micro USB** connector is much thinner than its **mini USB** brother, it has been especially designed for rough use and the connector is specified for at least 10000 connect/disconnect cycles. One of the reasons is that with mobile devices like cell phones, PDA's and smartphones the number of mate cycles will be significantly higher than with static equipment like printers and mice. Furthermore the **micro USB** connector is becoming the de facto standard to charge mobile devices and its use will therefore be even more widespread than of its **mini USB** counterpart.

In the original **USB** specification there was a strict separation between the host (mostly a computer) which acts as a master device, and the peripherals which have only slave functionality. As mobile devices get smart and often run their own operating system, the separation between the two types of devices has vanished. When connected to a PC a smartphone may be acting as a slave, but it could also be connected to a photo printer directly to print pictures made with the phone. In that case the phone switches from its slave role to a master. To allow this an extension to the **USB 2.0** specification has been written which is called *USB On-The-Go* or more often **USB OTG**. This supplement provides means for easy switching between the master and slave role of a device.

Because most small devices which can both act as a master and a slave only have one **USB** connector, additions to the connector definition were necessary to allow a role change with only one type of cable. This is where the **mini USB AB** and later the **micro USB AB** connector are defined for. The **mini USB AB** connector is now officially deprecated, but the **micro USB AB** connector is replacing its place rapidly. Countries like China are even considering to make this **micro USB AB** connector mandatory on all new cell phones sold. In this **micro USB AB** connector the **ID** pin is used to signal the master of slave function.



The pin numbering for the **micro USB** connectors is the same as for the **mini USB** connectors. The only difference is that for the micro **USB AB** connector the **ID** pin now has a function assigned to it.

Micro USB AB and B connector pin names			
Pin	Name	Color	Function
1	Vcc	Red	+5V supply voltage
2	D-	White	Data- signal line
3	D+	Green	Data+ signal line
4	ID	-	not connected: works as B connector connected to GND: works as A connector
5	GND	Black	Supply ground