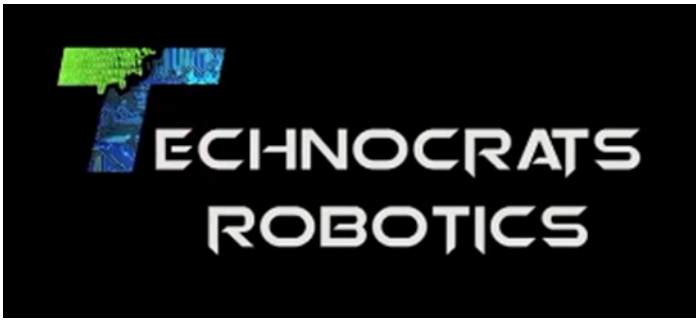

VACATION TASKS

SET-1

Connectors

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Tanush Biju

Connectors

Jumper wires

A jump wire is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.
Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

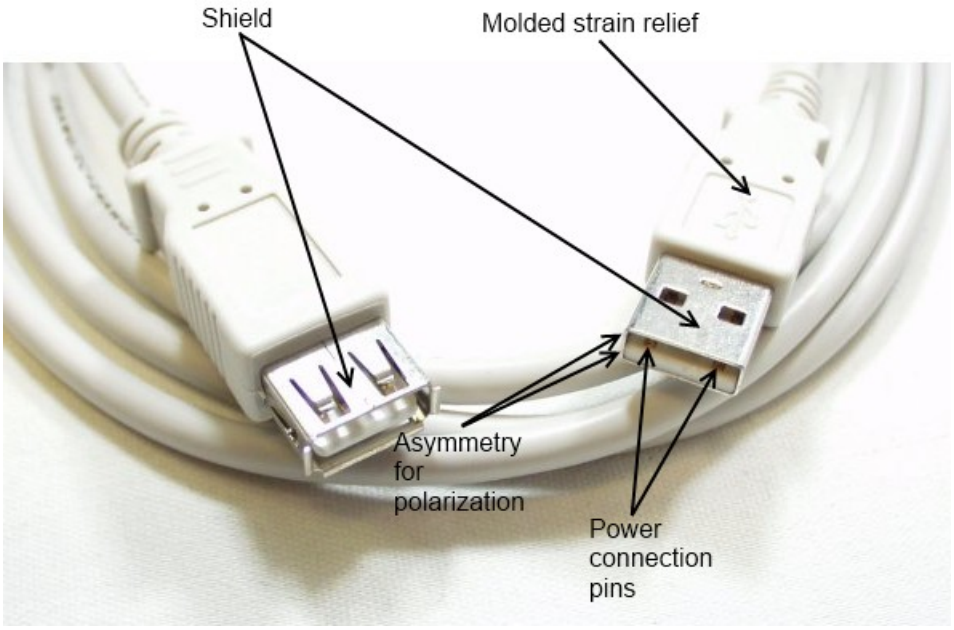
There are different types of jumper wires. Some have the same type of electrical connector at both ends, while others have different connectors. Some common connectors are:

- Solid tips – are used to connect on/with a breadboard or female header connector. The arrangement of the elements and ease of insertion on a breadboard allows increasing the mounting density of both components and jump wires without fear of short-circuits. The jump wires vary in size and colour to distinguish the different working signals.
- Crocodile clips – are used, among other applications, to temporarily bridge sensors, buttons and other elements of prototypes with components or equipment that have arbitrary connectors, wires, screw terminals, etc.
- Banana connectors – are commonly used on test equipment for DC and low-frequency AC signals.
- Registered jack (RJnn) – are commonly used in telephone (RJ11) and computer networking (RJ45).
- RCA connectors – are often used for audio, low-resolution composite video signals, or other low-frequency applications requiring a shielded cable.
- RF connectors – are used to carry radio frequency signals between circuits, test equipment, and antennas.

USB Connectors

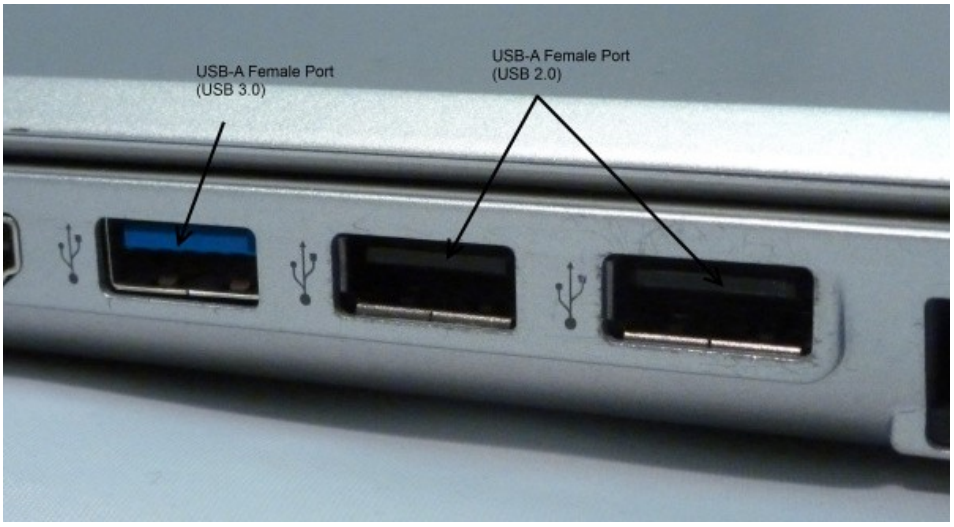
USB connectors come in two flavors: host and peripheral. In the USB standard, there is a difference between the two, and the connectors on cables and devices reflect this. However, all USB connectors will have some things in common:

- Polarization- A USB connector can only nominally be inserted one way. It may be possible to force a connector in wrong, but that will result in damage to the device.
- Four contacts- All USB connectors have at least four contacts (although some may have five, and USB 3.0 connectors have even more). These are for power, ground, and two data lines (D+ and D-). USB connectors are designed to transmit 5V, up to 500mA.
- Shielding- USB connectors are shielded, such that a metal shell which is not part of the electrical circuit is provided. This is important to keep the signal intact in environments with a lot of electrical “noise”.
- Robust power connection- It’s important for the power pins to make connection before the data lines, to avoid trying to power the device over the data lines. All USB connectors are designed with this in mind.
- Molded strain relief- All USB cables have plastic over-molding at the connector to prevent strain on the cable that could potentially damage the electrical connections.



USB-A Connectors

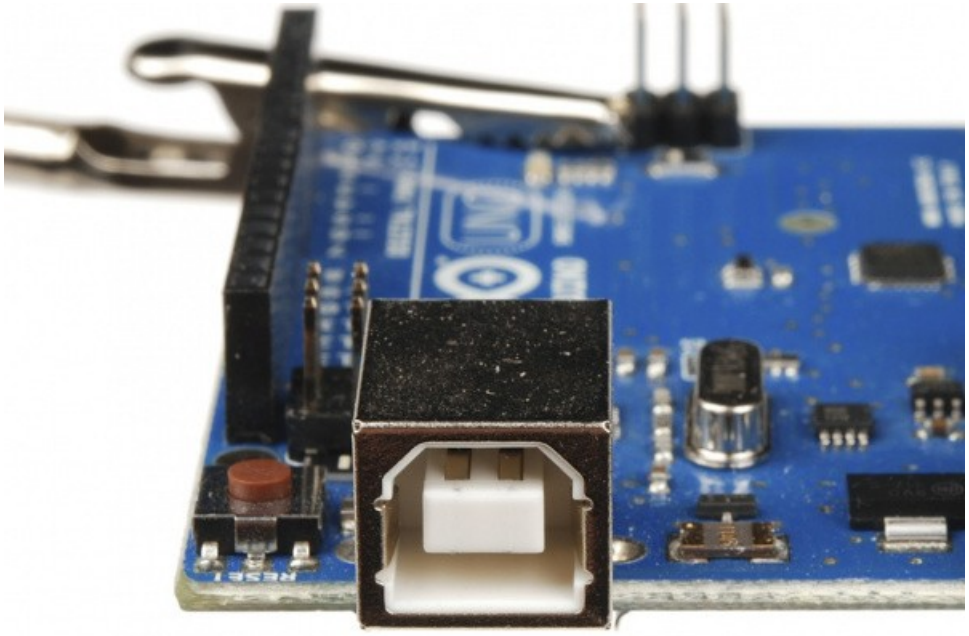
USB-A female is the standard “host” connector type. This is found on computers, hubs, or any device intended to have peripherals plugged into it. It is also possible to find extension cables with a female A connector and a male A connector on the other end.



USB-A male is the standard “peripheral” connector type. Most USB cables will have one end terminating in a USB-A male connector, and many devices (such as keyboards and mice) will have a built-in cable terminated with a USB-A male connector. It’s also possible to find USB-A male connectors that are board mountable, for devices like USB memory sticks.

USB-B Connectors

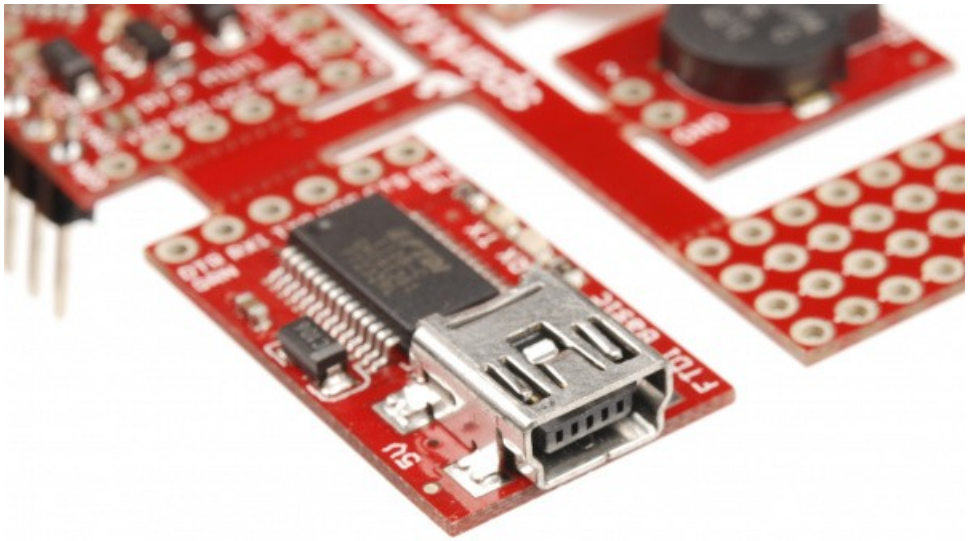
USB-B female is a standard for peripheral devices. It's bulky, but robust, so in applications where size is not an issue, it's the preferred means for providing a removable connector for USB connectivity. It is usually a through-hole board mount connector, for maximum reliability, but there are panel-mount options for it as well.



USB-B male is almost exclusively found at the end of a cable. USB-B cables are ubiquitous and inexpensive, which also contributes to the popularity of the USB-B connection.

USB-Mini Connectors

The USB-Mini connection was the first standard attempt to reduce the size of the USB connector for smaller devices. USB-Mini female is typically found on smaller peripherals (MP3 players, older cellphones, small external hard drives), and is usually a surface mount connector, trading robustness for size. USB-Mini is slowly being phased out in favor of the USB-Micro connector.

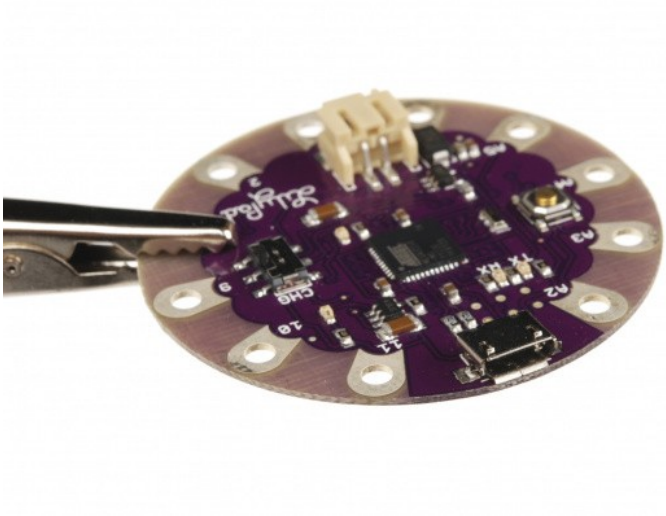


USB-Mini male is another cable-only connector. As with USB-B, it’s extremely common, and cables can be found cheaply almost anywhere.

USB-Micro Connectors

USB-Micro is a fairly recent addition to the USB connector family. As with USB-Mini, the primary concern is size reduction, but USB-Micro adds a fifth pin for low-speed signalling, allowing it to be used in USB-OTG (On-the-go) applications where a device may want to operate as either a host or a peripheral depending on circumstances.

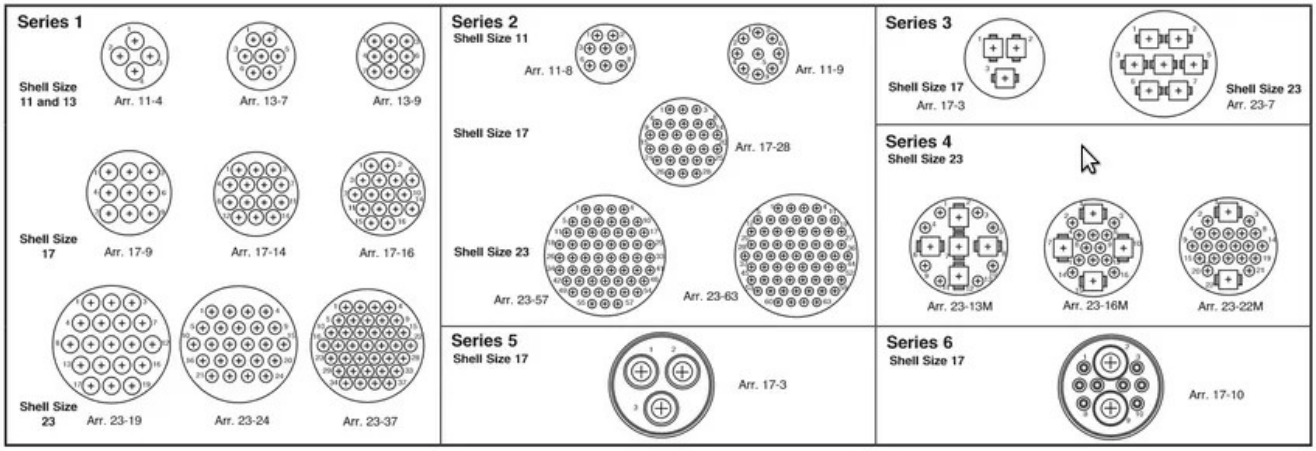
USB-Micro female is found on many newer peripherals, such as digital cameras and MP3 players. The adoption of USB-micro as a standard charge port for all new cellular phones and tablet computers means that chargers and data cables are becoming increasingly common, and USB-Micro is likely to supplant USB-Mini in the coming years as the small-factor USB connector of choice.



USB-Micro male is also a cable-only connector. There are generally two types of cables with USB-Micro male ends: one for connecting a device with a USB-Micro port as a peripheral to a USB host device and one for adapting the USB-Micro female port to a USB-A female port, to be used in USB-OTG capable devices.

Circular Connectors

The TE Connectivity CPC (circular plastic connector) is one such type. These are circular connectors capable of holding up to 63 conductors. The pins/sockets are rated for 28AWG – 8AWG wire. There is a rotating locking mechanism similar to mil-spec metal connectors for a reduced cost and weight in these connectors.



A similar type is the AMPHENOL Circular Mil Spec connectors. These are similar to the CPC connectors above but are made from metal. Since they are made from metal they are stronger, more resistant to wear and tear, and cost more.

Deutsch

The Deutsch line of connectors are very good and are commonly used in cars and heavy vehicles. There are many to choose from with different current capacity and conductor counts. The Deutsch connectors are easier to assemble and more resistant to water and dust then the CPC connectors. Once the pins/sockets are inserted into the housing there is a little clip that gets inserted to strengthen and seal the connector. The primary reason CPC's are used instead is that they do not have any strain relief for the connectors.
You need to provide some external way to strain relief them about 3 inches behind the end of the connector. For connectors that just hang in the air or sit in the robot this is not always feasible.

Anderson Powerpole

Anderson powerpole connectors are great connectors for high current devices such as batteries. These connectors can go up to 350A, however they have different sizes based on current needs. The connectors are each for one wire, however they can slide into each other to create a larger connector of the shape and configuration that you choose.
The two ends are the same however because of how they are designed they will only connect in one direction so you do not mess up and plug them in wrong. There is a notch between the connectors when you slide them together that is designed for a plastic insert to keep them from sliding apart.

D-Sub and HD D-Sub

D-Sub connectors are the ones we are used to seeing for things like (old) printers, serial ports, and VGA monitor ports. While we are used to seeing DB9 (9 pins), DB15 (15 pins high density (HD)), and DB25 (25 pins) connectors there are many other configurations. Some of the configurations can have data pins as well as power pins within the same connector. There are also a wide range of D-sub connectors available such as extra slim versions and waterproof versions. As with some other connector types you can get solder buckets built onto the connector or connectors that accept crimped pins and sockets

When you purchase D-Sub/HD-Sub connectors you can also purchase backshells that act as strain relief for the cable. Some extra thin or panel mount versions do not have a backshell option. You should also be careful since the pins/sockets do not always work in connectors from a different manufacturer, and the D-Sub and HD-sub use different size pins/sockets with a different crimp tool.

Molex

Molex makes a wide assortment of wire to wire connectors. In these the metal pins/contact are a bit exposed, they are the least protected from the elements from the connectors presented, there is no strain relief, the pins/sockets can separate from the shell with repeated use, and the pins bend easily.
They are low-cost and most styles are good at preventing people from plugging them in the wrong way, several of the styles have a locking tab that helps hold the connector together.

RF Connectors

A coaxial RF connector (radio frequency connector) is an electrical connector designed to work at radio frequencies in the multi-megahertz range. RF connectors are typically used with coaxial cables and are designed to maintain the shielding that the coaxial design offers.

There are many types of common RF connectors. With all of these you need to watch for the maximum power, the maximum frequencies it can carry, and the resistance of the cables/connectors (cables are often not labeled if they are 50 ohms or 75 ohms). Here are some of the more common RF connectors:

1. u.fl – This is one of the smaller connectors and is usually connected direct to a PCB. It has a very limited number of connection cycles.
2. SMA – This is another small connector that is on many commercial radios.
3. RP-SMA – This is the reverse polarity version of the SMA connector above (note the center socket instead of a pin). This is designed for consumer applications were “non-trained” end users can change the cables/antennas. This is common on home routers.
4. BNC – This is an easy to use type of connector that is not suitable for outdoor use. This is often found on electronics test gear (oscilloscopes, function generators, etc..).
5. TNC – This is a threaded version of the BNC above.
6. N – N connectors are very popular with antennas, and are nice, since they are both threaded and waterproof. They are also the largest physical size of these connectors here.