

# Connectors

## INTRODUCTION

In electronics, connectors are one of those things we tend to take for granted. They're just something hanging off the end of a cable so we can plug and unplug power or signals on some circuit. So what's there to think about connectors? The answer is "plenty"!

Besides the obvious, such as having the right number of pins, there are several things to consider when choosing a connector:

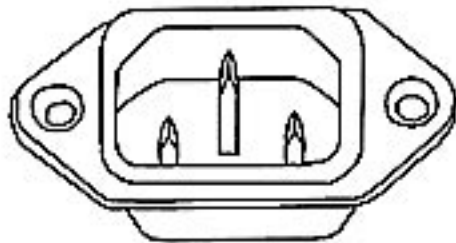
- **Cost:** Nobody wants to spend more than they have to. But using the cheapest connector you can find may not, in the end, be cost effective if it fails to do its job.
- **Ruggedness:** Is it going to be plugged and unplugged once a year, or ten times a day?
- **Environment:** Will it be exposed to the weather, such as on an outdoors antenna? How about salt water, such as on a boat? Will it be subject to vibration, such as on a machine? Is someone likely to step on it?
- **Signals Type:** Is it for power and ground? For analog or digital signals? If analog, what frequency? Is it audio or RF? If digital, what clock speed or bit rate?
- **Power Level:** If it's for power, is it for 24 Volts? Or 240 Volts? Or 2,400 Volts? Will it carry 0.25 Amps? Or 2.5 Amps? Or 25 Amps? Higher currents require larger, thicker pins. Higher voltages require more insulation.
- **Signal Level:** Is it for 2 Volt signals or 2 microVolt signals? Will the current be 5 milliAmps or 5 microAmps? Connectors used for very low signal levels (so-called "dry circuits") often have gold plated pins.
- **Second Sources:** Is it a standard type of connector available from many manufacturers, or is it available only from one company?

## TYPES OF CONNECTORS

If you've been around electronic equipment for any length of time, then you know there are many types of connectors. Here, in no particular order, are some of the common ones:

### Power Connectors

*Figure 1* shows a common type of 115 VAC receptacle used to connect the power cord to things such as personal computers and test equipment.



*Figure 1*

*Figure 2* shows a "Jones" or "Cinch-Jones" connector. These have been around for decades, and are used in applications such as supplying power to a DC motor.

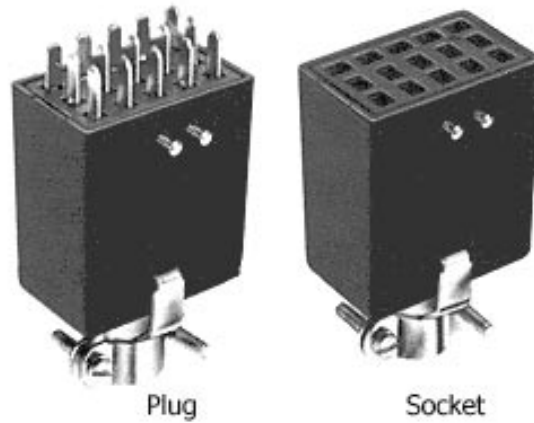


Figure 2

### Audio Connectors

Like the Jones connectors, most of these have been around for decades. **Figure 3** shows what is commonly called an "RCA" plug and jack. They are two-conductor connectors typically used with shielded cable. They are used in applications such as connecting microphones and small speakers to audio amplifiers.



Figure 3

**Figure 4** shows a "phone" (old telephone type) or "phono" plug and jack. They can be two or three conductor connectors used for one (mono) or two (stereo) audio signals carried on a shielded cable. There are several other types of connectors used for audio signals.

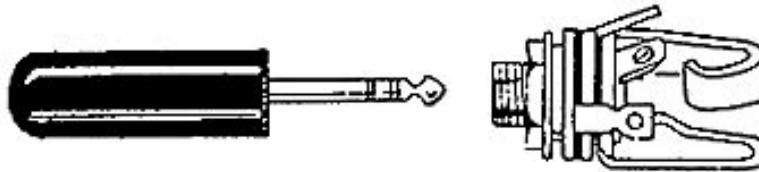


Figure 4

**Modular (Telephone) Connectors** These are used with UTP (unshielded twisted pair) cables. **Figure 5** shows an RJ11 connector commonly used with 4-wire telephone cables. An RJ12 connector is the same size but used with 6-wire cable. **Figure 6** shows an RJ45 connector used with 8-wire local area network (LAN) cables.

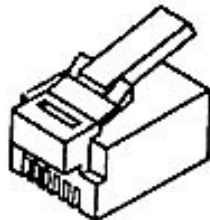


Figure 5



Figure 6

## BNC and UHF Connectors

**Figure 7** shows a BNC cable commonly used with shielded cable, such as RG58, carrying RF signals. Exactly what BNC stands for is unclear, but most people think the B is for bayonet because of the way the connector locks on to the receptacle. BNC connectors are common on electronics test equipment such as oscilloscopes.



**Figure 8** shows a UHF connector (UHF stands for Ultra High Frequency). Like the BNC connector, it is used on coaxial cables carrying RF signals. It can be used on thicker cable such as RG8. A UHF connector is threaded to screw onto the receptacle.



## D-Shell Connectors



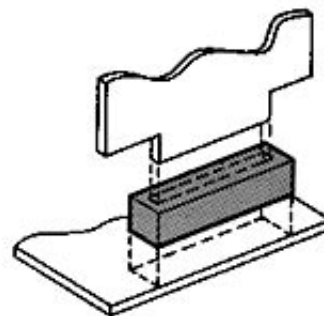
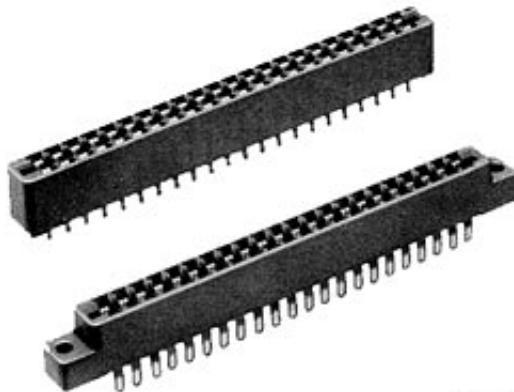
*Figure 9A*



*Figure 9B*

**Figure 9A** shows a DB9 connector. **Figure 9B** shows a so-called Centronics connector commonly used for the printer port of a PC.

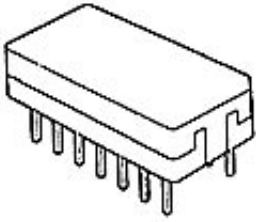
## Edge Connector



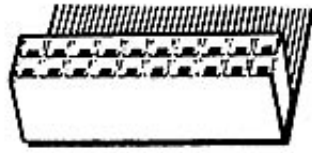
*Figure 10*

**Figure 10** show a typical connector used to connect to copper traces on the edge of a removable circuit board.

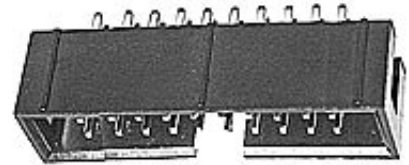
## Insulation Displacement Connectors (IDCs)



*Figure 11A*



*Figure 11B*



*Figure 11C*

**Figure 11** shows the types of connectors used with ribbon cables. **Figure 11A** is a "DIP" connector, which can plug into a standard IC DIP socket. The connector of **Figure 11B** mates a "header", which has pins on 0.1" centers and is common on circuit boards. The connector of **Figure 11C** is a "shrouded" header.