

Cables & Interconnection

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Cable & Parameters

- ▶ A cable is a conductor used to connect the different parts of electrical systems together so that electricity can flow.
- ▶ Material - Metal
- ▶ Resistance - lower, better

- ▶ Other important features:
- ▶ Annealing - Process to increase the ductility of metal.
- ▶ Wire Gauge - This refers to the thickness of the wire.
 - ▶ The standardized sizes are specified by the American wire gauge (AWG).
- ▶ Solid and stranded wire - a large gauge wire can either be a solid wire or stranded wire.

▶ Corrosion and Oxidation

- ▶ Corrosion : Corrosion is a problem that arises when two dissimilar metals are in direct contact with each other. Due to differences in potential, one metal will 'eat away' at the other one.
- ▶ Oxidation : Oxidation occurs when the metal combines with oxygen and other chemicals to create rust.

Audio Connectors

Given below are the most commonly used connectors in audio.



Phono(A-Type)



Phono(B-Type)



Bantam



BNC



XLR male
(Cable mount)



XLR Female
(Cable mount)



XLR male
(Panel mount)



XLR Female
(Panel mount)



XLR/Phono
Combo



RCA male



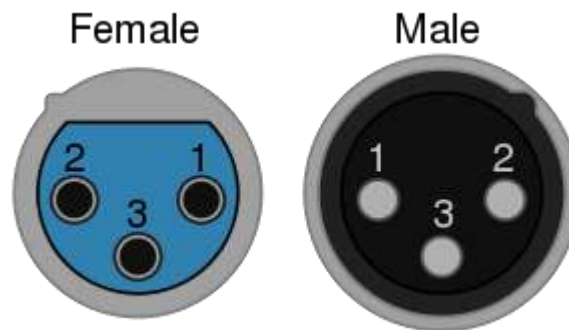
RCA female
(panel mount)



Toslink male

3-pin XLR

- ▶ 3-pin XLR connectors are mainly used for balanced audio signals. Using a balanced signal reduces the risk of interference.
- ▶ Pin 1 is the earth (or shield)
- ▶ Pin 2 is the +ve (or 'hot')
- ▶ Pin 3 is the -ve (or 'cold').



Unbalanced Connection

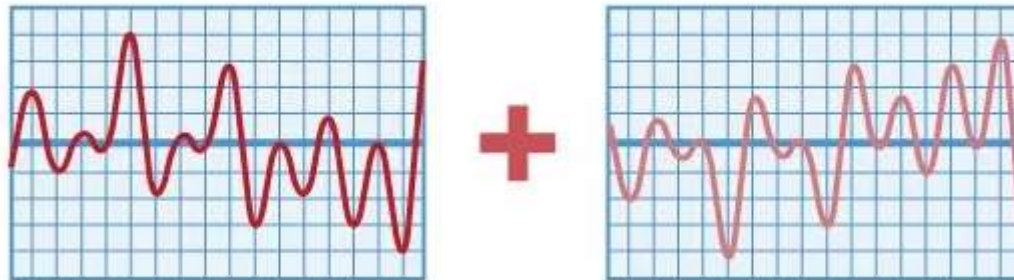
- ▶ An unbalanced cable consists of two connectors with two conductors each, connected by two wires inside the cable—a signal wire and a ground wire.
- ▶ The signal wire is typically in the center of the cable with the ground wire surrounding it.
- ▶ Ground wire serves to shield the main signal wire to some degree from outside interference from noise such as the hum from lights and transformers, as well as RF (radio frequency) interference

- ▶ Unbalanced cables are not very good at suppressing noise from outside interference, unbalanced cables should have a maximum length of 15-20 feet (4-6 meters)

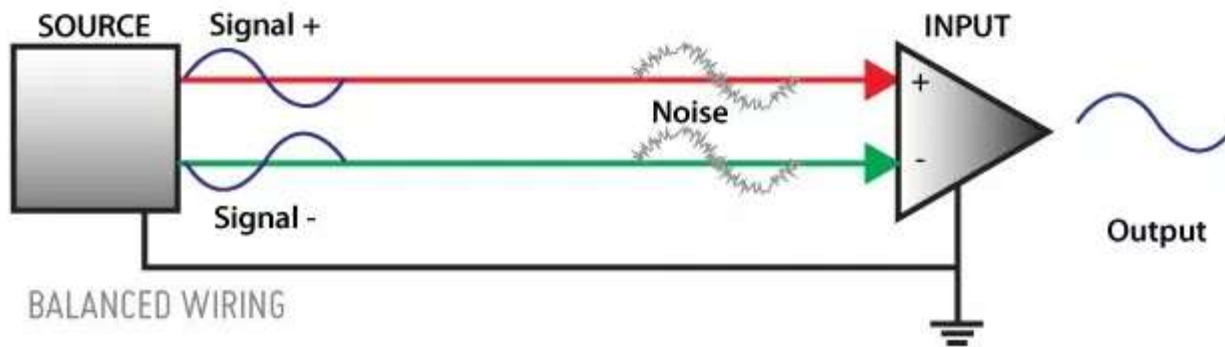
Balanced Cables and Signals

- ▶ Balanced cable has three conductors in the connector and three wires in the cable: two signal wires plus a separate ground wire.
- ▶ The ground wire still surrounds the signal wires and is used as a shield against interference.

- ▶ Balanced cables use two signal wires; both carry a copy of the signal, but the two copies are sent with their polarity reversed. If you sum two signals that are identical but are reversed in polarity, the signals cancel out, leaving you with silence.



- ▶ The receiving gear will flip the inverted signal back into its original orientation.
- ▶ Since both copies of the signal picked up the same noise as they traveled along the cable, flipping the polarity at the receiving end will produce the original signal intact and noise as reversed polarity.
- ▶ Thus signal is preserved and noise is canceled.



- ▶ Balanced cables can support much longer cable lengths; 50 to 100 feet (15-30 meters)
- ▶ Standard connectors designed for use with balanced signals are XLR and TRS (or “tip-ring-sleeve”).

1/4" Phone Jack (6.5mm Jack)

- ▶ There are two types of 6.5mm Jacks: Mono and stereo. The mono jack has a tip and a sleeve, the stereo jack has ring, a tip and a sleeve.
 - ▶ On the mono jack the tip is the +ve, and the sleeve is the -ve or shield.
 - ▶ On a stereo jack being used for a balanced signal, the tip is the +ve, the ring is the -ve, and the sleeve is the shield.
 - ▶ On a stereo jack being used for a stereo signal (left and right), the tip is the left, the ring is the right, and the sleeve is the shield.

DI Box

- ▶ The primary function of DI (Direct Inject) boxes is to take an unbalanced, high-impedance signal and convert it to a balanced, low-impedance signal.
- ▶ This allows the signal to be sent over long cable runs with significantly less signal loss (especially in high frequencies) due to the lowering of the impedance, and greater rejection of interference.

- ▶ Because all cables used in live sound and recording are "capacitive", and that capacitance reacts with the source and destination impedances to form a low-pass filter. So, long cables used without a DI box can become a "low-pass filter" which reduces the high end frequencies.
- ▶ So working with a low source impedance and relatively low microphone input impedance means signals can be passed over extremely long cables without problems.

Snake Cable



- ▶ An audio multicore cable commonly known as a snake cable or just a snake is a thick cable which contains from four to 64 individual audio cables inside a common, sturdy outer jacket.
- ▶ Snake cables are widely used whenever multiple audio signals, for example from a number of microphones, need to be conveyed between common locations.
- ▶ Typical professional audio applications include audio recording, sound reinforcement, PA systems and broadcasting.

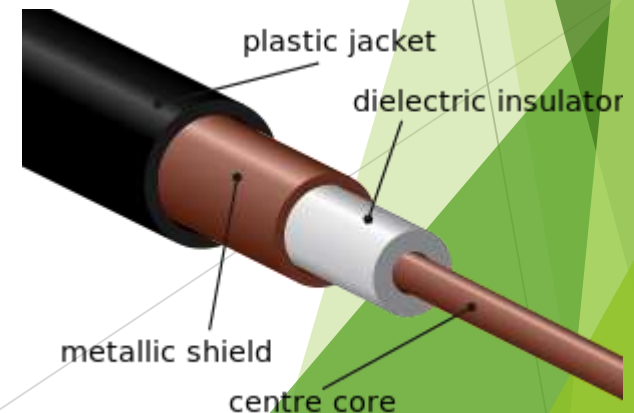
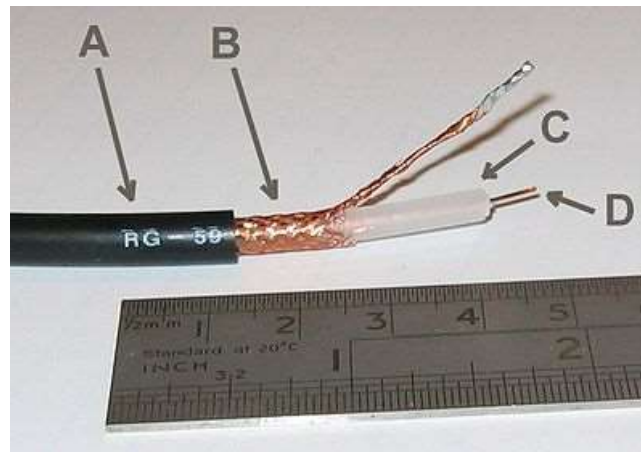
RCA Connector

- ▶ A type of electrical connector commonly used to carry audio and video signals.
- ▶ The name RCA derives from the Radio Corporation of America



Coaxial cable

- ▶ Coaxial cable, or coax is a type of electrical cable that has an inner conductor surrounded by a tubular insulating layer, surrounded by a tubular conducting shield.
- ▶ Coaxial cable is a type of transmission line, used to carry high frequency electrical signals with low losses.



- ▶ Coaxial cable conducts electrical signal using an inner conductor (usually a solid copper, stranded copper or copper plated steel wire) surrounded by an insulating layer and all enclosed by a shield, typically one to four layers of woven metallic braid and metallic tape.
- ▶ The cable is protected by an outer insulating jacket.
- ▶ Normally, the shield is kept at ground potential and a signal carrying voltage is applied to the center conductor.
- ▶ The advantage of coaxial design is that electric and magnetic fields are restricted to the dielectric with little leakage outside the shield.

- ▶ The technical specifications say they should be rated at 75 ohms for accurate transfer of the signal.
- ▶ A coaxial digital audio connection is used to send S/PDIF digital audio signals between devices.
- ▶ It supports stereo audio as well as DTS and Dolby Digital 5.1/7.1 surround sound signals.
- ▶ A coaxial digital output is often used when sending multichannel audio from a DVD player or computer to your surround sound system. Or from a CD player to a stereo amplifier.

DIN Connector

- ▶ A DIN connector is an electrical connector that was originally standardized in the early 1970s by the Deutsches Institut für Normung (DIN), the German national standards organization.
- ▶ There are DIN standards for a large number of different connectors.
- ▶ DIN 41524, for circular connectors often used for audio signals or some digital signals like MIDI

- ▶ It is comprised of a protective metal skirt that contains straight round pins.
- ▶ There are seven familiar patterns with three to eight pins with different five-pin connectors: 180° and 240° or 270°.
- ▶ The 3/180° and 5/180° connectors were originally designed to connect analog audio equipment such as stereo tape recorders to amplifiers or preamplifiers using four pins to connect and one to ground the system.
- ▶ 5/180° connector is used for MIDI connection.

