

## Section Four

### Cables and Connectors

In this section we will look at various types of cables and connectors. There are numerous cables each with different gauge (wire size) and connectors. This section is designed to give you an idea of what you may encounter as a stagehand.

#### Microphone Cables

The standard microphone cable is called an XLR cable. This cable uses a three-conductor wire and has a male XLR connector on one end and a female XLR connector on the other end. It carries a balanced signal. A balanced signal allows the microphones signal to be sent great distances and still come out clear without hum.

The connectors are known as 3 pin XLR connectors. Each of the pins has one of the wires in the three-conductor wire connected to it.

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Microphone Cable: XLR male to XLR female.



Three-conductor microphone wire.



XLR Female 3 pin connector close-up.



XLR Male 3 pin connector close-up.



Many times when you are working with audio. The connector on the end of the cable may be of the wrong sex. To eliminate this problem there are two cable adapters that you can use. These are called turnarounds. One is a female-to-female turnaround and the other is a male-to-male turnaround.

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Female to Female XLR turnaround.



Male to Male XLR turnaround.



At times you may have an input source that is too powerful for the sound console's input. When you encounter this you will need to use an XLR In Line Attenuator Pad. This lowers the signal to a manageable source. The Pad reduces the signal in decibel increments. Individual pads may vary as to how much gain reduction they produce.

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XLR In Line Attenuation Pad



Another In Line Transformer you may need is one that will reverse the phase of the audio signal. Phase is the term used to describe which way the signal flow is going. An example is: If the speaker is in correct phase the speaker pushes out as the signal goes to it. If the speaker is out of phase the speaker pulls inward towards the speaker cabinet. Phase cancellation also happens to microphones when they are too close together. This may happen on podium microphones quite easily. The resulting sound is muffled at some of the frequencies. If this happens, reverse phase on one of the microphones or check that the speakers are wired correctly.

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## In Line Phase Reversal



Another situation that occurs is sometimes you may need to convert an unbalanced signal to a balanced signal. This is accomplished with an adapter called the High to Low Impedance Signal Adapter.

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## High to Low Impedance Signal Adapter



The next connector that we will look at is the 1/4" mono phone plug. This is the type of connector that is found on musical instruments. It is used with a two-conductor wire. Many times it is referred to as a "guitar cable". It is also used many times for the effects in the effects rack and signal processors. It is found usually with the male connector on both ends of the cable. The female end will be found in the musical instrument or amplifier.

## 1/4" Male Mono Phone Plug



## Two Conductor Wire



Closely resembling this connector is the 1/4" stereo phone plug. This is also referred to as the TRS plug. TRS stands for Tip, Ring and Sleeve. It is also known as an insert cable. This connector is capable of sending two signals. The connector is used with a three-conductor wire. This reduces the number of cables from two to one. This is the same type of connector that is found on most headphones. It then allows for the stereo left and right signals to be carried down one cable. When used as a TRS cable connector, one end of the cable may split into two separate mono plugs. This allows the cable to work as both an input and output cable.

1/4" Male Stereo Phone Plug also know as TRS or Insert cable.



Three Conductor Wire



1/4" Stereo TRS cable with Y adapter to two 1/4" mono cables



## 1/4" Stereo TRS cable to two XLR cables: male and female



The next connector we will discuss is the RCA type of connector. This is the type of cable found on most home stereos, compact disc players and tape decks.

## RCA to RCA Connector Dual type



To make this cable useful in the pro audio field it is found many times with either the 1/4" mono connector on one end or the 1/4" stereo TRS connector on one end.

## 1/4" Stereo TRS cable to Dual RCA connector



## Multi Channel Snake

The Multi Channel is used to connect the microphones that are on the stage to the sound console that is out in front of house. Multi channel snakes carry numerous channels, anywhere from 6 up to and beyond 56. The snake not only carries the microphone signal from the stage to sound console, but also returns the main outputs (drive signal) of the sound console to the amp racks. One end of the cable has the stage box and the other end has the tails. Another version of the cable has multi pin connectors on each end of the cable. One end will have the tails as a fan out. The other end will screw into the stage splitter box.

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## 16 Channel Send and 4 Return Snake



## Multi-Pin Cable Connector



Before we move on I would like to discuss more about the Cable and the Wires in it. The cables we use have two descriptions in their names that we must look at. The first is the Wire gauge and the second is the conductors in the cable.

The Wire Gauge tells the diameter of the wire. This is the first number in the cable description. The higher the number in the cable description, the smaller the wire. An example is: 0 gauge wire is thicker wire than 12 gauge wire.

The Cable Conductor tells how many wires are in the cable. This is the second number in the cable description.

Below are there different cables with their descriptions.

16-2 cable has 16-gauge wire and 2 conductors (wires)



18-3 cable has 18-gauge wire and 3 conductors



12-4 cable has 12-gauge wire and 4 conductors



## Speaker Cable Connectors

Speaker cable connectors come in a wide assortment of types. Here we will discuss the major ones.

The Heavy Duty 1/4" Phone Plug is used for connections of moderate wattage systems. This cable will be found with the powered head mixer to speaker combination. It is also the cable to use when connecting guitar or bass heads to their speaker cabinets.

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### Heavy Duty 1/4" Phone Plug



The Banana Plug is the connector that is used on the back of power amplifiers. It has two male pins that plug directly into the back of the power amp. A two-conductor wire is used with this plug. Each conductor of the wire is pushed thru the two separate holes on the banana plug. They are held tight by precision screws. They also have a tab that sticks out on one side of the plug. This is to help keep the positive and negative wires in the correct place. This also keeps the phase correct.

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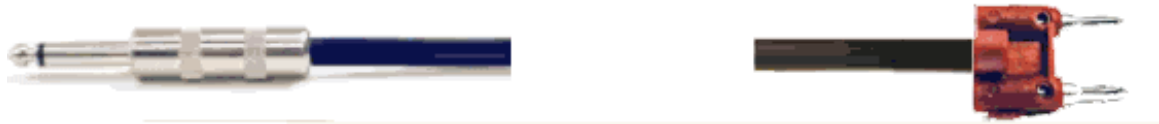
### Banana Plug



A common cable that uses a banana plug would have a heavy-duty 1/4" plug on the other end. The banana plug would go into the power amp and the 1/4" would go into the speaker cabinet.

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## Banana Plug to 1/4" Speaker Cable



The Speakon Connector is a connector that has a locking feature on it. Neutrik makes it. The male end is found on the speaker cable. The female end is found on the cabinet or amp rack.

## Neutrik Speakon Connector Male End



## Speakon Connector Female End



Another common combination of cables you may see involves the Speakon, the Banana and the 1/4" Heavy Duty Cable. Below is an example.

### Speakon / Banana/ 1/4" Cable System



Most of the cables shown so far have been for a mono or full range system. The next series of speaker cables are the ones commonly found with bi-amp or larger systems.

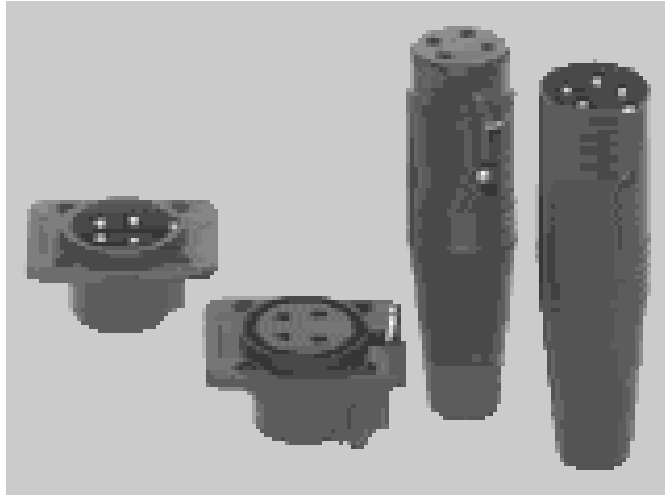
First we will look at four pin connectors. In a four-pin connector you will find each pin labeled. They will read 1+, 1-, 2+ and 2-. For an example we will discuss a two-way system. Pins 1+ and 1- will go to the lows and Pins 2+ and 2- will go to the highs. The connector at the amp end will break this down with Pins 1+ and 1- going to a banana plug. Pins 2+ and 2- will go to another banana plug.

If the system gets larger you follow the same formula. An example of a four way system would be: Pins 1+ and 1- are for the subs, Pins 2+ and 2- are for the lows, Pins 3+ and 3- are for the mids and Pins 4+ and 4- are for the Highs.

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The EP and AP series cables are designed to carry the load of speaker systems from 80 to 1000 watts. They come in either 4, 6 or 8 conductor cables. The wire in the EP and AP series is 13 gauge. The EP connector is a metal connector and the AP is a hard thermo plastic.

## AP 4 Series Connectors

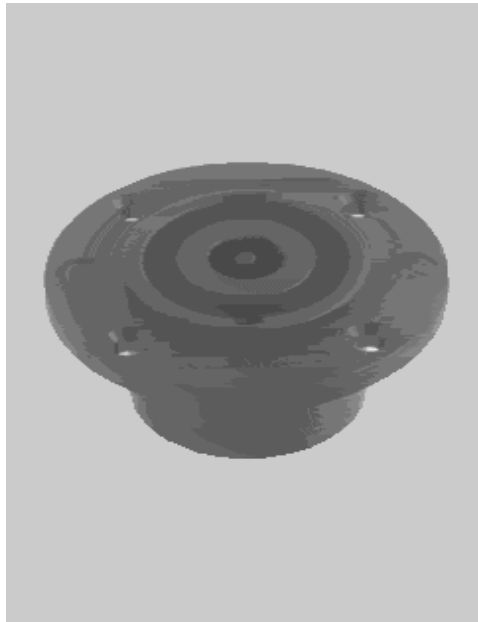


The Neutrik Speakon is also available for bi amplification audio systems. They follow the same wiring scheme but look a bit different. They go by the series name NL. This could be an NL4 or an NL8. The NL8 is a much larger connector than the NL4

## Neutrik Male end found on speaker cable



Neutrik Female end found on speaker cabinet or amp rack



If you find your cable is not long enough and you need to connect them use a barrel connector.

Neutrik NL8 Barrel Connector



## Specialty Cables

There are a few more cables here that need mentioning. Just remember that there are a lot more cables and connectors than we discuss here. These however are the most popular.

The cable loom is a group of cables tied together. It is the same as a cable snake. They are used to address special needs that the audio engineer may encounter when building a system with components from many manufacturers. They do not need a lot of discussion here. The connectors have been described in earlier sections. But the pictures may help you to get a visualization of these.

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### RCA to 1/4" Multi Snake



XLR to 1/4" Multi Snake



TRS Stereo Cable to Mono 1/4" plugs



XLR Y Cable Male to 2 Female



XLR Y Cable Female to 2 Male



## Cable Summary

In summary, cables and connectors come in a variety of shapes and sizes from many manufactures. Ask the questions below and it will help you to decide what the cable or connector is.

Is the connector male or female?

Is it XLR?

Is it RCA?

Is it 1/4"?

If so, is it mono or stereo (TRS)?

How many conductors are in the cable?

What is the gauge of the wire?

Is the connector a Neutrik Speakon?

Is the connector an EP or AP series?

How many channels are on the multi-channel snake?

Does the cable need a fan out?