Balanced to Unbalanced Wiring

Connecting 3-pin Balanced to 2-pin Unbalanced Inputs

In the commercial audio world, professional audio devices such as compressors, limiters, equalizers, line amplifiers, mixers and such use balanced audio inputs. **Commercial microphones have balanced outputs.** Balanced inputs use a passive, wide-response transformer or active circuitry, usually referred to as differential inputs, to create a balanced signal input.

Balanced connections employ two conductors, each of which carries the same signal but with the polarity of one reversed with respect of the other, located inside an isolated shield which is usually connected to an earth or chassis ground. The term "push-pull" is sometimes used for describing the output of power amplifiers, not line-level circuits. **The beautiful feature of a balanced audio line is that, when the signal cable is subjected to an interfering signal, that interfering signal is equal on those two conductors; but since they are out of phase, that noise is canceled and all that it left is the desired audio signal that has the opposite polarity and therefore does NOT cancel.**

Unbalanced connections can work just fine in small sound systems, or in fixed systems where ground loop problems can be eliminated once, and then forgotten. It is best to avoid, in audio systems that drive radio transmitters, as their audio input cables are subjected to the RF output of the transmitter. In a balanced input, that interfering RF signal would be canceled just by the nature of how a balanced audio input works.

The shield of a balanced signal connects to ground, usually just ONE end to avoid any ground loops. Any interfering signals that land on this shield are immediately dumped to ground, but what DOES land on the out of phase, balanced input lines inside of that shield is canceled.

Type of Cable

The shield for a balanced audio signal when subjected to high RF environment ideally should be a 100% silver braid, not the foil type with a "drain."

Balanced to Unbalanced Connections

All amateur radio transmitters (except the new Yaesu FTdx9000) unfortunately use an unbalanced microphone input. In connecting a balanced microphone, equalizer, or audio device that uses balanced signals, care has to be taken in how the balanced signal is UNBALANCED in order to feed that unbalanced input.

The nature of the active output of the mixer or EQ determines the type of cabling that may be used when that balanced output is connected to an unbalanced input. The two conductors inside 100% shield should be employed, allowing the cable to remain more or less balanced right up to the input of the unbalanced device. This actually helps cancel noise, because the shield drains noise to the earth ground and is not relied upon to carry the signal. The shield's finite resistance means that grounding the shield and the "low" side of the cable at the input to the unbalanced device is not the functional equivalent of doing so at the output of the balanced device potential, but with the polarity of one reversed with respect to the other.

The connections to allow a balanced output to connect into an unbalanced input or an unbalanced microphone into a balanced input are simply done by connecting the shield, ground tab, pin 1, and pin 3 together. This connects the shield to the chassis ground lug, the normal pin 1 ground, and the signal return of pin 3 all together, while the positive signal input is pin 2.

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