

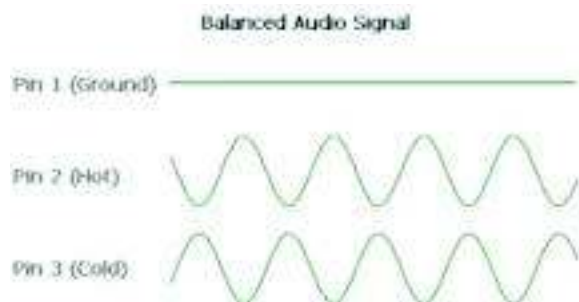
# Oops, Engineering!

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Scraping through the vast range of radio stations streaming on the internet (including hospital radio), I've come across a number of streams that just sound wrong. Correct wiring from the equipment to station output is essential to get the sound right.

All professional audio equipment would have "balanced inputs/outputs" and all domestic audio equipment will have simple "unbalanced inputs/outputs". If wired incorrectly, things can go horribly wrong. Stereo sound that is Out Of Phase (Oop) may sound "wide" or just odd.

So what is the difference of "balanced" and "unbalanced" audio? If you have a grasp of some audio wiring techniques, you will notice that some equipment have simple + and screen, whilst "balanced" equipment has +, - and screen. Balanced audio was developed to prevent interference. We hear audio sound waves, and this is converted into small electrical waves. These electrical signals are amplified and converted back to sound waves via an amp and speakers. During this process, the electrical signal can pick up electrical interference. To eliminate this "unwanted noise", balanced audio connections are used. With balanced audio, each channel (mono, left or right) will have a + signal as well as a - signal shrouded with a screen. Any interference picked up along the cables interconnecting the equipment will be "seen" by circuits and cleverly cancelled out. So in essence, when we connect up equipment in radio studios, we want a clean signal without interference and so balanced audio is used.



Pin 2 (hot) is the positive signal.

This is "balanced" with Pin 3 (cold) and shrouded with the screen Pin 1 (ground).

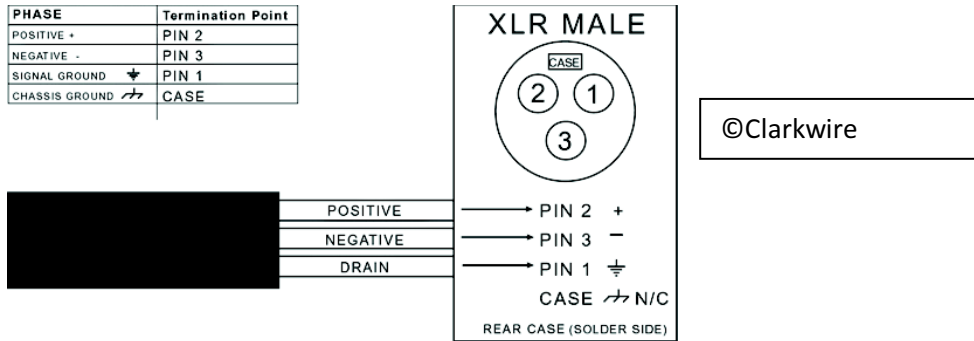
Electronically balanced circuits will filter out most interference picked up along the cable.

Picture ©Mediacollege

But if wired up wrong, this can cause audio to be "Out Of Phase" (Oops). In a stereo situation, both the left and right channels have to be correctly wired. If not the left channel can cancel out the right channel resulting in audio lost, and as most hospital radio services broadcast in mono to the wards we serve, songs without vocals or no audio whatsoever can result simply because two wires have been connected wrongly.

A simple way to find if something is out of phase is to force the audio signal into mono. Some mixing desks may have a mono switch on the monitor section (to force headphones/speakers into mono) or a phase correlation meter (mostly found on production desks).

To try to eliminate any confusion, we use wiring standards. Most balanced connections use XLR plugs/sockets.

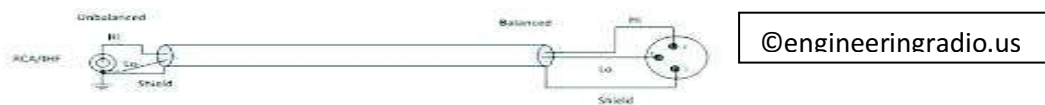


It doesn't really matter what colours of the cable is used to connect to the pins, as long as the same cable on pin2 is connected to pin 2 at the other end and the shield is connected to pin 1. All balanced equipment needs to be wired using this convention.

But what about connecting "unbalanced" equipment?

When we connect from unbalanced (such as a CD player), we connect using this convention:

\*Note that pin1 (screen) and pin 3 (cold) are wired together at the phono plug.



XLR pin 2 connects to the RCA/phono + centre pin  
 XLR pin 1 AND 3 connect to the RCA/phono outer shield

When it comes to connecting up to computers with standard soundcards, they often use 3.5mm jacks. These are unbalanced inputs and so care must be taken to ensure that they are wired correctly from your desk/transmission chain which is likely to be a balanced audio system.

You will need to feed a stereo signal, in essence six wires, to just three poles of a stereo mini jack plug. Again, remember Pin 2 (Hot or +) connects to the tip (left) of the jack and the first ring (right) of the jack. Keep all cable connections as short as possible. The screen of the mini-jack should have the pins 1 and 3 of each channel connected to it – unless you suffer with mains hum because of "ground loop".

But that's another story.....

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Appended

Annex:

The following images show Phase Analysis using Cool edit Pro/Adobe Audition



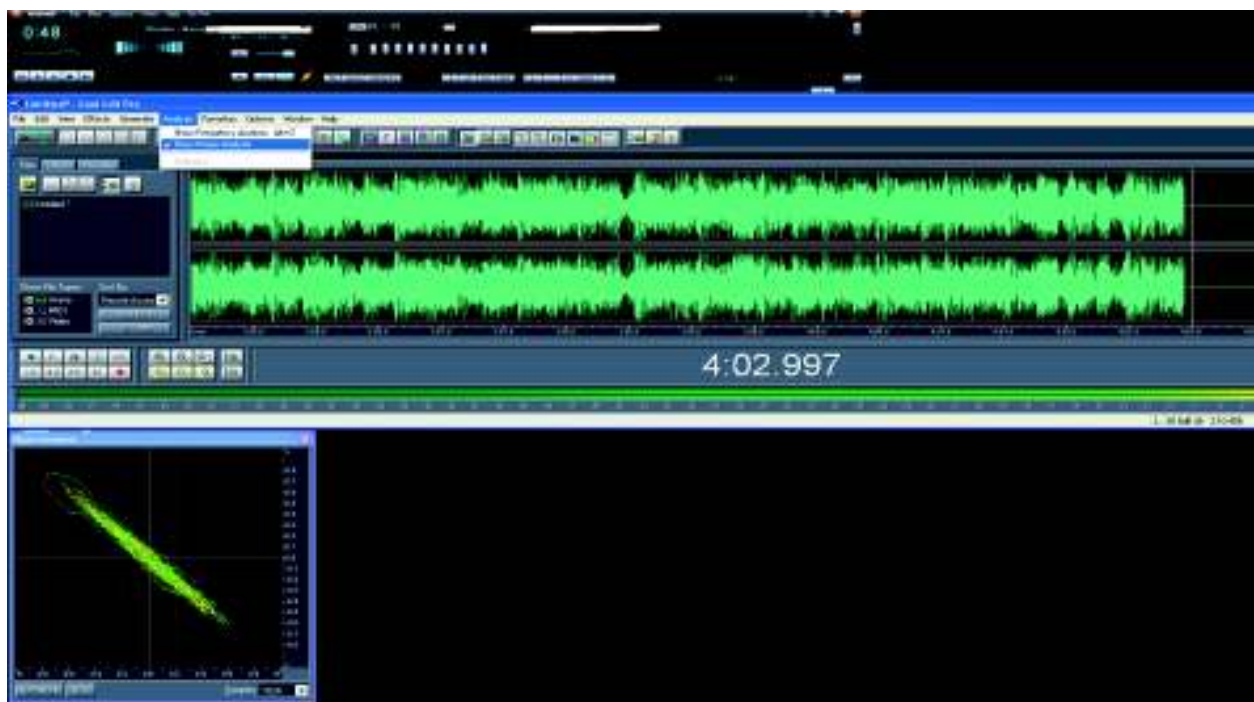
Using CEP/Adobe Audition Phase Analysis we can see that this tone is in phase (note the elliptical shape) upwards from left to right.



A clean stereo signal should have a graph as above.



A mono signal will have a bar at 45 degrees upwards from left to right.



A stereo signal that is Out Of Phase will result in the graph showing a signal pointing down from left to right.