pono TECH SHEET 01 V2.0

Balanced Audio Circuitry and Pono.

Overview

The audio circuitry in the PonoPlayer is fully balanced, from the D/A converter chip (and when used with specialized equipment) to the output jacks. This is the first portable audio player in the world to be made this way.

Balanced circuitry

This is most commonly used in recording studios. The reason is that very long runs of very low level signals (such as is found in microphones) may be fed over long cables of 100 feet or more in length. This is clearly not the situation in the PonoPlayer, or in most home audio systems.

The first thing to understand is how balanced circuitry works. A true balanced circuit has two signal conductors plus a ground conductor. The two signals are equal in amplitude but opposite in polarity. So as one signal goes positive, the other signal goes negative, and vice-versa.

The circuit that receives a balanced signal must be a special type of circuit that only amplifies the difference between the two signals. Often one signal is called the "hot" signal and the other signal is called the "cold" signal. Since two signals are going in opposite direction the input circuit has twice as much voltage to amplify.

This balanced input circuit has another special characteristic in that signals that are the same polarity in both conductors are rejected. So in a recording studio with long runs of low level signals the cables (no matter how well they are shielded) will pick up some hum from the AC wiring in the building, and this hum will be rejected by the special input circuitry.

Pono and Balanced Mode

As noted earlier, this has no advantage in such a small device as the PonoPlayer. So why go to the trouble and expense of using fully balanced circuitry in the PonoPlayer?

The true advantage of balanced circuitry comes about in a similar but different method. Specifically all circuitry must be powered by power supplies or batteries. There is no such thing as a perfect power supply or battery. The true advantage of balanced circuitry is that it rejects imperfections in the power supply (hum and noise) in the same way that the long cable in a recording studio rejects hum from the AC wires in the building.

Unless someone develops a completely perfect power supply or battery, balanced circuitry will always give higher performance than conventional single-ended circuitry. So until that day arrives, balanced circuitry will always provide higher sonic quality than conventional single-ended circuitry.

The disadvantage of balanced circuitry is that it is more complex and therefore more expensive and space consuming than conventional single-ended circuitry.

Since most consumer equipment only has single-ended circuitry, the outputs of PonoPlayer have been designed to also be compatible with conventional single-ended headphones and stereo equipment.

There is nothing special that needs to be done to use the PonoPlayer with conventional single-ended stereo equipment or headphones. However, using the PonoPlayer with balanced headphones or special equipment does require special cables. Please refer to the appropriate Tech Sheets (02 and 03) for information on using the PonoPlayer with balanced equipment.

Mono Cables

Never use the PonoPlayer with mono cables under any circumstances!!. These are easily identified as they only have one insulating ring separating the two pieces of metal on the connecting plug. Mono cables will short out one or more of the four output amplifiers in the PonoPlayer and can damage it. A mono 3.5mm plug looks like this – **DO NOT USE**

pono TECH SHEET 02 V3.1

Using the PonoPlayer in balanced output mode with a HiFi system

Correct for PonoPlayer firmware version 1.0.6

Overview

The PonoPlayer provides four output modes:

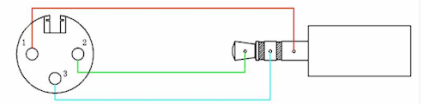
1. **Variable output**, for headphones - or as input to a power amplifier or powered speakers
2. **Fixed output** for use with a hi-fi system, in car system with an auxiliary input socket or powered speakers with their own volume control
3. **Two pairs of headphones** driven simultaneously
4. **Balanced output mode** for use with headphones, pre amplifiers or power amplifiers that support balanced mode

This Tech Sheet applies specifically to option 4 - using Pono in balanced output mode, with a HiFi system. A separate sheet (03) covers balanced mode with headphones, another (01) gives background to Balanced Mode.

Using Balanced Mode

1. Balanced mode on your PonoPlayer **must only be used** with HiFi equipment that itself supports balanced mode operation. Inputs on such equipment, typically power amplifiers, preamplifiers and headphone amplifiers are, by convention, 3 pin XLR female. Outputs are, again by convention, 3 pin XLR male. Please ensure that the inputs are balanced mode – in rare cases, XLR connections are used, but they are not balanced mode. **Under no circumstances** should cables that are terminated with RCA phono plugs be used. **These can cause serious damage to the PonoPlayer. These are illustrated at the foot of this Tech Sheet.**
2. You will need a pair of cables, one for each channel, each with a 3.5mm tip/ring/sleeve plug on one end and an XLR male plug on the other.
3. Cables must use the wiring configuration shown in the diagram below. **Do not assume that cables with the appropriate plugs are wired correctly for balanced mode operation with your PonoPlayer – you must ensure that they are wired in accordance with the diagram.** Please check this before purchase and use.
4. **Under no circumstances** should a mono 3.5mm plug be inserted into either socket, or cables fitted with such plugs be used. These are plugs that look like this, just a tip and a sleeve, no ring. **DO NOT USE**

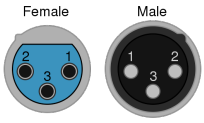
5. If you are in any way unsure about balanced mode operation, please seek professional guidance. **Pono cannot be held responsible for any damage caused by the use of incorrectly configured cables.**
6. We suggest that, before connecting cables to your pre-amplifier, power amplifier, or headphone amplifier, it should be switched off and switched back on after the connections have been made at the Pono end.
7. Balanced output mode can only be selected after both balanced mode cables have been plugged into the 3.5mm sockets, one in the “Headphones” socket (for the left channel) and one in the “Line out” socket (for the right channel).
8. Once the cables are plugged into the PonoPlayer, go to menu option “Settings”, select “Playback”, then “Balanced Mode”. A warning (shown in the picture at the top of this sheet) will appear stating that Balanced Mode must only be used with specialist equipment that supports this form of working.
9. Ensure that the volume control is turned down before playing music, then adjust as needed. Use the player in the normal way, all control and volume functions are available.
10. When either or both Balanced Mode cables are unplugged from the PonoPlayer, Balanced Mode is automatically cancelled.



Wiring diagram for a 3.5mm tip/ring/sleeve plug to a single Cannon XLR.

Under no circumstances should a mono plug be inserted into either PonoPlayer output socket – see item “4” above

Typical Balanced Mode cable to connect to HiFi – Pono uses two of these, one for each channel



Cannon XLR pin configuration for male and female versions – these are necessary for balanced mode connection on pre and power amplifiers.

Typical RCA Phono plugs.

UNDER NO CIRCUMSTANCES should cables terminated with these kind of plugs be used in balanced mode.

pono TECH SHEET 03 V2.0

Using balanced output mode with headphones

Correct for PonoPlayer firmware version 1.0.6

Overview

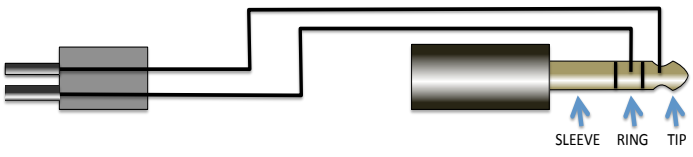
The Pono player provides four output modes:

1. **Variable output**, for headphones or as input to a power amplifier or powered speakers
2. **Fixed output** for use with a hi-fi system, in car system with an auxiliary input socket or powered speakers with their own volume control
3. **Two pairs of headphones** driven simultaneously
4. **Balanced output mode** for use with headphones, pre amplifiers or power amplifiers that support balanced mode

This Tech Sheet applies specifically to option 4 - using Pono in balanced output mode, with headphones. A separate sheet (02) covers balanced mode operation with HiFi equipment and balanced mode itself (01).
In this Tech Sheet Sennheiser is used as an example of the kind of headphones that can be used in balanced mode with the use of a specific cable. Headphones with detachable cables from other manufacturers may also be suitable for balanced mode operation. when used with Pono specific balanced mode cables.

Using Balanced Mode

1. Balanced mode operation on your Pono player **must only be used** with headphones that are either designed specifically for balanced mode operation or which have an appropriate cable to enable their use in this mode. **If you are in any way unsure of this mode of operation, please seek professional advice. Pono cannot be held responsible for any modifications to headphones or for cables not supplied by Pono itself.**
2. You will need a headphone cable with two 3.5mm tip/ring/sleeve plugs on the Pono end (one for each channel), and a suitable plug or plugs at the headphone end.
3. Cables must use the wiring configuration shown in the diagram below. **Do not assume that cables with the appropriate plugs are wired correctly for balanced mode operation with your Pono player – you must ensure that they are wired in accordance with the diagram.** Please check this before purchase or use.
4. **Under no circumstances** should a mono 3.5mm plug be inserted into either socket, or cables fitted with such plugs be used. These are plugs that look like this, just a tip and a sleeve, no ring: 
5. Balanced mode can only be selected after both balanced mode cables have been plugged into the 3.5mm sockets, one in the “Headphones” socket (for left channel) and one in the “Line out” socket (for right channel).
6. In the Pono player menu “Settings”, select “Playback”, then “Balanced Mode”. A warning (shown in the picture at the top of this sheet) will appear stating that Balanced Mode must only be used with specialist equipment that supports this form of working.
7. Ensure that the volume control is turned down before playing music, then adjust as needed. Use the player in the normal way, all control and volume functions are available.
8. When either or both Balanced Mode cables are unplugged from the Pono player, Balanced Mode is automatically cancelled.



Wiring diagram for a 3.5mm tip/ring/sleeve plug to a typical headphone plug. The illustration shows the Sennheiser plug with one pin thicker than the other. In unbalanced mode, the thicker pin is used for ground, the thinner one for signal. In balanced mode the thin pin is connected to the tip (hot/positive) of the 3.5mm plug.

Typical Balanced Mode cable to connect to headphones. This is for some of the Sennheiser HD series including HD25, HD580, HD600 and HD650 and is wired in accordance with the diagram to the left

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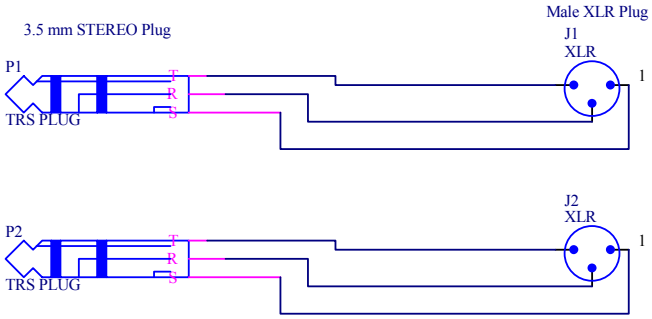
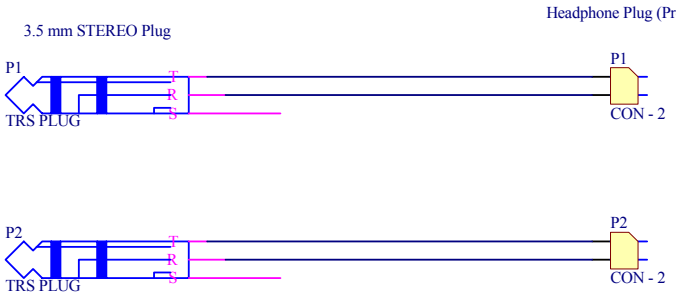


ONLY Connection That Will Work to Connect PonoPlayer In Balanced Mode to Balanced Stereo (XLR) Inputs

Note: NEVER Use a MONO 3.5 mm Plug! This Will Damage Your PonoPlayer!



ONLY Connection That Will Work to Connect PonoPlayer In Balanced Mode to Balanced Headphones

Note: NEVER Use a MONO 3.5 mm Plug! This Will Damage Your PonoPlayer!

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Dwg:	Drawn by: C. Hansen	Date:	2300-B Central Ave Boulder, CO 80301
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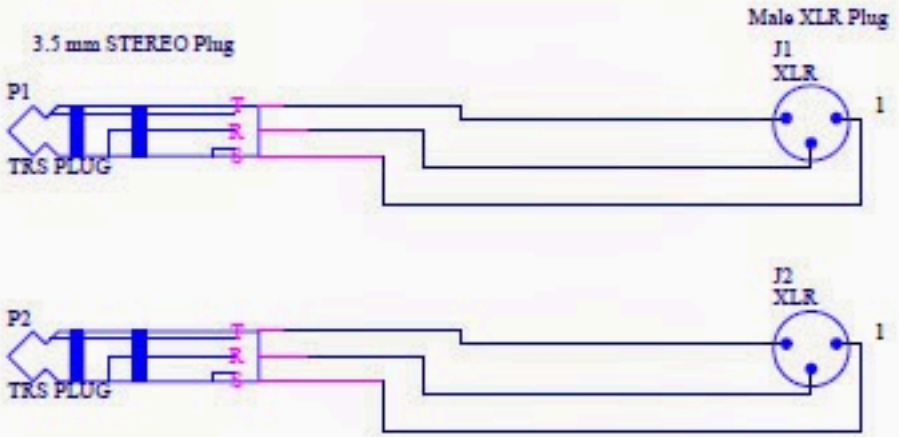
PONO PLAYER CUSTOM CABLES



Balanced Mode to Balanced Stereo XLR

Balanced Mode to Balanced Headphones

DONT USE 3.5MM MONO PLUGS FOR EITHER CONFIGURATION

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