

Turntable Electrical Hum Guide

09-2019

Hum is a quite common issue in audio setups with turntables. As fairly high amplification is needed to make the turntable signal audible, even minor faults in the setup can lead to hum issues. However, in most cases the cause of the problem is in the wiring/connection, so the turntable itself is not faulty.

A good starting point is to check whether the hum has mechanical or electrical origins. Just follow the steps below.

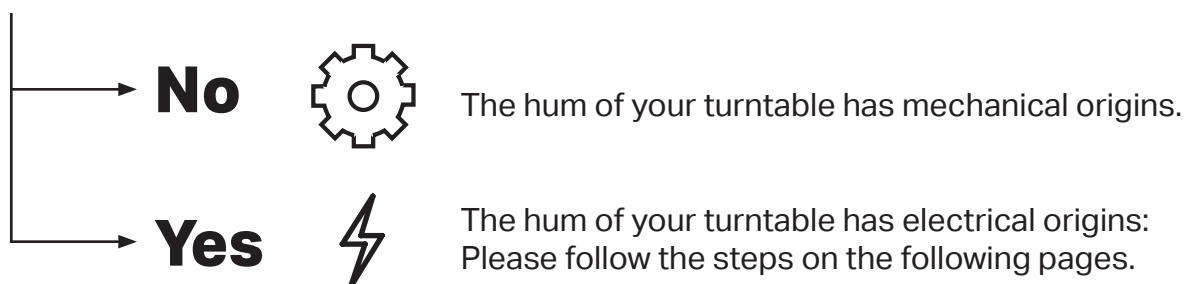
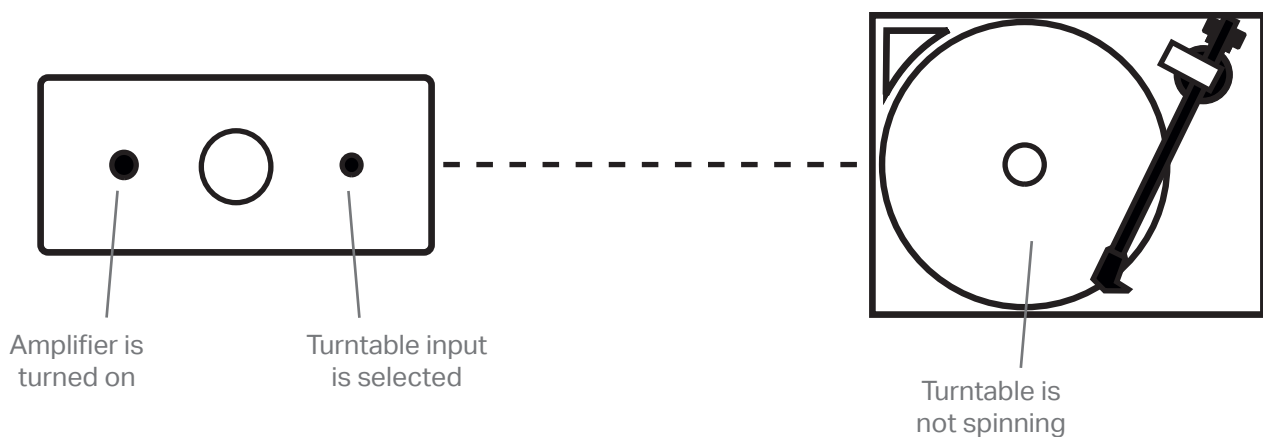
Problem:

Hum is audible when turntable is selected on amplifier input

Quick check:

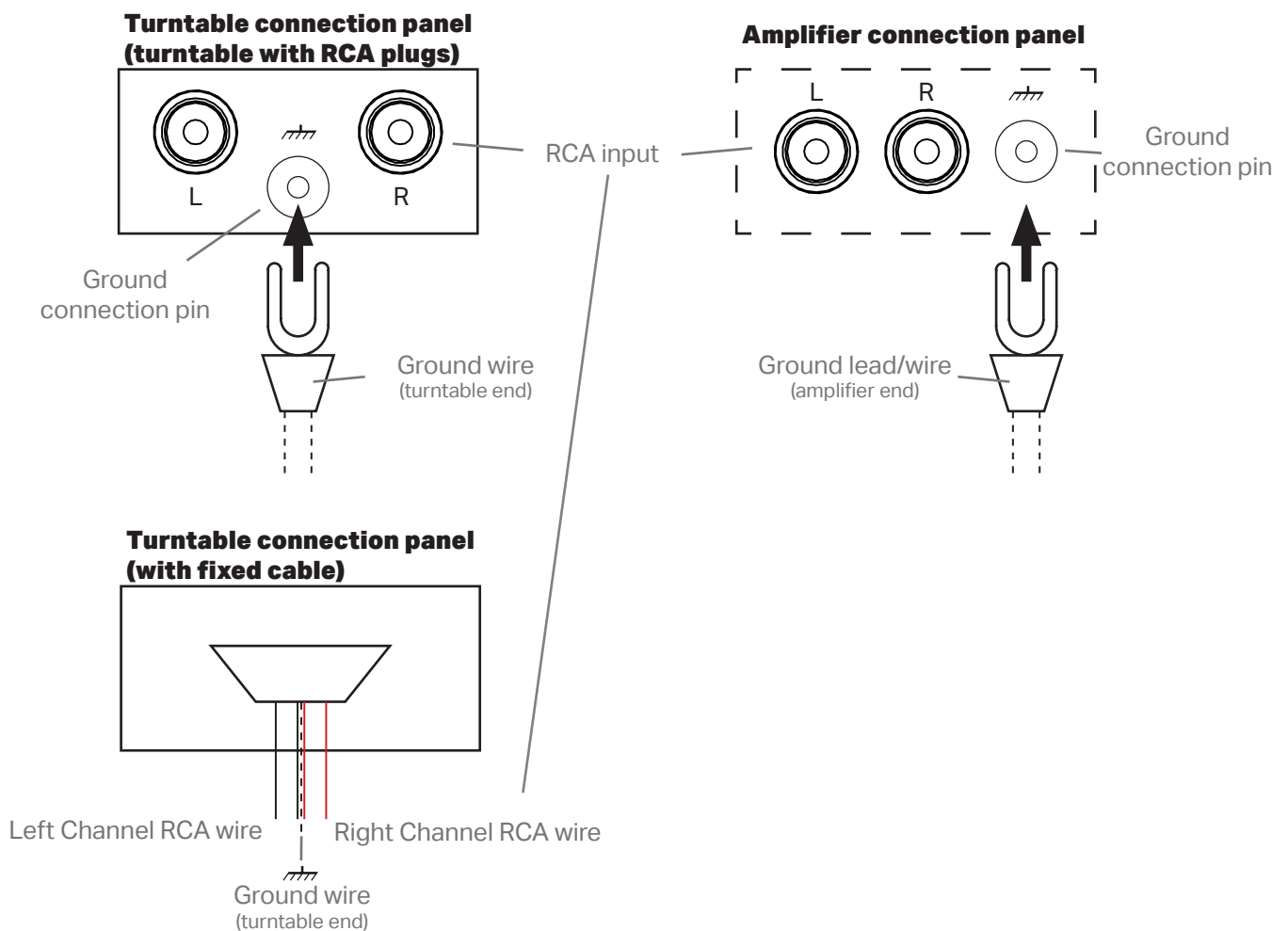
Is hum audible even when the turntable is turned off?

(i.e. it is not spinning, but amplifier is turned on & turntable input is selected)



1. Ground wire

Check if the ground wire is connected on both sides (i.e. to the turntable as well as to the amplifier). In case your amplifier does not have a ground connection pin, most likely it does not have a phono-input (phono-preamp). If this is the case use the turntables built-in phono preamp or an external phono-preamp. In some rare occasions the hum can also disappear when the ground connection is disconnected. So please try this step as well.



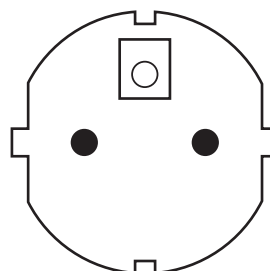
2. Grounding

Check the grounding of your system. This can be easily done by looking at the mains plugs of all components of your HiFi system (i.e. all components connected to your amplifier/powered speakers). See below a reference of grounded/non grounded plugs in various countries:

Non grounded version



Grounded version*



Europe (except UK & France)

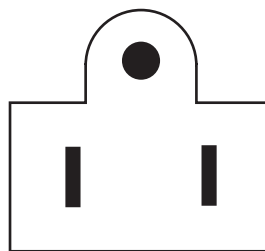
* Please note that a grounded plug is just a hint for a grounded device and a good starting point. However, this is not an absolute evidence, since the ground pin of a grounded plug does not necessarily has to be connected with the device.



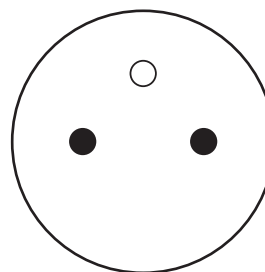
Grounded Power Cable: Pro-Ject Connect it Power

Non grounded version

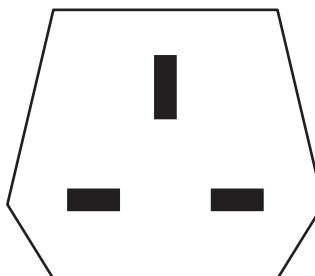
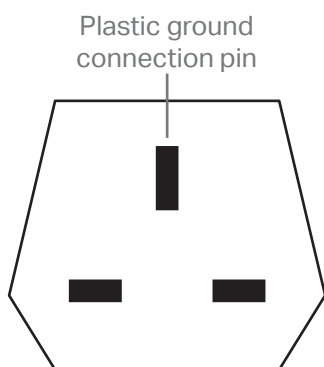
Grounded version*



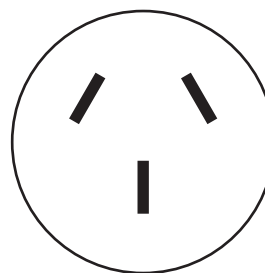
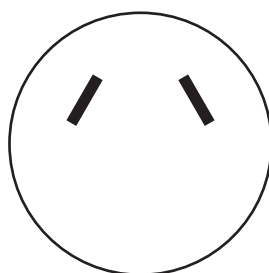
United States Of America



France



United Kingdom



Australia

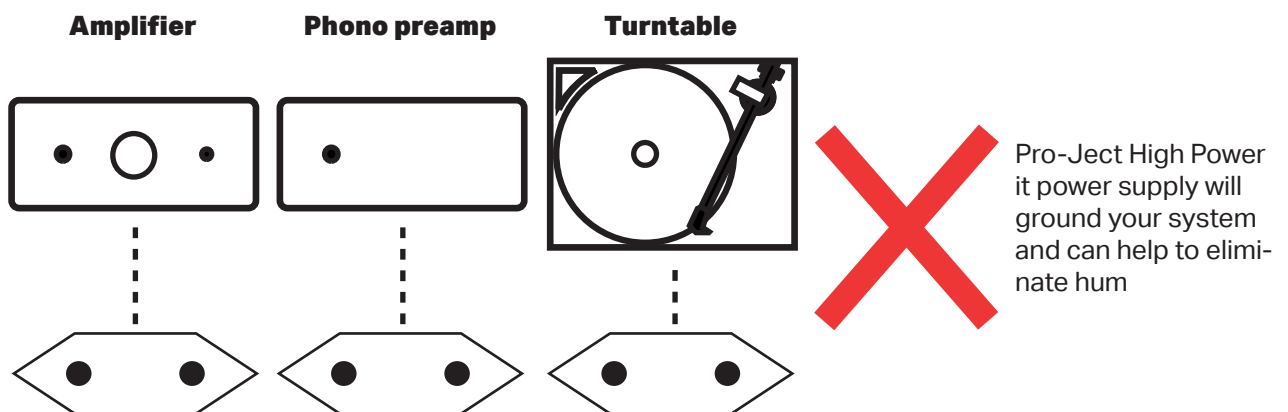
* Please note that a grounded plug is just a hint for a grounded device and a good starting point. However, this is not an absolute evidence, since the ground pin of a grounded plug does not necessarily has to be connected with the device.

- a.** If **none of your HiFi components** are connected via a grounded plug to mains you have a „floating ground system“ (see possible setup below). In that case you have to ground your system to eliminate the hum. We recommend connecting your Pro-Ject turntable with a **Pro-Ject High Power it power supply** to mains.

Note:

As convential audiophile amplifiers are usually grounded, it is not necessary to have a grounded power supply on turntables. Pro-Ject wants to avoid waste & unneeded features. Therefore a grounded power supply is not included in the standard package. However, if you own a Pro-Ject turntable + Pro-Ject Amplifier (e.g. preamp like Pre Box, integrated amp like MaiA, or similar - Phono Box alone doesn't count) and your setup does require a grounded power supply ask your dealer about a Pro-Ject High Power it

Possible setup (floating ground):

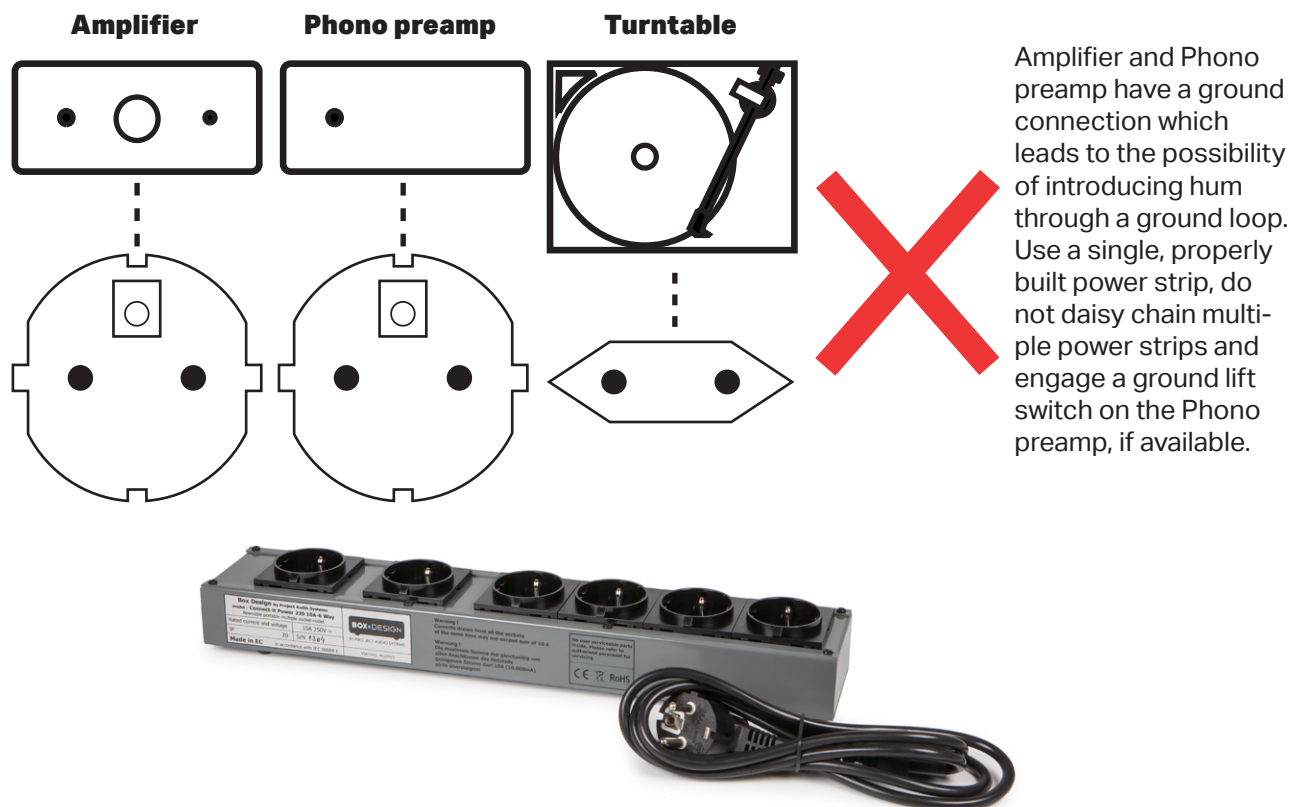


Pro-Ject High Power it
power supply

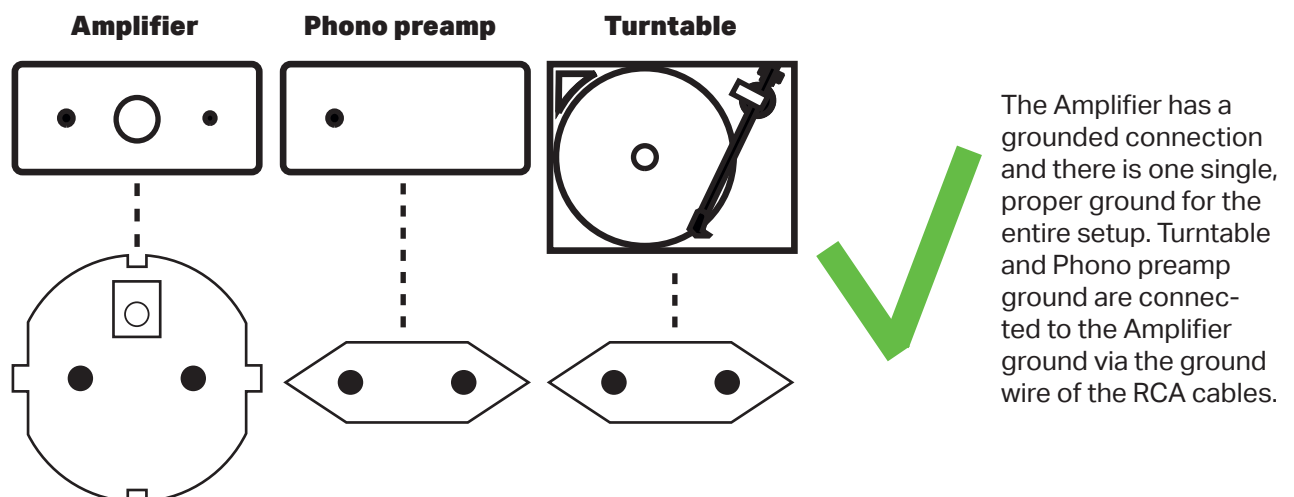
- b.** If **more than one of your HiFi components** are connected via a grounded plug to mains you have created a ground loop (see possible setup below). If you connect all your components to one single power strip, you can massively reduce the hum. Use a proper built power strip (**Pro-Ject Connect it Power 4 & 6way**) and do not daisy chain multiple power strips.

You can also check if any of the grounded components has a „ground lift“ switch. In that case switch to the „lift“ position on all but one components with a grounded plug. The amplifier usually remains on the „ground“ position & is the exemption.

Possible setup (ground loop):



c. **Possible setup (correct grounding):**



3. Electromagnetic interference

a. Electromagnetic interference (EMI) can also cause hum in your HiFi system. Turn all nearby (i.e. in the same room) electromagnetically radiating devices off.

Electromagnetically radiating devices are:

- WiFi Routers, Modems, WiFi Repeaters, etc.
- PCs, Laptops, Tablets, Mobile phones, etc.
- Stream devices (like Apple TV, Google Chromecast, Amazon Fire TV Stick)

If the hum disappears after you turned off those devices, try to place these devices as far away as possible from your HiFi system.

b. Another way of eliminating electromagnetically induced hum, is to change your MM (moving magnet) to a MC (moving coil) cartridge. Their low internal impedance is less prone to such interferences. However, a MC cartridge requires also a phono preamp that is suitable to a MC design. Note that not all phono preamplifiers can handle the very low output of a MC cartridge. For example a Pro-Ject Phono Box S2 Ultra or Tube Box S2 are excellent phono preamps for low output MC cartridges.

Great starter Phono preamps recommended for MC cartridges:

They feature a big set of options to individually tailor the preamp to the MC cartridge, resulting in best audio performance without noise. See chapter 4. for more information.



Tube Box S2



Phono Box S2 Ultra

4. Phono preamp

A not properly adjusted phono preamp can also be the cause when hum becomes audible. This can be due to unnecessarily high amplification. Unmatched gain, input impedance and input capacity on your Phono preamp can also lead to additional noise. The correct setup depends on your cartridge, but as a rule of thumb you can use these starting points:

	MM (moving magnet)	MC (moving coil)
Amplification (Gain)	~40dB	~50-60dB
Impedance	47kOhm	~10-500Ohm
Capacitance	~100-500pF, keep as low as possible	not relevant

*** IMPORTANT NOTICE:** Do not turn your Preamp volume all the way up, to unrealistic loudness levels. You want to check for hum or noise at regular/loud listening levels that you usually listen to music at. Otherwise you will add Preamp/Poweramp gain and noise, which will not accurately let you judge your real-world audio performance. If you are always listening at 100% cranked potentiometer levels, it might be time to upgrade other parts of your Hifi system to reduce noise and increase audio performance.

If - for example - the (input) impedance for a MM cartridge is too low, the output would be very little (i.e. quiet) & extremely recessed high frequencies. Increasing the amplification is the wrong solution & would lead to increased hum.

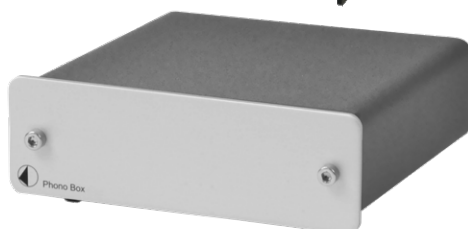
Note that some of these parameters might not be adjustable on your phono preamp. If you are unsure please consult the instruction manual. It's also possible that the phono preamp has just an MM/MC switch:



Phono Box MM

Fixed Gain/Impedance/Capacity settings for MM

Not Usable for low output MC



Phono Box

Fixed Gain/Impedance/Capacity settings with simple switch between MM and MC

OK for MC



Phono Box S2 Ultra

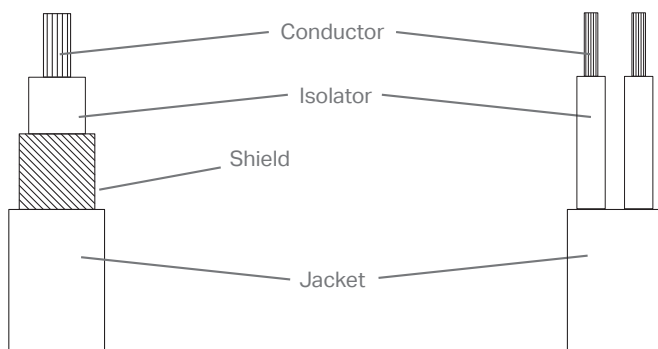
Variable Gain/Impedance/Capacity settings

Best solution for MC and MM

5. Cables

Take a closer look at your phono cable (i.e. the cable between turntable & phono pre-amp). It's important to use proper shielded cables. Unfortunately it is hard to tell from the outside how the shielding is done.

If you are unsure about your cable quality, invest in a better cable. Even if this doesn't solve your hum issues, it's definitely a worthwhile investment, as a good phono cable can improve sound quality enormously. Additionally, all Pro-Ject phono cables are semi-symmetrical and have a very low internal impedance, purpose designed to be used with turntables and phono preamps.



Shielded cable

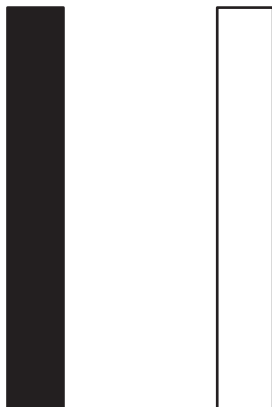
Unshielded cable



Semi-symmetrical, low-capacity, properly shielded phono cable: Connect it E (included with all Pro-Ject turntables)

Moreover, avoid parallel routing of audio & power cables. This is especially important for the audio cable from the turntable to the phono preamp, as the audio signal in this stage is extremely low & prone to interference. Try to separate them & cross them - when necessary - as close to 90° as possible.

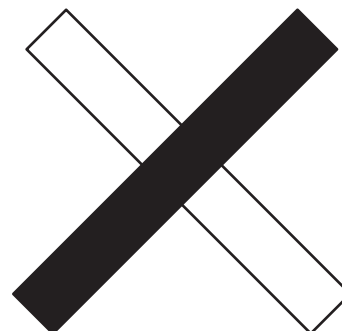
Avoid



Audio cable

Power cable

Do



Audio cable

Power cable