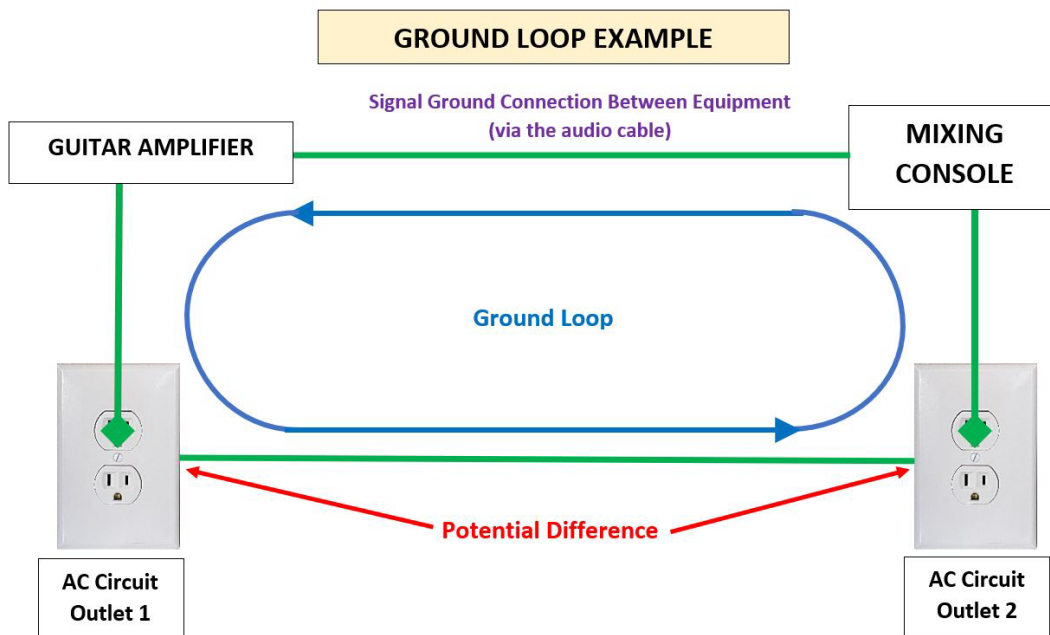


What are Ground Loops?

The basic definition of a ground loop is when two separate pieces of equipment in a sound system are connected to a common ground through different paths, and these two individual pieces of equipment are also connected by another path (which completes the loop). For example – plugging separate (but connected) pieces of audio equipment into different outlets on the same circuit. This can produce a path for current to flow from one piece of equipment to the other piece of equipment – establishing a “looping” circuit for the current to flow from “ground” to the equipment and back, and so on. This, in turn, usually causes a very annoying humming or buzzing in your sound system. There are ways to avoid ground loops and resolve issues (covered on the next page). Take a look at a “Ground Loop” example below.

A basic example of what could cause a ground loop issue in a sound system. Notice that the guitar amplifier and mixing console are plugged into separate outlets on the same circuit. Sometimes this will not be an issue, and sometimes it will cause a ground loop condition, especially if there is a “potential difference” (conductive path) between the circuits. A quick test to check if you have a ground loop issue is to plug both pieces of equipment into the same outlet and confirm if the hum and buzz go away (or not). This simple test can let you know if you are experiencing a ground loop condition. If the issue remains – there is likely a different cause of the hum and buzz. Plugging sound system components into “Lighting” circuits can also cause annoying “hum and buzz” as well.



Grounding and Shielding Notes

- Important Note – Proper Grounding is absolutely essential for safety reasons (shock hazards, etc.).
- Always use Balanced connections for both Inputs and Outputs. If your sound system is already designed with all Balanced inputs and outputs – you will still need to be mindful that there are other factors that will need to be considered (lighting circuits, poorly grounded circuits, etc.).
- Always run all sound equipment through the same stage circuits (power distro) to the same phase.
- Run Low-Voltage lighting controllers, stage lighting, and dimmer packs on a separate phase (never on the same phase as a PA system). This should be discussed with an experienced electrician as needed.
- Never lift the ground or cut off the ground terminal on any type of AC cable!
- If for some reason you have to disconnect the shield wire on a “Balanced” audio cable, disconnect it on the input side only. This should only be used as a “temporary” fix for emergency situations! Only lift the shield for issues that require the shield to be lifted temporarily (never as a permanent solution).
- Do not lift the shield wire on a microphone cable, this is never a good technique to utilize.
- Tech Note: Shields should always be connected to Chassis ground, not the Signal ground.
- The standard for an XLR cable is that Pin-2 is “Hot.” If you are using older model audio equipment – make sure to check the manufacturers specs to ensure that Pin-2 Hot is being utilized (and not Pin-3).
- Never use the shield wire as the signal carrier in “Balanced” connections.
- Ground loops can also occur when using “patch panels” to connect equipment together.

Steps you can take to Fix and / or Prevent Ground Loop Problems

1. Get with the Venue / Theater / Club “House Electrician” and ask for AC circuits with “Isolated” Grounds. This is the best way to help to prevent ground loop problems, but not always possible to acquire.
2. Make sure your sound system / stage equipment is not plugged into any Lighting circuits. Note: Finding out if you are plugging into a lighting circuit is not always something that can be easily verified.
3. You can use Isolation transformers to eliminate or prevent ground loops.

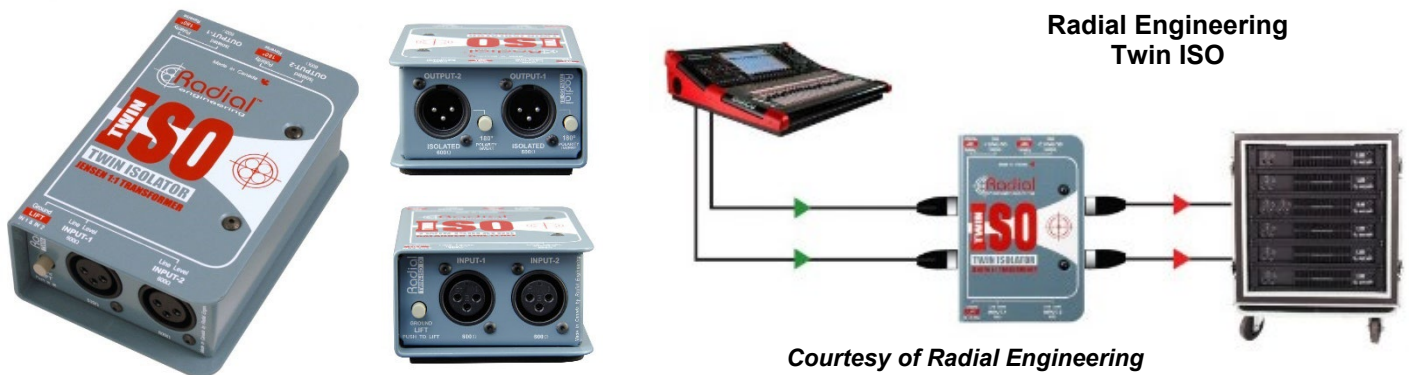
Isolation Transformers / Hum Eliminators – Basics

What are Hum Eliminators Used for?

A Hum Eliminator is an Isolation Transformer that helps prevent those annoying humming/buzzing sounds caused by ground loops. It eliminates the ground loop caused when there is a connection between the grounds of two pieces of equipment. Hum Eliminators can also remove hum and buzzing noises in extremely long cables and ensure a “safer” ground connection.

Here are some of the most popular and reliable Isolators used with sound systems.

The Radial Engineering Twin-ISO provides a simple and professional way to remove hum and buzz from ground loops by inserting them between two pieces of balanced audio equipment. It comes equipped with two premium “Jensen” transformers that deliver an exceptional frequency response from 20Hz to 20kHz, with low distortion and the ability to handle high signal levels without saturation - ensuring that the audio signal's integrity is always maintained. Connect the Twin-ISO between line-level audio devices, including consoles, amp racks, remote towers, and recorders, and instantly remove ground loops.



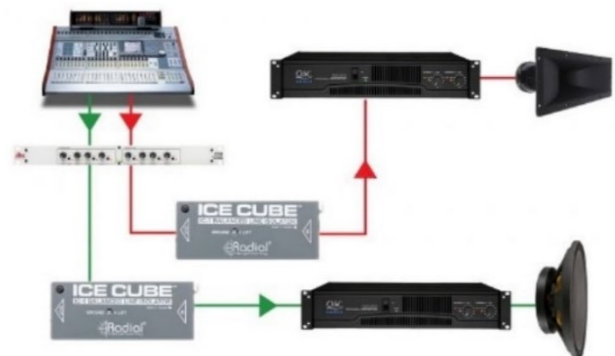
Courtesy of Radial Engineering

The Radial Engineering ICE CUBE (below) is an ideal problem solver for today's audio technicians and audio engineers, providing an easy way to insert an isolation transformer into the signal path to remove hum and buzz from ground loops. It also comes with a ground lift switch for additional noise reduction. Connect it between line-level devices, such as a mixer and a powered speaker, or a crossover and a power amp. The ICE CUBE will eliminate ground loop noise without limiting the audio bandwidth or introducing phase shift, and it can also handle “hot” signal levels without distortion. Isolating a crossover from a power amp and eliminating noise problems can take hours of troubleshooting. The ICE CUBE takes the hassle out of the equation with a simple “plug and play” solution that works every time.

Courtesy of Radial Engineering



Radial
ICE CUBE
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