

My system hums. What should I do?

Important Note: The material in this page is general and of an advisory nature only.

Welcome to the world of Audio System Grounding Techniques!

First, before we start on grounding, a word on electrical noise. In the audio world there are basically two types: Buzz and Hum. Sometimes if you're really unlucky, you'll get both together!

The buzzing sound usually heard through audio systems is caused by that most feared beast of audio professionals the world over - the **NOISY LIGHTING DIMMER!**

As you go through life in the audio world you'll discover that there are two kinds of Lighting Dimmers:

- Very very good ones (electrically quiet) which are well designed, with lots of expensive noise suppression built into the design and
- Very very bad and cheap ones (electrically noisy) which for reasons of economy (just whose economy it's not quite clear) have all the expensive bits left off!

The primary cause of this lighting buzz is Triac or SCR noise from dimmers leaking into Audio equipment. This occurs:

- When both Audio and Lighting power are drawn from the same circuit or phase of mains electrical power
- By induced interference from AC and Audio cables due to proximity.

These mains supplies should be drawn from electrically separate outlets. Usually in medium and large scale systems the audio and lighting will either be separated, either on a different circuit or phase or, in the ideal case, by completely separated and isolated mains and earthing (grounding) systems.

In small sound system situations you should ideally draw your AC mains for the audio from a different area of the venue to that of the lighting system. *ie.* in a Live Venue/Pub/Club/Bar situation, power the P.A System from the same outlet/s as that used for the stage equipment.

Take the power for the lighting from somewhere else, preferably the kitchen or somewhere similar.

To prevent induced dimmer buzz being introduced into the audio chain through the system cabling when running microphone or line cables, basic precautions should be taken. Running audio cables parallel to lighting/power cables is **definitely out!**. They should be kept as far apart as possible.

Likewise all audio equipment should be racked or fixed separately from your lighting equipment. If microphone or line level signal leads do have to be laid across AC Mains or Lighting power cables, they should be laid at a right angle or perfect cross to one another to minimise potential induction.

GROUNDING and EARTHING

First a word of **WARNING!!** That **green** (or **green/yellow**) wire coming out of your unit in the power lead is there for a reason, and that's **NOT** to be cut off at the first sign of an Earth/Ground Hum. It's there for the protection of both yourself and others. It drains potentially lethal currents that could occur through wiring or component faults to Earth or Ground where they can do no further harm.

Cutting either the **green** wire or the earth/ground pin on your equipment means this inbuilt safety feature can no longer function. These potentially lethal currents now have nowhere to flow except the path of least resistance, which if you are in contact with faulty equipment, will be **YOU!** And anybody else who is touching it.

If your system Hums, its not because of the **Green** wire, and although chopping the **Green** wire may seem to be the easy solution, your problem lies elsewhere!

**UNDER NO CIRCUMSTANCES SHOULD YOU
CUT, BEND OR DISCONNECT ANY AC MAINS EARTH/GROUND CONNECTION.
THE RESULTS COULD BE FATAL.**

As a general design rule, true professional equipment designed for the real world of Pro Audio should not have its mains/chassis ground and electronics ground permanently and directly connected. It should either be totally isolated / switchable or, as in the case of most current audio electronics, have the chassis and electronic ground connected via a soft coupling resistive/capacitive network. This ensures stability in all types of adverse operating conditions.

Ground loops are caused or occur because the ground connection in the electrical mains power system is duplicated by connections of different impedance or resistance. This difference causes an induced potential difference or voltage to either be produced or flow between the various pieces of equipment connected. This phenomenon brings about the effect we perceive as a **HUM**.

One way to ensure your system is as quiet as the proverbial mouse is to conform to the Star Grounding standard. Plan your system grounding ahead, irrespective of being a recording or broadcast studio, a club installation, small club vocal system or a 200,000 Watt Stadium Mega-Rig. Good grounding practice and a little planning go a long way.

Star Grounding: One Path to Ground

Star grounding is the name Audio and Electrical engineers use to describe a wiring system where all the electronic **SIGNAL** grounds (cable braiding, jack sleeves or pin 1 on an XLR) either

1. Flow through in a serial manner without coming into contact with the electrical or chassis ground on the way, or
2. Join the mains power supply ground (the really really big thick green wire) at the one place and one place only.

This system removes the possibility of a potential difference between mains grounds or the connection of mains grounds being duplicated in an Audio system.

With star grounding systems the centre that is usually chosen is either the Main Mixing Console or the multicore snake or patch bay that is plugged or hardwired into it. The reason for this choice is that most Audio Systems only have one main mixing console and the vast majority of devices are connected to it.

In Live Sound Applications assume for grounding purposes the monitor console is usually part of the stage box/snake system. However you should ensure the Monitor Console is powered from the same AC supply and grounding point as the FOH console.

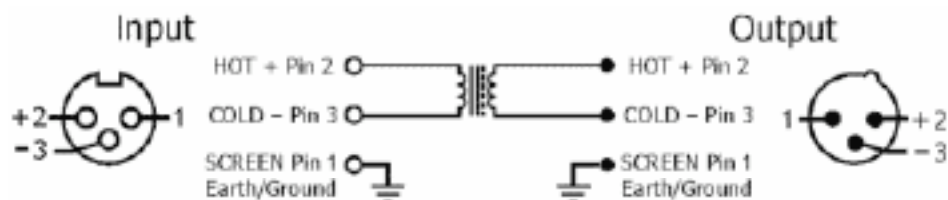
Conformity with this grounding system will usually ensure that your system, no matter how large, will remain hum free.

Transformer Isolation

If you are unable to ensure that you have a Star Grounded system, the alternative is Transformer Isolation.

By inserting a high quality audio transformer (such as the ARX Audibox [ISO Later](#)) into the signal chain we are able to break the Pin 1 Audio Ground/Earth connection, eliminating any Earth loop induced hums.

For safety and noise reasons you should ensure that both sides of the signal chain are properly Grounded/Earthed



Transformer Isolation

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ANY ELECTRICAL WORK SHOULD ONLY BE CARRIED OUT BY A LICENSED ELECTRICIAN