

Arrakis Systems Inc. 6604 Powell Street / Loveland, Colorado 80538
Voice: 970 461 0730 / Fax: 970 663 1010 / e-mail: dalede@arrakis-systems.com

Grounding and AC wiring techniques for your specific broadcast environment.

First install a separate 5ft. copper ground rod in to the earth just outside of the studios. Connect a copper strap about 2 inches or a copper wire such as a number 6 to the ground rod. Solder the connection to the copper rod do not use a mechanical clamp as this will corrode over time.

Bring the grounding strap into the building and place it into the studio.

Next, connect only the studios to this earth ground.

Now Separate or remove the existing transmitter ground from the studios. You want to be separate from the RF ground system. Over the years my experience has shown me by separating the studio ground from the transmitter ground I have greatly reduced the AM and FM radio frequency noise in the studio wiring.

The copper strap should connect directly to the audio consoles chassis. You may use short wire jumpers from the copper strap to your other equipment to ground them. Try to keep these wire jumpers as short as possible as not to act as an antenna.

Make sure there are no audio wiring shields connected to the transmitter room. Connect your studio audio wiring shields only at the studio end and not to the transmitter room.

AC POWER NOISE:

For the AC power noise issue use an AC isolation transformer between the AC power feed and the studios equipment. Check out this unit that has EMI filtering as well as Isolation for the AC power in several models.

<http://www.tripplite.com/en/products/model.cfm?txtModelID=228&qclid=CN6X58ycz6sCFaEBQAodBkiyVQ>

<http://www.alliedelec.com/search/searchresults.aspx?Ntt=&dsNav=N%3a4294956912-4294887189&Term=isolation+transformer>

Another alternative when dealing with RF and AC power noise issues is to install an EMI filter between the AC power feed and the studio equipment. Your connection would work like this. AC Power feed → EMI Filter → Equipment

Check out the following links lots of variety here.

http://www.radiuspower.com/single_phase_filters.html

<http://www.directindustry.com/industrial-manufacturer/emi-filter-73520.html>

You can install a filter for each AC power circuit as several of these units are rated for 25 to 40 amp ratings. Install one filter for each studio power feed. In a typical studio you

would have all the AC outlets for that room connected to just one circuit breaker. Electricians typically will wire 6 to 8 outlets on to one circuit breaker. I would use one EMI filter for each circuit breaker output. If there is room you can mount the filter inside the AC power box. If that doesn't work you can install a separate box for your filters and mount it next to the AC power box.

Your AC power connection flow would work like this.

Circuit Breaker → EMI Filter → AC Outlet

Another suggestion that was provided by a customer was to remove, clean and reconnect the AC power box hot (black), neutral (white) and ground (copper) wire connections. He discovered an intermittent ground loop problem. I know this engineer and his audio wiring in the studios is very clean and quite beautiful he cleaned up the AC power breaker connections and his ground loop noise cleared up as well. I must say that was a very interesting solution to this particular problem.

WARNING! this procedure has potentially fatal voltages turn off the main breaker or power feed before attempting or better yet have a trained electrician do this for you.

RF INTERFERENCE:

Another issue is AM and FM radio frequency interference noise problems especially when the studios are located at the transmitter site. This type of studio situation is very tricky to deal with and each installation is unique because of the frequency of the interference as well as the RF signal level involved.

However, there are installation techniques that have proven to be very successful. The studio needs a good station ground reference. This is very important especially in high RF environments with AM & FM transmitters. This ground should be a minimum of a 2 inch wide copper strap however in some studios with very high RF signal interference use a 4 to 8 inch copper strap. This strap should go to each studio to form a star ground. As we have previously mentioned above separate or remove the existing transmitter ground from the studios. You will certainly need to keep this transmitter ground attached to the transmitter but just not to the studio.

A typical question I am asked frequently is why does this transmitter ground not work for the studios. When your AM transmitter ground was first installed, all of the copper wire used to make the antenna ground system was new and made a very good ground system. However as the years pass your ground system becomes ineffective because of the corrosion to the copper ground wires making up the ground system. They will eventually erode away to where there is no more copper. Another issue is that your AM signal does not reach out as far as it once did which reduces your coverage area. Therefore, when there is no more antenna ground to work with the transmitter will find whatever ground is available to work from. Usually this ends up being your AC electrical ground as well as your studio wiring etc.

When installing Analog or Digital audio consoles connect a ground wire or strap from the console ground lug or chassis to the earth ground. We need to help minimize the RF noise as well as the EMI noise from interfering with normal console operation. Just like their computer cousins, digital audio consoles use microprocessors in their design.

These consoles are just as sensitive to RF and EMI interference as their analog counter parts so we want to minimize any static discharges and transients from entering their PC boards.

When using RS232 cables to connect between the PC computer and the digital console or digital engine and control mainframe try to use low noise shielded RS232 cables.

Use good wiring techniques when installing your digital cable as well as the analog audio cable. Remember the console performance will only be as good as the installation. On any wiring, which is installed in an RF environment, use a ferrite donut and wrap the cable through the donut 3 to 4 turns. In a very high RF environment, install the ferrite donuts at both ends of the cable when necessary.

When connecting the AC power, use the UPS (uninterruptible power supply) with EMI filtering. If you have a separate digital engine and control mainframe for your console connect them both to the same UPS unit.

If you have any questions please give me a call at (970) 461 0730 ext. 316.
Or email at dalede@arrakis-sytems.com Thank you for your time in this matter.

Arrakis Systems Inc.
6604 Powell Street
Loveland, CO 80538
PH: 970 461 0730
Email: support@arrakis-systems.com