Fixing Low Power AM Transmitter Hum Problems

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Hum can be an annoying problem for low power AM transmitters, but if you are persistent and willing to do a little experimenting, you are likely to be able to find and fix the problem. First, you can be assured that the AMT3000 transmitter has been carefully designed to eliminate power supply hum. Two voltage regulators on the circuit board produce very clean DC supply power to the circuits on the circuit board.

Following are the various possible sources of hum and recommended fixes.

AUDIO SOURCE OUTPUT LEVEL IS TOO LOW

First, you need to determine if hum is being introduced in the audio feed. With the audio source powered on and in the "pause" mode, set the radio volume at a high enough level to clearly hear the hum. Then turn the GAIN and COMPRESSION controls fully counter clockwise. Is the hum level lower? Hum in the audio source can of course be caused by bad audio cables, but that is the simple answer. It is more likely that the audio output level from your audio source is set too low. Compensating by raising the TX GAIN and COMPRESSION settings will amplify low level hum and noise during quiet portions of the program material. Be sure the audio source device volume level is up at max or nearly so and turn down the TX GAIN.

GROUND LOOP IN AUDIO CABLES

Hum can be introduced on the audio cables by a ground loop. A ground loop will occur when the audio source device is connected to a ground that is different from the transmitter ground.

You can check for a ground loop by unplugging your audio source from the AC outlet. If your audio source connects to other devices in addition to the transmitter, unplug them too. The objective to eliminate all other ground paths except for the transmitter ground path. First note the hum level with the audio source on and "paused", the GAIN control about midway and the COMPRESSION control at minimum. Then unplug the audio source from AC power. If the hum drops a lot or goes away, you have a ground loop.

If you are using the TX indoors, ground loops usually are not a major problem. If you do have a ground loop, try plugging the audio source device and the transmitter into the same outlet. Ground loops occur more commonly when using the outdoor base loaded antenna. The AC ground potential between the audio source ground (indoors) and the transmitter ground outdoors via ground rods and radials are often different causing a small AC current to flow in the shields of the audio cables which induces hum on the audio. One possible solution is to run a wire from the TX ground system back to the building AC service entrance ground rod. Another solution is to purchase a ground loop isolation transformer and place it in line with the audio feed cables to the transmitter. Do a web search for "ground loop isolator". There are many of these devices commonly available inexpensively. They are typically used in car audio installations.

> Two examples of inexpensive ground loop isolators:
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> http://www.radioshack.com/search/index.jsp?kwCatId=&kw=ground%20loop&origkw=ground%20loop&sr=1
>
> http://www.walmart.com/catalog/product.do?product_id=896355.

AC BUILDING WIRING INDUCED HUM

The most common source of hum with indoor installations is AC hum modulation induced on the RF signal by the building wiring. You can check for this type of hum by completely disconnecting the audio cables from the transmitter and turning the GAIN and COMPRESSION controls all the way down. If the hum persists, you have AC wiring induced hum.

When the black ground wire from the transmitter is NOT connected, the ground path for the transmitter is actually through the wall adapter, which is just a small transformer. The transformer will pass RF through to the building wiring and then on to the building AC service entrance ground. This can actually produce a stronger signal inside the building due to part of the signal being radiated by the wiring (like a carrier current system). However, the AC wiring can induce hum on the part of the signal that it radiates. Often you will note that a radio placed close to the TX will not have any hum, but a radio in a distant room will have hum. This is because the distant radio is getting most of its signal from the AC wiring.

Connecting the black ground wire to a grounded metal point such as copper water pipe or the outer shell of a cable TV jack can bypass much of the signal that normally couples into the wiring through the AC adapter.

Connecting the ground wire to the AC outlet screw may help since the RF will pass mostly through the AC wiring ground wire, but some may still be coupled to the hot and neutral wires.

It is best to try to eliminate the source of the AC wiring hum. Any eclectic appliance or electronic device that has a switching-type power supply can cause hum. Many consumer gizmos you can buy contain switching power supplies. Some examples are lamp dimmers, remote control lamp modules, cell phone chargers, ultrasonic pest repellers, battery chargers, rechargeable shavers, and even some TV and audio components. Many home TV and audio components these days have switching supplies that are at least partially on all the time to allow the remote to work. Try going around the house and unplugging everything that you think might fall into this category. Also, turn off all lamp dimmers completely, not just dimmed to a low level. If you succeed in finding the culprit, you may be able to plug it in to a different outlet and not get the hum, especially if the outlet is on a different wiring branch than the transmitter.

The absolute best way to find the offending device(s) in your AC wiring distribution is to isolate each wiring branch by turning off circuit breakers. Since you may have offending devices on more than one branch, it's best to start by turning off all circuit breakers except for the one powering the transmitter. If the hum is still present, unplug everything on that branch and turn off all lights on that branch. The hum should go away. Then go through the process of plugging things back in and turning on circuit breakers one at a time until the hum returns. When you turn on a breaker that causes the hum to return, carefully check everything on that branch. It could be a wall-switch dimmer or just about anything plugged into an outlet including some modern major appliances that are digitally controlled . Even some hardwired devices, like motion sensing spotlights, can cause hum.

SOME QUICK "FIXES" FOR AC BUILDING WIRING INDUCED HUM

If your radio has an internal directional antenna as most do, try rotating the radio. Often you can find a position where the signal is still strong, but the hum is markedly reduced.

It has been verified that changing the operating frequency can have a big effect on AC wiring induced hum. Try 20 to 50 kHz above and below your present frequency and see if the hum level changes. Be sure to re-tune the transmitter output each time you change frequency.