

Thoughts from an Installer about Noise

Okay you have heard the fables and myths about noise, but you probably never understood how to get rid of noise. I'm going to clear some of this up. I know you have heard to run your RCA's separate from your power leads, I also know this means you have to take apart both sides of the vehicle. Recommendations say that you keep these leads at least 18 inches apart. This is very true when you are dealing with coaxial style RCA's with no extra shielding (the basic cheap leads), and an older large motor vehicle without RFI suppression spark plug wires or with a generator instead of an alternator. There have been so many advancements, in the vehicles and cables that you'll typically be working with, that in most cases this is no longer a factor. I personally admit that for the better part of 14 years in professional installation most of the standard amp installs that I did, the power and RCA's were side by side running down the same side of the vehicle, without noise. Most noise can be classified into 2 categories "Radiated" and "Power". In no way should you ever need to put in a "noise suppressor" or a "ground loop isolator" these are quick fixes or "patches" that will limit your systems capabilities. Read along and we'll teach you how to actually fix the problem, and at the end there is a "tech tips" section to virtually eliminate power related noises and some radiated noise problems before you ever begin an installation.

If you are reading this I am assuming that you already know how to install an amp. You have your amp installed, you turn on your radio and you have noise. What do you do now; well first thought is blame it on a bad amp because you did a fine job on the installation, right? Usually you'll find that it is something related directly or indirectly to the vehicle.

Let's go through this the easy way first disconnect the RCA's directly at the amp and turn on the system. Turn the gain up on the amp, do you still have noise? If so the noise is coming from either radiated noise or power noise please proceed to that area of this sheet, if not please continue to read along. You have no noise at this point and no signal going to the amp. Now, disconnect the RCA's from the head unit and reconnect them to the amp. No noise, please

proceed to power noise, if you have noise now continue to read along. At this point you have found that the noise is coming from the RCA's at some point from when they leave the signal source. Turn your system OFF, and turn the gain back down on your amp. Now with as long of a set of RCA's that you have available run them from the head unit to the amp, outside of the vehicle over the roofline is preferable. At this point in most cases you should not have noise please skip ahead to signal path, if you still have noise there is a problem keep reading. Are the RCA's you are using damaged? Use a DMM to test for a short and make sure there is full conduction from one end to the other. If they are good put them back in line from head unit to amp and remove one lead from the amp then reconnect and remove the other one. If this solved the problem at some point, most likely there is a bad solder joint on the input of the amp which will create noise in some cases. Now you can blame the amp, swap it out for another one hopefully no noise is present at this point if so keep reading this paper and hopefully something may help if not contact someone for further troubleshooting.

Signal path: you have your new set of RCA's on the roof and no noise, with the signal source still on, take the RCA's off of the roof and run them (still connected with radio on) as close to the signal path that you had previously run. Noise again, if so proceed to radiated noise, if not keep reading. So you still have not reproduced noise at this point we should be able to blame the RCA's, connect the original one's again to the amp one channel at a time. Noise, you have found the culprit swap out you RCA's. Sometimes they'll get pinched in the installation (test them on another source or use a DMM to verify). If no noise is present when you reconnect the old RCA's you have an intermittent problem which may be related to power or radiated noise see if you can recreate the noise and continue reading this paper to see if this helps, if all else fails contact someone for further troubleshooting assistance or at this point you currently have no noise you can button it up and try to locate it again when/if the noise resurfaces.

Radiated Noise

Radiated noise is the most difficult to deal with because it is caused by something not directly in contact with the installed equipment. Causes that I have seen and found to be a problem:

electric fuel pump, non-RFI suppression spark plug wires, onboard computer (ECU, ABS control unit, SRS/Airbag control unit, Power steering assist control unit, etc...) anything that requires high current power, and anything that switches rapidly. As you can see there are a lot of possibilities and there are still more that aren't listed. This will typically affect: inexpensive RCA's and some high-end ones as well, outboard passive crossovers, and amplifiers. There are various ways to build a noise-sniffer available on the internet out of pieces that you may already have or you can buy one from an electronics shop.

You have your RCA's disconnected at the amp and you still have noise, first is your amp mounted directly to metal? If so remove it from the mounting point and place a sheet of cardboard or carpet underneath it so that it is not directly touching metal. Noise gone if so make a plate out of a material of your choice (no metal) to mount to the vehicle then mount the amp to the plate be sure the screws do not connect the vehicle chassis and amp. Noise still there, think about where the amp is mounted is it near the fuel pump or any thing that could radiate noise. Remove the amp entirely from the vehicle and bench test it using a verified power source and signal source. Noise, It's a bad amp. No noise, reconnect it in the vehicle and try moving the amp as far from that point as possible anything under an 18inch move will typically not show a good result. If you cannot move the amp try creating a noise shield to place under the amp. A good trick for creating a noise shield is take a peice of $\frac{3}{4}$ " MDF and attach a thin sheet of aluminum to it, or there are sound deadening products available that work as good or better than aluminum (one is a sticky rubbery material with a metallic layer on that, and the other is two thin sheets of foam with a thin layer of lead between them) you can use these in place of the aluminum. Take your recently created noise shield and place it, wood facing the car metal facing the amp, between the amp and the possible source of noise. Noise gone, make this noise shield pretty and install it permanently. Noise still there, try running a short wire between the amp ground and the metal of your noise shield. Noise gone, make the shield permanent. If you still have noise, seriously consider moving the amp to another location or adjust the gains to see if this gets rid of it, other than that you'll have to live with the noise or move the source.

You have your RCA's connected to the amp and not to the head unit or you have just re-routed a test set of RCA's down the first sets path and you have noise. Try rerouting your RCA's down the other side of the vehicle with the test set this should cure your noise, if not route the wires to a point of no noise. If you still have noise only with RCA's connected to the amp and no noise without RCA's connected to the amp you may have a bad input on the amp try a different amp. If you still have noise with either set of RCA's connected you have a serious problem look for further troubleshooting assistance.

Power Related Noise

Power related noise is the most common and the easiest to cure but sometimes is the most expensive because sometimes it can be directly related to other serious vehicle problems. Typical symptoms are as follows you have a whining noise that corresponds to your throttle movement, you have a general noise when you start the car but it goes away after the vehicle has been running for awhile, pops and clicks when you operate other vehicle systems.

First check the voltage of the vehicles' battery. If it's good, 12.3 volts nominally, continue on. If it's low charge it or let the vehicle run for awhile with nothing on (no: lights, heater, radio), after about 30 minutes, with the vehicle running, check the voltage again it should be around 14.4 volts; If not you have a problem with your alternator. Shut the vehicle off and check the voltage at the battery if it reads about 12.3 volts you have a good battery if it's lower than that you have a bad battery. If your system only makes noise when you start the car and goes away after a few minutes it is one of two things the starter may be going out and drawing way too much current or the battery is failing. An amplifier will tend to give a much degraded signal that can be interpreted as noise if the power is low, so if everything is good continue reading.

With your RCA's disconnected you no longer have noise. Check the voltage at the power lead and the ground for the stereo directly where it ties in for power as close to the units chassis as possible. Then do the same at the amplifier. In most cases you'll notice, if you have noise with the RCA's connected, at least a 0.2 volt difference. This is a difference in voltage potential and because of

which the units will use the RCA's to trade that power difference, this is what you hear as noise and is known as a ground loop (assuming that at this point you know for certain that your signal source is clean). To solve this problem the easiest way, you can run a signal ground with your RCA's and remote lead. A signal ground runs between the ground input of the amp to the ground input of the deck so the voltage can be balanced. For higher power systems I recommend using a common ground source and a common 12V+ source between the amp(s) and head unit. This will eliminate many voltage differences, and almost all possibility for pops and clicks associated with other vehicle systems.

Tech Tips

- Use a common power and ground point for your signal source and amp, processor, crossover etc...(do not use the factory supplied power and ground for the signal source it generates pops and clicks)
- Don't just run the minimum recommended power cables step up to the next size.
- Run a power and a ground lead directly from the battery. The ground will degrade through the chassis of the vehicle via small factory chassis ground and spot welds.
- Upgrade the factory ground leads from the chassis to the battery and to the alternator (they're usually very small).
- Never mount an amp directly to the vehicle metal, mount it a piece of wood or plastic so the chassis of the car and the chassis of the amp do not have an electrical connection of any kind.