

RFI IN MOBILE INSTALLATIONS

A Radio Frequency Interference (RFI) problem in a mobile installation can be very annoying because it masks weak signals, especially on Single Side Band (SSB). FM reception has the advantage of amplitude noise reduction so it's not as noticeable. One of the best preventative measures is to start with a good radio having an RF / IF Noise Blanker.

Automotive Ignition Noise

The hissing, "frying eggs" sound heard in many mobile receivers is ignition noise. It gets louder with higher engine RPM and is caused by the high-voltage discharge of the spark plugs as they fire. The reason it can be so irritating to mobile operation is because such noise is broad banded in nature, having its maximum energy around 35 MHz. Broadcast signals are much further removed. Ignition noise can get in the receiver either by "**conduction**" in the vehicle's electrical system, or by "**radiation**". **Conduction is the most common. The way to determine this is to simply replace the mobile antenna with a dummy load; if the noise is still present it's being conducted. If it is still present it is being picked by the antenna from radiation.**

You can pinpoint the noise source with a simple RF probe. Take a length of RG-58/U coax with a PL-259 at one end, and long enough to reach from the radio to the engine. Strip a few inches of the shield away from the other end. Use this center conductor end to probe around the engine compartment for the point of loudest noise.

Most vehicles had simple inductive discharge systems before 1975. In such cases the use of resistive spark plugs and wires could cure the problem. You can buy these at most auto parts suppliers. Newer vehicles now use sophisticated electronic ignitions based upon capacitive discharge action. The wires must therefore be relatively low resistance or engine performance suffer. Don't replace plugs or wires in such vehicles without consulting a mechanic first.

In the case of radiated noise, good grounding will usually stop it. First make sure the radio and antenna are properly grounded. Then get some heavy ground braids, or make your own using the shield of old RG-8/U coax with its center removed. **Bond all the major metal surfaces together, such as the hood to the firewall and the exhaust pipes to the frame.** Replace any wire that seems to be radiating with a shielded one. Any poorly grounded metal of the right length can resonate, generating RFI noise. And **don't overlook a possible bad plug, dirty rotor, or cracked distributor cap.**

Poor grounding is the main reason why magnetic antennas don't work well. Changing from a magnetic mount to a grounded type can be all that's needed to eliminate ignition noise.

Many people try to eliminate noise by using a coax cable for the DC power to the radio, running it through the firewall directly to the battery. This sometimes works but often does not, because the noise is being radiated not conducted. Besides, with a constant DC

power source like this you must always remember to turn the radio off manually or it could wear down the battery. **Conducted noise can only be stopped at its source.**

Other Automotive Interference

Any electrical device on a car can cause noise, such as the fuel pump, gauges, wiper or blower motors, voltage regulator or alternator. **The sourced can generally be controlled with bypass capacitors and series chokes, but first you must identify the sources.**

Alternator or generator whine is a high-pitched musical sound that increases with engine RPM. Voltage regulators make a ragged or raspy noise which is irregular. Gauge sending units and fuel pumps make irregular clicking noise. "Switch pops" can be caused by switching electrical devices like brake lights, seat belt buzzers, electric window, or turn signals.

One you isolate the source, install a bypass capacitor at its power leads. The coaxial type is more effective at HF and VHF than standard disc types, so invest the extra money. **If the problem persists, add series inductance of a suitable current rating, or shield the wire.** The same type bypass capacitor can also be used on the radio's positive DC power lead.