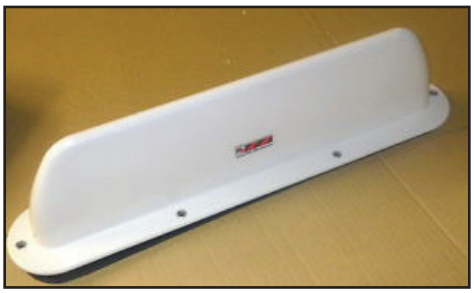
Optimizing your Railcar Radio Communications

by Frank Hubley

On a number of excursions, I have noticed that some railcar operators have great difficulty keeping in communications with other railcars that are located less than a mile from their location. There are several reasons that can cause railcar people to experience "unreadable" transmissions from a railcar not a great distance down the track.

The most common cause of exceptionally short range involves an inefficient antenna system on the railcar. The antenna on a radio system is like the transmission that couples your engine torque to the drive wheels. The basic antenna for our VHF channels is a whip that is about 18" long. Such an antenna should be mounted on the rooftop, clear of any significant metallic items like air horns or light bars. In order to be efficient, this antenna needs to be mounted on a significant metal "ground plane" with a radius of about 18" (think of something about the size of a traffic sign). Unfortunately many railcars do not have enough clear space on the roof to meet the requirement for a classic ground plane. A compromise ground plane can be created by applying two 36" strips of metal foil tape in an X pattern, with the antenna base mounted at the intersection on a small aluminum plate. In the instance of a railcar with a small roof area, one can utilize a special type of antenna that is designed to work without a ground plane. This is known as a half-wave antenna and is about 38" long at 151 MHz. A third possibility that has worked well on cars with a fiberglass cab is to mount the antenna on a right angle mount towards the rear and incorporate 12 gauge 18" long wire in the vertical plane inside the cab. The 18" wire is attached to one of the mounting studs with an appropriate crimp lug – the lower end is left floating. There is another style of stainless steel whip antenna that can actually increase transmit and receive signal levels. This 5/8 wavelength (about 46" long) antenna still requires the presence of a good ground plane to operate correctly.



Above; VHF "Linebacker" antenna

Avoid low profile antennas which have very narrow bandwidth because they cannot efficiently cover both the 151 MHz NARCOA channels and the 162 MHz RR channels. If these low profile antennas were purchased as a "used" item, there is an excellent chance that they were originally tuned to something different than the 151 MHz part of the VHF band. This would cause their performance to be like operating your railcar with the brakes locked in notch one!

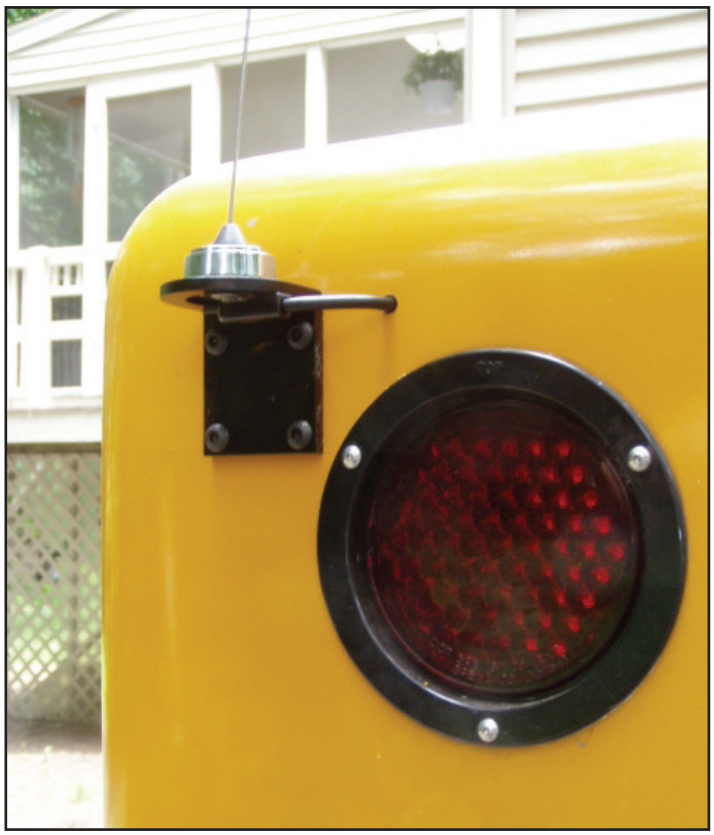
A common antenna system problem is related to the cable having either a shorted or open connector or a crimped coax cable. Coax connectors can be difficult to assemble correctly. Coax cable should never be kinked, pinched or spliced without the proper connectors. If you have questions about your antenna, contact a radio technician to have your system analyzed using an appropriate in-line watt-meter.

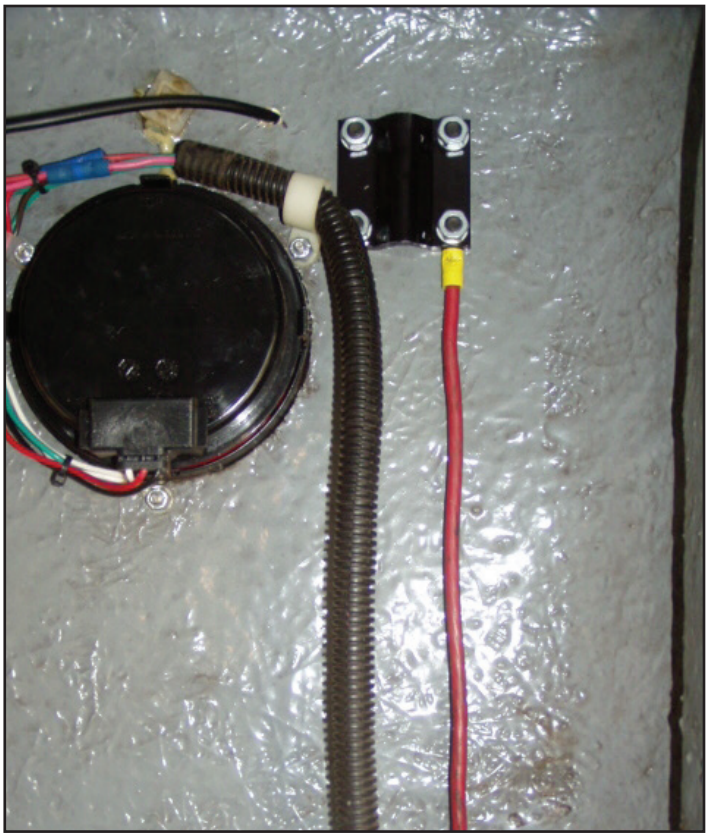
There are several operational procedures that can be used to greatly enhance the ride for all excursion participants.

The Excursion E.C.'s should have the lead and tail railcar operators call out each milepost as they proceed down the track. (This procedure will provide reassurance that the entire consist is located with a few miles of the lead railcar).

Every time the excursions' progress down the track comes to a stop, someone with a mobile radio should advise the Excursion E.C. of the reason for the stop. On many excursions, the line of railcars will stop and for some reason all the operators and passengers will dismount and walk toward the front of the line. It is much safer and more efficient if someone near the front of the pack would make a brief transmission and explain the reason for the stop.

Mobile radios should be wired so that they are "powered up" for the duration of the excursion, rather than being connected thru the ignition switch. Use a master power cutoff switch installed in the positive wire from the battery to insure that no loads are left draining the battery when the car is tied up overnight.



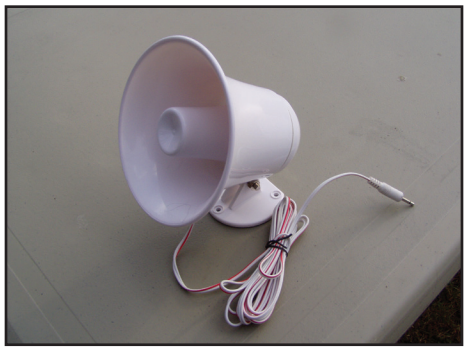


Above left: Exterior mounting of Type B antenna; Right: interior view of same antenna. Not the ground wire which is iportant to performance with a fiberglass cab. Below: A waterproof external speaker is very useful at rest stops.

Note: Do NOT install the cutoff switch in the negative lead as this can result in radio damage, as the radio is still connected to chassis ground via the coax shield conductor, bridging the cutoff switch switch.

When the line of railcars have stopped for either a planned or unplanned event, it would be best if one more of the railcars were equipped with an external speaker. Many times when a participants is attempting to contact the E.C.s they can hear the call on one of these external speakers. Note: External Speakers are "Standard Equipment" on railroad owned M.O.W. equipment

Always use proper microphone technique. Hold the microphone about 1" from your lips at a 45 degree angle and speak in a moderately strong level. Shouting into the mic will cause your message to be distorted! Receiving transmissions from others in the noise prone railcar environment with the standard mobile speaker is difficult. A better solution is to use headsets, which can also significantly reduce the ambient noise level from engine and track noise.



Most railcar people are unaware of the inefficiencies that are associated portable two-way radios. With a portable, one can usually hear transmissions from a distance five times greater then a portableradio can trnsmit to. This is caused by the inefficiency of the typical portable antenna (6" and no ground plane!) plus the fact that the portable is usually located at the chest or belt level.

Most Important - Check that the Antenna connector on your coax cable is properly connected to your radio! This is a commonly seen problem with the 3/8" Mini-UHF connectors that are used on recent Motorola mobiles. It is essential that the outer barrel of the coax connector is tightly engaged with the connector on the back of the radio. A loose or cross-threaded connector will cause your radio to have very short range! The additional information is the result of some tests I have made on installed railcar radios in the last few years. I discovered that 4 out of 9 radios that I inspected had improperly tightened antenna connections.

Frank