

A Better Signal from Your Handheld

Ward Silver, NØAX

A handheld FM VHF/UHF transceiver is a common first radio for hams, but it has one major drawback — range. Here’s a common situation: When attempting to make contact through a repeater, you receive a report of “being scratchy” or “barely making the repeater.” Your radio’s signal strength display (a.k.a. an *S-meter*) shows the repeater’s signal is strong. Why isn’t your signal strong, too?

You are receiving the repeater’s powerful transmitted signal just fine, but your transmitted signal isn’t being received as well by the repeater’s receiver. What can you do to create a stronger signal for the repeater input?

Easy and Free Things to Try

First, are you holding the radio so the antenna is vertical? Almost all repeater antennas are vertically *polarized* — they’re most sensitive to signals that are in a vertical orientation — so your signal needs to have the same polarization. You might be surprised at how much difference this can make! Watch the signal strength meter on the handheld’s display when the repeater is transmitting, and hold your radio in a position that gives the strongest signal.

You might be in a location where the repeater doesn’t receive very well. Using your handheld inside a vehicle can be challenging. Try to get to a higher elevation. If you are inside a building, go outside to a balcony or a spot clear of foliage and obstructions.

You may also be in a dead spot caused by *multi-path reflections*, which are signals bouncing off various surfaces. These signals can end up cancelling each other out. Try moving about one-half wavelength (3 feet on 2 meters, or about 5 inches on 70 cm) in some direction. Watch your S-meter and move around a bit for the strongest signal.

Better Antennas = Better Performance

The least expensive way to boost your signal is to improve your antenna. This is true in almost any part of ham radio! The *rubber duck* antenna that comes with handheld radios consists of a flexible coil of wire coated in tough plastic. These are made for convenience, not range, assuming most contacts will be through nearby repeaters.

Full-size antennas are more effective. A typical example is the dual-band Diamond SRH77CA (see Figure 1) that attaches directly to your radio. It can be used no matter where the radio is being operated. The only drawback is that it’s somewhat longer.



Figure 1: To get more out of your handheld radio, replace the “rubber duck” antenna with a full-size antenna such as the dual-band Diamond SRH77CA that attaches directly to your radio.

Whatever type of antenna you buy, be sure the connector on the antenna matches the one on your radio, or you’ll need an *adapter*. If you’re not sure what type of connector is on your radio (it should be described in the manual), call the company selling the antenna and tell them what kind of radio you have. They should be able to look up the connector type for you.

Figure 2: If you're operating from one spot — even from inside your car — a magnet-mount antenna affixed to a metal surface (including your car!) is an option for boosting your signal.



Figure 3: You can also use a roof- or ground-mounted antenna, such as this Comet GP-3, with your handheld.



Figure 4: Short, flexible adapter cables make it easier to use your handheld with an antenna that requires a feed line. Adapter cables are available for many combinations of feed line and radio connectors.

While operating from home or a fixed location, try using a *magnet-mount* antenna on a metal surface like a refrigerator or filing cabinet. The conducting surface to which the magnet is attached acts as part of the antenna. Combinations of mount and antenna are available (see Figure 2). As a bonus, you can use the mag-mount on your car to give your handheld's signal more punch while driving.

Mag-mounts come with coaxial feed lines already attached that are usually terminated with a PL-259 connector. You'll need an adapter to allow a PL-259 to attach to the connector on your radio.

Mag-mount antennas stick to an iron or steel surface, such as a steel sheet. If the surface is aluminum, the antenna will still work, but the base will need to be held to the surface with tape. For a 2-meter antenna, the surface should extend at least 19 inches in all directions from the base of the antenna.

Best of the simple options is an external antenna on your roof or on a ground-mounted mast. Ranging from simple J-poles to high-gain vertical arrays (see Figure 3), getting a full-size antenna up and in the clear will dramatically improve your range. Use high-quality, low-loss feed line such as LMR-400, particularly if the length of the line is more than 50 feet. Don't forget to use electrical tape to waterproof the RF connectors at the antenna!

If the feed line to the antenna is somewhat stiff, it will make using the handheld awkward and may put stress on the radio's RF connector. You can avoid this by using a short, flexible adapter cable such as the Comet HM-05JSJ as shown in Figure 4, which adapts a PL-259 to the reverse SMA connectors found on popular Baofeng transceivers. Adapter cables are available for many combinations of feed line and radio connectors.

What About an Amplifier?

RF power amplifiers will certainly increase your transmitted signal! An amplifier will produce 20 to 35 watts output from only 2 to 5 watts of input. Some amplifiers also have receiver preamps, which are designed to amplify incoming signals, but these aren't usually needed because most radios have excellent sensitivity.

Instead of buying an amplifier, consider a mobile-type transceiver. These cost about the same as an amplifier and have at least as much power output. Then you'll have a companion radio to your handheld!



Getting to a higher elevation is one way to improve the signal strength of your handheld.