

Vehicular Radio Installation

A ham two-way radio is a fairly personal item. I like to install my own because I have definite opinions about what I like and don't like. There are a lot of trade-offs (compromises) in any equipment installation. As long as you are comfortable with the job, and it works reasonably well, having a someone else do the work is just fine. If you are going to attempt your own, there are a few things to think about.

First, take the radio, or the control head part anyway, and sit in the car with it. Look for as many different places to mount it as you can think of. Critically evaluate each one. Look for any interference with the controls, cup holders, and glove box, anything that will conflict. Slide the seats all the way forward and back, open the console, move your legs around. Now is the time to find all the reasons that a particular mounting location will be a bad location. Meanwhile, keep in mind that you will want to be able to easily see the display and reach the controls. You will also want to mentally route the connection cable away from the control head, usually under the dashboard. With luck, you will find a location that will work for you.

I like to have the control head relatively low, below the main instruments on the dashboard. At night, a lighted radio face can be distracting. Most of my driving is local, so I don't have to actually look at the radio much, and yet I do want it where I can see it when I want to. Just be sure you don't have to change position from what is normal for you in order to see your radio. I have seen people who had the radio on top of the dashboard, obstructing part of their view, and others where the radio location made them lean over the passenger seat to see it. Think this one through. The radio is likely to be in the car until you sell it, and you are **NOT** going to want to move it later.

Now that we have a location in mind for the control head, it's time to figure out where the rest of the radio (the "guts") will go. It should be inside the shell of the car. Most will not live happily under the hood, but the trunk is acceptable. Under the driver or passenger seat can work fine, but look carefully for anything that might interfere and remember to allow for rear seat passengers' feet. In a hatchback configuration, look for nooks or hollows behind the rear wheel wells. Another place to look is under the dashboard, although airbags and air conditioning tend to fill that up nowadays. Just remember that the radio guts will need access for antenna, power and ventilation.

A third item to locate may be an external speaker. If the radio will go in the trunk, this is mandatory. It may even be a good idea if the radio is under the seat, because the small speaker in the radio may be directed up into the seat padding, while an external speaker aimed forward will be easier to hear.

Don't underestimate the importance of this planning process. Time spent looking over options at this point will save lots of grief later. Think through every aspect of the wire routing and look for alternatives in case "Plan A" doesn't work out. I will gladly spend 6 hours, over a couple of days, working out exactly how the install will go. Then when it comes to doing the actual work, watch out for the unforeseen. As soon as something unexpected shows up, re-evaluate the entire install. You want the finished product to be a professional job you can be proud of.

Running wires in a vehicle can be a challenge. It always takes twice as much wire length as you think it will. Running wires from one end of the cabin to the other can usually be done in the doorsills. The cover plates that protect the sill can be removed with a few screws to expose a wire channel that carries the wires for the taillights. Tracing these will provide a route to the trunk as well. There is usually ample room to lay additional cables in the groove. Whenever possible, look for existing wires and follow them when routing your own. The vehicle engineers have already provided paths for your wires if you just let them lead the way.

The most challenging wires to run are the main power leads. These are usually large diameter wires and they need to go through the firewall to get to the battery. It is extremely important that these wires not chafe on the firewall. You can purchase a rubber grommet and drill a proper size hole to pass the wires through. In my experience, there is usually enough room in an existing rubber bushings to get the wires through. Just be sure they are nowhere near a metal edge.

Use cable-ties to strap your wires to existing wire bundles. Do not run wires along hoses, pipes or tubes. Keep in mind that the motor and its associated components move around while underway. Keep your wires well clear of these items. Any color cable-ties are acceptable under the hood, but if exposed to sunlight, use black ones as they are UV resistant and will not deteriorate as fast as white, clear or other color ties.

The power leads for your radio want to connect directly to the battery. Use a fuse in each wire. Yes, BOTH the positive *and negative* wires should be fused, and as closely as possible to the battery. The battery is really the source of current to run the radio. The alternator keeps the battery charged. The battery also acts like a big filter.

If you don't fuse the negative wire, then it is possible for the main ground lead from the battery to the frame (or engine block) to loosen. Then when you go to start the car, the 100-plus Amps of starting current may try to find a better path back to the battery. If it finds the circuit from the grounded side of the antenna through the radio chassis and back through the radio's negative power supply wire to the battery, you may have a fire to deal with. None of the wiring associated with your radio is designed to handle more than 20-Amps. If you had a fuse in the negative power lead, it would save you a lot of grief.

If you try to power your radio from the car's fuse holder, you will discover that the vehicle wiring is inadequate for that task. Any part of the circuit that is common to other electrical devices will couple noise into your radio. The wipers and computer are particularly noisy. That is the reason for running directly to the battery.

One more secret... Radio Shack sells a special High Strength double stick tape that works for mounting lightweight items (like the control head) where you don't want to drill a hole. I used it in the new car and the control head is still there seven months later.

Velcro also works to stick items to the carpeting. This is a good way to mount a radio under the seat. If you drill any holes, carefully check what is on the other side of the hole first. Drilling into the gas tank or catalytic converter could ruin your whole day.

You will need an antenna. For a VHF/UHF radio in a vehicle there are four options (in order of invasiveness): Magnet Mount, on-the-glass mount, trunk lip mount, permanent mount (drill a hole). You will want a dual-band (2-meters and 70-cm) antenna.

Magnet mounts work well in the middle of the roof. Run the coax cable in the passenger side rear door; it's the least used and will chafe the cable least. It's best to run the cable in the DOOR rather than the window. The door usually has a soft rubber seal with enough room for the cable. Always wipe the roof (and the bottom of the magnet) off with a clean rag before sticking the magnet down. The magnet won't scratch your paint, but the dust under the magnet will!

On-the-glass antennas glue onto a window (inside and out) and pass the radio energy through the glass. They have to be on a fixed (not moving) window, away from defroster wires. Side or rear windows are best. They can be removed later without a trace.

If the car has a trunk, the lip mount works reasonably well. The cable is routed forward with the tail light wires to the radio. This can also work on hatchbacks. Paint damage is limited to two tiny points on the underside where the setscrews bite.

The best electrical connection is obtained by using a permanent mount, requiring drilling a hole. The hardware won't leak if installed correctly, but can impact the resale value of the car. A trick that sometimes works at resale time is to replace your ham antenna with a cell phone model made for the same base. Then the "bug" becomes a "feature".

Access to the inside of the middle of the roof can usually be had by dismantling the dome light. This will let you see the underside of the roof and let you fish cables with a hooked piece of stiff wire (coat hanger). BEFORE drilling any holes, be sure you have a path down one of the door pillars. The plastic trim can usually be removed if you gently work the snap-in fastener buttons out of their seats. Don't pry with excessive force or these will break off. I can't emphasize enough, before you drill the hole, have the entire rest of the job thought out and a "fish-wire" snaked up the path you will use to get the antenna coax out. I have a friend who once drilled the hole first. He had a cable hanging down inside the middle of his car until he sold it.

I use a length of #12 solid copper insulated house wire, or steel electric fence wire, and fish up from the doorsill to the middle of the roof. Once the hole is drilled, and the antenna mount inserted from the outside, cable first, the end of the coax cable can be taped to the wire and carefully pulled down to the doorsill to be routed to the radio. This method does not require messing with the headliner.

A VHF/UHF antenna will work best in the middle of the roof of a car or truck. The middle of the trunk is second best. The edge of the trunk lid would be third best. Mounting the antenna on the front of the vehicle should be avoided if possible. The engine compartment generates a lot of noise and coupling it into the antenna accomplishes little.

A VHF antenna wants to be located in the middle of a flat metallic sheet, at least 3 feet in diameter. That is not always possible, but it is the goal towards which you should trend. If possible, avoid the corners of your vehicle, as that makes the antenna slightly directional in the direction of the opposite corner. Also avoid mounting the antenna to an isolated metal

piece or bracket. Even luggage racks can make surprisingly bad ground planes. Mirrors, spare tire mounts, trailer hitches and bumpers are some of the worst places to mount antennas.

An HF antenna, being a larger, heavier and more unwieldy beast will probably have to mount on the rear bumper, frame or trailer hitch. Mechanical considerations usually trump ideal electrical location in this case. When planning an HF installation, it becomes important to bond (ground/connect) the bodywork to the frame at the antenna mounting point to provide as direct a path for the grounding current as possible. It may also be important to bond the trunk lid and hood to the body to make the shell of the car as RF-tight as possible. All of these vehicle components are generally rubber mounted. The electrical noise generated within the vehicle that is a minor nuisance on FM can completely cover AM, CW and SSB signals.

There are other mechanical considerations. Make sure you have clearance to enter/leave the garage or carport. Nothing will destroy an antenna faster than slamming it into the overhead repeatedly. In the case of an HF antenna, remember that if it gets too large, wires overhanging the road may become a consideration.

The operation of an Amateur radio in your vehicle can bring a lot of enjoyment, and fill otherwise empty hours. Most states that have enacted legislation to limit cell-phone use in vehicles have exempted ham radio. Be that as it may, don't let your radio operation distract you from the primary job of driving safely. If circumstances require it, just drop the mic and drive first.