

Build Your DREAM Antenna

As in "Dual-suspension, Removable, Easy-to-build, Amateur-radio, Multiple-band, 10-meter mobile antenna system.

Take a couple of hours, mix in a little creativity, and you can change that boring commute to work every day into hours of glowing reports and solid contacts.

This article describes an effective, efficient, broadband, 10-meter DX mobile antenna. Now, don't let poor past experiences with mobile signals put you off — you'll be surprised at the difference a full-size quarter wave antenna makes, especially if you're used to dealing with magnetic-mount antennas. The best mobile signal reports I've ever received were from 102-inch steel whips that were cut down to the 10-meter band.

Let's quickly review some of the problems with using a short antenna. You already know they're inefficient because of their size and use of coils, not to mention the narrow SWR bandwidths. And hey, get just a little bit of dirt or grit under the magnet and you get this interesting circle of annoying scratch marks right on the top of your car. On the other hand, quarter wave antennas are efficient and broadbanded, and this design does not cause any damage to the car! Plus, since we'll be using a standard antenna mount, if you ever get tired of 10 meters (can't happen, by the way!), you can just swap the whip for one of the many other antennas on the market.

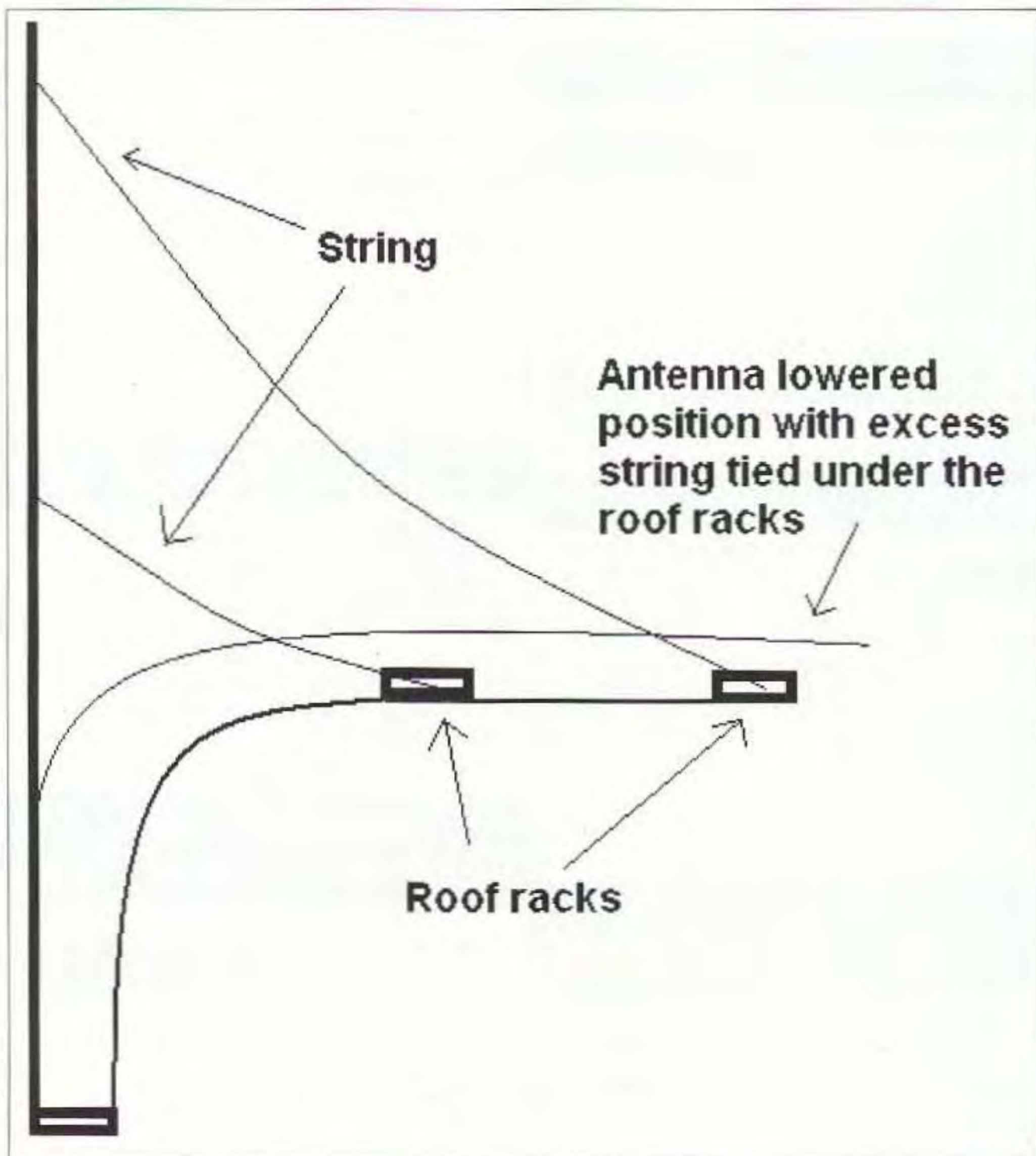


Fig. 1. Dual suspension.

Even with all these reasons to do this project, that doesn't mean there aren't any drawbacks to having an 8-foot monster antenna tacked onto the back of your vehicle. One problem to watch out for is the low-hanging trees in the neighborhood. I've whacked many a branch, so be on the lookout. And what about the fast food drive-through or even garages? Height limits are a problem there as well. Don't worry. My patented (yeah, right) design will solve these problems for you. To see how, let's start by taking a look at the promise of the article title.

Dual-suspension (Fig. 1)

Okay, so the dual suspension is just two pieces of string, but this very simple system is extremely effective. It's great for times when you are entering places with low overhead clearances. It solves these problems by allowing you to bend the top of the whip down to the roof of the car. If you are lucky enough to have a roof rack available (**Fig. 1**), one end can be tied near the top of the antenna with the other tied off to the roof rack nearest the front of the vehicle. Plus, if the roof rack is adjustable (with the ability to slide back and forth), there will probably be some sort of latch that opens. Just open the latch, pull the top string and antenna down toward the car, and wrap the excess line under it. And when you are ready to put it back up, all you have to do is just release the latch. If there is just no place to tie the top part down, you might want to try another setup I've used (**Photo A**) to at least control the sway of the antenna.

Removable

My goal was to put together an antenna system that does no damage to the vehicle at all. That way, when it comes time to buy a new vehicle, you don't have to just leave the mount on the old car and buy all new parts for your next car. It's non-invasive since no drilling (at least externally visible drilling) is needed. That way you don't have to worry about any loss in the price of the car. Even the cable and ground wires can be removed easily.

Easy-to-build

Besides the antenna whip and coax, there is only one other key component to this system. That is the antenna mount itself. It's actually a mirror mount (see the parts list), and it installs on the end of the 1/4" tubing (**Photo B**) that is used as the mounting support. Although it's easy to build (it generally just takes a few U-bolts and clamps), remember that I mentioned you'll need a little creativity? I wish I could just give one method of connecting up the antenna that would work for all cases, but if you take a quick look underneath various vehicles, you'll see that each is different and you'll need to come up with some possibilities for your particular instance. See the section on putting it all together later in the article for information and some ideas to get you started on this.



Photo A. Stabilizer tie-up.

Amateur-radio

Well ... No dah!! Or, should that be "No dit"?

Multiple-band

This one may surprise you. A quarter wave antenna is very broadbanded. In fact, after you get the entire system working perfectly on 10 meters, switch down to the 12-meter band and try a signal there. You can do this either through a



Photo B. 1/4" tubing supporting the mirror mount.

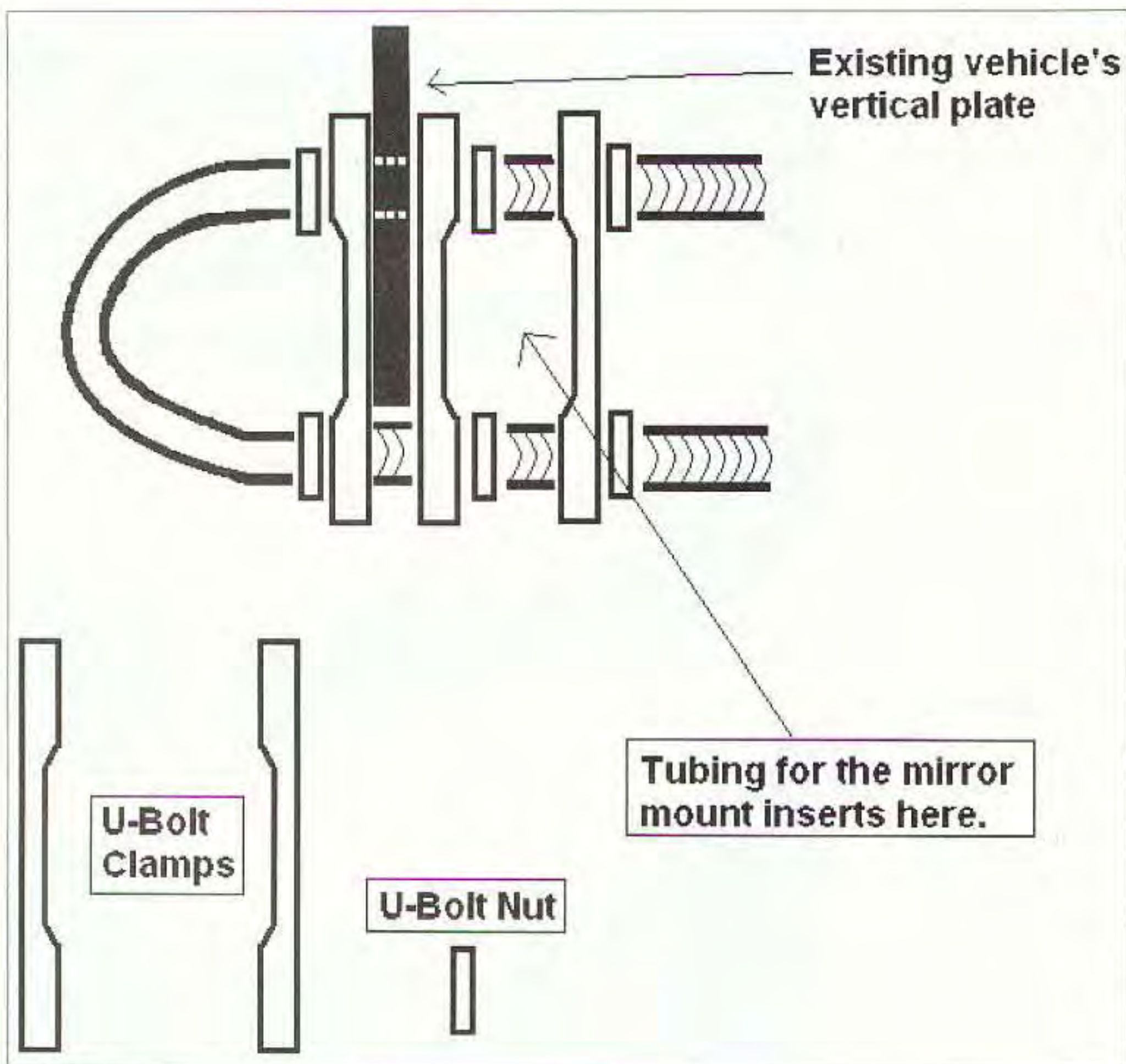


Fig. 2. Bolt and clamp assembly.

mobile antenna matcher or do what I do and just run it direct. If your radio has built in SWR protection, it will cut back the power to a safe level and you'll end up running 12 meters at low



Photo C. Slip the cable into the trunk through the water seal if there are no water holes that you can use.

power. Sure it's reduced power, but hey, QRP can be a lot of fun. Plus, the band isn't crowded so it doesn't take much to get a signal through. The antenna is pretty efficient at least down to 12 meters. Beyond that, you'll spend a lot of time yelling and screaming before making any contacts.

Putting it all together

Start the whole process by crawling under the back of the vehicle to decide on a mounting design to connect the two feet or so of the 1/4" tubing to the underside of the car. The length of the tubing will depend on just how far back under the car you need to go in order to find a place to attach it. Trying to figure out how to mount the tubing is going to be the hardest part of this project. You'll need to find at least two support spots. One will just support the weight of the mount and antenna; the second keeps the whole thing from swaying back and forth. Search for holes under the car that can be used as an attachment point for the U-bolts. Look for potential spots in the frame

up above where the tubing will be positioned or perhaps even horizontal to the tubing. Another option is to look for any existing bolts in the frame that may be extending out enough to be useful. If you find one long enough you can just lay the U-bolt over it and use that as the support. The best thing to do though is to draw a quick picture of what you see under there and then take a trip to the hardware stores, auto parts stores, and even plumbing supply stores to come up with some ideas. Some things that might work for you are toggle bolts, turnbuckles, and Milford hangers.

I did come up with a way (Fig. 2) of combining a few U-bolt and clamp parts together that you'll likely be able to use one way or another, so I'll take the time to describe it here.

In my case, my van happened to be a 1993 voyager. It had a vertical plate with some holes already drilled through it. Actually, one hole is all you need, that is, if it is near the bottom of the plate. This is because you can use the free space below the plate to act as the second hole. You'll end up running one of the U-bolt rods through the existing hole and the other bolt will hang below the plate.

You're going to need 3 sets of the U-bolts with clamps to do this, plus one extra set of nuts. Start with one of the U-bolts and screw on the two nuts. Take them all the way to the end of the threads nearest the U. This will provide a stopping point for the 1st clamp. Next, place the 1st clamp on with the "teeth" end going in first. It will stop at the nuts you've just put on. This makes the flat end available as a stopping point against the metal plate. Run the U-bolt through the hole(s) in the plate of the vehicle and the whole thing will stop against the plate.

Next, we need another clamp to brace against the other side of the car's plate. Push it on with the flat side first this time, to butt up against the plate. Now screw on another set of nuts and tighten them so the whole thing doesn't move at all. We're almost done now.

Next, put on a third clamp and slide it in toward the last one. This time "teeth" first. This provides us with a

space now between the two sets of teeth to grab the antenna mount tubing. Don't press it all the way in, because you'll do that once the tubing is ready to be connected up. Again put on two nuts. This will hold the outside clamp in place against the tubing when you are ready to attach it. And last, put on a final set of nuts. This last set will help keep the outside two from unscrewing over time due to the vibrations of the car.

Okay, now take the remaining U-bolts into your back yard. Drive a peg into the ground and start practicing horseshoe throwing — because they are of no use to the rest of this project!

Once you've got a mounting system plan ready, the hard part is out of the way. Before you actually mount the tubing to the vehicle, first take the tubing, and attach the mirror mount (Photo B). That way you can gauge when there will be enough room for the antenna to clear the back of the car. At this time you can also get the whole thing aligned correctly too, so the antenna is going to be vertical and not off on some angle. Be sure to place some tube pipe insulation around the antenna mount tubing to keep it from rubbing up against the bottom of the bumper. We don't want to do any damage there either. Besides, I think it looks cool. Tighten everything up and then screw in the 102-inch whip. Now you're ready to run the cable.

Part	Description
Steel whip	102 inch, Radio Shack #21-903
U-bolt with clamp	3 or 4 sets, RS #15-826
RG-58 cable	50 ohm, 20 ft.
Mirror and luggage rack mount	RS #21-937
1/4 inch tubing	2 to 3 ft., for use in mounting the mirror mount
Ground wire	4 ft., enough to find suitable connection points
Hose clamp	To attach the ground wire to 1/4 inch tubing
Tube pipe insulation	—
Optional	
Cigarette lighter adapter	12 V power adapter, 10 A, RS #270-1521
Banana jack binding posts and adapters	RS #274-718, #274-716

Table 1. Parts list.

Routing the cables and ground wires

Notice that I've listed RG-58 (the thin stuff) as the coax to use. We need to be able to route the cable from the outside of the car to the inside of the trunk area. First check to see if you have any rubber water plugs in the trunk that will give you access from below the trunk to the inside. If so, this hole must be at least big enough to pass the diameter of the cable through or better yet, the diameter of the PL-259 connector. If the size isn't big enough or if there are no water plugs there, you'll need to cut off the connector from one of the ends of the cable. With no hole available what we're going to have to do is to sneak the cable in through the water seal that runs along the lip of the trunk (Photo C). I've usually seen this seal with holes predrilled on one side of the seal. By putting one on the opposite side too, you can slip the RG-58 and even a ground wire through the seal.

Start by connecting the PL-259 end of the cable to the mirror mount connector and run the cable up and under the bumper or other path that works for your car. Open the trunk and route the cable up and through the water seal holes. Once through, you can use those handy dandy quick connect crimp-style connectors to easily attach the male connector to the end of the cable which is going to the radio. Attach a ground wire around the antenna mount tubing and secure it via hose clamps. Run that wire up along the coax and through the same hole, or another, if the size is a problem. Connect the other end of the wire to any convenient ground screw you can find.

This is one of the two grounds you'll want to have in the system. (Note: I've found that some ground spots are better than others, so you might want to check with an ohmmeter to see that you've got a good short to the main body of the car.) The second connection should be a ground wire from the radio to a ground screw near the radio at the front of the car.

SWR

I typically start with the full 102"

whip and cut down from there. Before you start cutting anything off of the whip, check the SWR as is. Depending on the type of vehicle (van, car, truck, etc.) and how close the antenna is to it, as well as how much of the antenna runs along side the vehicle, the length for a good match will vary. If you do need to shorten the antenna, only snip off 1/8"–1/4" pieces at a time. Decide ahead of time which portion of the band you'll be spending most of your time and go for the 1:1 match there. Note: Most of the voice SSB activity exists from 28.3–28.5 MHz.

If you plan to bring the rig into the house nightly, you should take care to install easy disconnect connectors of some sort. I won't go into all of the possibilities here, but I ended up using banana plug binding posts and that worked nicely. If you plan on just running QRP you can get away with running direct to a cigarette lighter

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plug or to an accessory outlet — watch the current maximums allowed here. They may be a lot lower than you expect, so read your owner's manual! Otherwise to run high power, run your power lines directly to the battery with fused lines. Be sure to run that second ground wire I mentioned earlier from the ground lug on the rig and use some sort of quick connect plugs to attach/detach to the ground wire for ease of removing the radio each day.

[By the way, if you own a 5-door vehicle and getting into the hatch is going to be an issue for you (I just don't use it), check out some of the sites I've listed for special mounts to handle this.]

As a last step, take a little time to arrange the cable neatly from the back of the vehicle all the way to the radio. Try to keep it out of tripping distance by tucking it under molding or carpet where possible. I've found that especially near the doors, it's easy to unscrew the molding, place the cable down and screw the molding back in place all in just minutes. It will save you a lot of aggravation later.

Testing it out — swinging the beam

Find an empty parking lot somewhere — up on a hill if possible — and scan the band for a decent signal. It's important to know this, so listen up. This is a directional antenna. Try pointing the front end (diagonally opposite to the side you have the antenna mounted) toward the incoming signal. While the station is talking, slowly

turn the car away from the signal and then back again — you've got a mobile beam! When the signals are down, take advantage of this fact, it does help! I've logged many hours of fun with this type of antenna system and you can, too. It's a great DX antenna and you'll see the best results on those long hops.

Is this antenna system for everyone? Of course not! But for me, it's a "DREAM" come true!

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