About this Article

This material was included with the downloadable supplemental content accompanying the *ARRL Antenna Book*.

You may print a copy of this material for personal use. Any other use of the information requires permission from the ARRL.

Copyright/Reprint Notice

The Ultimate Portable HF Vertical Antenna

Phil Salas, AD5X

AD5X

The complete unassembled antenna.

I've had a tremendous response to the portable antenna project published in the July 2002 *QST*. Many folks had problems locating some of the parts, however. It seems that sprinkler-system parts are not as common in other sections of the country as they are in Texas! Also, the original article required that you drill and tap screw holes in brass couplings and the sprinkler-system risers. I wanted to eliminate the screw-hole tapping to simplify the construction.

Over the years, the antenna evolved from the original design through changes that used fiberglass, aluminum tubing, and then brass tubing. The most recent design is longer, lighter and more compact (when disassembled) than the original antenna. It is also easier to build, and easier to the find parts. Band coverage is also increased to include 60 meters, as well as 40 through 10 meters!

The Ultimate Portable Antenna is designed for easy transport. It breaks down into multiple mast sections, a whip section, an air-wound center loading coil section, and a small base support. No piece is longer than about 20 inches, so it will easily fit into most suitcases. The lead photo shows the disassembled antenna, including guys and radials. The fully assembled antenna has a length of almost 16 feet! See Figure 1. That's me, standing next to the antenna set up on my front lawn, in Figure 2.

The key to efficiency for short antennas (such as a loaded vertical less than a quarter wavelength) is the length. The longer the antenna, the greater the radiation resistance and therefore the less impact you have on efficiency due to ground and loading coil losses. This antenna is almost $^1/_4$ λ on 20 meters. For operation on 17 through 10 meters, you will shorten the antenna to $^1/_4$ λ. The length of the complete antenna minimizes the required loading coil for 60, 40 and 30 meters. So let's build it!

AD5X

Figure 1—The complete antenna setup in the author's front yard.

AD5X

Figure 2—Standing next to the antenna to illustrate the height of the tubing sections and coil.

Gathering the Parts

You can find most of the parts for this antenna at your local hardware store. The loading coil, coil taps, 10 foot telescoping whip, and SO-239 are available from MFJ (**www.mfjenterprises.com**). Be sure to mention this *QST* article when ordering the kit of parts (MFJ-1964-K) for a special price discount. Table 1 is the complete parts list.

A few notes about pipe sizes may be in order for anyone not familiar with plumbing fixtures. When you go to the hardware store to purchase the $^1/_8$ inch NPT nipples and couplers, don't expect to find anything measuring $^1/_8$ inch! The outside diameter of a $^1/_8$ inch pipe is 0.405 inches, or about $^{13}/_{32}$ inch. The standard threads are 27 turns per inch. (The $^1/_8$ inch designation comes from the approximate inside dimension of the pipe, although today you may find pipes with different wall thicknesses and the same outside dimensions. For this project you don't have to worry about the wall thickness of your fittings.) The NPT specification

Table 1

Parts List

1	5 inch long × 2.5 inch diameter × 10 TPI air wound coil (MFJ-404-008)*
1	10 foot telescoping whip (MFJ-1954)*
1	SO-239 chassis mount connector (MFJ-610-2005)*
5	Coil clips (MFJ-605-4001)*
2	3 foot pieces of 3/8 inch diameter brass tubing (ACE Hardware) (McMaster-Carr 8950K581 — 6 foot length)**
1	3/8 inch diameter wood dowel. (36 inch length at Home Depot—only 3 1/2 inch needed.)***
1	3/4 inch PVC T — All of the PVC fittings are white schedule 40 pipe (Home Depot)
1	3/4 inch slip × 1/2 inch female pipe thread PVC adapter (Home Depot)
1	3/4 inch slip × 1/2 inch slip PVC adapter (Home Depot)
1	3/4 inch slip PVC plug (ACE Hardware)
1	1/2 inch NPT (male thread) to 1/8 inch NPT (female thread) brass adapter bushing (ACE Hardware)(McMaster-Carr 50785K64)
8	1/8 inch NPT brass couplings (Home Depot)(McMaster-Carr 50785K91)
4	0.7 inch long 1/8 inch NPT all-thread nipples (these are also called "close nipples") (Home Depot) (McMaster-Carr 50785K151)
2	#8 brass wing-nuts (ACE Hardware)
2	#8-32 × 3/4 inch brass machine screws (ACE Hardware)
2	#8-32 brass nuts (pack of 6) (Home Depot)
2	#8 copper-plated steel (or brass) split lock washers (ACE Hardware)
1	36 inch length of 1/8 inch diameter brass rod (Home Depot)
1	3/8-16 × 1 1/4 inch hex head bolt, zinc plated. Choose the longest you can that is threaded all the way to the head. (Home Depot)
1	3/8-16 × 12 inch hex head or carriage bolt, zinc plated. Choose the longest bolt you can find in this size if you can't find a 12 inch bolt (Home Depot)
1	3/8-16 coupler, zinc plated (ACE Hardware)
2	3/8-16 nuts, zinc plated (pack of 6) (Home Depot)
1	3/8 inch lock washer, zinc plated (pack of 10) (Home Depot)
4	#6 stainless steel 3/8 inch sheet metal screws (ACE Hardware)
3	#8 solder lugs (Home Depot)
6	#8 × 1 1/2 inch brass wood screws (pack of 6) (Home Depot)
90 feet	Wire (any gauge, insulated or not, for six 15-foot ground radials.)
1	Alligator clip and miscellaneous short pieces of connecting wire.

*The total retail price for all the MFJ parts is $53.80, plus shipping/handling. Mention this article when you order and MFJ will sell a kit containing the telescopic whip, coil, coil clips, and SO-239 connector for $39.95 plus $6 s/h. The kit is MFJ-1964K. You can order additional coil clips for $2.95 each.

You can use 3/8 inch aluminum tubing if you prefer. Aluminum tubing is about half the cost of brass, but you will either need to drill the brass couplings and aluminum tubing so they can be connected with stainless steel sheet-metal screws or solder them together using aluminum solder and a torch (see **www.solder-it.com).

***You can use 3/8 inch fiberglass rod instead of the wood dowel if you prefer, but fiberglass rod is more difficult to find. Check out bicycle flags and driveway marker stakes as potential sources of fiberglass rod.

The brass plumbing items are also available from McMaster-Carr, (**www.mcmaster.com**) a mail-order supplier with no minimum order requirement. They stock 6 foot lengths of 3/8 inch brass tubing as well as the close nipples, couplings and brass bushings. The Table lists part numbers to help you look up those items on the Web site.

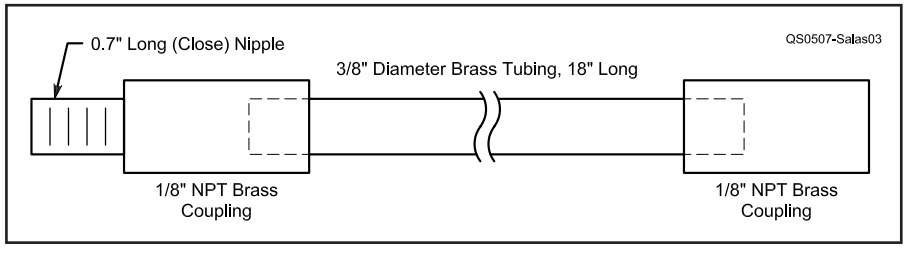


Figure 3—Assembly of the brass tubing sections.

means National Pipe Thread. There are several other thread specifications, but NPT is the most common.

I used 1/8 inch NPT close nipples for the antenna connectors. These are about 0.7 inches long, and are usually fully threaded over over the entire length. The PVC pipe fittings must be the white, schedule 40 PVC pipe. Do not use the thinner-walled pipe sometimes known as CPVC, which has a cream color or yellow tint. When fittings are designated as "slip," it means pieces are intended to be glued—they just slip together—rather than being threaded.

Brass Rod Preparation and Assembly

See Figure 3 for the assembly details. First cut three 18 inch sections of the 3/8 inch brass tubes with a hacksaw or tubing cutter and de-burr the tubing. The ends of the couplings that fit over the brass tubes must be reamed out with a 3/8 inch drill bit. Otherwise the couplings won't fit over the tubing. To do this, first screw a 1/8 inch NPT coupling on each end of a 1/8 inch NPT close nipple. Use wrenches to screw these together as tightly as possible. Next, clamp one of the couplings securely and ream out the opposite coupling with a 3/8 inch drill bit. (Use a drill press for this operation if at all possible.) Reverse, and ream out the other coupling. [See Figure 4 for one way to use a woodworker's clamp and a drill press.—*Ed.*] Now unscrew the couplings. One end of the nipples will break loose from one coupling, and the other end will stay tight in the remaining coupling. You'll now have a female and male end that will fit over each end of a section of brass tube, as shown in Figure 5. You will need four pair of these male/female brass connectors: three pair for the brass tubes and one pair

WR1B

Figure 4—A pipe coupling and nipple secured in a woodworker's clamp ready to drill out the end on a drill press.

AD5X

Figure 5—After the pipe couplings have been drilled out and one coupling removed from the nipple, the pair is ready to be installed on the ends of an 18 inch length of brass tubing.

for the loading coil assembly. If you'd like, you can solder the nipple/coupling assemblies together. The assembly tends to be very tightly secured even without soldering, however.

Now insert the male/female brass pairs just constructed over all three of the 18 inch brass tubes and solder the couplings directly to the tubes. This is easily done with a large soldering iron, or even better, with a torch and silver solder. Solder-It has a nice small butane torch that works well. See **www.solder-it.com**.

Loading Coil Assembly

Slide 1/8 inch NPT male/female coupling pairs over both ends of a 3/8 inch diameter, 3 1/2 inch long wood dowel. You will need to drill a 1/8 inch diameter hole completely through each of the 1/8 inch NPT brass couplings and dowel as shown in Figure 6. Next cut two 3 inch lengths of the 1/8 inch diameter brass rod. Insert one of these 3 inch sections through the holes on one brass coupling. Center the rod so that equal lengths are available on both sides of the coupling, and solder the rod to the coupling with a large soldering iron or torch. (Be careful not to burn the wood dowel with the torch!)

Now position a 3 inch length of the MFJ-404-008 coil such that the 3 inch brass rod just installed pokes through the last two turns on the coil. See Figure 7. Solder the coil turns to the rod. On the opposite end of the coil assembly, insert the remaining 3 inch brass rod through two adjacent turns on this end of the coil, through the brass coupling, and through the coil turns. Solder the coil turns to the brass rod, and then solder the brass rod to the coupling.

Next, indent every other turn on the coil with a small flat-head screwdriver. You should do this on opposite sides of the coil to give you plenty of adjustment capability.

Finally, on the end of the coil with the brass nipple (male end), solder a 6 inch piece of insulated wire terminated with an alligator clip. For extended outdoor use, you may wish to treat the wood dowel with varnish.

Top Whip

The MFJ-1954 10 foot telescopic whip comes with a standard 3/8-24 mounting thread. While the whip mounting stud is not a correct match for the 1/8 inch NPT coupling (27 turns per inch), I just thread the screw directly into the 1/8 inch NPT coupling. Because the 3/8 bolt is slightly smaller than the 1/8 inch pipe outside diameter, and the pipe coupling is tapered inside, they will go together. [See the "Alternative Construction Ideas" sidebar for a way to match the threads, if you are uncomfortable with the mismatch.—*Ed.*]

Base Assembly

For the base spike, I've used a 3/8-16 × 12 inch zinc-plated hex-head bolt. Only 1 1/2 inches of the bolt is threaded, and so I used the long smooth end of the bolt to go into the ground after cutting off the hex head. A damp cloth easily cleans the bolt after use. I also used a 3/8-16 × 1 1/4 inch

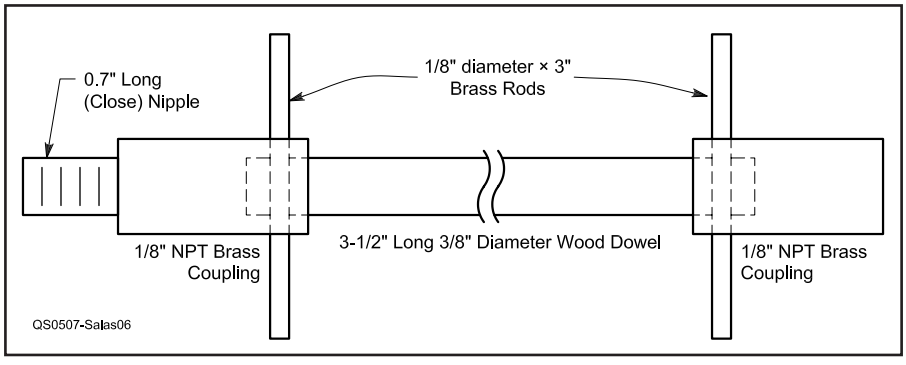


Figure 6—How brass couplings are installed on a length of 3/8 inch wood dowel and 1/8 inch brass rod in order to mount the coil.

AD5X

Figure 7—The loading coil assembly ready to be soldered.

zinc-plated hex-head bolt at the base of the PVC assembly, and a 3/8-16 zinc-plated coupler to attach the 1 1/4 inch bolt to the 12 inch bolt, as shown in Figure 8. This way you can leave the long bolt off if you want to bolt the base assembly directly to a metal plate or trailer mount, or screw on the long bolt for ground mounting.

Referring to Figure 8, drill a 3/8 inch diameter hole into the 3/4 inch PVC plug used for the base support 1 1/4 inch bolt. Cut off about half of the length of the 3/4 inch PVC plug to leave plenty of room inside the T for wiring. Solder a ground wire to the head of the 3/8-16 × 1 1/4 inch bolt as shown, or use a 3/8 inch solder lug. Insert the threaded end of bolt into the plug, and secure with a 3/8-16 nut and a lock washer. If you wish, you can glue the plug in place with PVC pipe cement instead of using the #6 stainless steel sheet metal screws shown. The screws make changing the support assembly easy in case you should ever want to, though. You might even consider using screws to attach the other two adapters into the T.

To prepare the 12 inch bolt, cut off the hex head and round this end with a file. Screw a 3/8-16 nut onto the threaded end, then add a lock washer and screw the 3/8-16 coupler onto the threads so the bolt is about halfway through the coupler. Tighten the nut against the coupler (with a lock washer between the nut and coupler). This 12 inch bolt assembly can now be easily screwed onto the 1 1/4 inch bolt on the base assembly for ground mounting.

Now place the SO-239 over the 1/2 inch hole in the 3/4 to 1/2 inch slip adapter and mark the location for the two #6-32 × 3/8 inch long stainless steel sheet metal screws that will hold it in place. (The adapter I used had a hex head on the outside lip, and by turning the SO-239 so diagonal mounting holes are over opposite points in the hex head, there should be enough material to hold the screws easily.) You'll see that these holes will be right in

Alternative Construction Ideas

As I began editing this article for publication in *QST*, I decided to build the antenna. After visiting three local Home Depot stores and most of the True Value and ACE Hardware stores in the area, I realized that builders may have difficulty finding some of the materials. For example, none of the stores I visited had any stock of brass or aluminum tubing in the size I wanted.

I contacted Phil Salas with a few questions about this article and the materials he specified. Phil informed me that since writing the article he had continued to try new ideas for building the antenna, and he found several alternative materials. His first suggestion was to use 1/2 inch aluminum tubing, with a wall thickness of 0.058 inch. He tapped the inside of that tubing for 1/8 inch pipe threads, and just turned the brass nipples into the pipe. This saves the step of drilling out the couplings to slip the 3/8 inch brass tubing inside. I was able to find some 1/2 inch aluminum tubing with a 0.050 inch wall thickness but not the thicker wall. Unfortunately, a 1/8 inch NPT nipple slips right inside that tubing, so I could not cut threads into the tubing. Perhaps 7/16 inch tubing with a 0.050 inch wall thickness would work, but I did not find any tubing in that size.

Phil also suggested McMaster-Carr (**www.mcmaster.com)** or similar mail-order/Internet stores as a good way to obtain the tubing and other plumbing parts. Their prices compare favorably with what I found in Connecticut, and with no minimum order they may save you some shopping time in a variety of hardware stores. Of course many of us probably enjoy browsing the aisles of our local hardware stores. You never know what new tool you may need or what other antenna projects may come to mind as you peruse the available materials. Phil has included McMaster-Carr part numbers for several of the pieces in Table 1.

I found a K & S Engineering display of hobby tubing at my local Do It Best hardware store. They ordered the 3 foot lengths I needed for a reasonable price. After building an antenna with that tubing, however, I realized that the 0.014 inch wall thickness was too thin to support the antenna without guy lines. Phil suggested that I could use that tubing by inserting a 1/4 inch dowel or 1/4 inch fiberglass rod, such as from a bicycle flag to stiffen the brass tubing. I ordered a 6 foot length of the brass tubing with a 0.032 inch wall from McMaster-Carr, as listed in Table 1. That proved to be a near ideal tradeoff between weight and strength.

I also discovered a much wider array of PVC pipe fittings than I had imagined. Many of the pieces appear to have similar specifications at first glance. For example, I found 3/4 inch × 1/2 inch adapters with male pipe threads on the 3/4 inch end and either male or female threads on the 1/2 inch end as well as one with both ends designed for slip fitting of the PVC pipe into the adapter.

There are many different ways to arrive at the end result you need. For example, if you can't find a 1/2 inch × 1/8 inch brass bushing for the top of the T, a 1/4 inch × 1/8 inch bushing will turn into a 1/2 inch × 1/4 inch bushing to achieve the same results.

All of my searching for parts shows that there may be a variety of materials that you could use to build a similar antenna. What you find in your area may not match what the author or I found. With a bit of creative shopping you will be able to find the parts you need to build the antenna.

The author suggests that you use #6 × 3/8 inch sheet metal screws to hold the pipe plug with the bolt into the bottom of the T. This will make it easier to disassemble that section if you have to fix a wiring problem inside the T. I decided that was a good approach for the fittings on the other two parts of the T as well. Photo A shows the T clamped in my woodworkers clamp, ready to drill the screw body holes.

Photo A — The 3/4 inch PVC T is clamped in a woodworker's clamp, ready to drill the screw-body holes with a 9/64 inch drill bit. I had first drilled 5/64 inch pilot holes with the adapters and bottom plug installed in the T. Try to center the hole on the side of the T, and drill all the way through both sides. Then remove the adapters and plug, and drill the screw-body holes in the T.

Phil has found that threading the 3/8-24 stud on the bottom of the telescoping whip into the 1/8 inch NPT coupling is adequate. The perfectionist in me doesn't like the idea of mismatched threads. I decided to make a slightly different adapter than Phil suggests in his article. I used a 1/8 inch pipe coupling and nipple on the bottom of a 1 inch length of the brass tubing. (I drilled out the brass coupling with a 3/8 inch drill, the same as is done for the antenna tubing sections.) For the top section of my adapter I used a 3/8-24 coupling nut, which is about 7/8 inch long. I drilled out the threads on about half of that coupling, too, and pushed it onto the brass tubing. (I soldered these, and all other joints on my antenna.) Now all the threads mate properly. The 1/8 inch NPT to 3/8-24 adapter allows me to attach the whip to any antenna section, as desired.
—*Larry Wolfgang, WR1B*

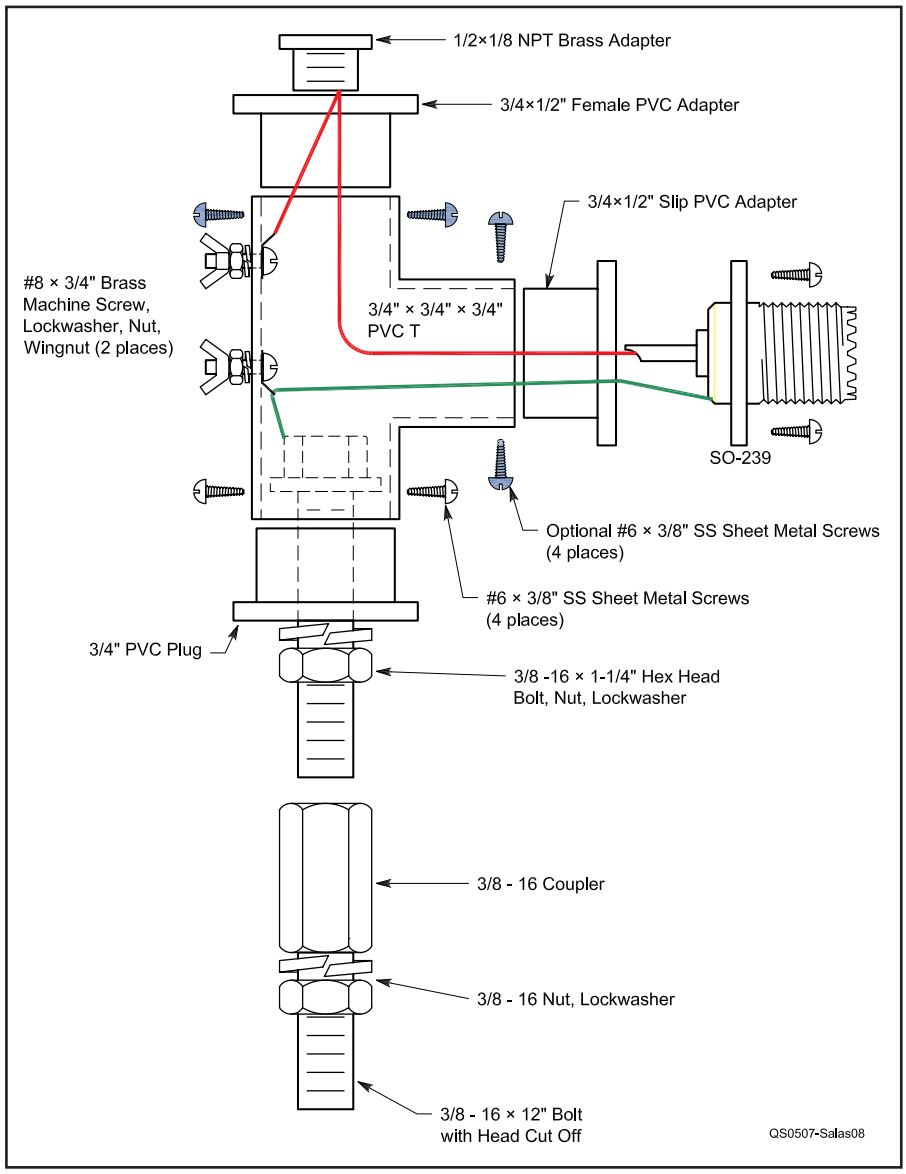


Figure 8—The antenna base and coaxial cable connector details.

the center of the PVC lip. Carefully drill two 5/64 inch holes at these points. We will mount the SO-239 on the adapter later.

Place the 3/4 inch PVC plug/spike assembly in the T and drill two 5/64 inch diameter holes through the T and plug. [See sidebar Photo A for how I clamped the T in a woodworker's clamp to drill the holes. Try to drill straight through both sides in one pass to make alignment easier.—*Ed.*] Remove this assembly from the T and drill out these 5/64 inch holes in the T to 9/64 inch. Also drill out two holes in the SO-239 connector to 9/64 inch, since the holes are not large enough to pass the #6 × 3/8 inch sheet metal screws.

Use an 11/64 inch drill bit to drill mounting holes for the #8-32 brass machine screws. I drilled the mounting holes close to the "top" and "bottom" of the T. Alternatively, if you align the bit with the inside edges of the side of the T and drill through the back of the T, you will be able to fit a screwdriver into the T to tighten this hardware.

Next we'll prepare the antenna interface at the top of the base. First, cut off part of the 3/4 inch slip × 1/2 inch female pipe thread PVC adapter so as to leave additional room in the T for wiring. Solder a piece of 14 gauge copper house wire directly to the inside lip of the 1/2 × 1/8 inch NPT brass adapter. You'll need a large soldering iron or a torch, since the brass adapter mass is pretty large. Screw this adapter tightly into the 3/4 × 1/2 inch PVC adapter.

Now solder a wire to the center conductor of the SO-239 connector as shown. This wire should be soldered to the wire stub on the 1/2 × 1/8 inch NPT brass adapter at the antenna interface, and then to the upper wing-nut assembly as shown. (Alternatively, you could use #8 solder lugs for these connections, and put the top #8-32 brass machine screw through the hole in the solder lug.) The 3/4 × ½ inch PVC adapter can now be glued into place using PVC pipe glue. Solder a short piece of copper braid (from a piece of RG-58 cable) from the SO-239 ground (solder directly to the SO-239 body) to the brass ground screw, and finally to the wire soldered to the head of the 1 1/4 inch bolt. (#8 solder lugs are a good alternative.) You can now complete the assembly of the base by inserting the PVC plug and 1 1/4 inch bolt assembly into the T and installing the #6 stainless steel sheet metal screws as shown in Figure 8. Incidentally, the upper wing-nut assembly is used in case you need to add capacitive or inductive base matching should you want to improve the SWR on the lower bands. See Figure 9.

Ground Radial Network

The radial network is made up of six 15 foot radials, using 22 gauge insulated wire, though any gauge wire, insulated or not, can be used. I've found it best to make up three pairs of two wires each attached to a #8 spade lug on one end of each pair. This minimizes the hassle of deploying, and later rolling up, the radials. The three #8 lugs will attach to the ground screw on the base assembly. When the wires are rolled up, you should hold them together with twist-wraps. Solder a 1 1/2 inch brass wood screw on the outer end of each radial. You can simply push these screws into the ground to hold the radials in place. Put a blob of hot glue on each wire/screw soldered interface to give it a little strain relief.

Guying

This antenna is self-supporting in a low breeze. In many cases, however, it will be necessary to guy the antenna because of its 16 foot length. For effective guying, I attached 9 foot lengths of nylon cord (3 pieces) just above the base of the 10 foot MFJ telescoping whip. Use a tie-wrap and close it just enough so that it won't slide over the base of the MFJ whip. Cut the 9 foot sections of nylon cord and heat the ends with a match to fuse the nylon so it won't unravel. Tie one end of a 9 foot section of nylon cord around each tie-wrap and secure with hot glue or epoxy. For the ground stakes, you can use the extra piece of brass tubing. (You only used 4 1/2 feet of the 6 foot length.) Cut the remaining 18 inch piece of tubing into three 6 inch sections.

AD5X

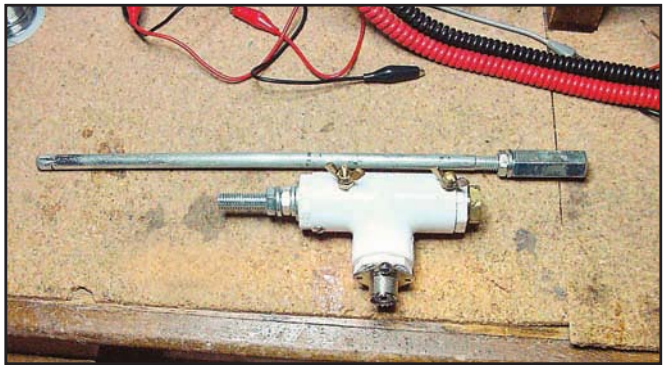


Figure 9—The completed antenna base and mounting spike.

AD5X

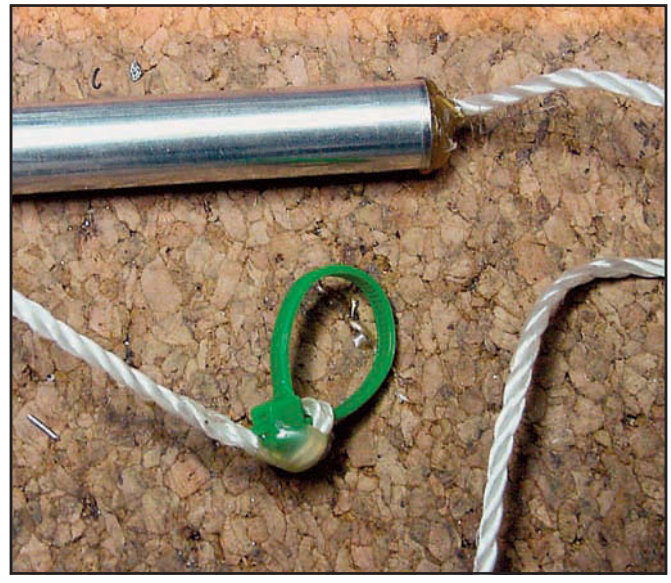


Figure 10—A set of 3 guys was made by using a wire tie (closed to slip over the top of the telescoping whip but not over the base of the whip). Hot glue was used to attach a nylon line to each wire tie. Hot glue was also used to attach the guy line to a left-over length of brass tubing.

Attach the end of the nylon cord without a tie-wrap to one end of each tube with hot glue. Also plug the open ends of the three tubes with hot glue. (You could also use some long spikes or bolts for stakes, if you are concerned that you won't be able to drive the brass tubing into hard ground.) For storage, wrap the nylon cord around each brass stake and hold it in place with masking tape. Figure 10 shows the details. See Figure 11 for a photo of the guys attached to the telescoping MFJ whip. When bolted to a trailer mount or plate, the antenna should really not need guying unless the wind is strong.

Antenna Assembly

To assemble the antenna, first screw the three brass-rod sections together, and then screw these into the top of the base assembly. Push the entire assembly firmly into the ground, keeping it as vertical as possible. Next, screw the loading coil and telescoping whip assemblies together. Slip the three guy tie-wrap/nylon cord assemblies over the whip and extend the telescoping whip. Screw this entire top assembly into the female end of the top brass tube. You only need to turn the brass fittings finger tight. Finally, push the guy rods in the ground and extend the six radials. Attach the common ends to the ground screw on the base assembly. Add coax, and you are ready to tune your antenna.

Antenna Tuning

Begin with 60 meters to determine the tap points on the coil. If your rig cannot tolerate a 2:1 SWR, you may need to add a 330 pF, 300 V, silver mica capacitor across the two wing-nut assemblies. See Figure 12 for a close-up view. This capacitor is fine for both 60 and 40 meters. The SWR on 30 meters will be closer to 1.7:1. If you need to improve this, use a 220 pF capacitor. You should not need any capacitors for 20 through 10 meters. Both my IC-706MKIIG and SG-2020 work fine into a 2:1 SWR.

To begin, use an antenna analyzer set to 5340 kHz to locate the coil tap point that gives the best SWR. Mark this tap point. Repeat the procedure at 5380 kHz. Move to 40 meters and repeat, again selecting two taps on 40 meters to give you the band coverage you desire. Repeat again for 30 meters—only a single tap is required for

AD5X

Figure 11—A close-up of the guy lines attached to the telescoping whip. The coil and coil clips detail can also be seen.

AD5X

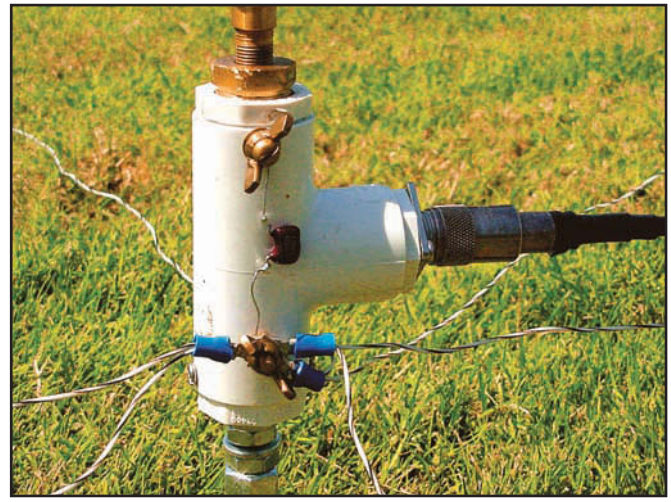


Figure 12—The antenna base, with the ground radials and a matching capacitor attached to the brass screws on the PVC T.

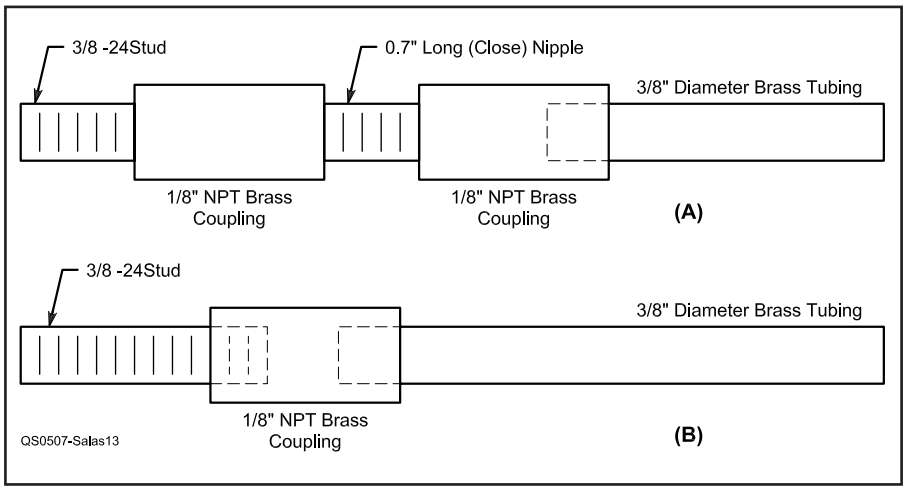


Figure 13—(A) shows how a 1/8 inch NPT brass coupling can be used to adapt the pipe threads to a 3/8-24 standard antenna mount. (B) shows an alternative attachment, if one only wants to attach the antenna to a standard mount, and not use the PVC base to mount the antenna on the ground.

this band. For 20 meters, you will find that only the top turn of the coil is necessary for resonance. The antenna is almost a quarter wavelength long on 20 meters.

For 17, 15, 12 and 10 meters, you will need to short out the loading coil and remove sections of the brass tube—then adjust the whip for resonance. On these bands, the antenna will be 1/4 λ long. Remove two brass sections for 17 and 15 meters, and all three sections for 12 and 10 meters. Use a permanent black marker pen to indicate the correct band positions on the telescoping whip.

Finally, attach the MFJ-605-4001 coil clips to the coil tap points determined above. You may wish to solder the clips in place to make the entire assembly a little more robust. From this point forward, you can just go back to these tap points, or re-adjust the top whip as necessary, and not have to worry about making SWR measurements.

Mounting Options

You can easily make a 3/8-24 threaded interface so that the antenna can be mounted on a standard 3/8-24 antenna mount. This would be useful for those with a standard ball mount on their car who want to use this extended-length antenna when stopped. As mentioned earlier, the 1/8 inch NPT thread is 27 turns per inch, and it is slightly larger than 3/8 inch diameter, with a slight taper. While the 3/8-24 standard stud will screw into an 1/8 inch NPT thread coupling, the 1/8 inch NPT nipple will not screw into a 3/8-24 threaded coupling. Therefore, an adapter is necessary if you want to mount this antenna to a standard 3/8-24 antenna mount.

One way to make an adapter is to purchase a 3/8-24 bolt and screw it tightly into a 1/8 inch NPT coupling. Cut off the head of the 3/8-24 bolt with a hacksaw and file carefully so that you don't damage the threads. Running a 3/8-24 die over the threads will clean up any damage you may have done. You can now either screw this assembly onto the 1/8 inch NPT nipple on the bottom brass tube section, as shown in Figure 13A, or screw the 3/8-24 bolt directly into the bottom 1/8 inch NPT coupling as shown in Figure 13B (if you'll never need the 1/8 inch NPT interface on the bottom antenna section).

Conclusion

Because of the interest in my original portable antenna, I've evolved that design into an antenna that is longer, lighter, more compact and easier to fabricate, and gives you more mounting options. You can also experiment with the antenna length. For example, you can remove a section or two, use more or fewer sections, decrease or increase section lengths, or place the loading coil in different positions. With the loading coil described in this article, you have quite a bit of latitude in the antenna length for a given band. For best efficiency though, try to keep the antenna as long as possible and the coil as high as possible.

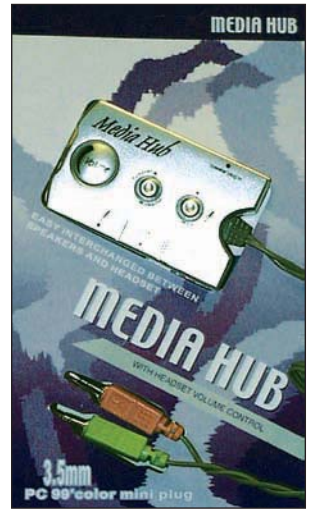
Don't hesitate to make changes based on hardware availability. Try aluminum or copper tubing, or even wire wrapped 3/8 inch fiberglass or wood dowel. It's fun to design antennas "on the fly" while standing in the plumbing section of your hardware store. This makes for interesting discussions with the clerks, however!

Finally, I want to express my appreciation to Martin F. Jue, K5FLU, and Richard Stubbs, KC5NSZ, of MFJ, for working with me to provide a reasonably priced kit of parts to make this both an affordable and fun project to build.

Phil Salas, AD5X, is an ARRL Life Member. He's been licensed for 41 years, and enjoys HF operating (mostly CW). Phil's wife Debbie (N5UPT) and daughter Stephanie (AC5NF) are obviously very understanding of this hobby! Phil holds a BSEE from Virginia Tech, and an MSEE from Southern Methodist University, and is now fully retired after 33 years in the telecommunications industry. Phil can be reached at 1517 Creekside Dr, Richardson, TX 75081-2913 or at **ad5x@arrl.net** *if you have any questions or comments.* QST

NEW PRODUCTS

SOUND CARD EXTENSION BOX



♢ The MFJ-5420 is a sound card extension box for sound card interfaces. This device extends sound-card connections from the rear of a computer to the front. In addition volume controls are provided to supplement those available in computer software. The plastic box has a jack for external audio input from a radio or microphone, an input jack on-off switch and a jack for external stereo speaker hookup. In addition, a stereo headphone jack is provided as is a thumbwheel control for speaker and headphone volume setting as well as a speaker-headphone switch.

While designed to operate with the MFJ-1275 and 1279 interfaces, the unit is said to be compatible with other units. The 3×2×3/4 inch unit is priced at $12.95, including input and output cables. To order, or to locate a dealer, call 800-647-1800; or write MFJ, 300 Industrial Park Rd, Starkville, MS 39759, or see **www.mfjenterprises.com**.