CALLING ALL HAMS

Design Tips for 15/40 Dipole Antennas

☐THE PVC PIPING MOUNT STRUCTURE, described in a previous issue of **Hands-on Electronics** (See Fig. 1), can be the foundation for several additional antenna types. In a similar manner as the inverted-V dipole, the legs of a 3/2-wavelength antenna can also be attached and erected. A 3/2-wavelength antenna has two 3/4-wavelength segments which can be attached to the terminals at the top of the PVC mast.

A 15/40-dipole combination is convenient because the frequencies of the 15-meter band are approximately three times higher than the frequencies of the 40-meter band. In fact a half-wavelength dipole on the 40-meter band has segment lengths that correspond to approximately 3/4 wavelength on the 15-meter band. The center feedpoint of a 3/2-wavelength antenna also has a low impedance that can be matched to a coaxial transmission line. Details on that arrangement follow.

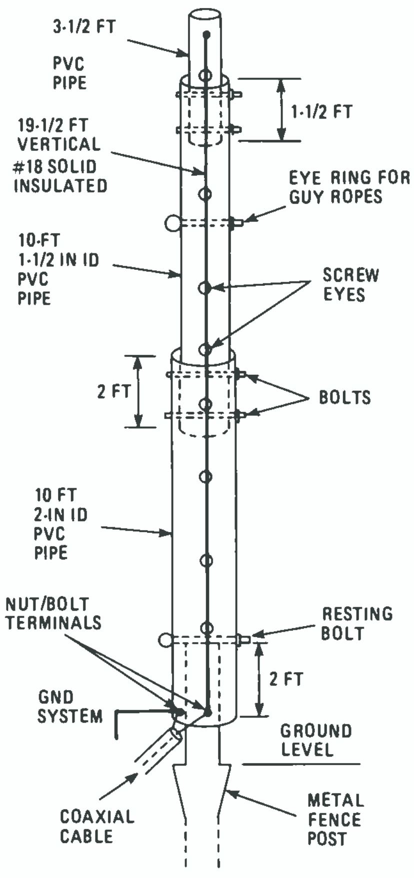

FIG. 1—PVC mast construction needs eyelets at the top for dipole use.

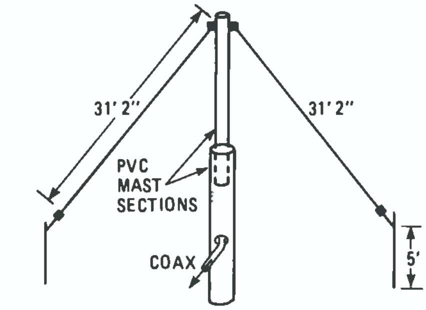

FIG. 2—40-meter inverted dipole.

Inverted-V Dipolers

The basic inverted-V dipole structure is shown in Fig. 2. Each of the two antenna segments are supported by two metal or wooden fence posts about 5 to 6 feet above ground. This will make the ends accessible from the ground.

Antenna leg lengths are such that resonance is obtained in the single sideband section of the 40-meter band. It is a simple matter to operate the antenna on the CW low-frequency portion of the band by clipping on two short lengths of wire to the ends of the antenna segments. Refer to Fig. 3. Note that the antenna legs are made of insulated wires. Wire is bared at the ends and then looped. As a result a good-quality clip will make a sound grab to the bare wire. CW operation is now possible with a low SWR ratio.

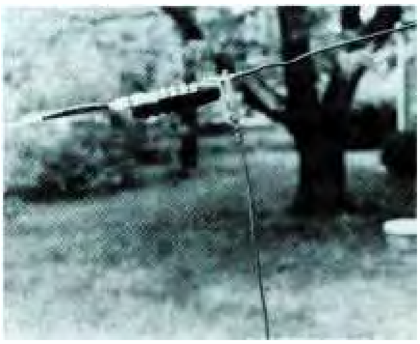

FIG. 3—Clipped on frequency-shift segments (2 required) lowers antenna resonance to CW frequencies.

In my installation, it was only necessary to add a 12-inch length to obtain very low SWR readings at the CW end of the band. Resonance was approximately 7050 kHz. Of course you could obtain a low SWR reading at the CW end by using a tuner. However, two pieces of wire and two clips is an easy, inexpensive way. An SWR meter will help you find the exact add-on length you require.

Resonance on the 15-meter band as a 3/4-wavelength antenna element requires some additional length. The add-on lengths I wanted also require additional length. The needed add-on lengths are given in Fig. 4. Clip on a 22-inch length for 15-meter sideband operation and a 27-inch length for 15-meter CW operation. Lengths given will bring you into the ball park for your installation. You may wish to do a bit more trimming if you wish to center on one specific frequency.

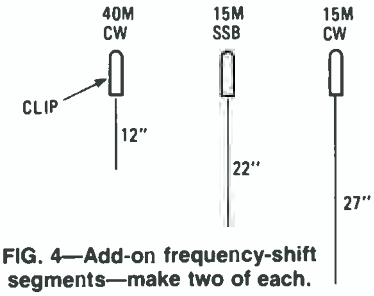

FIG. 4—Add-on frequency-shift segments—make two of each.

My three sets of add-ons are stored near the back door. They can be clipped in place quickly when operation on other than the 40-meter sideband is desired. Once the add-ons have been prepared, frequency-changing becomes less troublesome and perhaps even faster than retuning a tuner. In that procedure you choose a better plan by tuning the antenna rather than the line. Also you get out of your operating chair and gain a little exercise as a side benefit.

The alternative plan of Fig. 5 shows how the clips can be installed permanently, along with three separate insulators. When insulator A is open the antenna installation is ready for 40-meter sideband operation. Closing A and opening B places the antenna in the 40-meter CW section. Closing A and B and open-

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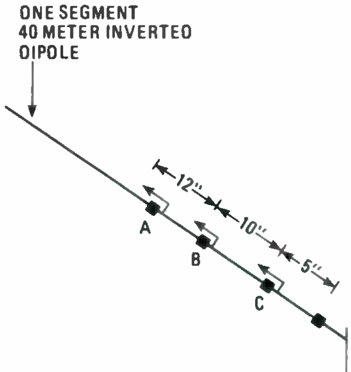

FIG. 5—Alternative jumper plan.

ing C arranges things for operation on 15-meter sideband. All three jumpers closed sets up operation on 15-meter CW.

Horizontal Directivity Change

The simple arrangement of Fig. 6 demonstrates a way of changing the horizontal directivity of the antenna. In that plan the antenna is made more directive by raising the height of the tie-down mast or post in such a manner that the antenna leg ends do not come as near to ground. In addition to the main mast, you would require two 10-to-15 feet of PVC piping. Those set over metal fence posts. There are three

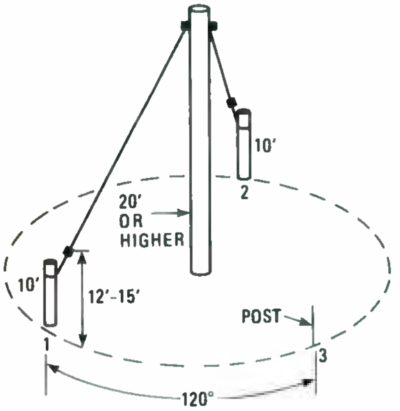

FIG. 6—Manual direction change by shifting posts.

such posts spaced equidistantly in a circle about the main mast. You change direction by lifting one of the masts off its post and moving it to the unused post. That plan provides an easy method of manually rotating a long dipole. Provide the necessary rope slack for each antenna segment that permits you to lift the mast off and move it to another post. You can use nylon rope and a flag-pole cleat attached to the PVC piping at chest level, Fig. 7.

If you want to obtain maximum broadside directivity from the antenna, you can use PVC mast all the same height. Some guying might be required and it would be a bit more trouble to make an exchange.

FIG. 7—Using a flag-pole cleat.

However, getting the end of each antenna segment 12 to 15 feet above ground provides acceptable directivity. You can obtain that height with the proper adjustment of your rope slack and the physical distance of the ten-foot PVC pipe from the main mast.

How the directivity changes is demonstrated in Fig. 8. In the examples, the orientation of the short PVC pipe 2 is such that the line between the main mast and the pipe 2 is directly north. Two other pipes are located at positions 120° on either side of pipe 2. Therefore, in Fig. 8A, the approximate figure-eight pattern on 40-meters is NW/SE. There is a 120° rotation of pattern for Figs. 8A and 8C depending upon which pair of short masts support the antenna. The three possible positions provide a maximum each 60° around the 360° circumference.

The directivity is similar for 15-meter operation. However, the dipole segments do tilt. Hence, the antenna operates as a 3/2-wavelength type, the maximum directivity is at an angle the bisects the direction of tilt. In Fig. 8A maximum directivity would be northwest. However,

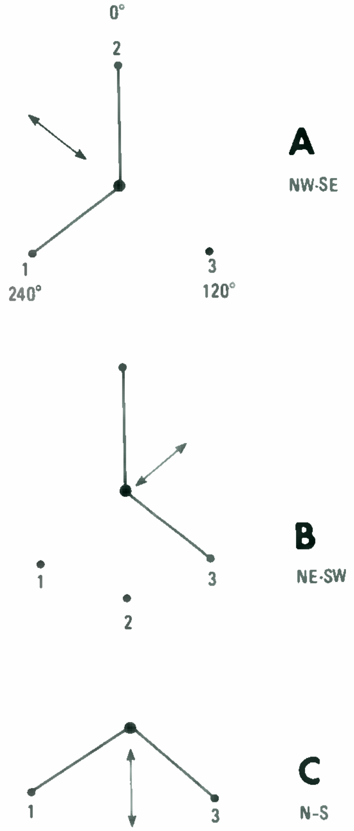

FIG. 8—Shifting directivity of a dipole.

there are significant lobes in other directions, too, because that configuration is not highly directional. Fig. 8B favors the northeast; Fig. 8C favors the south.

Of course the short-mast positions need not be specifically on 0°, 120°, and 240°. You can arrange them in your mounting site to place maximums in the directions you prefer. In my own location, the ideal positions for the three short masts are 90°, 210°, and 330°. —Ed Noll, W3FQ3