Six-Band Linear Trap Antenna

Multiband operation without coils or capacitors.

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Trap dipoles using L/C traps require careful choice of components and adjustment before use. Traps must be waterproofed, and they add extra weight and wind resistance to the flat-top dipole. Components used to construct the traps are an added expense. They also make the antenna more visible where it might be best not to advertise the existence of an antenna.

The linear trap dipole described here is constructed entirely of wire—no coils or capacitors are needed. Any adjustment needed can be done with a pair of diagonal cutters. From a slight distance it is no more noticeable than a single-wire dipole. Less than 175 feet of wire are required, and it provides an isolated half-wave dipole on 40, 20, 17, 15, 12 and 10 meters.

Theory of Operation

The flat-top is a half-wave 40 meter dipole. At five measured points along each half of this dipole single insulated wires, each a quarter-wave long on 10, 12, 15, 17 and 20 meters, are soldered. After trimming to the desired portion of each band, these insulated wires are bundled along the 40 meter dipole with the free ends towards the central feed point. The assembly is then held together neatly with nylon wire ties.

These quarter-wavelength wires, along with the part of the 40 meter dipole along which they extend, become quarter-wave stubs. Because the end of the stub soldered to the main dipole is shorted, the impedance transfer presents a very high impedance at the open end, thus isolating the remainder of the outer ends of the dipole at the position of the open end of the stub. Thus, a half-wave dipole on each band is provided.

Construction

Figure 1 illustrates the layout of one half of the 40 meter dipole. For clarity, the quarter-wave insulated wires are shown expanded. Dimensions are given calculated for the low frequency edge of each band.

The points on the flat-top, identified as A through E, are where the insulated wire stubs are attached and soldered.

Table 1 gives the length of each of the quarter-wave wires, also identified as A through E. Each is connected to the dipole at the point identified by the same letter. There are two insulated wires for each lettered point, one for each half of the 40 meter dipole.

Cut and strip one end of a pair of insulated wires—the wire gauge is not important—of length A from Table 1. Solder the stripped end of each wire to the two points marked A.

Continue as just described until you have connected the proper insulated wire pairs to points B through D on each half of the dipole. *Do not attach wires to point E at this time.*

The wires at point E will be attached only after the 40 meter dipole has been adjusted to length, so at this time use tape or string to bundle the insulated wires temporarily to each side of the dipole with the open ends extending towards the central feed point.

Adjustment

Step 1. Feed the antenna with a small amount of RF through an SWR meter at some frequency in the 40 meter band where you usually operate. The SWR will probably not be 1:1.

Step 2. Shorten each end of the 40 meter dipole by the same amount, an inch or two, and recheck the SWR.

Step 3. Continue repeating this step until the SWR is as close to 1:1 as possible.

Step 4. Check SWR across the band to determine the 2:1 SWR bandwidth.

Step 5. Attach insulated wires at point E at each end of the 40 meter dipole, and solder. Bring this wire along the flat-top towards the feed point. Use nylon wire ties to bundle all wires neatly against the flat-top.

Step 6. Feed the antenna as described in Step 1 in the 20 meter band.

Step 7. Remove the RF and shorten the open ends of both point E wires an inch or two, and repeat Step 6, for the lowest SWR.

8. Continue repeating Steps 6 and 7 until the SWR is as close to 1:1 as possible.

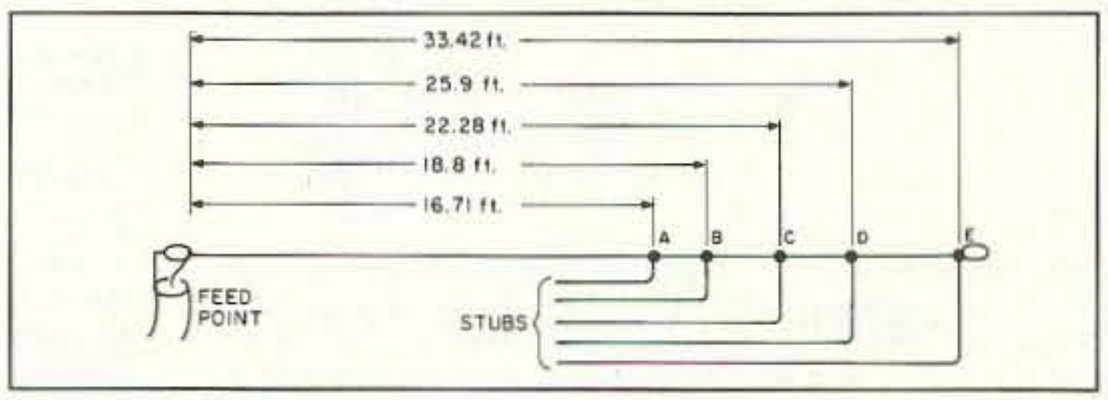

Figure 1. Stub attachment points on one-half a 40 meter dipole.

9. Check across the 20 meter band to determine the 2:1 SWR bandwidth.

10. Repeat Steps 1, 7, 8 and 9 in the 17 meter band, carefully shortening both wires connected to point D.

11. Repeat Step 10 in the 15 meter band, shortening both wires connected to point C.

12. Repeat Step 10 in the 12 meter band, carefully shortening both wires connected to point B.

13. Repeat Step 10 in the 10 meter band, carefully shortening both wires connected to point A.

This completes construction of the linear trap dipole.

Installation

As long as you remember the truism "higher is better," this antenna can be installed as a flat-top, a sloper or an inverted "V." Although it is somewhat more broadband than a trap antenna using L/C traps, the 2:1 SWR bandwidth may shift somewhat up or down in frequency when the antenna is installed in its permanent position. It is unlikely to require further trimming of the quarter-wave wires.

For the purist, attachment points A through D can be moved slightly closer to the feed point during adjustment to further reduce the SWR, although without this refinement the SWR should be below 1.5:1 over a fairly wide range on each band.

Although this antenna is designed to cover the bands from 40 through 10 meters, it is not possible to include the 30 meter band. Each half of the lowest frequency dipole must be at least one half-wave long at the next highest band, so the 30 meter band can be included only if this antenna is expanded to cover 80 meters.

If there is insufficient space for the full flat-top length, the ends of the dipole can be dropped down vertically or at right angles to the horizontal portion with very little loss of capability. Both ends should be dropped the same amount, of course.

For those hams who have space for a long-wire antenna, this linear trap design can be applied at one end of the long wire. Constructed in this manner, a long-wire antenna will be fed at a low impedance point on each band since it will effectively be fed one quarter-wavelength

Table 1. Stub Lengths

Point	Length (feet)
A	8.37
B	9.40
C	11.14
D	12.95
E	16.72

from one end, thus eliminating the need for an antenna tuner.

For those hams using rigs incorporating automatic tuners, an SWR of 1:1 is possible with this antenna on all bands covered, with the possible exception of the very wide 10 meter band.

However, if carefully adjusted as described herein, no antenna tuner should be needed, although one can be used if desired to achieve a broader bandwidth at low SWR. It is also probable that an antenna tuner will match this antenna in the 30 meter band, although this has not been attempted here.

Conclusion

With three insulators, a feedline, less than 175 feet of wire and some minor clipping of wire ends with diagonal cutters, you can have an effective isolated dipole on six of the best DX bands. It does not require an antenna tuner and it is probably the simplest and cheapest multiband antenna which can be constructed by any ham. 73