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A Tribander for the Attic

—work 10, 20, and 40 with this compact antenna

This three-band, small-attic antenna is put together much like Gypsy chicken pot pie. Instead of first stealing a chicken, you first steal the XYL's broom handle which will be used for the trap coil forms. The rest of the materials are equally exotic: a few feet of no. 18 zip cord for the trap capacitors, some scrap plastic for insulators, and about 100 feet of no. 16 copper wire. For purists, a 1:1 balun such as the Van Gorden Engineering unit,[1] at $9.95 ppd., reduces possible TVI by providing a good balanced match from 50- or 75-Ohm coax. Including balun, this multi-band antenna may be built for less than $13.00. Typical maximum swr on all three bands (28.5-29.0 MHz on 10 meters) is less than 1.5:1, except with snow on the roof, and then does not exceed 3:1 even after a heavy snowfall.

Fig. 1 illustrates the layout for a small 21'-long attic. If you are fortunate enough to have a longer attic, by all means install segments C, D, and E horizontally in the same plane as A and B for a slight, but measurable, gain of approximately 1 dB on 40 meters. Test equipment required to optimize this antenna on your favorite frequencies on each band consists of a grid-dip oscillator and swr bridge. If you do not have a GDO, just follow directions, as both the first and second traps are high inductance/low capacitance units with resultant wide bandwidths.

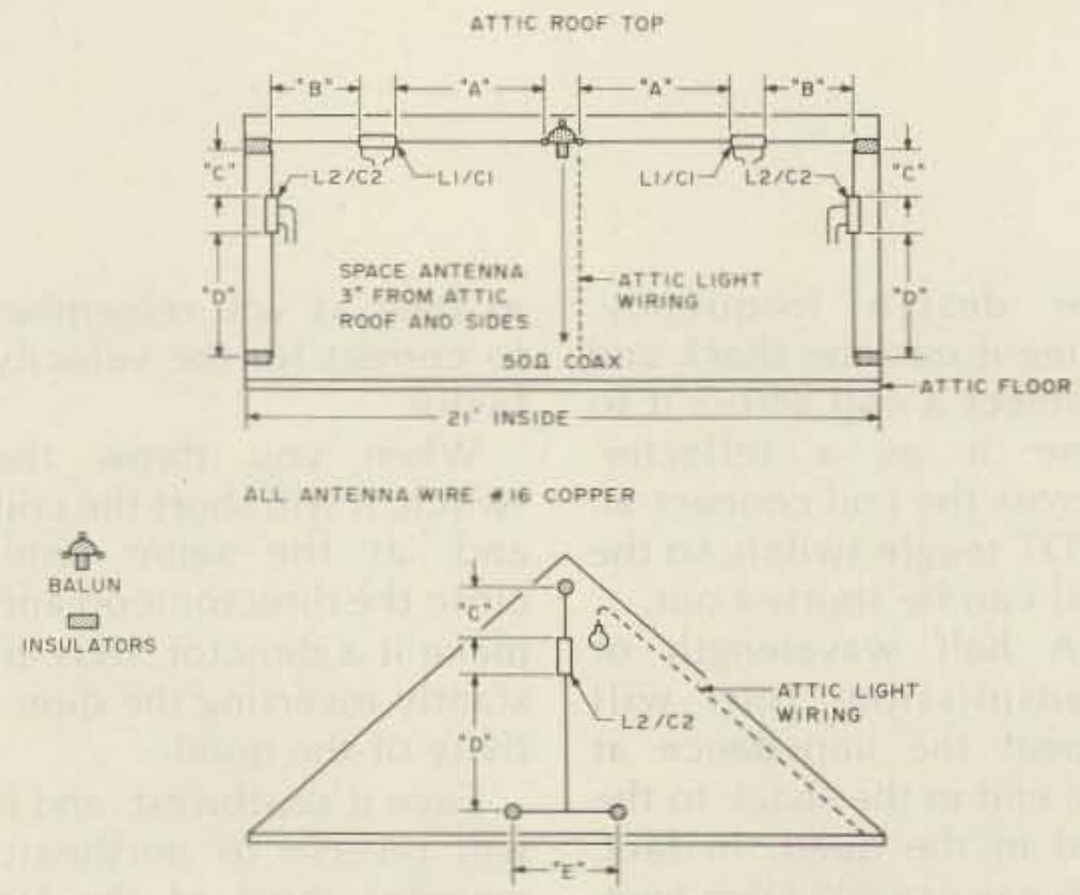

Fig. 1.

The antenna segments with traps are resonant as follows: Segment A is resonant on 10 meters, segment A+B+C on 20 meters, and segment A+B+C+D+E on 40 meters.

Trap L1/C1 is parallel resonant at 28.7 MHz, offering a high impedance and thus isolating the rest of the antenna at 10 meters and providing a loading inductance for shortening the 20-and 40-meter segments. Trap L2/C2 is parallel resonant at 14.2 MHz and presents a high impedance, thus isolating the rest of the antenna at 20 meters and providing a loading inductance for shortening the 40-meter segments, D and E.

Construction Detail

L1 is a 3-inch length of 7/8" diameter broomstick using 5 feet of no. 16 double cotton-covered (DCC) copper wire space-wound with 19½ turns as shown in Fig. 2. No. 16 DCC copper wire should be used if available, but ordinary bare bus bar wire may be used if you carefully wind and space the turns on L1 and L2 to ensure that there are no shorts. C1 is a 10½-inch length of no. 18 zip cord. Grid-dip L1/C1 and adjust to 28.7 MHz. L2 is a 6-inch length of 7/8" diameter broomstick using 12 feet of no. 16 DCC copper wire, slightly closer than space-wound with 46 turns, as shown in Fig. 3. C2 is a 17¾-inch length of no. 18 zip cord with one end trimmed 6½" short and attached to L2 as shown in Fig. 3. Lengths of each antenna segment illustrated in Fig. 1 are:

Segment	*Length*
A	96"
B	24"
C	22"
D	46"
E	20"

Tuning

As the lengths of all loaded segments interact with each other, this multi-band antenna should be tuned exactly as follows or you will surely come to grief! Using your GDO, tune traps L1/C1 and L2/C2 individually, unconnected to anything, while they are balanced on a glass mayonnaise jar (empty) at least 8" above your wood workbench or desk. This is to avoid obtaining misleading GDO readings due to stray capacitance. Start with both C1 and C2 an inch longer than specified and trim off ¼" between GDO readings until the GDO null (max dip) is exactly at the desired frequency. Also, use your station receiver to check your GDO frequency reading, as all GDO readouts are only approximate and may be as much as 1 or 2 MHz off actual frequency when coupled to the trap under test.

After the traps are tuned with the GDO, leave them alone. Install the entire antenna system as illustrated in Fig. 1. Using *very low power* from the station transmitter, with the swr bridge in the coax line, check swr at 28.5 MHz, 28.7 MHz, and 29.0 MHz. Swr should be less than 2:1 if the antenna is installed correctly. There must be *no* electrical power/lighting wiring parallel to or close to any of the antenna segments if you wish top performance. An overhead attic light is OK if installed close to the balun at the center of the antenna and the light's wiring is run down the inside of the roof, 90 degrees to the plane of the antenna, as shown in Fig. 1.

If you wish to change the center frequency on 10 meters, add or subtract approximately 3/8" per 100 kHz. After 10 meters is satisfactory, check the 20-meter swr at 14.0 and 14.3 MHz, and, if necessary, shorten or lengthen segment C for minimum swr at the desired frequency. After 20 meters, adjust the width of segment E for minimum swr on your favorite 40-meter frequency. A few inches either way will make a considerable difference as segment E is, in effect, a capacity hat for the 40-meter dipole.

Harmonics

Being a multi-band antenna, this system is an extremely efficient harmonic radiator. If there is any question in your mind about your transmitter's harmonic output, you would do well to include a coax antenna tuner between the transmitter and coax for your own sake, your fellow amateurs, your neighbors, and the FCC. The MFJ Enterprises model 900 coax antenna tuner, at $49.95, will resolve any problem in this line you might otherwise have.

15-Meter Option

Although I do not operate 15 meters, the second method described here was satisfactorily developed for a young friend who does operate on that band. There are two obvious ways to include 15-meter coverage in this antenna system, if desired. The first method uses a separate 10-meter trap with ½ the turns of L1 and double the length of zip cord C1. The 15-meter trap, placed about 14" out from the new L1, is tuned by additional capacity across the old L1 (now the 15-meter trap). Both segments B and C are shortened accordingly. The second method, and surely the simplest, is another dipole from the balun in parallel with the original antenna system. It should be slanted so that the outside ends are drooped 2' below segment B, and, most importantly, not less than 12" away from segments C and D to avoid disastrous interaction/detuning of the original system. Ordinary plastic clothesline can be used to support the drooped 15-meter dipole at point X. See Fig. 4 for details.

Conclusion

Squeezing a normally 66'-long 40-meter dipole/three-band antenna into your 21'-long attic is not really difficult, expensive, or very time-consuming if logically pursued. It can be built and tuned in a short

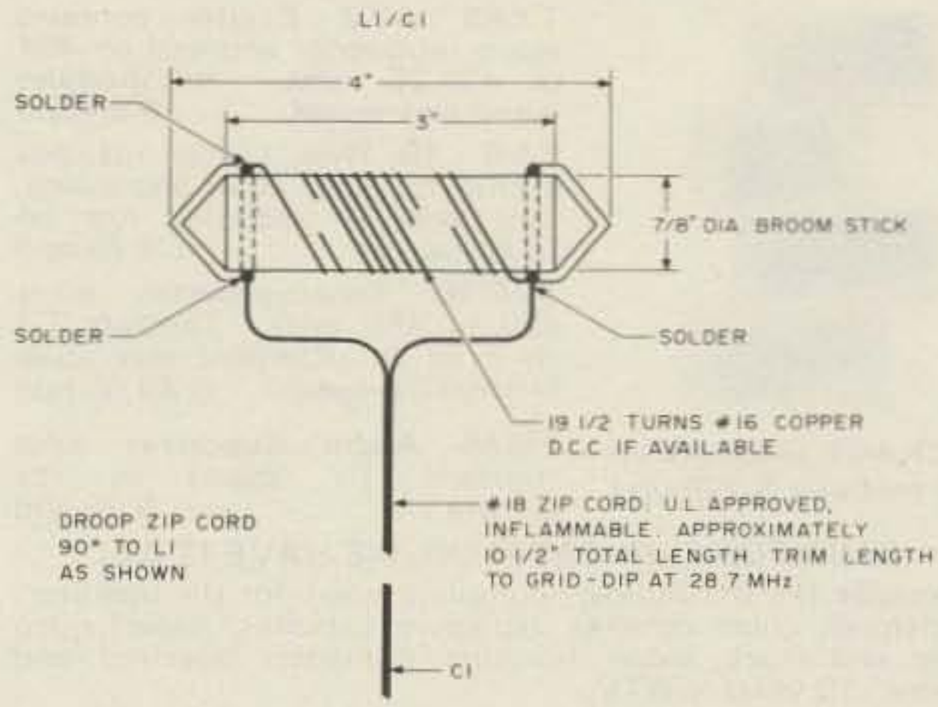

Fig. 2.

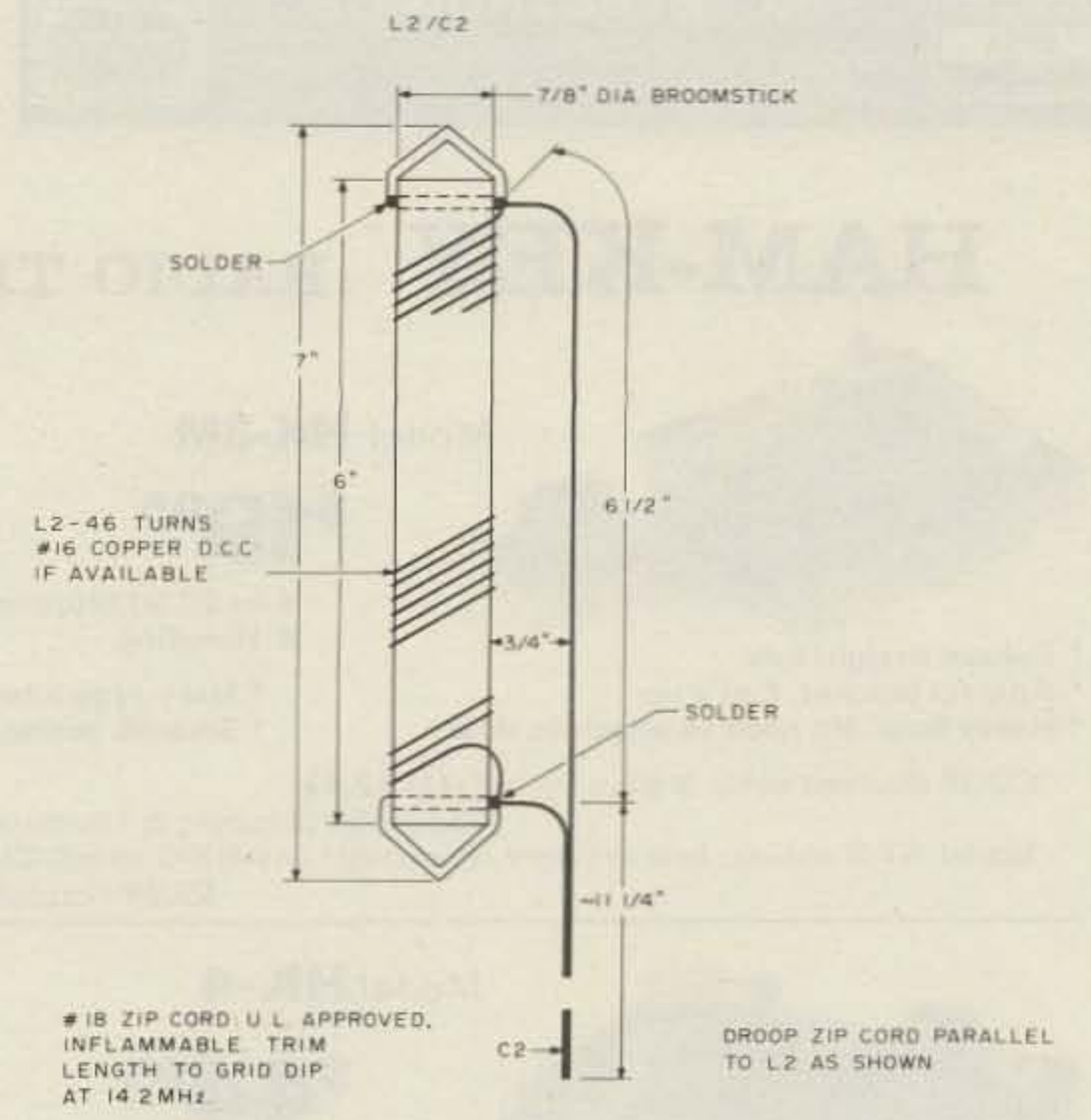

Fig. 3.

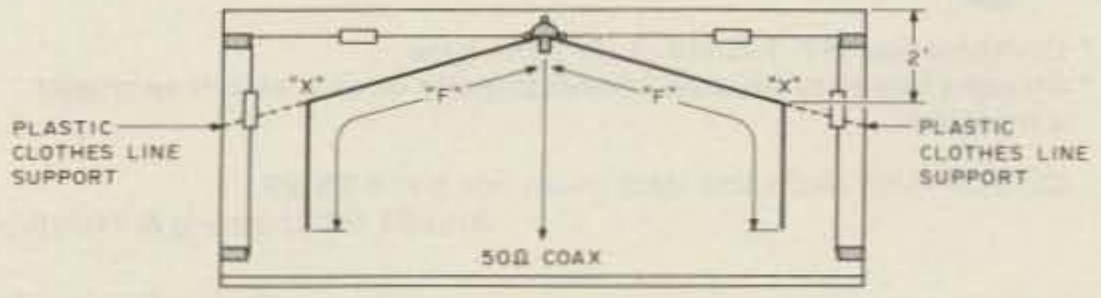

Fig. 4. 15-meter dipole option. Start with each segment "F" at 11'6". Trim one inch at a time for minimum swr at your favorite 15m operating frequency. Do not allow drooped ends of "F" closer than 12" to either L2/C2 or segment D, to avoid detuning other bands.

weekend. When a given band is open for F2 propagation, it will serve you nearly as well as any tri-band beam, being only about 6 dB down. The difficult part is when you wish to turn the antenna 90 degrees from the direction your attic is pointing. Let's save that solution for a future article!

One point of caution. The no. 18 zip cord capacitors are safe up to about 100 Watts PEP output. Also, use only Underwriters Laboratories (UL) approved inflammable zip cord. Be sure to test a short piece with a match. If it burns, get a refund and try again. Beyond the 100-Watt PEP output level, you would do well to substitute pieces of RG-8/U coax as the C1 and C2 tuning capacitors. Surely you do not wish to mimic the Chinese roast pork recipe: "First put a porker in the house; then burn the house down."

Most every antenna article usually ends with a typical cliche: "How I worked the High Lama of Tibet with one Watt to my gamma-matched W4UCH coat hanger." I will not disappoint you. While tuning up this little 21-foot multiband miracle, using a nearly 20-year-old 100-Watt Hallicrafters HT-37 at reduced power, my first two contacts were: Tony CT2CP in the Azores on SSB and Mario I5CZP in Siena, Italy, on CW.[2] This is not remarkable unless one knows that we had over a foot of snow on the roof and Mario was running only 5 Watts. ■

References

1. Van Gorden Engineering, P.O. Box 21305, South Euclid OH 44121 — "Hi-Q Balun," 1:1 ratio, $9.95 postpaid.
2. Richcraft Engineering, Box 1065, Chautauqua NY 14722. TRS-80 Morse Transmit/Receive Program, $15 ppd.