The 160 meter band is growing in popularity at a much faster rate than the size of your property. If you can't wait around for your property to grow, then you might consider KI6O's solution and get in on the fun.

The KI6O Top-Linear-Loaded 160 Meter Inverted "L" Antenna

BY DEANE J. YUNGLING*, KI6O

After using one of the top commercial verticals on the 160 meter band for the past two years, I decided that I wanted an antenna with more bandwidth. My vertical, which used a loading coil for 160 meter operation, required the use of an antenna tuner for operation over more than a few kiloHertz of the band. This required constant adjustment of the tuner during contests to keep my Kenwood TS-930S, which has solid-state finals, at full output.

I live on a city-size lot. Immediately behind my house I have a guyed 60 foot tower. A few feet above the top of the tower is a triband Yagi, and 12 feet above the beam is a 40 meter dipole.

I had considered some sort of inverted "L" in the past but had never tried one. The W4TWW coaxial inverted "L" (see August 1984 *CQ*, p. 72, "The W4TWW Coaxial Inverted 'L' Antenna For 160 Meters") seemed interesting. However, I don't have enough room to fit the top portion of the "L" on my lot. I decided that some form of linear loading that would reduce the space required and still work well could be used. The final design exceeded my expectations.

The antenna provides a bandwidth of about 90 kHz with a 2:1 SWR or less. At the design frequency it approaches 1:1.

I adjusted mine to resonate at 1.840 MHz. That way I can work all of the band where most normal and contest activity occurs without needing an antenna tuner. For excursions above 1.885 MHz I can still use the tuner.

There are a number of methods that can be used to support the antenna from

*7932 Sunset Ave., Fair Oaks, CA 95628

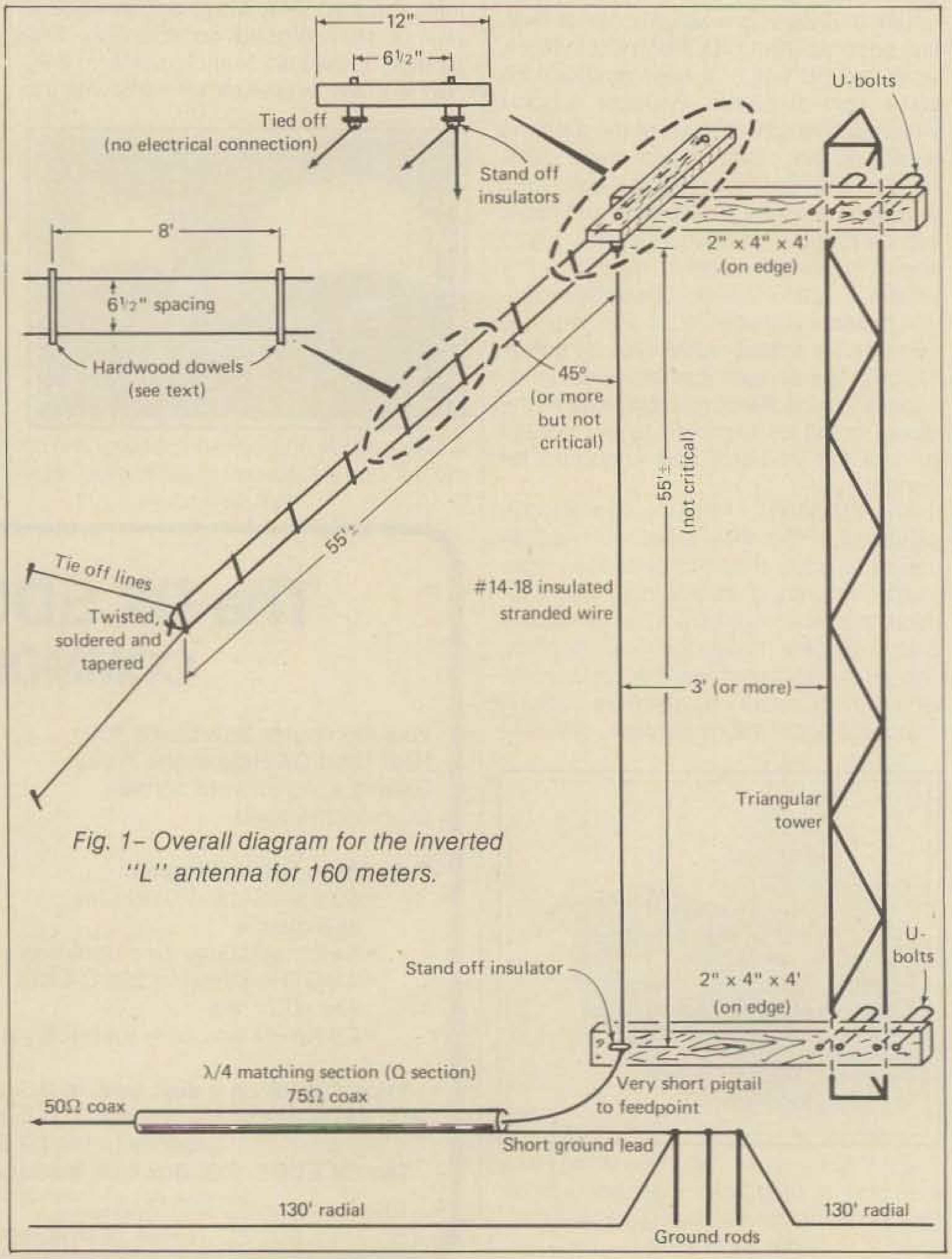

Fig. 1– Overall diagram for the inverted "L" antenna for 160 meters.

the tower. The method shown is inexpensive, easy, and works as well as any other. The fir boards, commonly referred to as 2 by 4's, are 4 feet long. They are bolted to two legs of the tower, preferably on the outside, using one "U" bolt for each tower leg. The boards are on "edge" and should extend 3 or 4 inches beyond the rear tower leg. All holes should be drilled and the boards treated with a preservative prior to installation on the tower.

The feedpoint is a stand-off porcelain insulator. The vertical portion of the antenna is about 55 feet long. The wire is #16 stranded, insulated wire (not critical). At the top, the vertical wire, as well as one side of the ladder, attaches to another porcelain stand-off insulator.

The top portion of the antenna is a sloping "ladder" made with the same wire. The spacers (about every 8 or 10 feet) are made of ⅝ or ¾ inch hardwood dowels which have small holes drilled 1 inch in from each end to hold the wires. The dowels are sprayed with two or three coats of acrylic clear spray for weather protection. The wires are tied firmly to the dowels where they pass through the holes with waxed lacing twine or similar material. The dowels can still be adjusted, with difficulty, after being tied.

The end of the wire is tied off to another stand-off insulator. The ladder is sloped at approximately 45° (not critical). The end of the ladder is tied off to whatever is handy. In my case, it is to the end of my house. The end of the ladder is about 10 feet above my house (which is a single-story ranch-type home). The support lines, which can be of heavy nylon fishing line, should be spread apart at least 10 feet (or more if possible) to keep the ladder from twisting. The ladder is light enough so that it can be tensioned to have very little sag.

Initially the ladder should be a few feet longer than the 55 feet shown to allow for adjustment. The resonant frequency can be checked and a few inches removed at a time from the bottom end of the ladder until the desired frequency is reached. To do so, loosen the support lines and let the ladder swing down. The wire can then be cut in the middle of the bottom end and twisted back together. It can be soldered and then taped to the bottom end dowel when the desired frequency is reached. Remember to keep both sides of the ladder the same length. As a final note, the antenna appears to work best if the ladder, the vertical wire, and the tower are all in line—that is, in the same plane.

As with most vertical antennas, this antenna requires a good ground system. I installed a system of ten 4-foot ground rods at the base of the antenna and two 130-foot radials zig-zagged around my backyard. (The more radials and/or ground rods used the better.)

The feedpoint impedance was determined to be about 20 ohms with an antenna noise bridge. Therefore, some form of matching arrangement was necessary. Because of its simplicity and broad-band characteristics, I elected to use a quarter-wave matching section (Q-section). The required impedance for the matching section to match the 50 ohm transmission line to the 20 ohm load is about 30 ohms. To obtain this impedance I used one quarter-wave section of 75 ohm coax (RG-59 or RG-11) in parallel with one quarter-wave section of 50 ohm coax (RG-58 or RG-8), with the resulting impedance of about 30 ohms. This gave a very close match, as shown by the near 1:1 SWR at resonance.

The method I used to attach the two lines in parallel is shown in fig. 2. It requires two "T" connectors, four "L" (or elbow) connectors, and two barrel connectors. All fittings should be sealed with electrician's tape, Coax Seal™, or some other sealant after assembly. The matching section can then either be coiled up in a convenient location or it can be used for the run to the operating position.

The antenna as described will handle the full legal power limit. As for performance, the antenna has surpassed my expectations. It works considerably better than a vertical on both transmit and receive, has a much wider bandwidth, and picks up less noise than the vertical. As a final note, it seems to exhibit no directional characteristics in spite of its relation and close proximity to the tower.

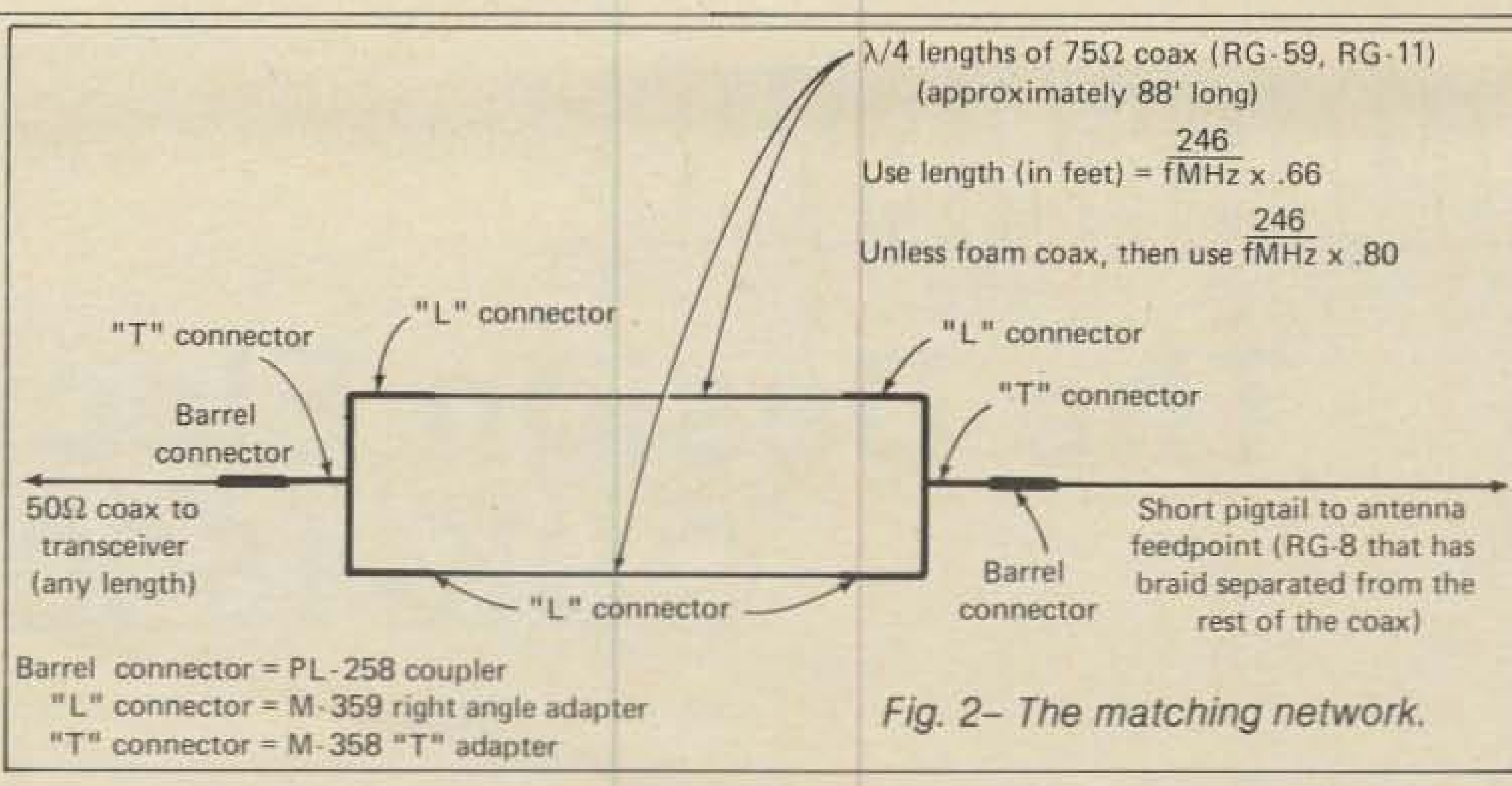

Fig. 2– The matching network.