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The Sensuous Tuned Lunch Box

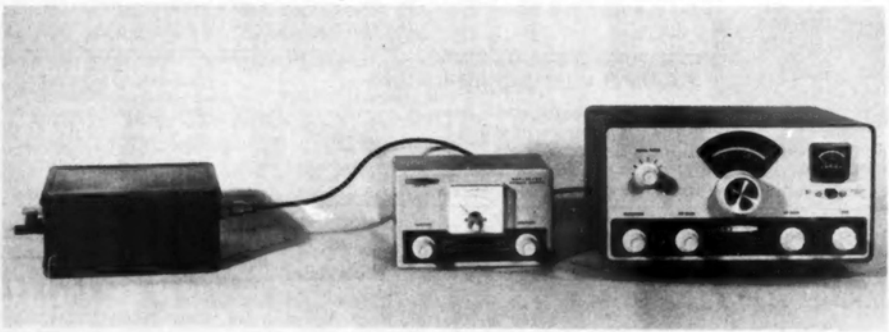
End-fed antennas seem to have lost their popularity about the time coax came into ready supply in the ham world. The reasons are quite obvious: A center-fed dipole is easy to match with coax, you don't have rf floating all around your shack, and finally, most of today's transmitters have low impedance output. From the standpoint of convenience, however, they are hard to beat, especially when you take your rig with you on vacation.

As I mentioned, most transmitters have a low impedance output. The end of a half wave antenna is very high in impedance. Consequently, if an end-fed antenna is to be used, some kind of impedance-transforming device is needed – hence the antenna tuner.

I picked up the lunch box for 50¢ at the local junk shop. The rest of the parts came either from my junk box or from the trash can at work. For the ham without the convenient access to discarded electronic goodies that I enjoy, the inductor would probably be the most expensive component, and even that is no big deal.

The circuit used is called an "L-network," and is a favorite wherever a low-to-high impedance transformation is used. Perhaps it is over-simplification, but I find it easiest to understand by rearranging it to look like the classical parallel-tuned circuit with the signal source in series. A parallel-tuned circuit, which is what the antenna sees, is a high impedance device. On the other hand, circulating currents within the circuit are quite high, and very little voltage exists between the "low" end of the coil and ground. Low voltage and high current defines a low impedance. Thus the transmitter sees a low impedance load.

The latch and handle were taken off the box long enough to paint it. If you want a "cool" looking tuner, leave the original design intact. After drilling the mounting holes for the connectors, strip the paint from around each hole on the inside of the box to provide a good ground connection. Just to be on the safe side, I ran a wire to join the ground points of all parts. You might not want to do that.



Note that there are two input connectors. Heath transmitters often use an RCA phono connector for the antenna, while most others use the SO-239. Banana jacks receive the end of the antenna wire, and a lead to an external ground, if needed.

You will need a reflected-power indicator to tune it up. Generally speaking, the point of maximum forward power does not correspond exactly with the point of minimum swr. You want the lowest possible swr, because it is only in that condition that such things as low-pass filters work exactly as designed.

Tuning up this thing for the first time can be a headache, but it need not be. Troubles come only if you are working with more than one variable. However, if you know the approximate setting where your transmitter matches into fifty Ohms, set it there and leave it alone while you work with the tuner. With the antenna in place, set your station to the receive mode and tune the capacitor for maximum receive sensitivity. If your tuner seems to approach but not pass that point, you may need to change the inductance. Remove turns if it approaches peak at minimum C; add turns if it approaches peak at maximum C. This operation gets you into the right ball park. No change of inductance was needed in my unit. Now key your transmitter with reduced drive, and tune for maximum forward power. (CAUTION: Do this with your transmitter drive reduced to give about 50% of its normal output.) Next switch your reflected power meter to read swr and adjust the tuner for a dip in swr. Now you're ready to set your transmitter for full output and fine-adjust the tuner if necessary.

Once tuned up, you will find you have an almost immeasurably small swr. The tuner has a fairly wide tolerance to small changes in frequency. For larger changes, simply readjust for minimum swr. Experience with this type of tuner indicates that the needed inductance is inversely proportional to fre-

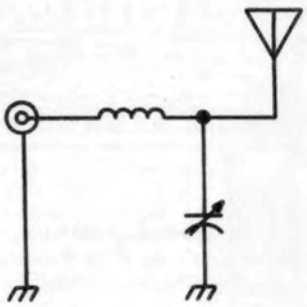


Fig. 1(a). The basic L-network.

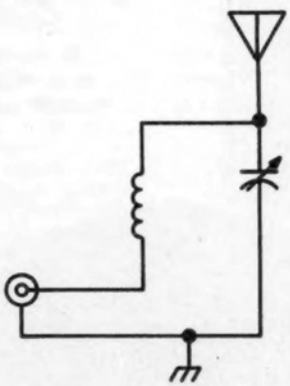


Fig. 1(b). Rearranging (a), we see the antenna at the top of a parallel-tuned circuit, while the transmitter output is in series with the circuit components, therefore seeing a low impedance.

quency, with about 123 feet of antenna. Although I didn't do it in this particular tuner, I have, in other tuners using the same circuit, operated multiband by simply tapping the coil. You may need to experiment a bit, but if you tap it about midway for 40 meters, 25% from the input end for 20, and about 16% from the input end for 15, very satisfactory swr can be achieved using an 80 meter half wave antenna. It simply becomes full wave on 40, a 2 wave

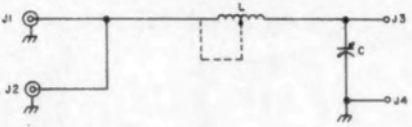


Fig. 2. The lunch box schematic (see Parts List for component values).

longwire on 20, and a 3 wave longwire on 15, all of which have similar end-feed impedance.

For those who may doubt that this thing works, it was fired up on 75 phone at 9:15 am, August 10, 1975. The transmitter was a Heath SB401. Signal report was S9+ in Cleveland, about 200 miles away. Swr was measured at 1.15 to 1 into a 125 foot wire. Later that day, when I checked into the Western New York Emergency Net, with the lunch box still in the system, I was reported as having "one of the best signals you've ever put into the net."

Parts List

J1 – SO-239
J2 – RCA phono connector
J3, J4 – Single banana jacks
C – 100 pF air variable
L – 80m: 27 mH B&W 3059, or equivalent; 40m: 13 mH B&W 3053, or equivalent; 20m: 6 mH B&W 3052, or equivalent; 15m: 4 mH B&W 3048, minus 3 turns; 10m: Experiment!

Above values are for half wave antennas. By tapping off turns in the 80 meter unit, you can feed an 80 meter antenna on 40, 20 and 15 with an excellent swr. Power limits depend mostly on wire size in the coil and plate spacing in the capacitor. This unit should be OK up to 400 Watts or so. For higher power, use a bread box and make your coil from a B&W 3064.

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