

73 Review

by Jeffrey Sloman NIEWO

The AEA IsoLoop™

10-30

A big antenna in a small package.

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 Price Class: \$349

Can a two-inch aluminum band a little over three feet in diameter work as anything more than a dummy load on HF? The textbooks say it can, and AEA has proven it with the new IsoLoop 10-30. Loop antennas have been in use from the beginning of radio, but practical loops for use at HF frequencies face several engineering problems and real world limitations that AEA has managed to overcome.

The IsoLoop is a 43-inch aluminum loop, with a center portion—made of UV resistant, injection molded high density polyethylene—shaped roughly like a dumbbell. In the center of the dumbbell section is a hole designed to accept a mast up to two inches in diameter, along with stainless steel hardware for clamping the antenna in place. A stainless steel hose clamp is provided for mounting the antenna radially, for use from, say, a balcony railing. The stainless U-bolt is also needed, and it is a minor inconvenience that the antenna housing must be disassembled—three hex bolts with nylon-retained aircraft nuts—to remove it from its default center position.

In the larger end of the dumbbell is a 10,000-volt split-stator capacitor. The two ends of the irradiated aluminum band that makes up the loop are welded to the two halves of the capacitor's stator. This one-piece design is very rugged, its only downside being the need to deform the loop to fit it into a UPS-shippable box. It takes some work to get the loop round again after unpacking it, though it need not be perfectly round to operate perfectly. If you are like me you will want the loop to be round for aesthetic reasons. Also in this end of the housing is a precision stepper motor and gear train for remote control of the capacitor's tuning.

On the smaller end of the dumbbell is a one-turn electrostatically shielded loop made of coaxial cable. This shielded coupling loop matches the extremely low impedance—less than 1/10 ohm—of the radiating loop to the 50-ohm feedline. It also acts as a balun which isolates the feedline from the antenna—the effect that gives the IsoLoop its name. The input to the antenna is through a supplied right angle PL-259 adapter which helps to route the coax at a 90 degree angle to the antenna. The antenna must be mounted with the SO-239 connector facing down, along with the

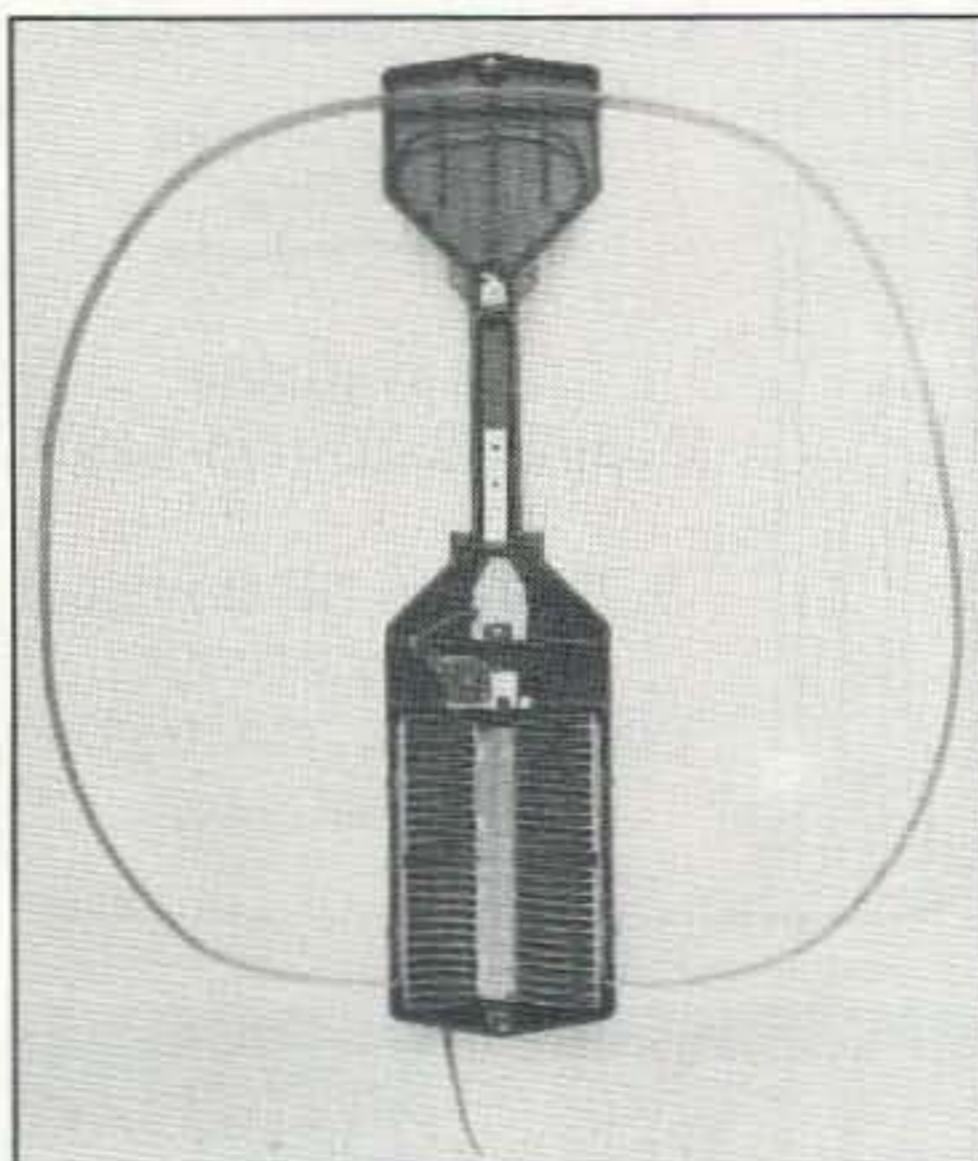


Photo A. The dumbbell shaped housing of the IsoLoop contains a 10,000-volt split-stator capacitor, a stepper motor, and a one-turn loop for impedance matching.

drain hole also located on this side.

Also in the package are the LC-2 controller—for tuning the antenna—and its 12-volt wall mount transformer power supply. The LC-2 is a small beige box with two thumbwheel controls, two push-button switches, and four LEDs. The left-side control—marked SENS—adjusts the sensitivity of the LED audio level indicators; I'll explain these later. The control on the right—marked SPEED—adjusts the pulse rate of the signal sent to the stepper motor located in the antenna, which adjusts the tuning speed. The push-buttons control the direction of the capacitor's travel. On the back of the LC-2 are jacks for power (standard coaxial), the stepper motor (5-pin DIN), and the audio in/out (1/8 phone).

New and Improved

This IsoLoop is the new and improved version of the original IsoLoop 14-30 antenna introduced in 1990. [Ed. Note: See the review of the original antenna in the September 1990 issue of 73, p. 10.] The original had an operating range of only 14-30 MHz; AEA has added 4 MHz to the low end to cover the 30 meter band. The original used aluminum tubing and required assembly. This design was

prone to loss from bad connections of the tubing sections to each other and the capacitor. The older model used a belt drive for reduction from the stepper motor to the capacitor, while the improved version uses a gear-driven reduction unit.

How It Works

The IsoLoop has a wonderfully elegant design. It is a simple tuned LC circuit, with the aluminum band providing the L and the custom designed capacitor providing the C. The connection to the antenna is made through mutually coupled air core inductors. The one-turn electrostatically shielded loop is inductively coupled to the resonating loop. Undoubtedly, many of you have already recognized this as the same design common to antennas used by BCB (BroadCast Band) DX enthusiasts. The difference between this antenna and the IsoLoop is twofold. The IsoLoop is designed for much higher frequencies and so is actually quite efficient in spite of its small size. Its efficiency ranges from about 70% on 20m to as high as about 95% on 10m.

The second principle difference is the capacitor in the IsoLoop. Designed for transmitting, it is capable of about 150W. Its split stator design avoids the moving contacts required by conventional designs. The IsoLoop achieves the ideal of placing the tuner at the antenna. This antenna tuner does what its name says: tunes the antenna! Because the IsoLoop is actually resonant, it easily outperforms practical dipoles mounted at the same height. There is some misunderstanding concerning the ability of a small antenna to perform well in the HF bands. The fact is, what is important is resonance—and this antenna resonates.

Installing the IsoLoop

Unpacking the IsoLoop is easy; it is packed in a box slightly smaller than the IsoLoop's diameter. Two small cardboard boxes contain the LC-2 controller, its power supply, and male-to-male 1/8-inch phone patch cord. The antenna slides from the box with little effort, and its 18-pound weight is not too difficult for one person to handle. Out of the box the antenna is set up for axial mounting, parallel to the earth. In this configuration

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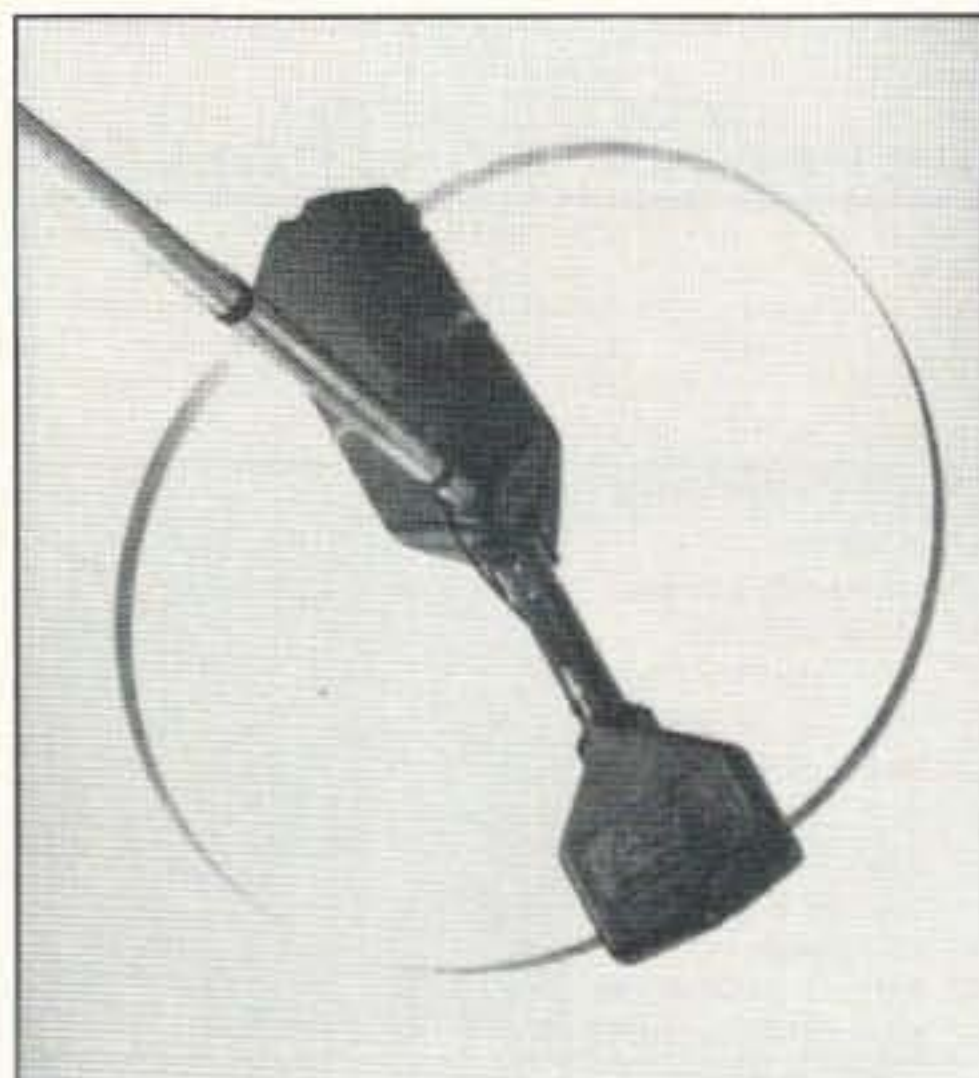


Photo B. The IsoLoop's default mounting position is parallel to the earth and provides an omnidirectional pattern.

the antenna's radiation pattern is omnidirectional. A bidirectional pattern is also possible using the alternate mounting position, which places the antenna perpendicular to the earth. Since the antenna is especially good for restricted space installations—like apartment buildings—using the alternate (radial) mounting position may prove useful for installing the antenna on high-rise balconies and out of windows.

When choosing a mounting location, keep in mind that the IsoLoop will only perform properly when mounted at least four feet from large—especially metallic—objects. This includes four feet from the ground, which, while it sounds like a relatively poor location, is not necessarily that bad. The IsoLoop is a loop antenna and not a dipole. It does not suffer from the problems of a dipole located closer than a half wavelength to the earth. While four feet off the ground is clearly not ideal, the IsoLoop's radiation angle is about 37 degrees, while only a quarter wave from the

earth. This low radiation angle insures better DX performance by delivering most of the transmitter's power at an angle that will take advantage of ionospheric propagation. Remember: The angle of incidence equals the angle of reflection.

While the IsoLoop was being tested here, it spent most of its time on a four-foot aluminum stepladder in the middle of the second-floor ham shack. Even in this makeshift installation the antenna performs exceptionally. In any case, while the IsoLoop is more forgiving than other antenna designs, it still works better mounted higher in the air. Its relatively small size allows for mounting with standard TV mast and hardware, and its low profile is unlikely to cause too much consternation among the neighbors.

Once the mounting location is chosen, and the antenna physically mounted, the feedline and control cable must be routed back to the transceiver. Supplied with the antenna is a right-angle adapter for the SO-239 input to the antenna. This allows the coax to be routed at 90 degrees to the antenna which minimizes induced currents in the feedline. A small piece of Coax Seal™ is included to protect the antenna connection. Fifty feet of control cable comes installed on the antenna. If this is not enough, AEA can supply 50-foot extension cables. The 5-pin DIN connector used on the control cable is a common type, and the cable itself is a shielded 5-conductor cable, so building one yourself of arbitrary length should be no problem.

Once the cables are routed back to the shack, the coax is connected to the transceiver and the control cable is connected to the 5-pin DIN connector on the back of the LC-2 control box. The LC-2 will also need its power supply connection. The supplied patch cord is used to connect the rig's speaker output to the input on the back of the unit, and an external speaker is plugged into the adjacent output. These connections are only neces-

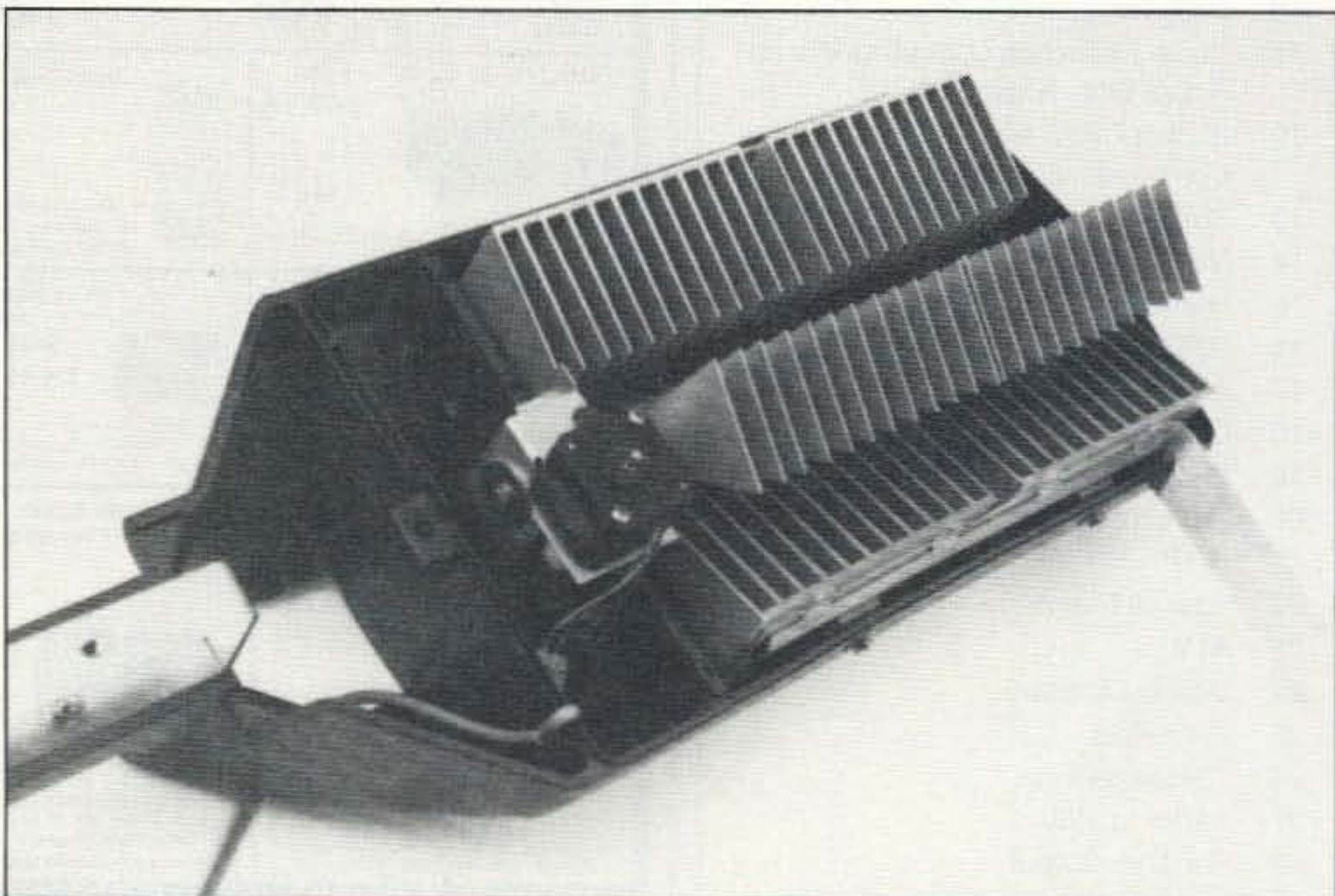


Photo C. The special split-stator tuning capacitor built into the IsoLoop is capable of handling up to 150 watts. The capacitor is remotely tuned via a motorized gear-driven reduction unit.

sary if you intend to use the LC-2's tuning indicator—which is especially useful for older radios (see the description below). Once all these connections are made, the antenna is ready for use.

Using the IsoLoop

Without some understanding of how to use the IsoLoop, you could spend several frustrating hours getting the antenna to work. Because of the extremely narrow passband of the IsoLoop, it is important to understand how to tune the IsoLoop and/or to develop a technique of your own.

Tuning the loop is accomplished with the LC-2 controller. The capacitor is driven by the stepper motor through a 30:1 gear reduction drive. This allows very fine adjustments of the capacitor, which are necessary because of the very tight resonance of the loop. The speed control adjusts the pulse rate of the signal to the stepper motor with the slowest setting providing the tiny adjustments necessary to fine-tune the SWR, while the highest speed will move the capacitor's rotor through its entire rotation in about 15 seconds. Tuning works like this:

1. Remove any antenna tuners from the feedline, and if the rig has a built-in tuner—turn it off.

2. With the speed control in the fastest position, press either direction button until the noise in the receiver peaks. This will happen quite suddenly, and the peak is very small. You will probably pass through the peak, but let go of the button as soon as you notice it. It will sound like a burst of noise. [Note: If you have an older rig with a mechanical S-meter, and you have connected—what AEA calls—the audio-visual LEDs, you can use these to observe the peak. Adjust the sensitivity control until just the left-most LED glows, and the first of the two center LEDs flicker. As you rotate the capacitor, you can watch for the peak—on the LEDs—as well as listen for it. If you have a modern rig with an electronic VU meter—one that supplements the S-meter, showing the audio level—you can use this instead of the LC-2's LEDs.]

3. Adjust the speed control to about middle speed. Press the other direction button, which will bring the capacitor back the other way, toward the peak you passed. You will not have to wait long. You will probably pass through the peak in the other direction. Alternate the directions—adjusting the speed control downward if necessary—until you feel you have peaked the noise (or signal) as best you can.

4. Adjust the speed control to its slowest position and, using an SWR meter, repeat the procedure above for the lowest reading. A correctly installed IsoLoop should tune down to about 1.5:1 or less from 10-30 MHz. Retuning will be necessary every 10-100 kHz, the bandwidth increasing with frequency. Keep in mind:

- The capacitor has no stop, it rotates freely and there is no absolute up and down related to the directional controls.

- The peak is very small; you will have to

practice to make the antenna work.

- Turn off your antenna tuner! You will try forever to get the IsoLoop tuned with no success if it is on.

- Be sure to mount the antenna at least four feet from large objects if at all possible.

As you can see, the tuning procedure—while not necessarily complex—is specific. Once you get the hang of the procedure you will probably find yourself using faster and faster speeds for all but the final touch-up for SWR. You will also become better at hearing the peak. This antenna becomes better as you do. Some of you may remember a similar procedure—at least in feel—from the days before automatic antenna tuners.

Performance

I was interested in the IsoLoop because of my limited space and restrictions against outside antennas. Connected to a Kenwood TS-450S, the antenna performed brilliantly. I had the opportunity to work some band openings on 10m—and got universally excellent signal reports. Running about 25W, I was able to work the East Coast from my Indiana QTH. I had a hard time convincing some of the stations I contacted that I was using the IsoLoop and 25W—but I was. Keep in mind, too, that the antenna was indoors on an aluminum stepladder. The IsoLoop consistently outperformed a 50-foot longwire using the automatic antenna tuner in the Kenwood. I was able to monitor packet QSO on 30m, and CW and SSB QSO on 20, that were not even audible on the longwire.

Who Should Use an IsoLoop?

The IsoLoop is extremely flexible. It is the perfect limited space HF antenna, useful for apartment dwellers, those with restrictive covenants, and those with aesthetically sensitive neighbors. It is also useful for mobile applications, such as mobile homes, emergency command vehicles, and boats—but with its 15 pound weight, I would be hesitant to put it on a car (though I have heard it's been done). Even if you don't have space restrictions, the IsoLoop works better than wire antennas, is easy to install and use, and might just be the ideal antenna to supplement your tribander.

Conclusion

The IsoLoop is one of those products that is a pleasure to use. It is an elegant application of a traditional design with modern engineering. Its performance is exemplary; it will not disappoint you.

IsoLoop 10-30 Specifications

Frequency coverage	10 to 30 MHz (continuous)
Nominal impedance	50 ohms
Connector	SO-239
Power handling	150W
VWSR	1.5:1 or less across operating range
Diameter	43"
Shipping weight	25 pounds, may be shipped UPS

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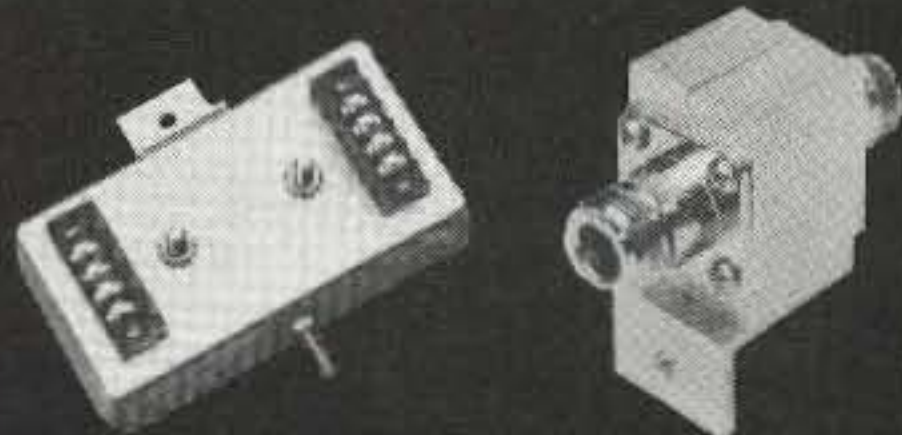
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