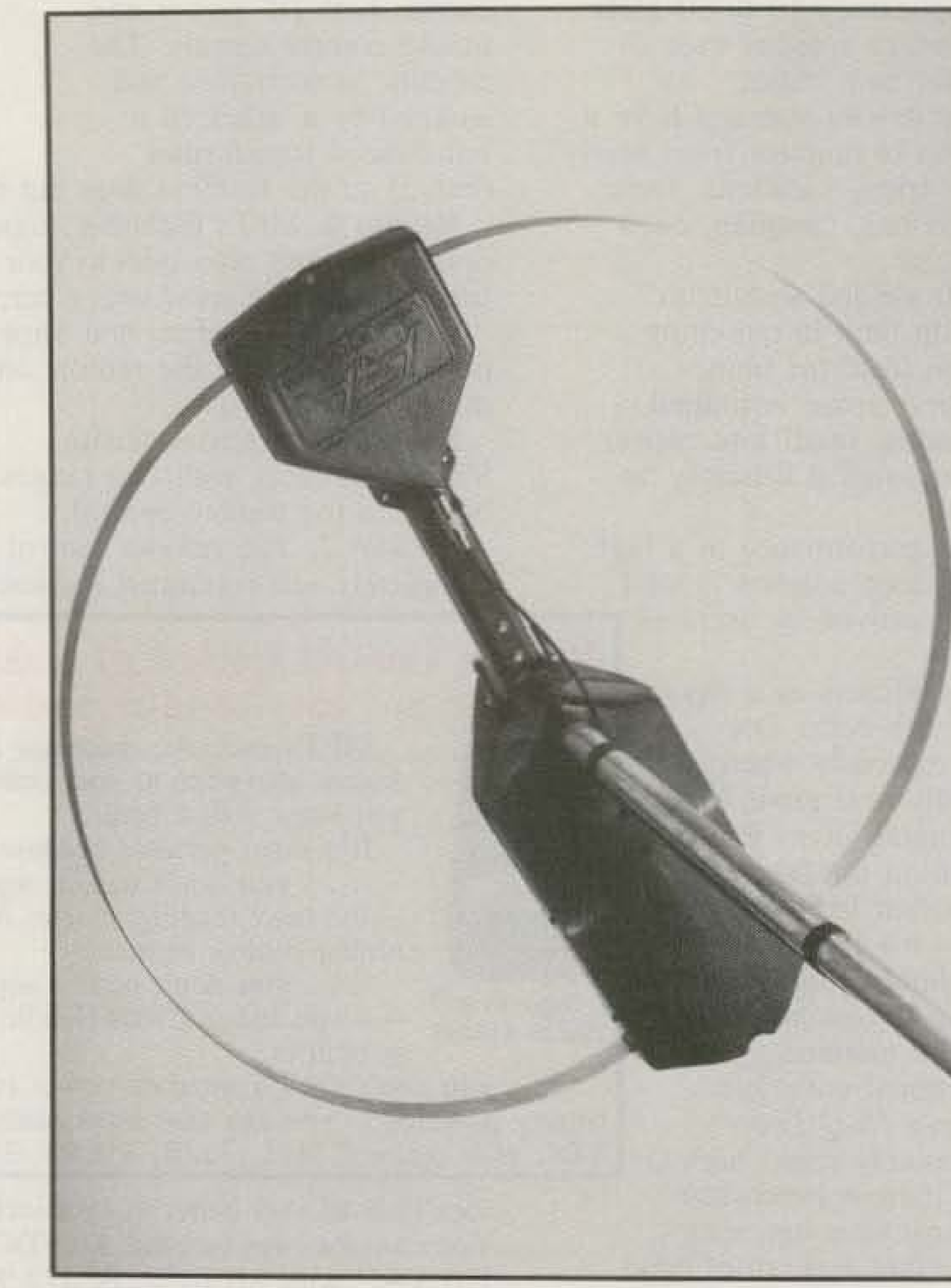
CQ REVIEWS:

The AEA Isoloop Antenna

BY LEW McCOY*, W1ICP

Some time back Buck Rogers, K4ABT, *CQ*'s Packet Radio Editor, reviewed the first version of the AEA's Isoloop antenna (July 1990 *CQ*, p. 18). Since then a new, improved version of the antenna has been made and is now marketed by AEA. This review covers this latest version.

I grew up in a school that taught that small antennas, physically small antennas for a given frequency, in no way can compare to full-size antennas as far as gain is concerned. Basically, and I'll try to keep this simple, the feed point impedance of an antenna drops as a resonant antenna is made physically smaller. For example, an 80 meter half-wavelength dipole has an impedance of approximately 70 ohms. Of this impedance, the useful resistance (radiation resistance) is on the order of 68 ohms, while the ohmic resistance is 2 to 3 ohms. If we feed 70 watts to this antenna, 68 watts will be radiated and 2 watts will be dissipated as heat (lost power). If we reduce the physical size of this antenna—for example, an 80 meter mobile whip 8 feet long—the impedance drops drastically. In fact, an 80 meter whip can have an impedance of less than one ohm radiation resistance and two or more ohms ohmic resistance. If we feed 70 watts to this antenna, we can expect to lose about 69 watts or so as heat with only a watt or so to be radiated. As one can see, the ratio of lost power as heat rises dramatically. Before some high-power engineers jump down my throat, this is a *general* example for the purpose of showing the losses of an antenna that has a very small effective aperture.



The Isoloop makes a neat antenna installation. It will accommodate mast sizes up to 2 inches in diameter.

How do you get around this problem? Keep in mind that a physically small antenna could be as efficient as a full-size one *if we could keep the feed impedance within reasonable tolerances.* In other words, keep the ohmic resistance portion as low as possible. This means extremely good connections in the antenna, large components to reduce ohmic losses, etc. We are aiming here to keep the loss ratios from radiation resistance to ohmic resistance as good as we can make them.

The AEA Isoloop is a very good approach to answering this problem. This is an antenna that covers 10 through 30 meters (continuous) with a power rating of 150 watts input. The SWR is less than 1.5 to 1 with a matched feed impedance of 50 ohms. How does the Isoloop overcome the technical disadvantages I just pointed out? This is accomplished by using extremely high-quality connections and a very large and efficient variable capacitor (see photos).

The capacitor is used to tune (resonate) the loop to frequency, and it is tuned remotely (at the operating position) via what is called the LC-2 Controller—more on this in a moment. The main loop is 43 inches in diameter and is constructed of a wide strip of Iridited aluminum which is welded to the variable capacitor. (Remember, this keeps ohmic losses down.) The main loop is an inductor, which with the variable capacitor forms a very high Q circuit. This

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means at 150 watts you can have very high RF voltages develop across the capacitor. However, this is protected by the plate spacings of the variable capacitor, which are rated at 10,000 volts!

Everything that should be done to make this small antenna efficient was done by AEA. They rate the efficiency of the loop at 72 percent on 20 (a half-dipole on 20 would be on the order of 98 percent). On 10 the loop's efficiency goes to 96 percent. Keep in mind that this is not a "small" antenna on 10 meters. It closely approaches a quarter-wave dipole on 10.

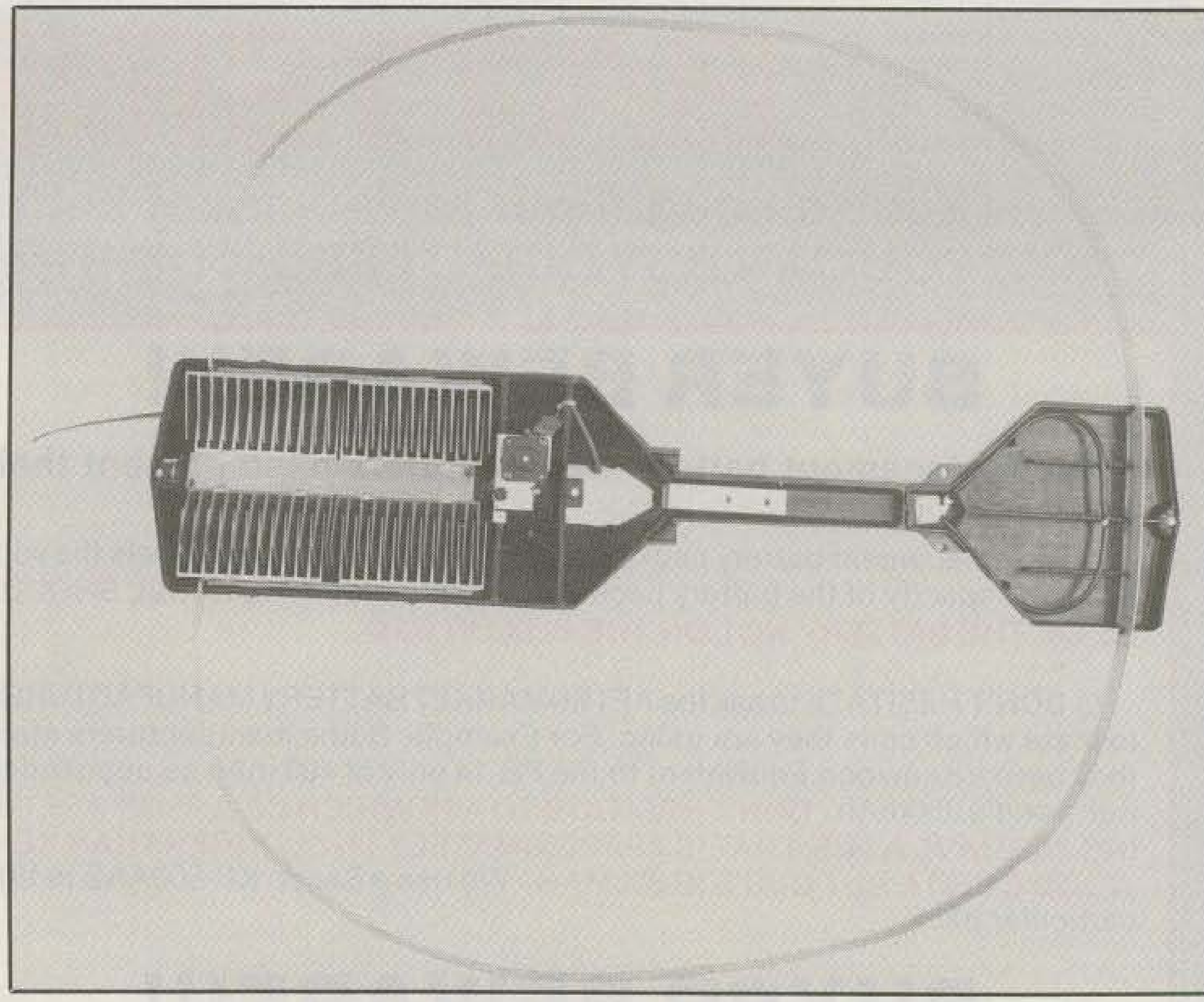
The loop is provided with a 50 foot long cable for the LC-2 controller (longer lengths are available). A standard UHF coax connector is used on the antenna. The LC-2 is to be set near your transceiver, and the controls are extremely simple. They consist of a speed and direction control for the variable up in the antenna. There is a stepper motor on the variable to accomplish rotation.

Okay, so how good is the Isoloop compared to full-size antennas? I mounted the Isoloop 30 feet above ground, and some distance away I installed a 20 meter dipole, also at 30 feet. Last but by no means least, I had my 3-element 20 meter beam on a 60 foot tower. I should add for this report that my location is probably one of the best in the world. I am 6400 feet above sea level, almost smack on the Continental Divide, and my QTH sits over an old copper and silver mine.

I made many, many tests on 20 meters. These were simple A–B tests: "Compare my signal—now and now." I found that while the dipole was slightly better in most cases, there really wasn't that much difference. In fact, in many instances the loop did a better job on DX. I know the reason for this is because the loop inherently has a lower angle of radiation for the same height as the dipole, *in this case*. The 20 meter dipole at 30 feet has more higher angle radiation than the loop.

I suppose it isn't fair to compare the loop to the beam. However, truth must be told. I found that in all instances the beam outperformed the loop, usually on the order of two S-units. But heck, this was expected. The problem, if it could be called a problem, was that with 150 watts I usually had a signal that was well over S9 on the beam. In all fairness, the loop brought in many S9-plus reports also, but what is important is that *in no case was the loop inaudible when compared to the beam.* Or simply put, I could have made the same contact with the loop.

Some conclusions are in order. Many amateurs find that they cannot get up dipoles or beams. The Isoloop could well be the answer for these amateurs. In fact, it could well pass for a "special" type of TV antenna. Or it is small enough not to be noticed by complaining neighbors. It certain-

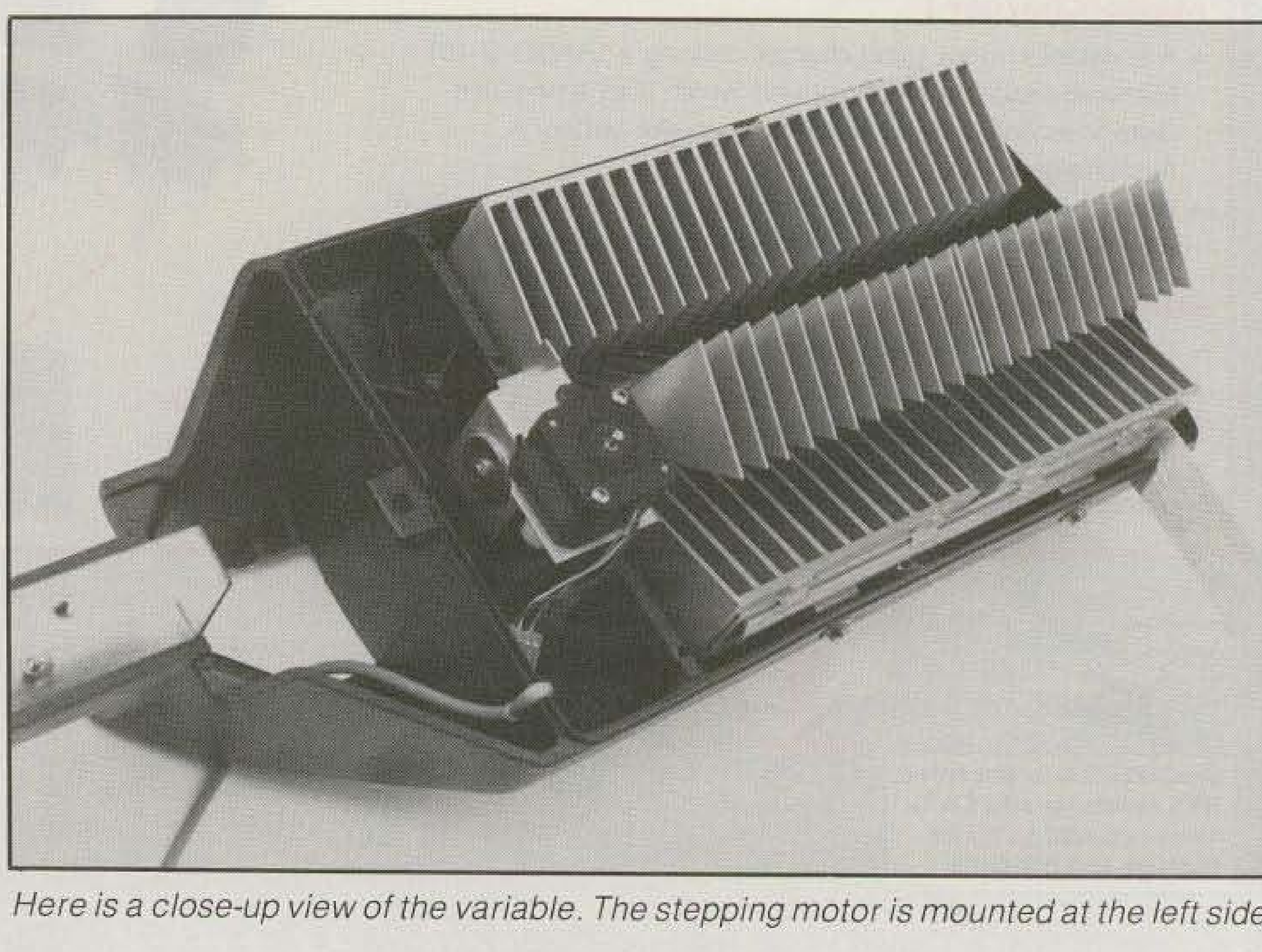


This shows the loop and its interior construction. A small matching loop is used to match from the low-impedance feed to 50 ohms. The variable capacitor is at the opposite side. Note the size of the capacitor.

ly is a respectable antenna, and I could recommend it for amateurs in tough antenna situations.

Last, I put up a 10 meter dipole to compare the loop on 10. As I expected, the loop at times outperformed the dipole and vice versa. One thing I really liked was switching to a band, tuning the LC-2, and hearing the band become "hot." Naturally, I tried the WARC bands and 15, comparing results to the beam . . . same results as on 20.

The AEA Isoloop lists for $389.00. It is manufactured by Advanced Electronic Applications, Inc. P.O. Box C2160, 2006 196th St. SW, Lynnwood, WA 98036. CQ



Here is a close-up view of the variable. The stepping motor is mounted at the left side.