The MFJ-1786 High-Q Loop Antenna for 10 to 30 MHz

Reviewed by Kirk Kleinschmidt, NT0Z

Judging by recent press in ham magazines and discussions on packet radio and various computer services, the small loop antenna is one hot topic! Jack Belrose, VE2CV, described the performance characteristics of these antennas in November 1993 *QST*. Robert Capon, WA3ULH, showed us how to build one in the May 1994 issue. In that same issue, Chip Margelli, K7JA, told us how he won a major contest with one ("An Enchanted Sweepstakes Expedition"). Several years ago, AEA introduced the first large-scale commercial mini HF loop for amateurs (the IsoLoop), and now MFJ throws its hat into the ring with the Model 1786.

The lure of the small loop is easy to understand: A single small antenna—about 3 feet in diameter—can cover all the ham bands from 10 to 30 MHz. It's easy to install, reasonably portable and can be mounted in a variety of ways.

Mini loop proponents insist that the tiny antennas offer no (or few) performance compromises, but average hams probably have their doubts. After all, why waste all that aluminum if a 3-foot loop will do?

I must admit that I was in the latter category as I started this review. Oh, I'd heard all the scuttlebutt about how AEA's IsoLoop was a good performer, and I even edited Chip Margelli's "How to Win a Contest with a Mini Loop" article. But as I unpacked the MFJ loop and eyed it speculatively, I wasn't convinced that the loop would exonerate itself.

So, did the 1786 change my mind? Am I now in the former category—the mini loop inner sanctum? Read on!

Unpacking and Setting Up

The MFJ loop comes in one large box. Unpacking and setup are easy, thanks to the loop's integrated design. Inside the box is the 36-inch loop (with its built-in control sensors and motors), the loop's control box, the user's manual, a wall-cube power supply and two sets of mounting brackets. There's nothing to assemble except the mounting brackets. The loop can be mounted horizontally or vertically.

The loop itself is made from sturdy 1¼-inch OD aluminum tubing. The joints are welded to minimize resistance. A molded plastic cover protects the control motors and tuning capacitor from the elements.

The user's manual goes into some detail about how the various mounting orientations affect polarization, and how the height above ground (or large metal surfaces) affects radiation efficiency and the antenna's radiation pattern. The manual's bottom line on mounting the loop comes down to this: If the loop can't be mounted more than 20 feet above ground or above a metal roof, mount it vertically; otherwise, mount it horizontally. In each case, the loop's radiation pattern is mostly omnidirectional.

One of the MFJ loop's nicest features is its single coaxial feed line. Dc control voltages from the loop's shack-mounted control box are routed up the coaxial cable to the sensors and motors in the loop itself. No extra control lines are required!

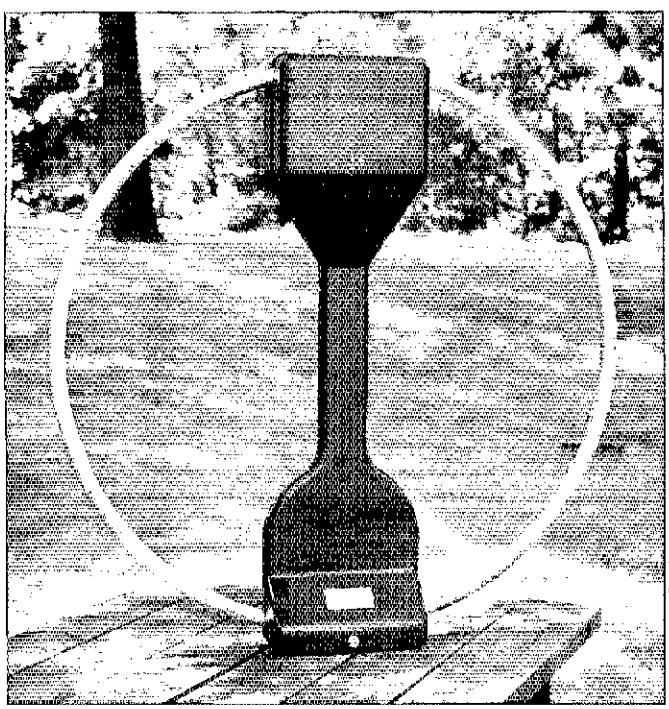
Because of these dc control signals, the manual strongly cautions users against installing antenna switches or relays between the control box and the loop. If you insert an antenna switch, for example, and the switch grounds all unused contacts—poof! there goes your power supply or control box (that's generally what happens when you short out a power supply, right?). Don't do it!

Similarly, the manual cautions users against using grounded dc power supplies. The wall cube supplied with the control box is ungrounded, and the manual admonishes users to use it and nothing else.

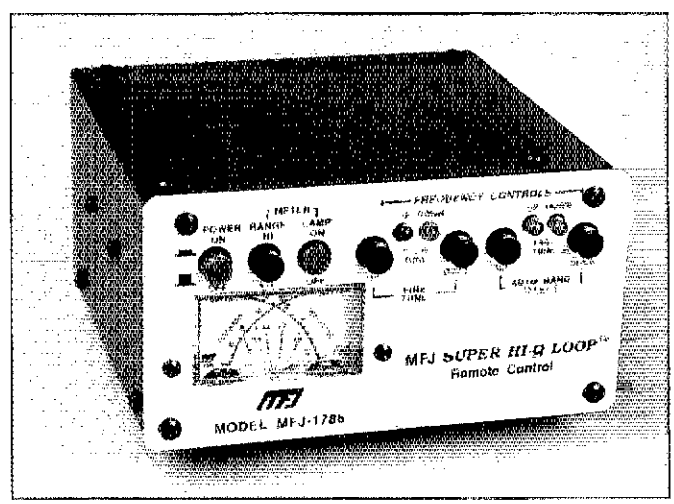
Installation, then, is a snap. Mount the loop (horizontally or vertically), run a single 50-Ω feed line from the control box to the loop (SO-239 coax connectors are

The Bottom Line

For such a small, relatively portable antenna, the performance trade-off is rather minimal. For those living in areas with antenna restrictions, the MFJ-1786 offers an opportunity to get on the 10 to 30-MHz HF bands with an unobtrusive, yet very effective antenna.



The MFJ-1786 10 to 30-MHz loop antenna is about 3 feet in diameter.



The MFJ-1786 control box features a built-in SWR meter and several other features to make tuning the antenna easier.

provided on both ends), run another 50-Ω jumper from the control box to your radio, and apply power to the control box via the supplied wall cube. You're on the air from 10 to 30 MHz!

Using the MFJ Hi-Q Loop

The station end of the MFJ-1786 is a small control box with the look and feel of other MFJ products. Here's what's on the front panel: a **POWER** switch; a **HI/LOW METER RANGE** switch; a **LAMP ON/OFF** switch; locking pushbuttons for **UP** and **DOWN COARSE TUNING**; nonlocking pushbuttons for **UP** and **DOWN FINE TUNING**; four tuning LEDs, two for fine and two for coarse and a cross-needle **POWER/SWR** meter (300 W high, 30 W low). On the back are: two coax connectors (one goes to the loop antenna, the other to your transmitter), a wing-nut post for grounding and an in-line connector for the dc power supply.

With everything set up, tuning is straightforward, if a bit tedious. Adjust your transmitter to any allowable frequency between 10.1 and 29.7 MHz and transmit a low-power unmodulated carrier. Assuming the **UP/DOWN** coarse tuning control has been set at its maximum upper limit prior to tuning up, press and lock the **DOWN** button while transmitting. The **DOWN LED** will light during the process and the control box will issue a short beep when the loop is tuned to your transmitter's frequency. Release the **DOWN** button as soon as you hear the beep.

An **UP** or **DOWN** LED will remain lit. Briefly push (poke or jab, actually) the fine tune button corresponding to the lit indicator LED and carefully watch the reflected power meter for a *very* sharp dip. Stop as close to zero reflected power as you can. You'll probably need to tap the **UP** or **DOWN** fine tuning pushbuttons a time or two (or three or four) to get it just right.

Although little RF energy is radiated when the loop is off resonance, you're still a "tuner upper" who can potentially interfere with ongoing conversations! The user's manual suggests that you carefully choose an unoccupied frequency and ID when you're done tuning up your loop.

Tuning the loop *is* tricky, but after a while, you'll get the hang of it. Once you've tuned the loop at low power, you can increase your transmitter power to a maximum of 150 W.

During the review process, I had no trouble tuning the loop with 5 W (as low as I could go with my radio). The user's manual says the control head's resonance-indicating beep will work with as little as 100 mW of RF, with 50 W or so being the best.

I experienced no arcing or untoward behavior at power levels of up to 120 W or so. High power can be cause for concern for mini loop users because the RF voltages generated at the feed points of a small loops can be *extremely* high. Needless to say, don't mount the loop in places where someone might accidentally touch it while you're transmitting. This "cute little antenna" has a substantial RF "bite!"

The User's Manual

Weighing in at 17 pages, I rate the 1786's user's manual as "okay." It's not crystal clear everywhere, especially in the section that discusses polarization and antenna pattern, but it presents the required "how to" information well enough. Because the MFJ-1786 loop is likely to be used in portable setups or indoors, I was pleased to see that the manual included information on safety and bio-effects, and cautions against using the antenna near people if you're running high power.

There's no schematic, but there is an adequate troubleshooting section and prominent technical support telephone numbers—something that most users appreciate. During the review, my loop and control box worked flawlessly, and I did not have to refer to the troubleshooting section at all. Thanks!

My Indoor Setup

You could say that I really put the MFJ loop through its paces. In fact, I even stacked the deck *against* the mini loop in my on-air comparisons! For tests on 30, 20 and 15 meters (I didn't work stations on 10 meters, but I did tune up there), my reference antenna was a full-wave 40-meter horizontal loop about 20 to 25 feet off the ground (a good DX and stateside performer at my shack for five years). It was fed with an MFJ antenna tuner. The MFJ loop was mounted inside my fourth-floor walk-up attic, at about 40 feet above the ground (four feet above the attic floor). Because the antenna was indoors, most of my operating was at 20 W or less.

On-Air Tests

After you master tuning up the loop, the first thing you'll notice is just how high the Q is (I guess that's why it's called the MFJ Hi-Q Loop, right?). Tuning is sharp, and it takes a little getting used to. In my indoor installation, the SWR bandwidth was quite narrow, with the match deteriorating if I tuned more than a few kilohertz up or down in frequency. Mounted outdoors, in the clear on a 15-foot mast, the loop was easier to use. The bandwidth between 2:1 SWR points (as indicated on the control-box meter) ranged from about ±8 kHz at 10 MHz, to ±25 kHz at 14 MHz, to ±150 kHz at 28 MHz.

The narrow bandwidth has a side benefit. The loop acts as a sharp preselector, virtually preventing the receiver from hearing any off-frequency signals. If your receiver is easily overpowered by strong nearby signals—in band and out—the small loop will almost certainly help its performance. It's like having a crystal filter in your receiver's front end!

The second thing you'll notice is that the MFJ loop works very well considering its diminutive size. During two weeks of casual operating and SWLing, on 90% of the signals I heard and the stations I worked, signals on the mini loop were as strong as signals on the big outdoor loop, or within one S unit. Every now and then a signal on the mini loop would be dramatically weaker—up to 10 S units or so—and sometimes signals on the mini loop were a smidgen stronger than those on the 40-meter loop.

In my book, being an S unit down from a full-size outdoor wire antenna is high performance indeed! Remember, this is a 143-foot outdoor loop battling with a 3-foot indoor loop! I was impressed, and so were the ops I worked who listened for my back-and-forth comparison transmissions!

I worked dozens of stations stateside and overseas with 20 W or less. I worked Europeans with 5 W and a VK on 30 meters with 20 W. It was easy. I couldn't tell that I was using a "compromise antenna" (although I knew I wasn't using a 2-element quad, either).

My informal tests are far from scientific, but the results certainly suggest that the mini loop is a real scrapper—it will happily step into the ring with the Mike Tysons of Amateur Radio antennas.

Tidbits

If you're listening to an active band, you can usually tune the mini loop simply by listening to the sharp peak in band noise as the loop tunes through resonance. The scratching noise made by the loop's variable capacitor drive motor aids this process, however. According to MFJ, the motor noise is intended as a tuning aid. You can pre-tune the loop by tuning for maximum motor noise. This feature is not documented in the manual, but will be in the future. It is helpful to get the tuning capacitor into the ballpark without transmitting a signal.

I used the band noise trick while listening to shortwave broadcasts. I listened to band noise or watched the S meter peak on the station I was listening to (I couldn't exactly transmit an out-of-band signal!). Because shortwave stations are often strong, you can get away with tuning off frequency a bit while you're looking for them, peaking the loop after you've "arrived." The loop performed admirably as an SWL antenna, tricky tuning procedures aside. The loop's tight bandwidth helps eliminate broadcast-band crud (I'm a mile from WPOP on 1410 kHz, and right in their antenna pattern).

One thing I wanted to try was putting my vertically mounted mini loop on a small antenna rotator. The loop's pattern is virtually omnidirectional, but there are narrow, deep nulls off the loop's broad sides. A rotator may be able to eliminate these nulls and peak the desired signal (or null an in-

terfering one!). It might be worth a try.

For portable or Field Day operation, the control box features internal battery holders and connectors, allowing you to use and tune the loop just about anywhere. Battery drain would vary with the amount of tuning you did, and whether you have the SWR/power meter lamp turned on.

Parting Thoughts

As I said earlier, the little loop's performance impressed me. For such a small, relatively portable antenna, the performance trade-off is rather minimal. For those living in areas with antenna restrictions, it offers an opportunity to get on the air with an unobtrusive, yet effective antenna. The tuning is somewhat tricky, but MFJ's **AUTO BAND SELECT** feature (with the tone) helps a lot. An affordable "smart," autotracking control box would be a really valuable option.

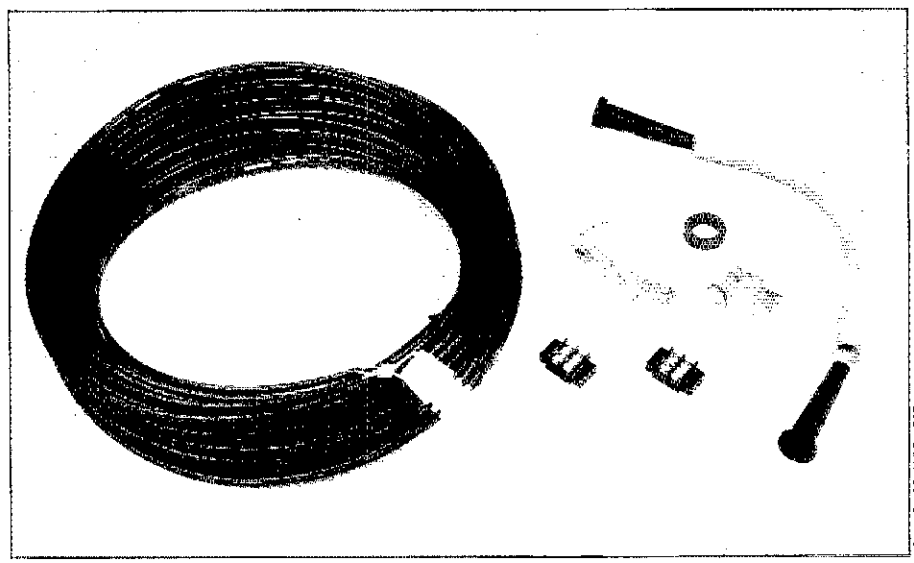
Pricewise, at $300, the MFJ loop is competitive. Although it's not a casual purchase, if you need an effective portable or limited-space antenna, this one is worth a close look. You can save a few bucks with MFJ's $270 Model 1782 mini loop, which is identical to its big brother, minus the "band beeper" circuits in the control box. (The **FAST/SLOW** tuning buttons remain.)

Manufacturer's suggested retail price: $300. Manufacturer: MFJ Enterprises, Box 494, Mississippi State, MS 39762; tel 601-323-5869, fax 601-323-6551.

JADE Products 160-Meter Twin-Lead Marconi Antenna

Reviewed by Steve Ford, WB8IMY

If you're looking for a relatively easy way to get on 160 meters, consider this twist on the Marconi antenna. The JADE approach uses a conductor made of 300-Ω twinlead in a design that borrows from the concept of the folded dipole. As a result, the JADE Marconi provides 160-meter capability in slightly less horizontal space than required for an 80-meter dipole (about 130 feet). In addition, the antenna can be fed with 50-Ω coaxial cable.



The twinlead Marconi is designed to hang between two supports in inverted-L fashion (the radiator starts from ground level and goes straight up like a vertical, then takes a 90° bend and runs horizontally to its end support). The instructions recommend that the vertical portion of the antenna be as long as possible. In my case, I could achieve a vertical height of only 30 feet. So, 100 feet of the Marconi was stretched horizontally across the yard and anchored to a tree. The remaining 30 feet dropped straight down to the ground. If I could have installed the antenna at, say, 60 feet, the horizontal section could have been reduced to 70 feet.

The JADE Marconi uses a curved tube and a clamp to support the antenna at the point where the twinlead drops vertically. The curved tube bends the twinlead to the vertical position while the clamp provides a convenient point to attach the support rope. The components are all top quality, and the 12-page instruction manual is excellent. (In addition to clear installation and tuning instructions, the manual provides several pages of technical information on the antenna).

At the feedpoint there is a simple barrier strip (provided). The twinlead attaches to one end and the coax to the other. As the instructions state, the strip must be held securely in place and protected from the weather.

The antenna ground attaches to the barrier strip as well—and that caused my greatest problem. The twinlead Marconi works best only when referenced to an excellent ground. With a good ground, the theoretical impedance of the antenna falls somewhere in the neighborhood of 10 to 15 Ω. The transformer action of the twinlead design effectively raises the feedpoint impedance to between 40 and 60 Ω—a good match for a transceiver.

If you can only install a limited radial ground network, the manufacturer recommends connecting both twinlead conductors together on the same barrier-strip terminal. On my relatively small lot there was little room for radials of any sort. For hard-case folks like me, the instructions offer details on building an unbalanced-to-unbalanced transformer to provide a 1:4 impedance step-up. I was just about to start winding the transformer when I spotted the well head in my backyard. Of course! One hundred and fifty feet of iron casing pipe nestled deep in the water table. Perhaps it could do double duty as my antenna ground!

Sure enough, it worked. I attached the ground wire from the terminal strip to the pipe and proceeded to load up on 1.850 MHz. My SWR was a surprisingly low 1.5:1, but the proof of performance was on the air.

Despite noisy summertime conditions, I heard several stations on the band. I called CQ and was answered by a station in suburban Boston, about 130 miles from my location. He gave me a solid 59 report. During the remainder of the evening I worked stations throughout the Northeast