

Two Meter Tracking Transmitter

Low-cost beacon.

by Carl Lyster WA4ADG

Here's a simple 2-transistor CW transmitter that can generate up to 10 milliwatts of power on the 2 meter band. I originally designed this circuit for use as an animal tracking transmitter for the Tennessee Wildlife Resources Agency.

This circuit has a wide variety of applications whenever a low-cost signal on 2 meters is required. The Indianapolis Foxhunting Club has been using it for their "Easter Egg Hunts." They take several of these transmitters on different frequencies, enclose them in plastic eggs, and scatter them about the search area. The low power allows the trackers to easily walk right up to the hidden eggs without severely overloading their HTs or scanners. The trick comes in attempting to remove the eggs from the middle of thorn bushes!

This transmitter has also been used on two high altitude balloon flights. Its low current drain makes it a good choice for this kind of experiment. It's amazing what 10 milliwatts will do from 60,000 feet, as stations over 300 miles away were able to copy the beacon at an S-5 level. [Ed. note: The package shown on this month's front cover used one of these tracking transmitters.]

Circuit Description

To keep this as low-cost as possible, the transmitter was designed to use inexpensive scanner crystals. Most VHF scanners use a third overtone crystal in the 48 MHz range. To find the 2 meter output frequency of a

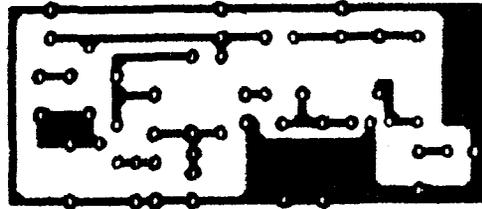


Figure 2. PC Board foil pattern.

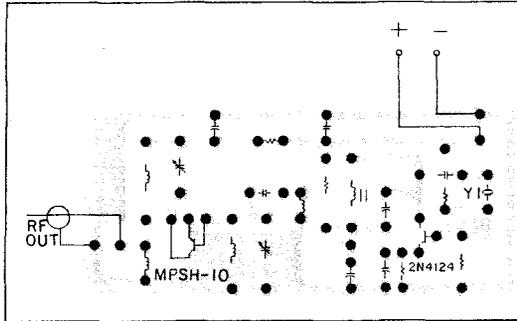


Figure 3. Parts placement.

particular scanner crystal when used in this transmitter, just subtract 10.7 or 10.8 (depending on the scanner's IF scheme) from the commercial frequency. For example: a scanner crystal for 155.15 MHz would give the transmitter a 2 meter output of 144.35 MHz if the crystal was made for a scanner with a 10.8 MHz IF. Scanner crystals ranging from 154.8 to 158.7 MHz should work in your tracker transmitter in the 2 meter band.

The oscillator section generates between 5 to 10 milliwatts of RF in the 48 MHz range. The output of the oscillator then drives a simple diode tripler to generate a signal at 144 MHz. The MPSH-10 transistor is used as a class-C amplifier, and it also helps clean up the final RF output. The closest spurs at 96 MHz and 102 MHz are at least 40 dB down.

Supply voltage to the transmitter is controlled by a 2N2222 transistor keyed by a logic level from your favorite CW Identifier circuit. [An appropriate CW Identifier was described in the June "Above and Beyond" column. Another excellent choice is the GLB ID-1.] If too much chirp is present, you might try leaving the oscillator running continuously and just key the final amplifier.

Construction

The circuit can be built on perfboard with point-to-point wiring. However, I've included a PC board foil pattern which will make layout simpler. The 4-turn coil which couples the oscillator into the diode tripler can be wound directly over the 6-turn slug-tuned coil in the oscillator tank circuit. The 2-turn output coil is mounted in line with the collector end of the 4-turn coil in the amplifier tank circuit. Place the 2-turn coil as close as possible to the tank coil for maximum output power.

Tune Up

Build the transmitter up one stage at a time, starting with the oscillator. Apply 6 volts to the oscillator and make sure it's running. You should be able to hear its second harmonic on a stereo receiver set for 96 MHz. If the oscillator fails to start, try varying the slug-tuned coil in the tank circuit until it kicks in solidly. If this fails, you could increase the value of the 4.7k resistor or lower the 470 ohm resistor feeding the tank circuit.

Once the oscillator is functional, build up the tripler and amplifier section and place a small dummy load on the RF output. Adjust the input and output variable capacitors for maximum RF out. A grid dip meter or spectrum analyzer would be helpful at this point. However, you could simply adjust for maximum signal on your 2 meter rig's S-meter. Don't try to get more than 10 milliwatts out of this transmitter, as spectral purity will suffer. There will be some chirp with this circuit, especially if you key both the oscillator and amplifier. Chirp can be minimized through adjustment of the slug-tuned coil in the oscillator.

The transmitter works best with a supply voltage between 6 to 9 volts and draws about 10 mA. Any 9-volt battery should provide a reasonable operating life. For extended transmission times, you could use some of the newer Lithium 9-volt batteries.

The tracker transmitter can be enclosed in some extremely small packages which can be a real challenge to find during a foxhunt. Even though this is a CW transmitter, it can be easily heard with an FM receiver, so everyone can join in the fun! **73**

You may reach Carl Lyster WA4ADG at 4412 Damas Rd., Knoxville TN 37921. This article was reprinted from the July 1989 issue of ATVQ.

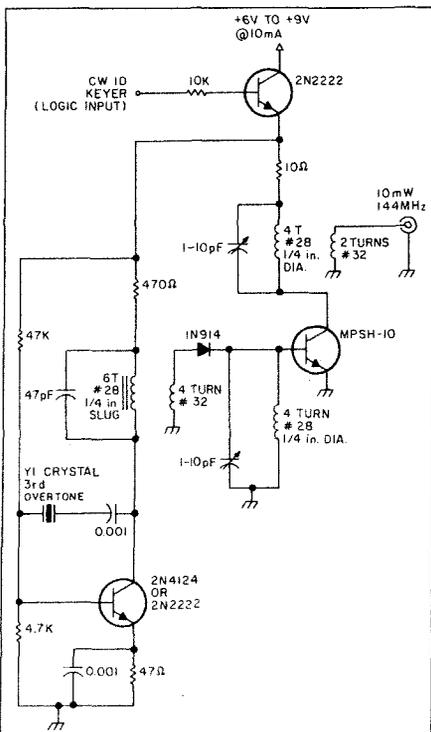


Figure 1. Schematic of the 10 mW transmitter.

Parts List

Qty.	Part Description
1	2N2222 transistor
1	2N4124 (or 2N2222) transistor
1	MPSH-10 transistor
1	1N914 diode
1	1/4" slug-tuned coil
1	Scanner crystal, Y1
1	#28 wire, short length
1	#32 wire, short length
2	1-10 pF variable capacitor
2	0.001 μF ceramic capacitor
1	47 pF ceramic or mica capacitor
1	10 ohm 1/4 watt resistor
1	47 ohm 1/4 watt resistor
1	470 ohm 1/4 watt resistor
1	4.7k 1/4 watt resistor
1	10k 1/4 watt resistor
1	47k 1/4 watt resistor
1	PC Board

Note: A blank PC Board is available for \$3 + \$1.50 postage/handling from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

business: Ten-Tec is about the only one that actually lets you speak directly to the repairman working on your particular set. "This way, nothing gets lost in the translation—and here at Ten-Tec, no translation is necessary." As I scribbled this comment down during my visit, I thought it appeared to be a friendly swipe at the competing Japanese service bench technicians.

More from the Mailbox

Robert Ballinger N6QQO backs up this claim. "On June 26 I sent to Ten-Tec a very old, and very tired, and somewhat abused by its original owner transceiver. Garland Jenkins in the repair shop was extra courteous on the telephone, and indicated the repair would be under \$75 after several items were fixed. Everyone was very polite, and everyone I talked to seemed genuinely interested in my repair problem. Three weeks turnaround time was well worth the wait when you could have seen what condition my set went back to them in, in the first place!"

George Scott W2LFX: "I would like to add my experience with Ten-Tec. In the past 13 years, I have purchased 3 different models; Triton 2, Omni-D, and now the Corsair 1. The few problems I have had were quickly corrected by the Ten-Tec service factory. Immense help was given me right on the telephone without having to send my equipment back. Ten-Tec indicated they would send me the circuit board and asked that the old board be returned within 30 days. Sending out circuit boards to replace bad boards in the field is a delight—

and they trust us as hams to return the old board without charging us for the new one."

Scott sums up his feelings, saying, "I guess they are the only ham radio company manufacturing in the U.S.A., and they're giving us the U.S.A. treatment we like."

Allen Fink K9DKJ: "Fast service! They also did some modifications to the power switch without my even having to ask." He adds, "I talked personally with Rick, who was a Paragon repairman. He was a very knowledgeable, helpful, and friendly person. I bought Ten-Tec because it is American made, and I am very happy with the transceiver and service at the factory. What a delight to be able to call the service technician who's actually working on the equipment."

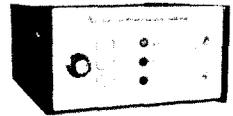
So far, Ten-Tec service has achieved the highest satisfaction among 73 readers who responded to our service survey. I was impressed with the genuine down-home attitude of everyone involved at Ten-Tec. Sid Kitrell of Ten-Tec said, "...we're delighted to learn that we will be included in your service survey. Glad you could come on down and spend some time at our service center."

Ten-Tec service technicians look for problems in a piece of equipment with genuine interest, as if it were the technician's own rig.

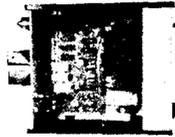
Next month, the Yaesu service department rolls out the red carpet for "Gordo" WB6NOA, and makes some late-breaking announcements about regional service centers to back up their new modern service facility in Cerritos, California. **73**

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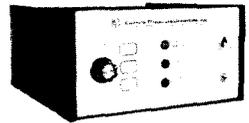
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