

Extending the Range of the Ramsey HR-4

Go further on your 40 meter receiver for less than \$4.

by Mike Gray N8KDD

I bought an HR-4 40 meter receiver kit intending the project to be a learning experience for my nine-year-old son. After getting it together, we discovered that it covered only a small portion of the 40m band. I found that it was able to tune only 64 kHz in the available 300 kHz, without adjusting the slug in transformer T2. Additionally, the maximum frequency tunable with T2's slug screwed all the way down was 7.256 MHz. This article tells you how to extend the receive coverage of the HR-4 to the whole 40m band.

Varactor Tuning

We wanted a method of tuning the whole band, without adjusting the slug in T2 and without losing much resolution (see Figure 1).

Tuning is accomplished by adjusting the reactance of a diode, as a function of reverse bias voltage. The diode supplied with the kit was a 1N4002. The diode being the easiest and least expensive component to replace, I decided to experiment with different types of diodes from my junk drawer. I didn't really want to buy a diode designed for this purpose if another would work as well.

Diode	Lower	Upper	Delta
1N4002	7.192	7.256	0.064 MHz
1N4004	7.095	7.210	0.115 MHz
1N4742	6.780	6.993	0.213 MHz
1N4744	7.006	7.161	0.155 MHz

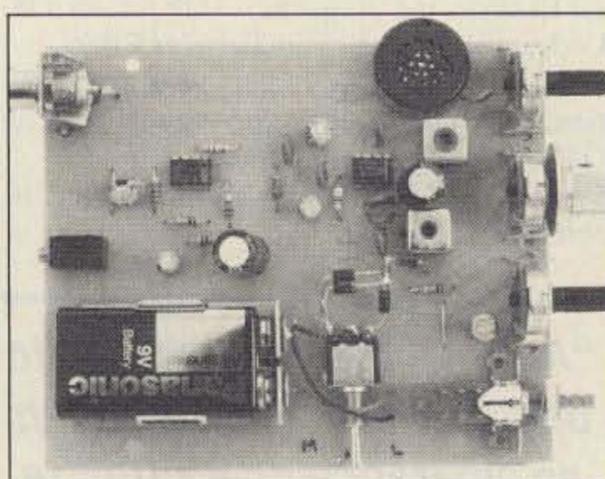
Table 1.

Experimentation

The first thing I did was insert several different diodes (one at a time), and measure the high and low frequency without adjusting the slug in T2.

From these results, shown in Table 1, I chose to replace the 1N4002 diode with a 1N4004 and listen awhile. Although the tuning range was nearly doubled by replacing the diode, and selectivity (resolution) did not seem to be a problem, it still would not tune the entire band, nor would it reach 7.300 MHz.

I had to drill a hole in the circuit board in order to screw the tuning slug in T2 down a few more turns. The slug needed only a cou-



The HR-4 40m receiver.

Results of the Parallel-Diode Experiment				
Switch	Coverage	MHz	Delta	1N4004
High	7.200	7.312	.112	one diode
Medium	7.101	7.265	.164	two diodes
Low	6.800	7.231	.431	three diodes

Amateur 40 meter band, 7.0-7.3 MHz

Table 2.

ple of turns for the oscillator to reach 7.3 MHz, and I could get the same results by lifting T2 from the board slightly before soldering.

Replacing the varactor diode increased coverage, and adjusting the tuning slug in T2 allowed tuning the upper end of the band. I still could not tune the entire band without adjusting T2. Slug adjustment is not possible when the receiver is housed in a case, and it's not easy out of the case.

Experimenting further, I found that 2 diodes in parallel reduce the oscillator frequency and extend the coverage (see Table 2). Because the oscillator was already tuned for the upper end of the band, the selection of additional diodes makes a lot of sense. And it's easy to do with a toggle switch mounted on the front panel. My son plans to use this radio in a science project, so we glued the switch to the circuit board, rather than mount everything in an enclosure.

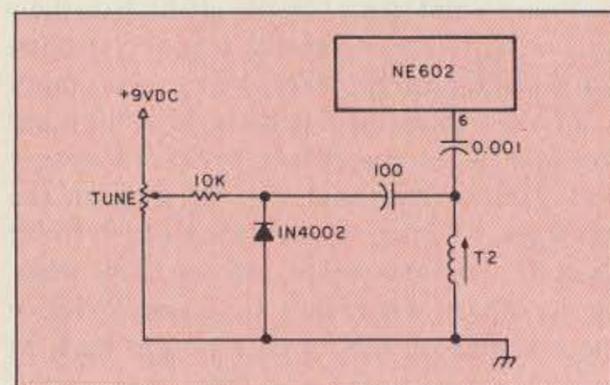


Figure 1. The original HR-4 tuning circuit.

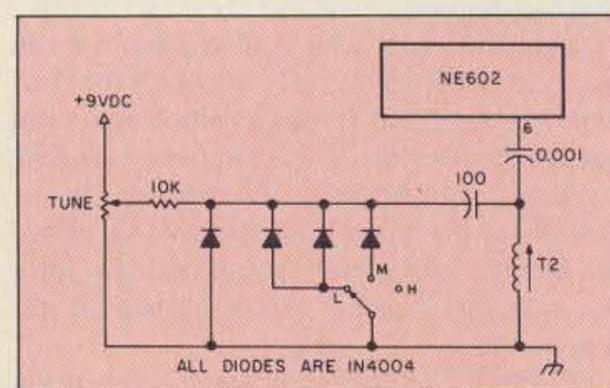


Figure 2. The HR-4 tuning circuit modified for greater coverage.

Solution

In addition to drilling a hole beneath coil T2, I modified the kit further, adding a few more diodes and a switch (see Figure 2). I chose a 1N4004 because it has nearly double the coverage of the 1N4002, and I had a whole package of them. If I weren't so lazy or cheap, I would use 1N4002 diodes for better resolution and less overlap in each band segment. I might also add more diodes in parallel in order to listen in well below the amateur band.

The kit is easy to assemble, and the circuit board sufficiently large to accommodate other components. It's a rewarding project, and provides an ideal platform for experimentation and education in radio principles.

The HR-4 receiver is available from Ramsey Electronics 2575 Baird Rd., Penfield NY 14526. The kit is reasonably priced at \$24.95, and the optional enclosure is \$12.95. 73

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