

IS THE HRO-500 THE GREATEST RECEIVER EVER MADE?

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Technical Editor

All solid-state, pinpoint dialing, and drift-free performance certainly help

ARE YOU AN SWL who has everything but still wants more? Then take a good look at the new HRO-500 solid-state communications receiver put out by National Radio Company (Melrose, Mass.). Priced at a whopping \$1295 (less speaker and optional preselector), the HRO-500 covers the entire VLF and HF spectrums (5 kc. to 30 mc.) continuously in *sixty* 500-kc. bands, and provides excellent reception of SSB, CW, FSK, and AM signals.

Frequency Determination and Synthesizer. The unit uses a single highly stable 500-kc. master crystal oscillator from which 60 crystal-stable HF oscil-



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lators inputs are synthesized. Between 5 kc. and 4 mc., the HRO-500 operates as a triple-conversion receiver. Incoming signals in this region are up-converted to 26 mc., plus the signal frequency. The synthesizer output is then used to convert these signals to the i.f. range of 2750-3250 kc., where they are mixed with the 2980-3480 kc. VFO to produce the last i.f. of 230 kc. Signals in the 4- to 30-mc. range are directly converted by the synthesizer to the tunable i.f. without the necessity for an intermediate up-conversion.

Frequency Stability. We, at POPULAR ELECTRONICS, gave the HRO-500 a thorough going over and frankly were quite impressed. For example, in our tests the HRO-500 was found to be remarkably drift-free over relatively long periods of continuous operation. The manufacturer claims a frequency stability to within 100 cycles from turn-on through any 10-minute interval, including a 30° C change in ambient temperature, and a 40-volt change in the a.c. input voltage. Typical long-range fre-

quency drift is said to be on the order of a few hundred cycles per week. You can't beat that for stability.

Antenna Requirements. Proper antenna matching was found to be very critical, and the HRO-500 does not have an adjustment to compensate for antenna mismatch. The receiver *must* have a 50-ohm antenna impedance if you are to get all the sensitivity built into the equipment. If your antenna happens to be of the high-impedance type, you can use a separate high-impedance input which is provided.

In our tests we used both a Hy-Gain Model SWO antenna and a Mosley Model ID-3 Jr. multi-trap dipole antenna, and got excellent results at frequencies down to 4 mc. Below 4 mc. a 100-foot long wire was employed which also provided good signal strength; but when the wire was switched over to the low-frequency antenna input and tuned below 500 kc., there was a noticeable degradation in receiver performance.

Tuning Very Low Frequencies. The manufacturer recommends that a preselector be used when operating at frequencies in the 5-kc. to 500-kc. range, and it didn't take us long to see why. Without the preselector, literally scores of aeronautical beacons were picked up in addition to a considerable amount of 500-kc. marine traffic. At night the 60-kc. signal from WWVB came in; and frequency-shift keying signals were heard loud and clear

Exact frequency to which the receiver is tuned is determined by adding the tuning dial indication (in kilocycles) to the synthesizer tune indication (in megacycles) in the window above the tuning dial.



The PRESELECT TUNE control is shown being adjusted for peak performance of the receiver. This control tunes three r.f. circuits in the HRO-500's front end. Left window above PRESELECT TUNE control indicates resonant frequency of preselector.



between 16 and 22 kc., probably from the U. S. Navy communications network. The manufacturer tells us that they are coming out this month with a VLF Pre-selector (Model LF-10) that will practically quadruple receiver sensitivity in the low-frequency range.

Operating the Tuning Dial. The receiver was found quite easy to tune, although it does take a bit of twiddling around with the controls to get the knack of it—tuning, that is. You will find the epicyclic tuning control (main tuning) exceptionally smooth to turn. Aside from easy tuning, another feature worth mentioning is the fact that the receiver will operate from a 12-volt d.c. source (approximately at 200 ma.) as well as from any 117/230-volt, 50/60 cycle source.

Conclusion. Is the HRO-500 the greatest receiver ever built? We don't know... but it could very well be. —30—

These receiver controls and S-meter enable the operator to (1) select upper or lower sideband without changing the frequency of the incoming signal; (2) select any one of four bandwidths; (3) eliminate interfering heterodynes; (4) select stand-by, SSB/CW, amplitude modulation or calibration mode. S-meter is calibrated in db above a 1- μ v. signal.

SPECIFICATIONS*

Frequency Range:	5 kc. to 30 mc.
Modes:	Upper Sideband, Lower Sideband, AM, CW
Frequency Stability:	Within 100 cycles in any 10-minute period from turn-on
R.F. Input Impedance:	50 ohms unbalanced; separate high-impedance unbalanced input
Receiver Sensitivity (nominal for 10 db S/N)	
AM:	2 μ v. with preselector; 25-50 μ v. without preselector from 5 kc. to 500 kc.
SSB/CW:	Better than 1.0 μ v. from 500 kc. to 30 mc.
Calibration Accuracy:	Within 1.0 kc. over entire tuning range of VFO; within 250 cycles when zeroed to nearest calibration point
Power Requirements:	200 ma. at 12 volts d.c., or 100 ma. at 24 volts d.c.; 115/230 volts, 50/60 cycles, 15 watts
Size (inches):	7 $\frac{5}{8}$ H, 16 $\frac{1}{2}$ W, 12 $\frac{3}{4}$ D
Weight:	32 pounds
Semiconductor Complement:	37 transistors; 20 diodes

*Partial listing

Epicyclic tuning dial, used to tune each 500-kc. band, is calibrated with linear 1-kc. divisions from zero to 500 kc.; it can be locked in position by DIAL LOCK at left. At right is a PHASE LOCK warning lamp which flashes when receiver synthesizer is not locked properly to a 500-kc. frequency increment.

