

# HAMTRONICS® HRA (SERIES A) HELICAL RESONATOR AMPLIFIERS INSTALLATION AND OPERATION INSTRUCTIONS

## FUNCTIONAL DESCRIPTION.

The HRA-144, HRA-220, and HRA-432 are low noise preamplifiers with helical resonator input filters. The combination of a three or four section helical resonator with a low noise bipolar amplifier provides sharp front end selectivity without degrading the front end gain of the receiver. The effect of the helical resonator is to reduce intermod and cross-band interference in critical receiver locations and in repeater installations. OSCAR mode J users can use the HRA-432 to reduce interference from their own 2 meter transmitter. Typical gain of the unit is 12 dB. 1 dB compression point is -20 dBm (22,000 uV) input. Typical noise figure of the amplifier is 1.0 dB at 2 meters, 1.1 dB at 220 MHz, and 1.2 dB at 432 MHz. However, the insertion loss of the helical resonator ahead of the amplifier does not allow the full potential of the low noise amplifier to be realized. The effect on the sensitivity of the receiver depends on how good the receiver is to begin with. The sensitivity of the receiver with the HRA unit installed may be slightly higher or slightly lower than the receiver by itself. The primary function of the HRA unit is to reduce interference; so the useable sensitivity in critical applications will be improved by eliminating desense and crossmod interference. Limits of tuning for the helical resonators is 143-150 MHz, 213-233 MHz, or 420-450 MHz, depending on model. We also have modified versions available for slightly higher frequencies. Selectivity curves below show typical response when tuned at band center. Resonators can be retuned for peak at any frequency in the tuning range.

## INSTALLATION.

The preamp is designed to be mounted next to the receiver. Two mounting holes are provided to allow the unit to be mounted with standoffs to a chassis. In repeater service, the HRA unit should be mounted in the same rf tight box as the receiver. Antenna and receiver connections are made with RCA plugs to the jacks on the board. We do not recommend that you substitute another type of connector or direct coax soldered to board. The connector type was chosen to make the shortest possible shielded connection to the board. The jack connected directly to the helical resonator is the input and the one by the transistor is the output.

B+ for the unit must be filtered + 12 to + 14 Vdc. Current demand is 5 to 10 mA. Connect B+ by soldering wire to terminal board — either insert in center of pin or wrap pin and solder. **CAUTION:** Solid state low noise amplifiers can be damaged by large voltage transients and reverse polarity. Although zener protection is provided in the unit, avoid such conditions as a matter of principle. Care should be taken especially to install reverse diodes across such inductive devices as relays operating on the same B+ line to absorb transients at the source.

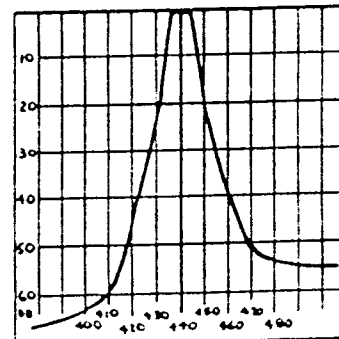
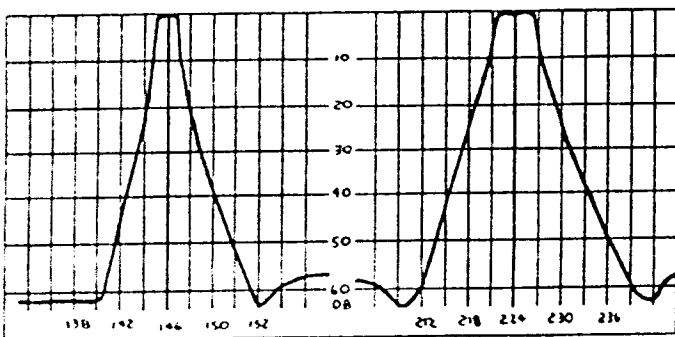
## ALIGNMENT.

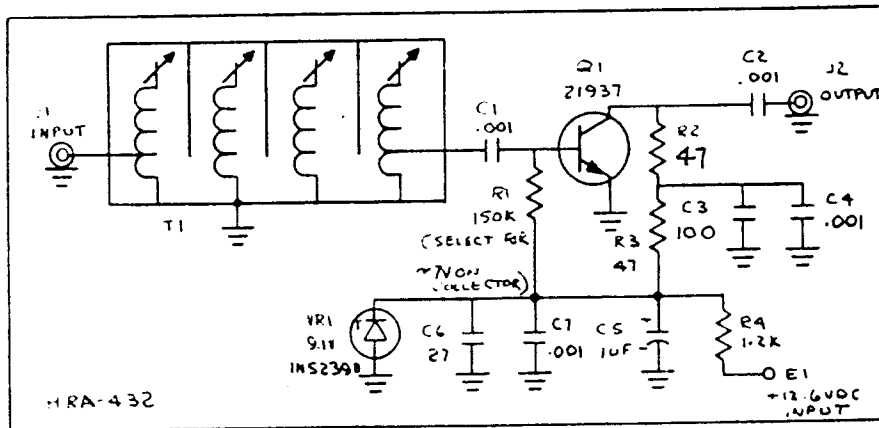
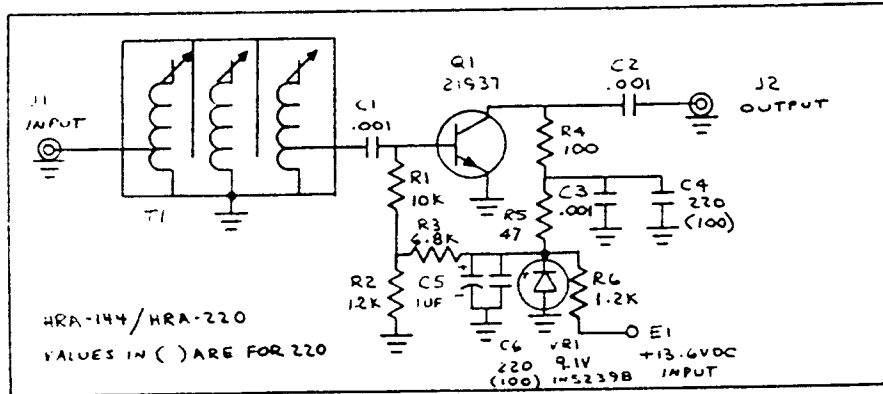
The unit was factory aligned at the center of the ham band; however, you should repeak the helical resonator screws slightly after installation, using a weak signal. Alternately tune the three or four screws until all interactions are worked out. Be careful not to tune any screw more than a few turns either way as the metal slug inside the resonator can be unthreaded from the lead screw. (If that happens, you may be able to carefully remove the affected section and reassemble the tuning slug.) The resonator normally is tuned with a sweep generator or tracking generator and spectrum analyzer for a flat response at the top. However, if it is to be used at only one frequency, such as in repeater service, all screws can be adjusted for peak at the one frequency.

## TROUBLESHOOTING.

Parts for each model are selected for optimum noise figure. When replacing parts, be sure to match parts supplied originally. You can order transistors and other special parts from us by model number and reference designator. Dc voltages at the collector and base of the unit will vary somewhat between units. However, in general, the base voltage should be about 0.7 to 0.8 V and the collector voltage should be about 6 to 8V. Note that 9.1 Volt zener diode VR1 in the collector supply circuit normally does not conduct; it provides protection against overvoltage, reverse voltage, and transients. If you measure about 9V at the collector of the transistor instead of 6 to 8V, it means that the transistor has been damaged and is no longer drawing current to cause a voltage drop in 1.2K the input resistor.

NOTE: The pc board for all vhf models has "HRA-144" printed on the copper side because the same board is used for all units.





NOTE: LONG TRANSISTOR LEAD = COLLECTOR

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