

RESTORATION OF THE EARLY HRO RECEIVER

by William B. Fizette*, K3ZJW and John E. Wiesner**, W2FFC

Restoration of early HRO receivers has interested the authors for several years, and in view of the superb mechanical design the results have been invariably satisfactory. If care is taken during the reconstruction process, the outcome will be a classic receiver, with a sensitivity of 0.1 microvolts, which can be used as the basis of a 1930's type ham station, or for general SWL use. The selectivity will not be as good as that of a modern communications receiver, but there will be plenty of signals to listen to.

The general condition of the receiver and the object of the restoration must be considered before work is started. If the end result is to be a receiver which works as well as it did when manufactured, then extensive work on the circuitry is indicated. If, on the other hand, all that is desired is a clean-looking version of the original, then mechanical restoration should take precedence.

A word of caution is in order. Generally speaking, the closer a piece of gear can be returned to its original state...with a minimum of restoration...the more desirable it is as a collectible. If the receiver being considered is one of the early (1935) HRO's, with the metal-cased S-meter, the push-button AVC, the satin-finished dial, and the black enamel chassis, such a unit will have more monetary value if it is given a careful cleaning and then placed upon the shelf. Many collectors consider a receiver which has been extensively reworked as having a decreased value; in other words, the closer to the original state, the more interest they have.

MECHANICAL RESTORATION

The mechanical restoration can vary all the way from a good cleaning to a complete rebuilding job, depending on what you have to start with and what you want to accomplish. Unless you are very lucky and have a unit which is dirt-free, you will have to at the very least take it completely apart to rid it of the accumulated dirt and grime of almost 50 years. The authors have used both approaches.

Begin by removing the tubes, carefully noting the locations, and put them in a very safe place. (You don't get them at Radio Shack if one drops!) Remove the 5 small knobs; set the main tuning (PW) dial to 250 before loosening the set screws, carefully noting the position of the tuning capacitor, and its relation to the dial at both the zero and 250 settings. Detach the S-meter and its switch (or button), the phone jacks, dial light and the 2 toggle switches. Remove the rear panel and top, and then the front and side shroud. The chassis can now be cleaned of dirt and grease using the usual solvents and procedures. (Caution: Do not

overdo the use of organic solvents on the unglazed ceramic insulating materials...it can dissolve a wax which is part of the insulator.)

If the chassis shows corrosion and/or flaking of the enamel, spot and patch if feasible. If the damage is too extensive, however, the only alternative is to bite the bullet, remove all the parts, and repaint. Do this by first removing the IF cans and the crystal filter, and then drilling out the rivets and dropping the wiring harness. Remove the main tuning capacitor, leaving the coil terminal blocks attached. (This is difficult...good luck.) Needless to say, make copious notes and sketches as you proceed.

The best surface preparation for repainting is by sand-blasting the old paint and dirt away, being careful not to penetrate the thin layer of plated copper found on some models. Use a good metal primer, followed by the proper color enamel finish. The early models had a black chassis; later ones were finished in "National gray"...look at the color of the gear box if in doubt. Spraying, especially with the fast-drying enamels, will give much better results than brushing, but home workshop painting of metal is generally a frustrating experience because of particle contamination and runs. It is almost impossible to avoid these problems unless you are an expert, and the best approach is to take the job to an automobile body shop.

Replace the wiring harness, using new hardware. The IF cans, the crystal filter box, and the tube shields should be cleaned by washing with a good detergent and 0000 steel wool, followed by a thin coat of paste wax. Replace the grommets and any dead hook-up wire, adhering to the original colors and style of wire as closely as possible. Maintain the original lead dress.

Examine the IF coils carefully with a magnifying glass and clean and test all windings for continuity. (Good windings will measure approximately 7-10 ohms.) Replace the IF cans, with the National emblem facing the front. Clean and replace the main tuning capacitor after examining and cleaning the coil contact blocks. A little care with the capacitor unit will be well worth the time spent. Remove the cover of the gear box and clean all the old grease out of the gears with lacquer thinner and Q-tips. Clean between the gears but do not remove the gears or the worm drive from the housing. Relube with white grease (Lubriplate or similar), checking to see that the anti-backlash springs are in place. Clean and lube the grounding springs on the capacitor rotors, making sure they have adequate tension.

The black crackle finish, if not too abused, usu-

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CONTROLS

Clean all controls, using a good contact cleaner with lubricant. A small amount of WD40 works very well to silence scratch pots and switches.

CONTACTS

Burnish all contacts. For the headphone jack, a telephone company burnishing tool works well if you can get one.

meter, and peak all IFs for maximum reading. If the frequency is off, the tracking will be off. The crystal may or may not be on 456 kc as it was originally, but some slight leeway is allowable. If it is too far off, a replacement crystal element may be needed.

BFO ALIGNMENT

Set the BFO dial to 8 and zero-beat the 456 kc

Conditions: HRO receiver Ser. #G-200, manufactured about 1936. Equipped with 6.3 volt tubes. Oscillator tube RCA 6C6. Room temp. 70 degrees and dial set at 50. Measured with HP #8640B signal generator starting with a cold receiver.

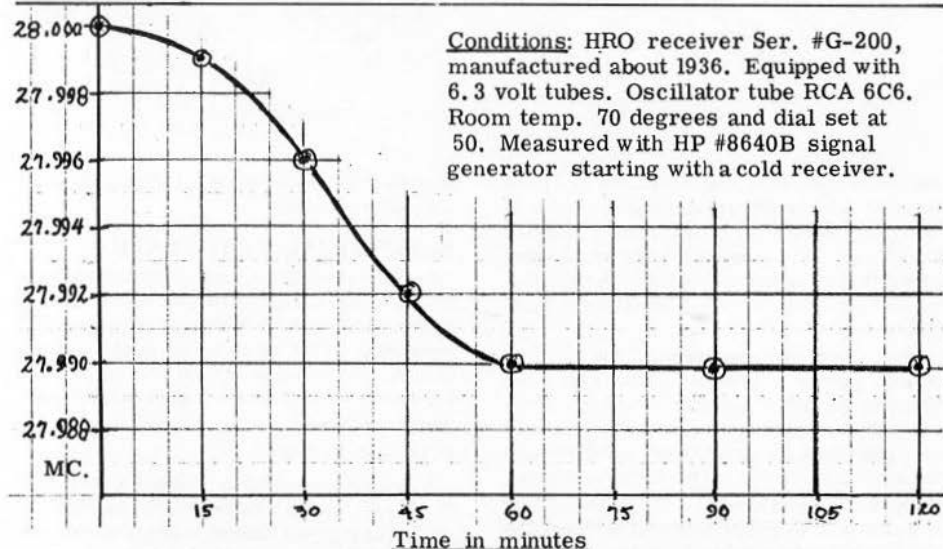


Fig. 2 Stability check of a restored HRO receiver. Drift at 28 mc. was 10 kc. over a period of one hour, after which time the receiver became stable. At 3.5 mc. the total drift was 1500 cycles occurring during the first 15 minutes after the receiver was turned on.

CAPACITORS

For best performance, all the paper by-pass capacitors should be replaced with the new Mylar type. The older (original) capacitors are invariably leaky and the receiver will suffer in performance. Change one at a time to preclude error. The two cathode 10 mfd electrolytics can be left in place for appearance, and bridged with small solid-state units.

CIRCUIT

Carefully trace all wiring for compliance with the original circuit diagram. Remove all components which may have been added by some enterprising ham seeking to improve on the original design. Replace all cracked and dried wiring. Carefully check all ground connections.

IF ALIGNMENT

With the AVC on, the RFG on full, and CWO off, loosely couple a good signal generator, set precisely to 456 kc (that's what they called it in 1935), to the grid cap of the mixer stage. Adjust the signal level to just enough to move the S-

signal with the AVC off. Note that the two capacitors in the BFO transformer are in parallel.

FRONT END ALIGNMENT

Facing the receiver, the coils and capacitors are in order, left to right, the 1st and 2nd RFs, the 1st detector, and the oscillator. Looking down at the top of the coils, the bandspread trimmer capacitors are on the left and the general coverage on the right. The coil switching screws are the reverse, with the GC on the left and the BS on the right. Be sure to get these screws in the proper slots for alignment. Following the calibration charts, set the oscillator coil first and then peak the RFs and the mixer. If the tracking is off substantially, then the full alignment procedure as detailed in Rider's Volume 8 or in the HRO manual will have to be followed. The additional tracking adjustments are reached through the back of the coil drawers.

S-METER ADJUSTMENT

Disconnect the antenna, turn off the AVC, and set the RF gain at 9½. Adjust the S-meter balancing pot until the meter reads 0.

(Continued on next page.)

LONDON MUSEUM

Ernie Heckler just returned from a London trip. On a tip from the *OTB* (Sept., p. 32), he visited Gerald Well's Museum and found a most hearty welcome and a nostalgic evening surrounded by hundreds of early receivers. This brings up the subject of the AWA British Meet next June. President Peckham is making the arrangements, which will be announced in the March *OTB*.

RADIO CLUB OF AMERICA

celebrated their Diamond Jubilee Anniversary this past November 18 in New York City. This prestigious organization was founded in 1909. Several AWA/RCA members were recognized for their contributions to radio development and history:

President Award - Stuart Meyer, W2GHK

Batcher Award - Joseph Pavak, W0OEP

Sarnoff Award - William Halligan, W9AC

We note with special interest and pride that an AWA member again receives the historical Batcher Award - 7 times in 8 years!

NATIONAL HRO RECEIVER

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It is important that the plate circuit of the output tube be complete before power is applied, with either an output transformer or a jumper inserted in the tip jacks, to preclude damage to the output tube.

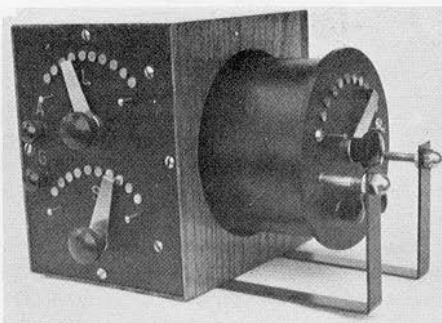
As a matter of interest, one of the receivers which had been restored following the above procedures was checked for drift, since this was a problem of early HROs. The results are shown in Figure 2. It should be emphasized that the restored receiver had no added components such as modern temperature compensating capacitors which were not in the original design. The favorable results are probably due to the use of high quality replacement components as well as careful attention to detail, such as proper chassis grounds.

Finally, a word of caution is in order on the plug-in coil drawers. If you are lucky, you will have the coils which were originally assigned to your particular receiver. If not, replacement drawers can often be located, including many from surplus receivers manufactured at a later date. However, some of the later units may not be physically and electrically compatible; careful checking, including alignment and tracking procedures, will tell if the units will perform properly.

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EXCELLENT REPLICA



The above loose-coupler is one of the several replicas currently being made by Bob Herbig, W6ME. This particular model is an early Clapp-Eastham coupler. As noted, it is well constructed and closely follows the original design. The box is made of oak with coils tapped in the traditional manner. Although small compared to some, it is one of the better couplers and would be the major component in making an early crystal set. As a hobby, Bob makes other types too. If interested in acquiring one, send SASE to:

Bob Herbig, W6ME

4178 Chasin Street

Oceanside, California 92054

DID YOU KNOW-----?

that Benjamin Franklin was wrong when he developed the lightning arrestor rod with a sharp point.... Recent experiments have definitely proven a blunt point at the tip of the rod attracts lightning far better than a point. In fact, something resembling a doorknob, as high as possible, is the best protection.

Statistics tells us there are 2000 thunderstorms in progress around the world at any given time! The Empire State building is struck on the average of 23 times a year and 77 people were killed last year by lightning.....

Change In Address?

All address changes and dues MUST be sent to: Bruce Roloson, Box 212
Penn Yan, New York 14527
