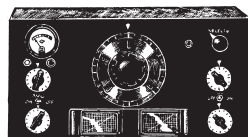


# THE COMMUNICATIONS RECEIVER



EDITED BY **WILLIAM FIZETTE, W2DGB**, RR 1, BOX 1634, HENRYVILLE, PA 18332  
E-MAIL: w2dgb@arrl.net. PLEASE INCLUDE SASE FOR REPLY.

## The Federal Type RC-123 Coast Guard Receivers

In the frantic months leading up to World War II, as the United States became the “great arsenal of democracy,” the U.S. stepped up its efforts to produce as much military equipment as fast as possible. Shipping to deliver the goods to Europe became a highest priority, and communications were part of the maritime package.

This little receiver falls into that category, with two order dates of 4 and 5 February, 1942. Designed for both shipboard and fixed station use, and built by Federal Telegraph in Newark, NJ, it covers the range of 15 to 650 kHz in four bands. The RC-123 is identical to the Mackay Radio 128AZ. While this particular set, the RC-123, is listed for Coast Guard use, it is similar in design and appearance to those used in other shipping applications.

### General Description

The RC-123/128AZ receivers are of tuned-radio-frequency design with one RF stage, a regenerative detector with a separate oscillator tube, and two AF amplifier stages. The AC-DC design can be configured to work on a variety of power sources, including DC or an AC line as well as from batteries. With only six tubes, the



*The Federal Type RC-123.*

power requirements are quite sparing.

With battery operation, the “A” battery is 6.3 V with a drain of 1.9 amperes. The “B” supply drain is 8 mA at 90 volts. With AC as a source, the power consumption is 36 watts, or about 400 mA, the total for both the plate and heaters. Switches on the front panel enable the operator to change immediately to batteries for emergency operation in case of line supply failure.

As another example of emergency redundancy, there is also a front-panel switch to change immediately to an emergency antenna in case the main antenna fails. At the other end, the audio output is the standard 600 ohms impedance, with an output power of 70 to 140 milliwatts.

### Circuit Details

Two features of this receiver circuit are of interest. First, the built-in power supply for operation from either AC or DC lines has both sides of the supply filtered so that the receiver may operate from a DC source having either a positive or negative ground. When the plate-supply switch is in the LINE position, the supply is floating with respect to the chassis, except for some by-pass capacitors.

For use with an AC line, a separate filament transformer is mounted inside the cabinet, con-



*Cabinet Interior—Filament transformer at upper left (see text).*

nected to the terminal strip on the back wall. This transformer must be disconnected when the power source is switched to DC.

The second interesting feature is the use of a regenerative detector with a separate oscillator, an innovation in regenerative receiver design which was documented in *QST* a number of times during the 1930s, beginning with well-known BC-348 designer H. A. Robinson's article in Feb. 1933, followed by De Cola in December 1934, and then Talbert in February 1936.

The concept also was incorporated in superhets to increase sensitivity, as for example the George Grammar receiver presented in *QST* for April, 1936. The Talbert article presents an extensive discussion of the idea, and is recommended reading for those interested in increasing stability and sensitivity in regenerative receivers.

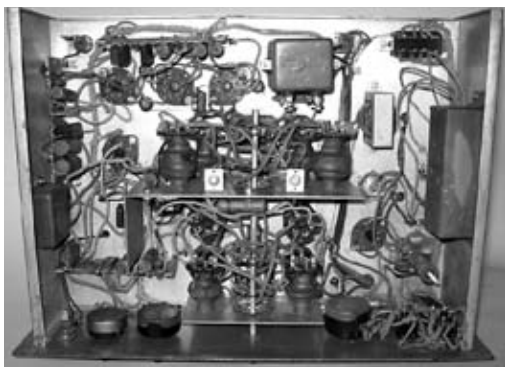
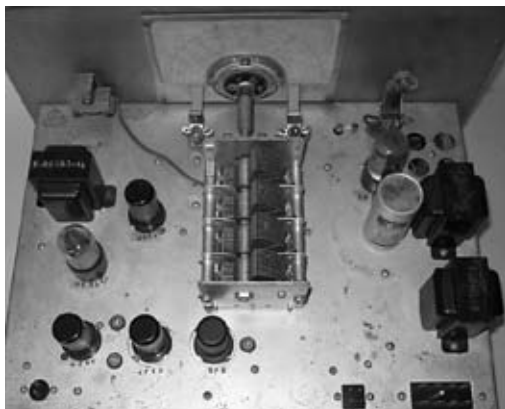
The circuit in the RC-123 differs from those mentioned above in that the regeneration is accomplished in the triode oscillator tube, a 6J5, and the signal then coupled into the detector, a 6SJ7. The end result, however, is that there is regeneration in the detector, which is run at optimum conditions within fixed parameters, the variables imposed by the regeneration process taking place within the separate triode. A similar circuit is shown on p. 152 of the 1945 *Popular Science Monthly* publication *Radio for the Millions* ("Midget Radio Uses Two Detectors").

## Physical Description

The cabinet is totally enclosed, without a lid, and with the only access to the inside through a few small, dedicated, rubber-grommeted access holes in the rear. Mounted inside on the rear wall are several terminal strips which are attachment points for a 6.3VAC filament transformer for AC operation as well as interconnections for three Jones plugs which connect to the radio chassis. The cables are long enough to enable servicing when the chassis is out of the cabinet.

The overall quality of construction is quite good, considering the simplicity of the design. Three circuit boards hold most of the passive components, and to minimize microphonics, the detector and oscillator tubes are mounted on a small sub-panel, suspended from the chassis by rubber mounts.

The back-lighted National ACN dial gives good tuning control, and components in general seem to be of good quality. The four-gang tuning capacitor, manufactured by the Radio Condenser



*Neat component layout and wiring is evident above and below the chassis.*

Co., appears to be a specific design for this receiver. Considering that the four tuned circuits had to track across each of the four frequency ranges, with only an antenna trimmer to peak signals, quality in both design and manufacture seems obvious.

The nine front panel controls are: the main tuning dial with frequency readouts; the range selector switch; the antenna switch and antenna trimmer; RF gain; regeneration; AF gain; power and battery switches; and a phone jack.

The writer was fortunate in obtaining the original manual from the AWA member who sold the receiver (name unfortunately forgotten—if he reads this column, he has the writer's sincere thanks). It is written in standard military format, and lists almost every information detail that could be needed. The circuit diagram is on a large fold-out, as is the wiring diagram, showing the actual wiring interconnections. Considering that most wiring is cabled, and the colors are faded with time, the latter can be invaluable to a present-day service technician.

## Performance

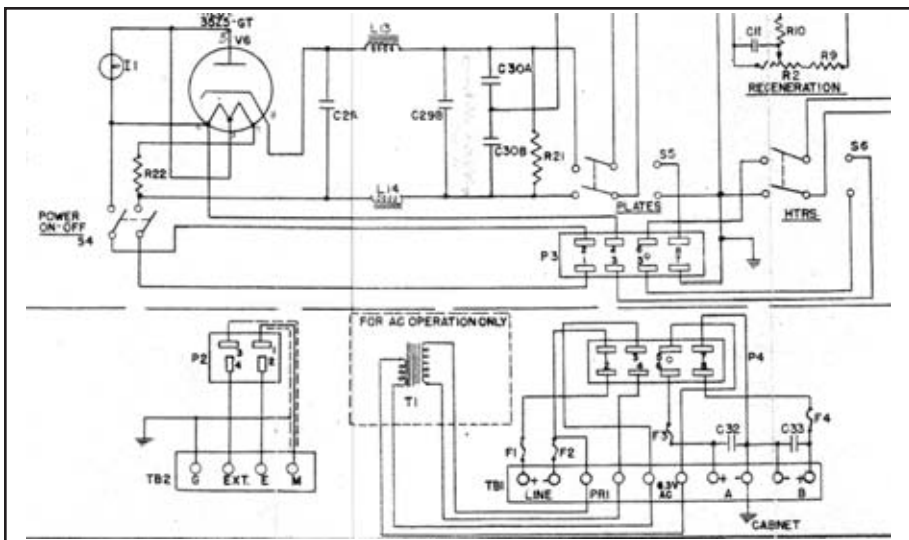
For a couple of reasons the writer elected to leave this receiver in the "as is" condition. First, the restoration to meaningful working condition would involve replacing most or all the old 1940s paper by-pass and electrolytic capacitors, and while this is certainly do-able, it would remove this set from the shrinking pool of original production radios.

The writer feels that this is important from a historical point of view, as something should be left for future historians to view. Paraphrasing Lincoln, we are heirs to an estate of early wireless technology, and as heirs we have obligations to preserve as much of it as possible for the next generation of owners. Second, there is little use for the frequencies covered by this radio, unless

you are into LF radio, so why bother?

On the other hand, since this is an AC-DC set, I did give it a try. I fed it with a Variac after first determining that the B+ line did not show a short, and then slowly brought the voltage up to about 115 VAC. Unfortunately the internal power supply was inoperative, and considering the time and work involved, I didn't pursue it further.

Finally, this little receiver, while fundamentally simple, combines some interesting and unique circuitry in the one package which, from all indications, performed reliably in a variety of locations, often under adverse environmental conditions. Perhaps some readers can contribute personal recollections from those times. As one example of reader feedback, refer to the Letters column in the front of this *Journal* issue. ☐



RC-123 power supply and power switching circuitry (see text).

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some bench work and replacement of both transformer windings with replacement parts from Antique Electronics (1), I brought the set to life using bench power supplies.

With a 50-foot wire up into the sycamore tree in my back yard, I brought in local stations on my 'phones using the short winding on the series-tuned antenna tank. Looks like the full winding would tune to the longer-wave stations of the period. Regeneration is plenty smooth using the variometer control. I'm estimating the "B" and "C" voltages shown in the schematic from my bench results and from the 199 characteristics in the tube manual.

I like the sets in my collection to be operable, so I made a line-operated supply to fit into the battery compartment and will soon put together a matching two-tube amplifier to run an external speaker. This is about the most primitive set in my collection. With its minimum parts count and the early tubes, it's one I'll hold on to with satisfaction. ☐

## REFERENCE

- (1) Part No. P-T431, replacement winding for A-53 type interstage transformer ( $\frac{1}{2} \times \frac{1}{2}$  inch core); Antique Electronics Supply, Tempe, AZ; <http://www.tubesandmore.com>