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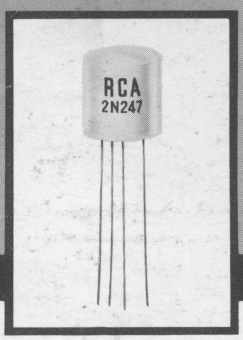

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A TWO-TRANSISTOR REGENERATIVE RECEIVER

For 80 and 40 Meters

By E. M. Washburn, W2RG*

The operating enjoyment on 80, 40, and 15 meters provided by the transistorized QSO-getter described in my article for the July, 1957, issue of HAM TIPS prompted the construction of a companion transistor receiver.

It seemed desirable that the receiver be a superheterodyne, and literature was searched for a suitable circuit. Although several promising circuits were found, they all had the same shortcoming: they required more transistors and other components than would fit readily into a cabinet as small as the one used for the transmitter. The July, 1957, issue of QST, however, contained a description of a transistorized regenerative "reflex" receiver built by W6WXU. It seemed to provide the answer. This receiver used only two transistors (a 2N107 and a 2N170) and two 1N60 diodes, and was built in a case small enough to be held in the palm of one hand.

A breadboard receiver was constructed, using the basic circuit of W6WXU's receiver with modifications to suit the components on hand. Two RCA-2N247 p-n-p DRIFT FIELD transistors were used in place of the 2N107 and 2N170, the two diodes were changed to type 1N34's, and a B & W Type 3015 Miniductor was used as the antenna coil in place of the hand-wound ferrite-rod antenna used in the original. A small output transformer with primary and secondary connected in series was used instead of the 2-henry choke.

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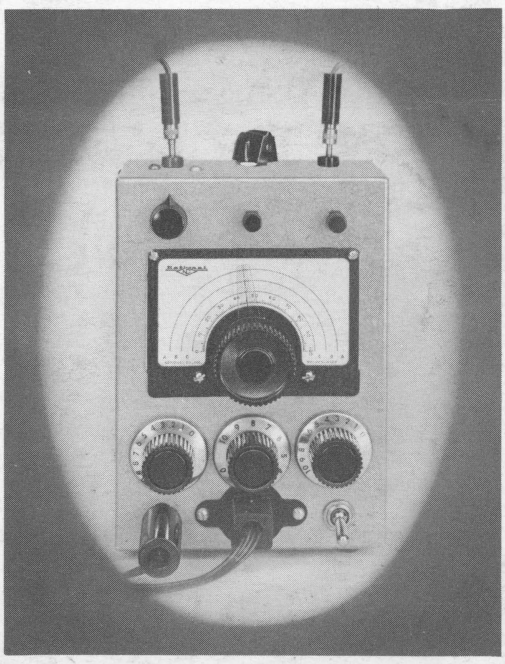
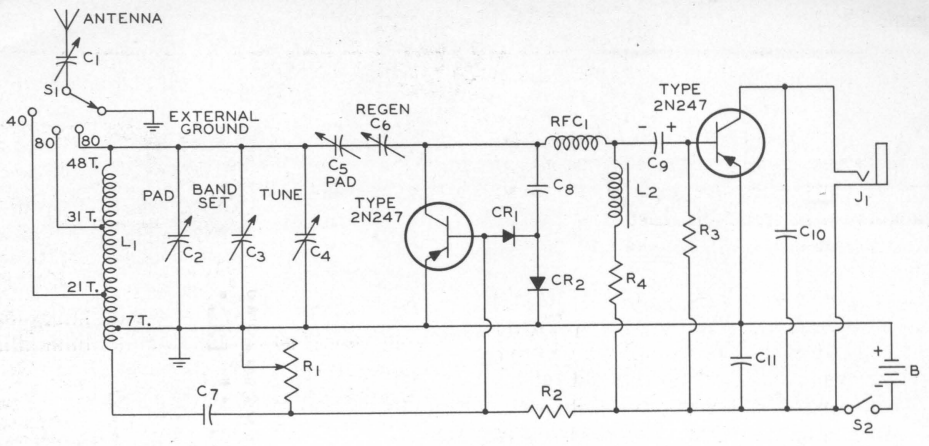


Front view of W2RG's receiver. The two transistors are mounted externally just above bandspread tuning dial.

This breadboard model worked so well that it was rebuilt in a 7- by 5- by 3-inch Minibox, as shown in the accompanying photographs. The receiver covers 3.3 to 8.5 Mc in three ranges which can be adjusted by means of the bandsetting capacitor to provide continuous coverage or separate bandspread coverage



B_1—Battery, 6 volt, heavy duty (RCA-VS009 or equiv.)
C_1—0-50 $\mu\mu$f, variable
C_2—7-45 $\mu\mu$f, ceramic variable (Erie type N500 7-45 or equiv.)
C_3—0-75 $\mu\mu$f, variable
C_4—0-20 $\mu\mu$f, variable
C_5—1.5-7 $\mu\mu$f, ceramic variable (Erie type NPO 1.5-7 or equiv.)
C_6—0-50 $\mu\mu$f, variable
C_7—270 $\mu\mu$f, mica
C_8—220 $\mu\mu$f, mica
C_9—8 μf, electrolytic
C_{10}—0.01 μf, ceramic disc
C_{11}—0.01 μf, ceramic disc
CR_1, CR_2—Crystal diode, type 1N34 or equiv.
J_1—Phone jack, open circuit
L_1—48 turns, B & W Miniductor #3015, tapped as shown
L_2—AF choke, 2 henrys
R_1—Bias control, 10,000 ohm potentiometer
R_2—220,000 ohms, ¼ watt
R_3—270,000 ohms, ¼ watt
R_4—270 ohms, ½ watt
RFC_1—2.5 millihenrys, rf choke
S_1—Wafer switch, single-pole, four position
S_2—On-off switch, SPST

Figure 1: Schematic diagram and parts list of W2RG's two-transistor 40- and 80-meter receiver.

for the upper and lower halves of the 80-meter band and for the 40-meter band.

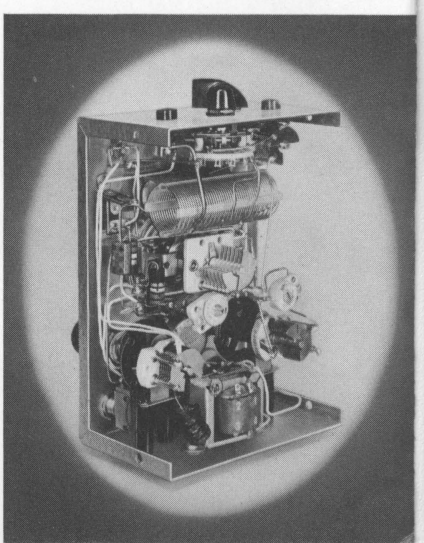
Circuit Description

The circuit of the receiver is shown in Figure 1. The rf section includes the antenna coil L_1; the padding, bandsetting, and tuning capacitors C_2, C_3, and C_4, respectively; the first type 2N247 transistor; the two crystal diodes, and the regeneration-control capacitors C_5 in series with C_6. The remaining components comprise the "reflex" and af-amplifier portions of the receiver. R_1 controls the bias on both transistors. According to the description of W6WXU's receiver in QST, the first transistor acts as a regenerative amplifier feeding the two series-connected crystal diodes. The af voltage appearing across the grounded diode is fed back to the first transistor (through the base), amplified, and reamplified in the second transistor. We have not questioned this very brief explanation because one thing is certain: the receiver works beautifully.

Construction Details

The arrangement of the major controls and components is shown on page 1 in the front view of the completed receiver. From left to right across the top of the cabinet are the antenna jack, band-selector switch (S_1), and ground-connection jack. Above the tuning dial are the antenna-trimmer capacitor C_1, and the two RCA-2N247 transistors. Just below the dial are the band-setting capacitor C_3, the transistor-bias control R_1, and the regeneration control C_6, and across the bottom are the phone jack, power-supply connector, and ON-OFF switch S_2.

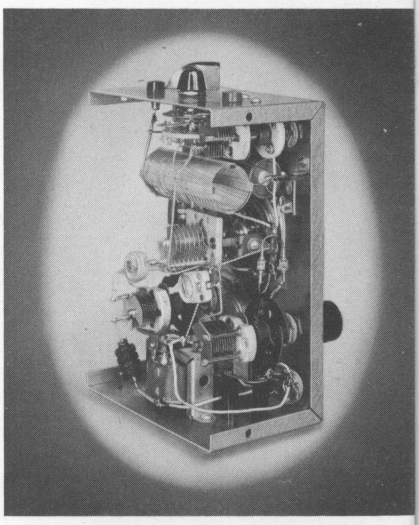
The photographs on pages 2 and 3 show the internal construction. Hand-capacitance effects in tuning are eliminated by the National dial for the band-spread capacitor, and by the use of flexible couplings and bakelite extension shafts for the antenna-trimmer, band-setting, and regeneration-control capaci-



Inside view of the receiver, showing placement of major components.

tors. To assure mechanical stability, the antenna-trimmer, band-setting, and regeneration-control capacitors are rigidly mounted on brackets and stand-off insulators, and smaller components are supported by heavy bus-bar wire.

All 48 turns of the B & W Type 3015 Miniductor are used for the antenna coil, L_1. Turns adjacent to the two tap points and the ground connection are depressed to permit clean soldering of connections at these points without danger of shorted turns. The electrolytic capacitor, band switch, flexible couplings, and resistors shown in the photographs are larger than necessary, because I simply used whatever parts were at hand.



Inside view of the receiver, showing mounting of the two-crystal diodes.

Operation

The only power supply needed for the receiver is a 6-volt battery, which may be the same as that used for the transmitter. Although an antenna may not be necessary, a good external ground connection is essential to eliminate phone-cord body-capacitance effects. If an antenna is used, it should be only a very short length of wire—not the transmitting antenna—and should be very loosely coupled to the antenna coil.

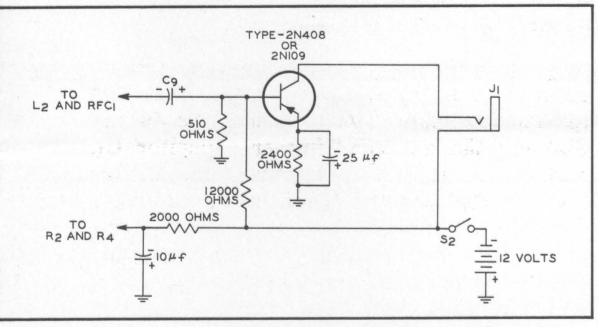


Figure 2: Modified output circuit for operation of W2RG's receiver with 12-volt dc supply.

The receiver performs best on CW signals. For most stable performance, the bias and regeneration controls should be advanced well beyond the threshold of oscillation. For very weak signals, it will be necessary to work closer to the oscillation point. For phone signals, as in any regenerative receiver, the regeneration control should be set just below the oscillation point. Weak phone signals, however, are difficult to copy.

High-resistance headphones should not be used with the receiver because they cause motor-boating and make it difficult to maintain smooth control of oscillation. Phones having a dc resistance of about 135 ohms, such as the Trimm Z-300, are satisfactory and provide plenty of volume on most ham signals, even with a 6-foot antenna.

To avoid burnout of the transistors, it is absolutely essential that the bandswitch be set in its "EXTERNAL GROUND" position before transmitting, and whenever the receiver is not being used. If even a moderately high-power transmitter is being used in the vicinity of the receiver, the receiving antenna should be disconnected.

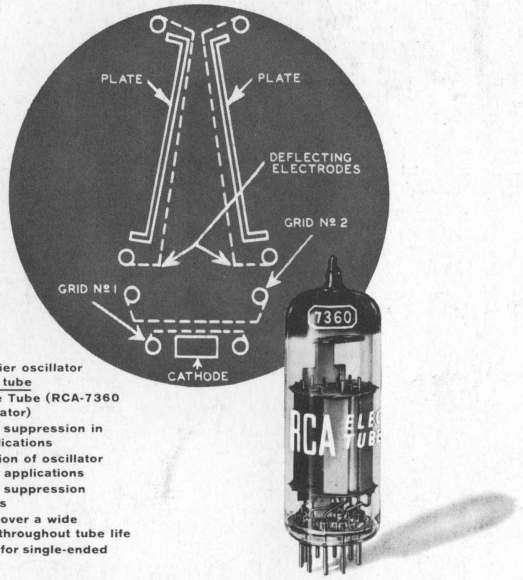
When the receiver is first turned on, its tuning drifts slightly, and both the bias and regeneration controls may require readjustment. During transmitting periods, the receiver frequency tends to move upwards, so that when you turn it over to the other chap and throw the band-selector switch to either the 40- or 80-meter band, you have to retune slightly in the downward direction.

Nevertheless, the receiver has proved to be well worth the effort and expense that went into its construction. With its companion 300-milliwatt transistorized transmitter, it has provided many two-way QSO's over distances up to 1,000 miles, and many European ham stations on 40 meters have been copied during evening hours.

Modifications

If operation from a 12-volt battery is desired, the circuit should be modified as shown in Figure 2, and either an RCA-2N408 or -2N109 transistor used in place of the 2N247 in the output stage of the receiver.

New RCA Beam-Deflection Tube... simplifies SSB!



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RCA-7360's are now available at your RCA Industrial Tube Distributor. For a technical bulletin on RCA-7360, see your RCA Industrial Tube Distributor. Or write RCA, Commercial Engineering, Harrison, N. J.

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