The Novice RS-3

This three-tube regenerative superhet for beginners is used by permission of *QST* magazine, July 1963.

For novice work, this receiver will outperform any ready-built job costing twice as much—even if all the parts are bought right off the dealer's shelves. But at least half the cost can be saved if you've got an old TV chassis to dismantle. With such junk-box contributions, you'll have a thoroughly practical Novice receiver for less than $20.

Getting the Parts

It is easy to obtain a ready-made junk box by getting an old TV set. The sets can be obtained from TV servicemen for a few dollars or, in some cases, just for the asking. You'll find the majority of parts for this receiver can be found in an old set.

A beginner usually doesn't know what can be substituted for what if he doesn't happen to have a part of the same value shown in the circuit.

When he looks at the parts list, at the values on the various components, a beginner may assume that he *must* have *those values* on his components before the unit will work. There is quite a wide range of values for certain components that will work; and to make it easier for the beginner, we'll list them.

The maximum plus-B voltage in this receiver is between 130 and 140 volts. This means that *any* capacitor with a working voltage higher than 140 volts could be used. There is an exception to this in the case of the audio-tube cathode bypass capacitors C_9 and C_{10}. Any working voltage over 25 volts is satisfactory for these two units.

On all the electrolytic capacitors (the ones with the polarity marked on the circuit) the *minimum* value is given. For example, in the power-supply filter section, C_{13} and C_{14} are shown as 30-μf each. Any value greater than this can be used.

You may find that when you strip down an old TV set that you'll have some 40-μf or even 60-μf capacitors. They can be used for C_1 and C_{14} as long as their working voltage is over 140 volts. Any capacitance value higher than those specified can be used.

In your old TV set you'll find a dual potentiometer with an AC switch on the back. This is the unit used for S_1, R_3, and R_5. Originally, this was the volume and brightness control on the set. The brightness control was a variable resistor of 50,000 ohms and the volume control, 1 megohm.

The volume control value is a fairly standard one in TV sets, but the brightness control may be as low as 5,000 ohms. This value would be too low to use for the regeneration control. However, any value between 25,000 to 100,000 ohms should work. In such a case, the value of R_2 could be changed accordingly. More about this later.

One thing more about these controls. The ganged unit is suggested because it is convenient. However, there is no reason why the controls can't be separate if you don't find a ganged unit to fit the values. It will mean a slightly different panel arrangement, but it will work as well.

All the fixed-value resistors should be available in good supply from the TV set. However, on the ceramic-type bypass capacitors you may find only 0.001 μf or 0.01 μf. We have specified 0.002 μf at C_5. In this case, all you need do is connect two 0.001-μf units in parallel to get 0.002 μf. Note that C_{15} and C_{16} are 100-pf mica capacitors. Any value between 100 pf and 470 pf should work fine.

The power-supply filter choke, L_6, is a 7-henry, 50-ma. unit. However, the average TV choke is about 2 hy, and this will be adequate.

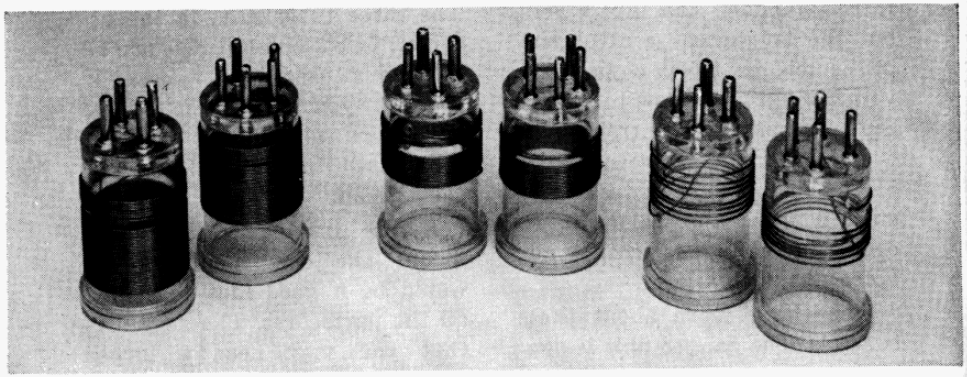
You should be able to use the output transformer, T_2, and speaker from the TV set, assuming you get a speaker with it. The three tubes used in the receiver, 6U8's and a 6AQ5, are all commonly used in TV sets. If the set you get doesn't have them, you may be able to get some used tubes from the TV serviceman.

Before getting a chassis to mount the components on, it would be a good idea to collect all the parts first. The reason is that you may need a larger chassis than the one we used, which is aluminum and is 9 x 7 x 2 inches. Some of the components from the TV set may be larger than those we used and you would therefore need a larger chassis.

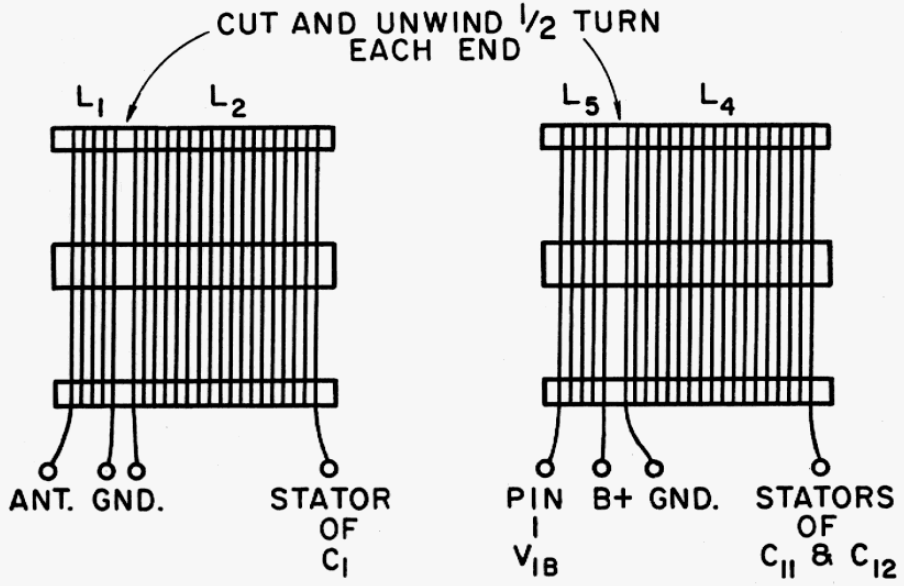
Unless you are a fairly experienced radio builder, you will need quite a bit of help in assembling this receiver. It would be well to take the schematic and the parts list to your counselor and get his advice about parts as well as assembly.

If you decide to wind your own coils, he will be particularly helpful. They are tricky, although not as complicated as they sound, and will not require very many turns of wire.

Do not be confused by the schematic, which shows the 6U8A tubes as though they were cut in half. They are only drawn this way to make an orderly diagram and to relate them better to the circuits involved. The RS-3 uses interchangeable coils that



plug in like a radio tube to cover different broadcast bands. They are easily wound on ready-made plastic forms available at parts suppliers. Use the specifications on page 35, and the winding guide below. Be careful in soldering the wires in the coil-form pins. The polystyrene forms will soften if heat is applied to the pins for a short period.



Instead of the coil forms, you could get some old radio tubes and carefully break the glass away. Then, dig out the material in the base of the form that holds the glass tube. The tube bases can be used to hold the coils by cementing them to the tube bases to hold them in place.

Table I

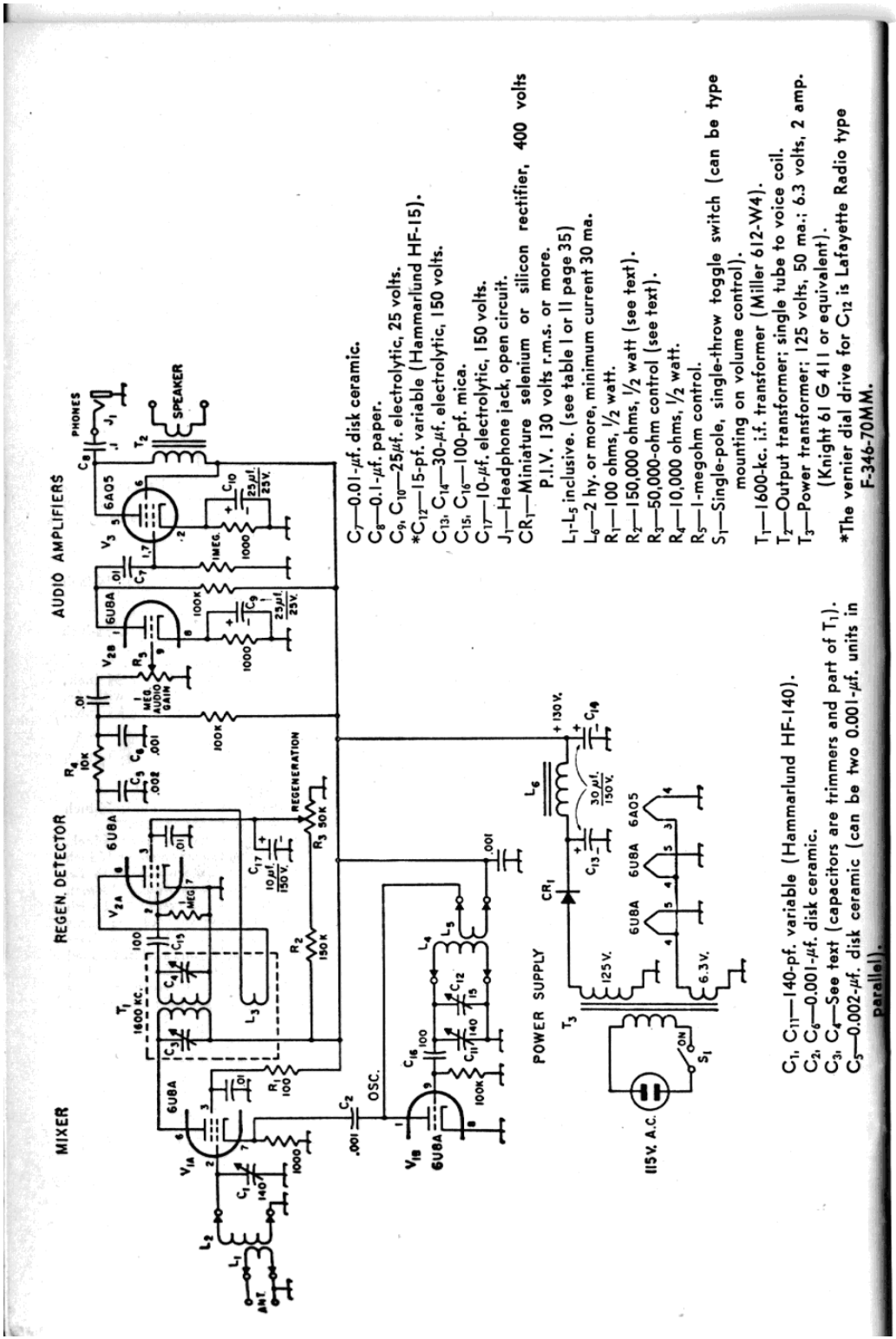
Mixer Range	Coil Data
2.5 to 6.4 Mc.:	L_1 — 10 turns No. 24, 1-inch diam., 32 turns per inch. L_2 — 46 turns No. 24, 1-inch diam., 32 turns per inch. (L_1 and L_2 made from a single length of B&W Miniductor 3016)
6.0 to 16 Mc.:	L_1 — 6 turns No. 20, 1-inch diam., 16 turns per inch. L_2 — 14 turns No. 20, 1-inch diam., 16 turns per inch. (L_1 and L_2 made from a single length of B&W Miniductor 3015).
16 to 32 Mc.:	L_1 — 2 turns No. 20, 5/8-inch diam., 16 turns per inch. L_2 — 8 turns No. 20, 5/8-inch diam., 16 turns per inch. (L_1 and L_2 made from a single length of B&W Miniductor 3007).
Oscillator Range	
2.9 to 5.1 Mc.:	L_4 — 32 turns No. 24, 1-inch diam., 32 turns per inch. L_5 — 10 turns No. 24, 1-inch diam., 16½ turns per inch. (L_4 and L_5 made from a single length of B&W Miniductor 3016).
5.0 to 12 Mc.:	L_4 — 17 turns No. 20, 1-inch diam., 16 turns per inch. L_5 — 4 turns No. 20, 1-inch diam., 16 turns per inch. (L_4 and L_5 made from a single length of B&W Miniductor 3015).
10 to 22 Mc.:	L_4 — 7 turns No. 24, 1-inch diam., 16 turns per inch. L_5 — 3 turns No. 24, 1-inch diam., 16 turns per inch. (L_4 and L_5 made from a single length of B&W Miniductor 3015). L_3 — 7 turns No. 20, 5/8 inch diam., 16 turns per inch (B&W Miniductor 3007).

The coil forms used are Allied Radio No. 24-4P (four prong) for L_1-L_2, and 24-5P (five prong) for L_4-L_5. Different type forms are used so coils cannot be incorrectly plugged in.

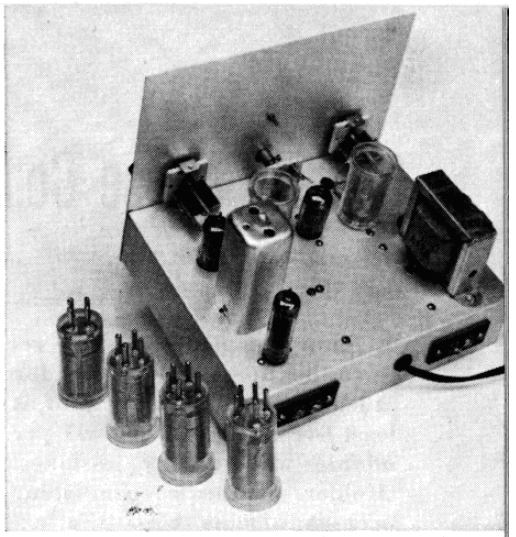
TABLE II

Using the same type of coil forms listed in Table I, you can save additional expense by winding your own coils. All of the coils listed below are made with No. 22 enameled wire.

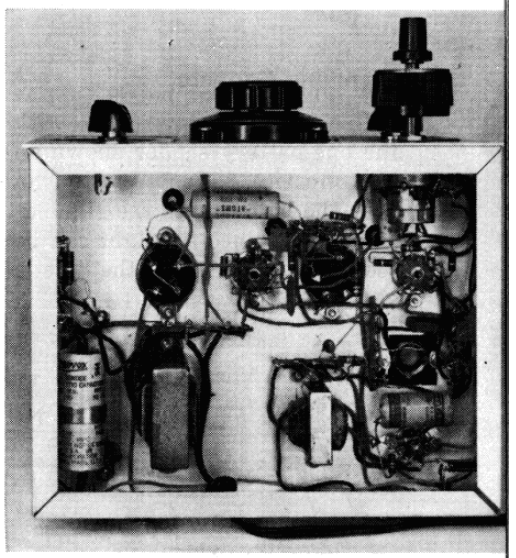
Mixer Range	*Coil Data*
2.5 to 6.4 Mc.	L_1 — 8 turns, close wound; 1/8-inch spacing between L_1 and L_2. L_2 — 35 turns, close wound.
6.0 to 16 Mc.	L_1 — 4 turns, close wound; 1/8-inch spacing between L_1 and L_2. L_2 — 13 turns, close wound.
16 to 32 Mc.	L_1 — 2 turns, spaced over 3/8 inch, with one turn interwound with L_2. L_2 — 7 turns, spaced over 5/8 inch.
Oscillator Range	
2.9 to 5.1 Mc.	L_4 — 28 turns, close wound; 1/8-inch spacing between L_4 and L_5. L_5 — 7 turns, close wound.
5.0 to 12 Mc.	L_4 — 16 turns, close wound; 1/8-inch spacing between L_4 and L_5.
10 to 22 Mc.	L_4 — 6 turns spaced to cover 5/8 inch. L_5 — 2 turns spaced to cover 3/8 inch with one turn interwound with L_4. L_3 — 7 turns, close wound, 5/8-inch diameter. This coil can be tied with thread or string to hold the turns together and then slid over the base of the i.f. transformer and positioned to give regeneration as described in the text. Once the correct position is determined it can be paraffined in place.



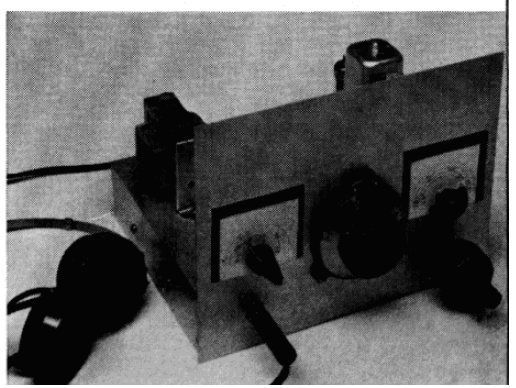
C_1, C_{11}—140-pf. variable (Hammarlund HF-140).
C_2, C_6—0.001-μf. disk ceramic.
C_3, C_4—See text (capacitors are trimmers and part of T_1).
C_5—0.002-μf. disk ceramic (can be two 0.001-μf. units in parallel).
C_7—0.01-μf. disk ceramic.
C_8—0.1-μf. paper.
C_9, C_{10}—25μf. electrolytic, 25 volts.
*C_{12}—15-pf. variable (Hammarlund HF-15).
C_{13}, C_{14}—30-μf. electrolytic, 150 volts.
C_{15}, C_{16}—100-pf. mica.
C_{17}—10-μf. electrolytic, 150 volts.
J_1—Headphone jack, open circuit.
CR_1—Miniature selenium or silicon rectifier, 400 volts P.I.V. 130 volts r.m.s. or more.
L_1-L_5 inclusive. (see table I or II page 35)
L_6—2 hy. or more, minimum current 30 ma.
R_1—100 ohms, ½ watt.
R_2—150,000 ohms, ½ watt (see text).
R_3—50,000-ohm control (see text).
R_4—10,000 ohms, ½ watt.
R_5—1-megohm control.
S_1—Single-pole, single-throw toggle switch (can be type mounting on volume control).
T_1—1600-kc. i.f. transformer (Miller 612-W4).
T_2—Output transformer; single tube to voice coil.
T_3—Power transformer; 125 volts, 50 ma.; 6.3 volts, 2 amp. (Knight 61 G 411 or equivalent).
*The vernier dial drive for C_{12} is Lafayette Radio type F-346-70MM.



This simply arranged top view with its clean and simple appearance hides a powerful and versatile RS-3 receiver. Notice two coils are plugged in with four alternates ready for duty.



The "works" underneath are neatly arranged and wired for easy inspection and repair.



The attractive panel gives the receiver a professional and finished look.