Building Kit Generator Solves Design Problems

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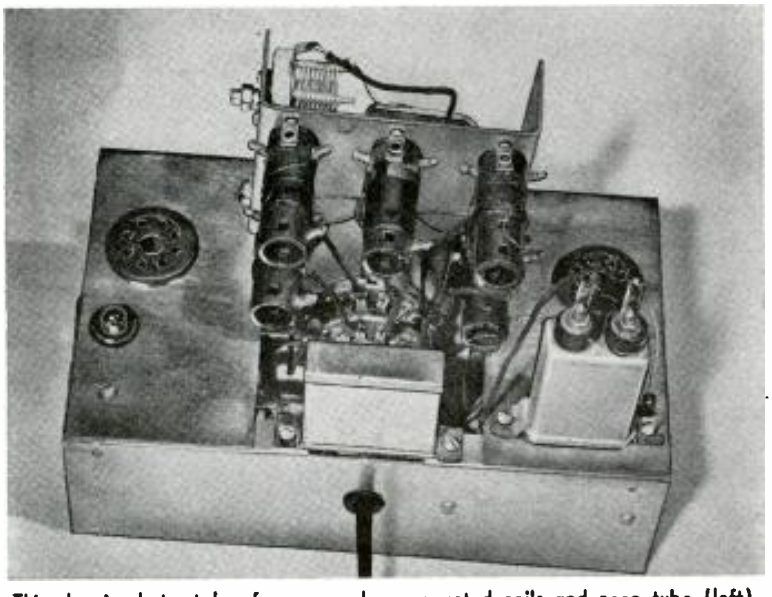
The Heathkit signal generator all assembled.

THE acquisition of test equipment by the beginning radioman is generally a process of passing over so much hard cash for the particular instruments desired, quite a lot of cash if the workshop is to be well equipped. In times past it was quite feasible to build your own for the gear was relatively simple. Today the picture is somewhat different, with the wide range of frequencies covered by ordinary home radios and the extension of voltage and resistance ranges encountered in television. To design and construct one's own test equipment now requires considerably more than a bit of engineering ability, and the equipment for accurate calibration is not often available to the average serviceman. It would seem to boil down to "you pays your money and you takes your choice" for commercially built equipment, the only yardstick of evaluation presumably being that the high dollar gets the best equipment.

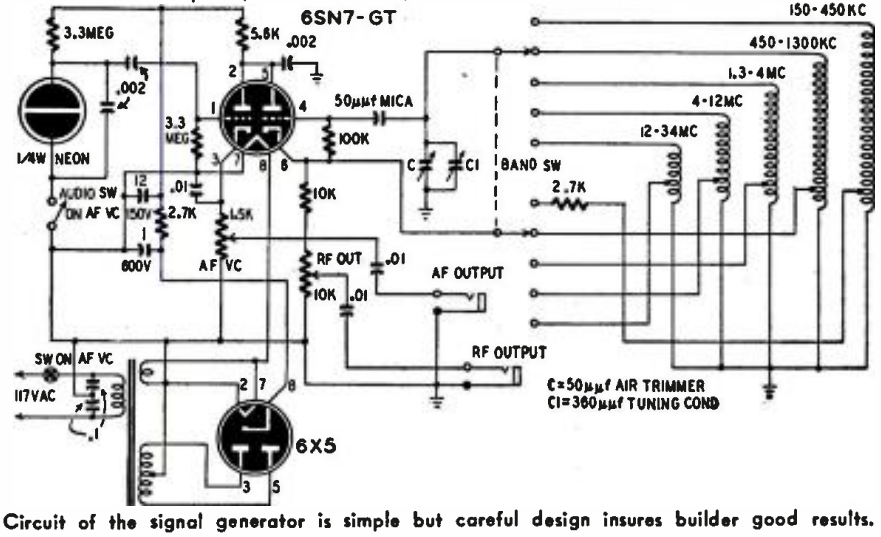
There is, however, a bright spot in the picture. Kits of test gear are available. They contain precut and formed chassis and panels which are suitably marked, all parts matched to fit, and—most important—some simple means of calibration, all at a substantial saving in price.

We assembled our own signal generator from a kit purchased from the Heath Company, which specializes in test-equipment kits. The results were entirely satisfactory. Though it is feasible for the average builder to start from scratch (without a kit) and build his own generator, he must usually be willing to spend considerable time on the elimination of bugs and on accurate calibration.

A kit such as this generator has been developed by competent radiomen who have already eliminated the bugs that beset the home constructor. It is a professional-appearing instrument, the cabinet and panel being well made and suitably labeled. All parts are preformed, the holes are cut, and parts are supplied to fit. Most of the strong-arm work is eliminated. The signal generator is self-calibrating, requiring only a broadcast receiver and a little adjustment. The accuracy is excellent. The price is very little more than the cost of individual parts.



This chassis photo, taken from rear, shows mounted coils and neon tube (left).

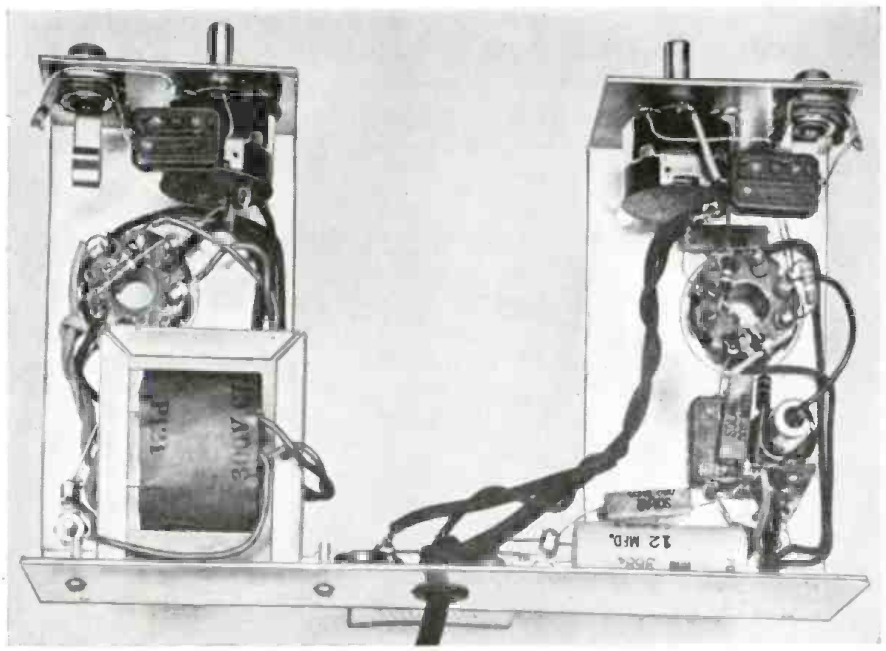


Circuit of the signal generator is simple but careful design insures builder good results.

Circuit design

The radio-frequency portion of the signal generator includes a set of coils, a variable capacitor, the band switch, and the necessary resistors and fixed capacitors. Half of a 6SN7-GT is a Hartley oscillator of excellent stability. Output is taken from the cathode to lessen the loading effect of an external circuit. The r.f. attenuator is a potentiometer in the cathode circuit. Adjustments have no appreciable effect on frequency.

Audio is generated by a relaxation oscillator using a ¼-watt neon bulb. The output of this oscillator is low; it is amplified by the other half of the 6SN7-GT. Audio voltage is obtainable



The main chassis assembly contains the power supply and audio generator. Wire it up first.

from the cathode circuit for use in lining up audio systems. The frequency is approximately 400 cycles, about the best compromise for general-purpose work. The same audio tone modulates the r.f. oscillator because of the parallel connection of the two triode plates. The circuit diagram shows the relative simplicity of the circuit and how effectively the parts are utilized. A transformer-type power supply provides isolation from the line, this being particularly desirable when working with a.c.-d.c. receivers. A simple resistance-capacitance filter provides adequate hum reduction since the current requirements are small.

Assembly and wiring

In assembling the generator it is a good idea to start with the main chassis. The photos show the locations of parts. The manufacturer supplies sketches which are very helpful in placing the components. Detailed instructions are also furnished. And—very important—every component needed, down to the last lock-washer, is supplied.

The power-supply section should be wired first. Filament wiring should be twisted to minimize hum pickup. The neon bulb, which is the audio generator, is mounted by inserting it into a rubber grommet of the correct size, the grommet being first inserted in the chassis. This arrangement provides a shock-proof mounting for the lamp. Incidentally, this type of bulb should be handled with great care since even a slight shock may ruin it.

The tuning assembly, coils, main tuning capacitor, padder, and band switch are wired as a separate unit, as shown in the photo. The wiring scheme shown in this photo and in the maker's sketches should be adhered to strictly, and leads kept short, especially for the three higher-frequency coils, since excessive lead length can materially change the calibration. Be sure to ground one end of each coil to the common solder lug mounted at the center of the tuning-chassis assembly.

The two assemblies, tuning unit and main chassis, may now be joined. With tubes inserted, the unit is plugged into an a.c. line. The neon tube should glow when the switch is turned on. The parts provided in the kit for the test cable are a PL-55 phone plug, a length of shielded and insulated cable, and two alligator clips.

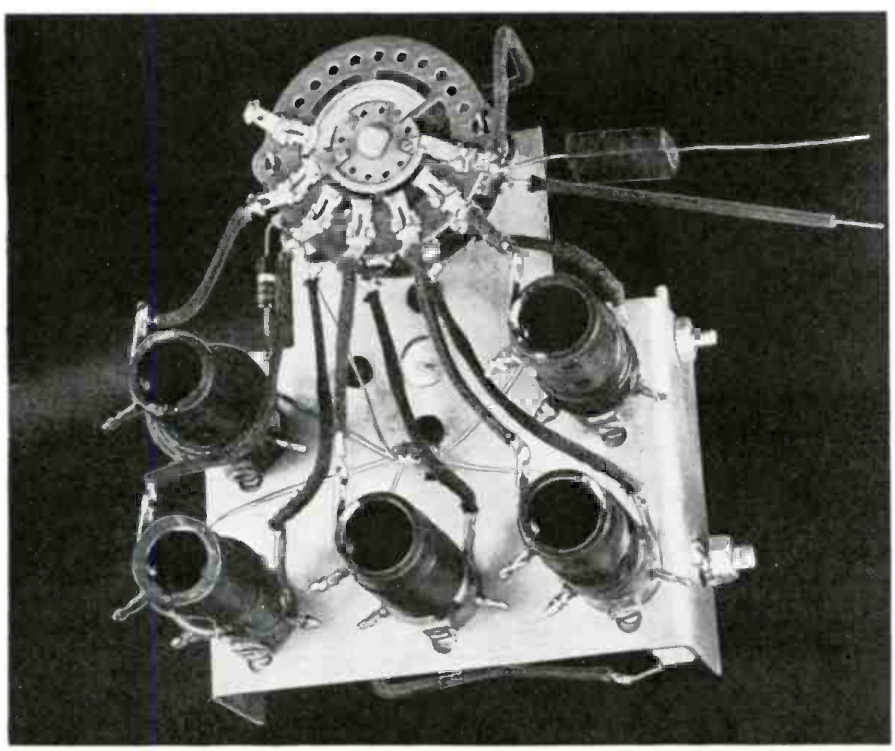
In assembling the kit make sure that all mechanical connections are firm and that all soldered connections are made with a *hot* iron, using only rosin-core solder.

Calibration and use

Calibration is quite simple. With the tuning condenser at full mesh, set the pointer at 150 kc and turn the generator on. Let it warm up for several minutes. Now tune a broadcast receiver to a station of known frequency around 1000 kc and then tune the generator to about the same frequency, as indicated by a whistle in the receiver. It may be necessary to bring the output lead from the generator fairly close to the antenna post of the receiver. Set the pointer to the frequency of the station. Now carefully adjust the trimmer capacitor to the position which gives the lowest-pitched note or a complete null (zero beat). At this point the trimmer should be nearly fully meshed. Calibration should now be close enough on all bands for all average purposes.

When using the generator with commercially built receivers, refer to the manufacturer's data and notes if available. When aligning a.c.-d.c. receivers, it is well to use an isolating transformer in the power line as a safety precaution. Since the generator has a built-in line filter (the two 0.1-μf capacitors across the line to ground), there may, if no isolation is used, be developed a voltage, no greater than half the line voltage, between the generator and receiver chassis. This is shorted when the ground clip from the generator lead is connected to the receiver chassis.

Construction of this signal generator not only provides a fairly accurate instrument at reasonable cost, but is a valuable experience to the builder, especially if he is a novice.



This view of the r.f. coils shows clearly how the r.f. section is to be assembled and wired.