A THREE-BAND OSCILLATOR TRANSMITTER FOR THE NOVICE

The novice transmitter shown in Figs. 6-35-6-38, inclusive, is easy to build and get working. It is a crystal-controlled, one-tube oscillator capable of running at 30 watts input on the 3.5-, 7-, and 21-Mc. Novice bands. A special feature of the transmitter is a built-in keying monitor which permits the operator to listen to his own sending.

Regulated voltage is used on the screen of the oscillator. This minimizes frequency shift of the oscillator with keying, which is the cause of chirp. In addition, a small amount of cathode bias (R_4) is used on the oscillator. This also tends to improve the keying characteristics in a cathode-keyed simple-oscillator transmitter.

Circuit Details

The oscillator circuit used is the grid-plate type, and the tube is a 6DQ6A pentode. The power output is taken from the plate circuit of the tube. On 80 meters, an 80-meter crystal is needed. On 40, either 80- or 40-meter crystals can be used, although slightly more output will be obtained by using 40-meter crystals. To operate on 15 meters, a 40-meter crystal is used.

The tank circuit is a pi network. The plate tank capacitor is the variable C_6, and the tank inductance is L_2L_3. C_8 is a two-section variable, approximately 365 $\mu\mu$f. per section, with the stators connected together to give a total capacitance of about 730 $\mu\mu$f. This range of capacitance is adequate for coupling to 50 or 75 ohms on 7 and 21 Mc. When operating on 3.5 Mc., an additional 1000 $\mu\mu$f. (C_7) is added to furnish the needed range of capacitance. L_1 and R_2 are essential for suppressing v.h.f. parasitic oscillations.

The keying-monitor circuit uses a neon bulb (type NE-2) audio-frequency oscillator connected to the cathode of the 6DQ6A at the key jack, J_1. The headphones are plugged into J_2, a jack mounted on the back of the transmitter chassis. Another jack, J_3, is used as a terminal for the leads that go to the headphone jack on the receiver.

Power Supply

The power supply uses a 5U4G in a full-wave circuit. A capacitor-input filter is used and the output voltage is approximately 370 volts with a cathode current of 90 milliamperes. A 0-150 milliammeter reads cathode current. The screen and grid currents are approximately 4 ma. when the oscillator is loaded.

Construction

All of the components, including the power supply, are mounted on a 2 × 7 × 13-inch aluminum chassis that is in turn enclosed in a 7 × 9 × 15-inch aluminum box. (Premier AC-1597). One of the removable covers of the box is used as the front panel, as shown in Fig. 6-35. The box has a ½-inch lip around both openings, so the bottom edge of the chassis should be placed one inch from the bottom of the panel. The sides of the chassis are also one inch from the sides of the panel. The chassis is held to the panel by S_2, J_1, and the mounting screws for the crystal socket, so both the front edge of the chassis and the panel must be drilled alike for these components. S_1, at the left in the front view, is one inch from the edge of the chassis (that is, two inches from the edge of the panel) and centered vertically on the chasis edge. Thus it is one inch from the bottom of the chassis edge and two inches from the bottom edge of the panel. The hole for J_1 is centered on the chassis edge and the holes for the crystal socket are drilled at the right-hand end of the chassis to correspond with the position of S_1 at the left.

There is nothing critical about the placement of the meter or the shafts for C_6, C_8 and S_1. As shown in Fig. 6-38, C_6 is mounted directly above J_1 and approximately two inches from the top of the panel. C_8 similarly is above the crystal socket and on the same horizontal line as C_6. S_1 is about at the middle of the square formed by these four components.

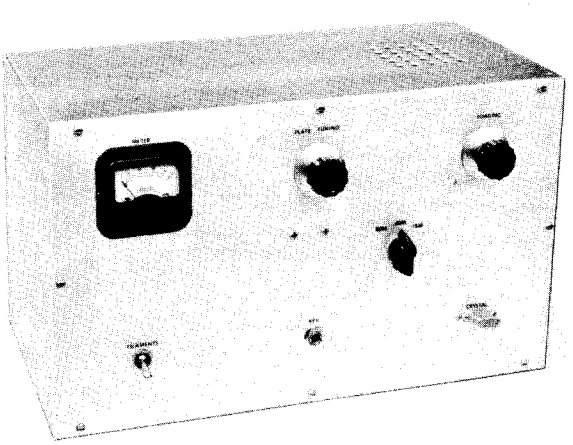

Fig. 6-35—This 30-watt three-band Novice transmitter is enclosed in a 7 × 9 × 15-inch aluminum box. A group of ¼-inch-diameter holes should be drilled in the top of the box over the oscillator tube, as shown, to provide ventilation. A similar set of holes should be drilled in the back cover behind the oscillator circuit.

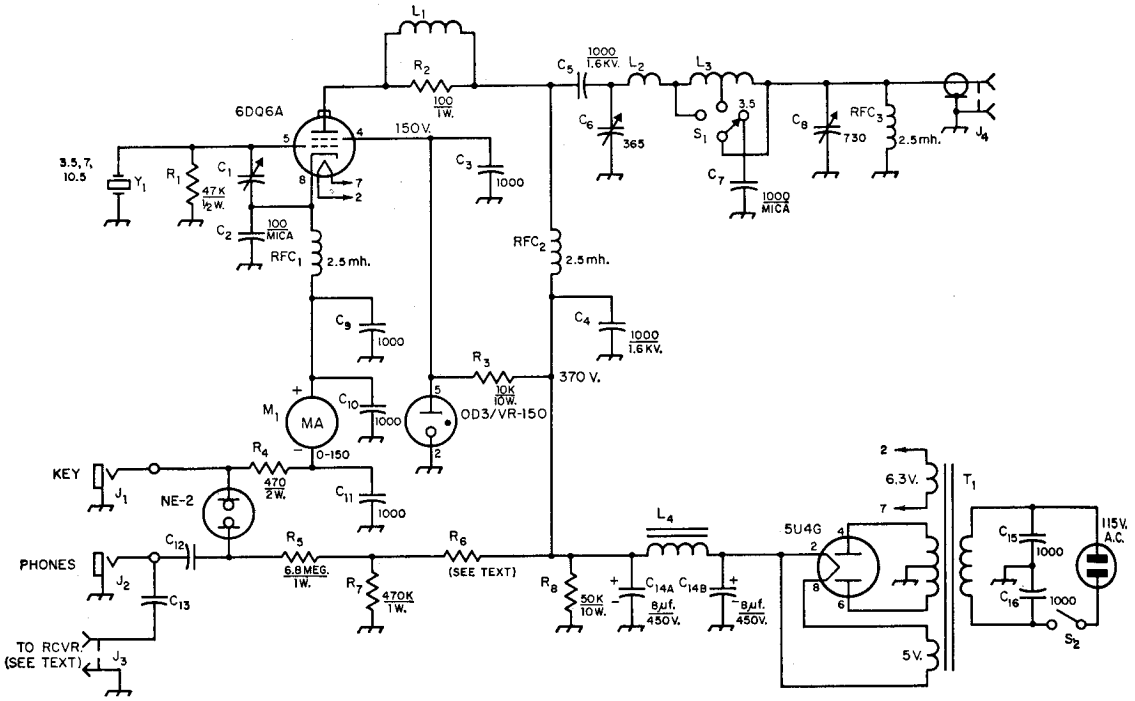

Fig. 6-36—Circuit diagram of the three-band transmitter. Unless otherwise specified, capacitances are in µµf. Resistances are in ohms (K=1000).

C_1—3-30-µµf. trimmer.
C_2—100-µµf. mica.
C_3, C_9, C_{10}, C_{11}, C_{15}, C_{16}—0.001-µf. disk ceramic.
C_4, C_5—0.001-µf. 1600-volt disk ceramic.
C_6—365-µµf. variable capacitor, single section, broadcast-replacement type.
C_7—0.001-µf. 600-volt mica.
C_8—365-µµf. variable capacitor, dual section, broadcast-replacement type.
C_{12}—500-µµf. mica or ceramic.
C_{13}—0.01-µf. disk ceramic.
C_{14}—8/8-µf. 450-volt dual electrolytic capacitor.
J_1, J_2—Open-circuit phone jack.
J_3—Phono jack, RCA type.
J_4—Coaxial chassis connector, SO-239.
L_1—10 turns No. 18 wire space-wound on R_2.
L_2—6 turns No. 16 wire, 8 turns per inch, 1¼ inches diam. (B & W 3018).
L_3—23 turns No. 16 wire, 8 turns per inch, 1¼ inches diam. (B & W 3018). The 7-Mc. tap is 18 turns from the junction of L_2 and L_3.
L_4—8-h. 150-ma. filter choke (Thordarson 20C54).
M_1—0-150 ma (Shurite 950).
R_1–R_8 inc.—As specified.
RFC_1, RFC_2, RFC_3—2.5-mh. r.f. choke (National R-50 or similar).
S_1—Single-pole 3-position switch (Centralab 1461).
S_2—Single-pole single-throw toggle switch.
T_1—Power transformer: 360-0-360 volts, 120 ma.; 6.3 volts, 3.5 amp.; 5 volts, 3 amp. (Stancor PM-8410).
Y_1—Crystal (see text).

The holes on the rear edge of the chassis for the coaxial connector J_4, phone jack J_2, receiver connector J_3, and for the a.c. cord are drilled at the same height as those on the front edge. Access holes should be cut in the rear cover of the box at the corresponding positions; these holes may be large enough to clear the components, but not larger than is necessary for this purpose. The cover fits tightly against the rear edge of the chassis and thus maintains the shielding for preventing radiation of harmonics in the television bands. However, it is advisable to fasten the cover to the chassis edge with a few sheet-metal screws, in order to insure good electrical contact.

There are several different types of broadcast-replacement variable capacitors on the market. Some of these have holes tapped in the front of the frame, and this type can be mounted directly on the panel using machine screws and spacers. Others have mounting holes only in the bottom. In this case, the capacitor can be mounted on a pair of L-shaped brackets made from strips of aluminum.

Both L_2 and L_3 are supported by their leads. One end of L_3 is connected to the stator of C_8 and the other end is connected to a junction on top of a one-inch-long steatite stand-off insulator. L_2 has one end connected to the stator of C_6 and the other end to one of the terminals on S_1.

The voltage-dividing network consisting of R_6 and R_7 provides the correct voltage for operating the keying monitor, R_6 is 1.65 megohms, a value obtained by using two 3.3-megohm 1-watt

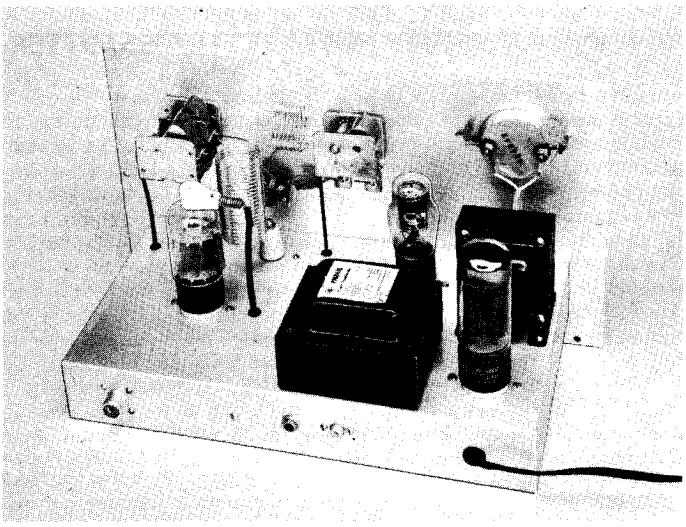

Fig. 6-37—Rear view of the transmitter showing the placement of components above chassis. The loading capacitor, C_8, is at the left, L_3 is the vertical coil and L_2 the horizontal one. Rubber grommets are used to prevent chafing and to furnish additional insulation on the leads coming from below chassis.

resistors in parallel. These resistors and other small components may be mounted on standard bakelite tie points.

Adjustment and Testing

When the unit is ready for testing, a 15- or 25-watt electric light will serve as a dummy load. One side of the lamp should be connected to the output lead and the other side to chassis ground. A crystal appropriate for the band to be used should be plugged into the crystal socket, and a key connected to the key jack. S_1 should be set to the proper band. S_2 may then be closed and the transmitter allowed to warm up.

Set C_8 at maximum capacitance (plates completely meshed) and close the key. Quickly tune C_6 to resonance, as indicated by a dip in the cathode-current reading. Gradually decrease the capacitance of C_8, while retouching the tuning of C_6 as the loading increases. Increased loading will be indicated by increasing lamp brightness and by larger values of cathode current. Tune for maximum lamp brilliance. The cathode current should read between 90 and 100 milliamperes when the oscillator is fully loaded.

C_1 should be adjusted for the best keying characteristics consistent with reasonably good power output. It is not advisable to attempt to adjust C_1 with a lamp dummy load, since the lamp resistance will change during the heating and cooling that take place during keying, and this will affect the keying characteristic of the oscillator. Use a regular antenna, with or without an antenna coupler or matching network as the antenna system may require, and listen to the keying on the station receiver. Remove the antenna from the receiver to prevent overloading, and adjust the r.f. gain control for a signal level comparable with that at which signals on that band are normally heard. Further details on checking keying will be found in the chapter on keying and break-in.

(Originally described in *QST* December, 1957.)

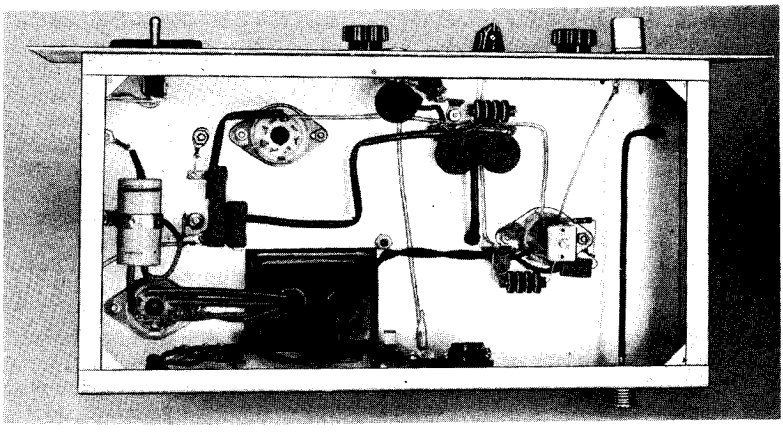

Fig. 6-38—Below-chassis view. Power-supply components are mounted in the left-hand side and the oscillator section is at the right-hand side. Mounted on the back wall of the chassis is the keying monitor. Although not visible in this view, the monitor components are mounted on a four-terminal tie point.