

## A HIGH-FREQUENCY CRYSTAL-FILTER SIDEBAND EXCITER

When a sideband signal is generated at 500 kc. or below, several frequency conversions are usually required to move the signal to the 14-Mc. band without danger of "image" signals. By generating the sideband signal at a high frequency, only one frequency conversion is required. The sideband transmitter shown in Figs. 9-7 through 9-10 is built around a commercial 9-Mc. crystal filter and, with a 6DQ5 in the output stage, it will deliver 50 watts p.e.p. on 75, 40 and 20 meters. The crystal filter is furnished with two matching crystals for the oscillator, so that upper or lower sideband can be obtained by shifting the (suppressed) carrier frequency to one side or the other of the crystal-filter pass band.

To facilitate construction and adjustment, the exciter has none of the "frills" to be found in some commercial equipment, although they can of course be added by the experienced amateur. Plug-in coils and crystal control are used, although there is provision for "pulling" the crystal frequency by means of a "VXO" circuit. Voice-controlled break-in has been omitted in the interests of simplicity (and perhaps a better type of operation), and the transmitter is turned on or off by a foot switch or key. No operating conveniences have been omitted, however, other than the ability to make sudden large frequency changes. A "calibrate" position of the mode switch permits accurate setting of one's frequency at a level that does not block the receiver, and in the "standby" condition a bias voltage of -100 is available to be applied to any subsequent amplifier that might generate undesirable diode noise without the additional bias.

Referring to the wiring diagram in Fig. 9-8, the two triode sections of a 6CG7 are used in cascade for the speech amplifier, to bring the voice signal up to the desired level of about 1 volt. This is used to modulate the beam of the 7360 balanced-modulator stage. The 7360 is also used as the (suppressed) carrier oscillator, by raising its cathode above r.f. ground and connecting the carrier-frequency crystal between control grid and ground. Two crystals are furnished with the crystal filter; in this case they have nominal frequencies of 8.998500 and 9.001500 Mc. The 12- $\mu\text{f}$ . adjustable ceramic capacitors (Centralab 827-B) in shunt with the crystals are used to pull the frequencies into correct relationship to the filter pass band. Since the good linearity of the 7360 is destroyed if the grid is driven positive, a 1N34A diode is used to provide bias in addition to that produced by the cathode resistor. Carrier balance is obtained through adjustment of the relative positive biases (about +20 volts) on the deflection plates, and also through the capacitive balance made possible by the range of  $C_1$ . Upsetting the balance by changing the bias on one deflection plate provides a "calibration" signal or, by changing the unbalance still more by closing  $S_2$ , sufficient carrier for c.w. operation.

The 9-Mc. crystal filter,  $FL_1$ , is a low-impedance device (560 ohms), and the double-sideband signal appearing in  $L_1$  is coupled to  $FL_1$  through a low-impedance winding. A suitable termination for the filter is obtained by the properly-transformed self impedance of the circuit made up of  $L_2$  and the 47- $\mu\text{f}$ . capacitor; since the correct

Fig. 9-7—This single-sideband exciter unit uses a 9-Mc. crystal filter and a choice of oscillator frequencies to obtain the upper or lower sideband. The output tube (right) is a 6DQ5. For simplicity, plug-in coils are used, and two of them are shielded by grocery-store products painted gray (center).

One side has been removed for the photograph; the top plate is "plug on" at the four corners through jacks mounted on the four corners of the top plate.

The frequency control for the unit is a "VXO," a crystal-controlled oscillator that can be pulled several kc. by a panel control (large knob under meter). The crystal in use is plugged in at the lower right, just above a small CAL control knob that sets the signal level into the receiver when the function switch (left, below VXO control) is on "calibrate." Small knob at lower left is sideband-selector switch. Switch to left of meter switches meter to grid or cathode of output tube or to r.f. voltmeter on output line; knob just below adjusts sensitivity of r.f. voltmeter.

