• Recent Equipment —

The 5100 Transmitter and 51SB Single-Sideband Generator

ANY amateur interested in a complete 'phone/c.w. transmitter in the 150-watt class, to which he can later add s.s.b. with a minimum of effort, will do well to consider the new Barker & Williamson 5100 Transmitter and its companion unit, the 51SB Single-Sideband Generator. When the two units are tied together, switching to c.w., a.m. or s.s.b., or any amateur band, 80 through 10 meters, is simple and quick.

The 5100 Transmitter

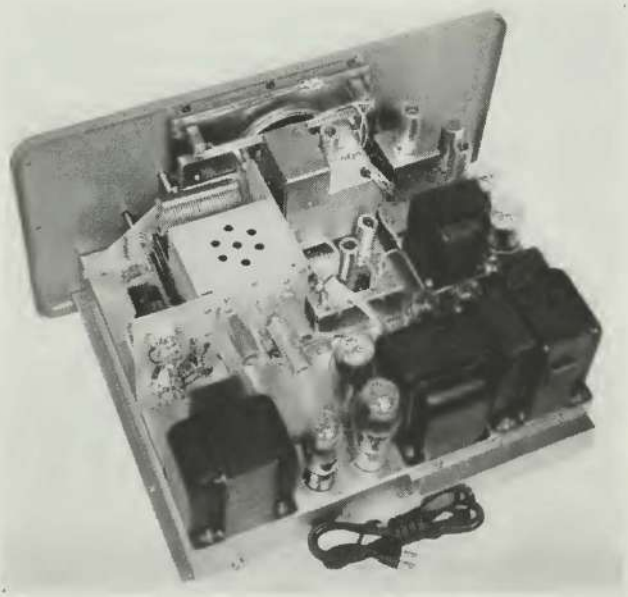
Designed for table-top operation, the 5100 is 22 inches wide, 11½ inches high and 14¾ inches deep. It weighs 83 pounds. The r.f. line-up consists of a 6BJ6 VFO (in the 160-meter band) followed by two 6BJ6 buffer stages. The second buffer stage is grid-block keyed, and serves as the crystal oscillator when crystal-controlled operation is demanded. The frequency-multiplication section of the transmitter uses up to four 6AQ5s, depending upon the multiplication requirement, and this entire section is broadbanded and consequently requires no tuning in operation. The output stage uses two 6146s in parallel, with a pi-network output circuit. A small variable condenser across the grid circuit of the output stage trims the circuit and serves as an excitation control. Recommended operation of the 6146s permits a power input of 135 watts on 'phone and 150 watts on c.w.

The audio section of the 5100 uses a 6U8 triode-pentode speech amplifier, 6AQ5 transformer-coupled driver, and a pair of 6146s for modulators.

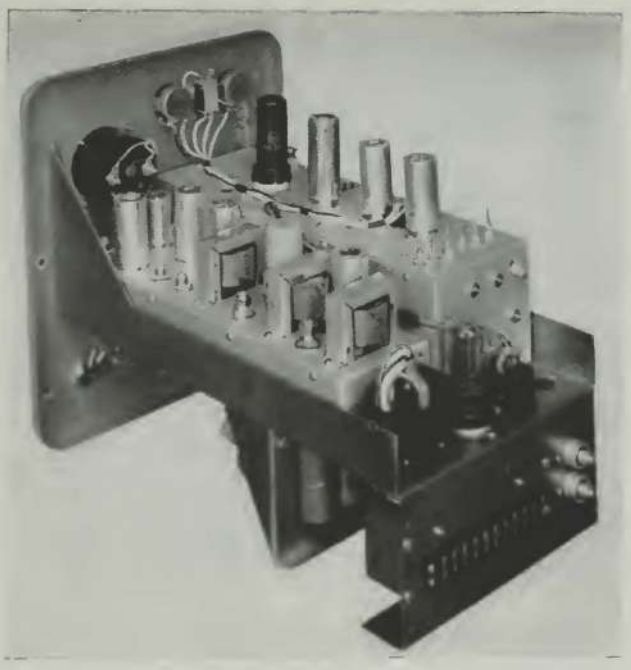
A low-pass filter is included in the transmitter, which makes it mandatory that the transmitter work into the same load resistance (75 ohms) on all bands. All leads entering or leaving the package are filtered, as a further precaution against TVI. The manufacturer states that the low-pass filter has a minimum attenuation of 85 db. over the TV range, with over 100 db. at Channel 2. The instruction book devotes two pages to suggested antenna systems, apparently to allay any fears that working a transmitter into a given load resistance may represent an insurmountable obstacle. Actually, of course, it is the only way a transmitter with a built-in low-pass filter of this type can be operated, and it has the advantage that the pi-network circuit can be properly designed for the same *Q* on all bands.

Two power supplies are included in the transmitter, a high-voltage one for the 6146s and a low-voltage one for the other stages and for bias voltages. A pair of 5R4GYs is used in the heavy supply and a 5V4G handles the job in the other supply. Two VR tubes take care of the regulation problems.

One bit of unusual circuitry can be found in the frequency-multiplier section where, for d.c., one pair of 6AQ5s is connected in series with the other pair of 6AQ5s across the 600-volt high-voltage supply. This is a good way to utilize a power supply to best advantage, but it is the



A top view of the 5100 Transmitter shows how the construction has been broken down into subassemblies. The r.f. output section can be seen at the left near the panel, while the 6146 modulators are at the right near the panel. The four tubes in the r.f. multiplier section are mounted horizontally.



This view of the 51SB Single-Sideband Generator shows the audio subassembly in the foreground and the r.f. section behind it. The audio phase-shift network is housed in the gray metal-tube envelope between two small transformers.

first time we have seen it in a piece of commercial gear. A similar dodge was used a few years ago in a mobile rig described in *QST*.[1]

For c.w. operation the screens of the output 6146s get their power from the low-voltage supply; on 'phone the screens are fed from the high-voltage supply through a dropping resistor, so that modulation is applied to both plates and screens. For tune-up on either 'phone or c.w., the voltage of the big supply is reduced by dropping the line voltage through a resistor.

The owner of a 5100 doesn't have to give up the unit when going to higher power — terminals at the rear permit utilizing the audio power (up to 75 watts) to drive a larger modulator.

Looking at the 5100 from the operating stand-

[1] Harrington, "Ten-Meter Mobile With Remotely-Tuned VFO," *QST*, August, 1951.

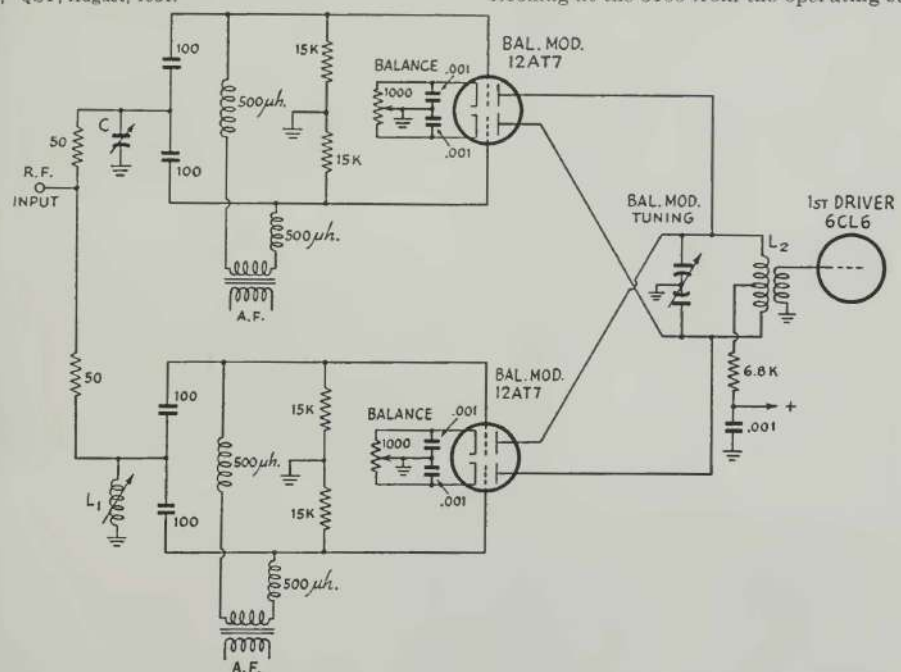
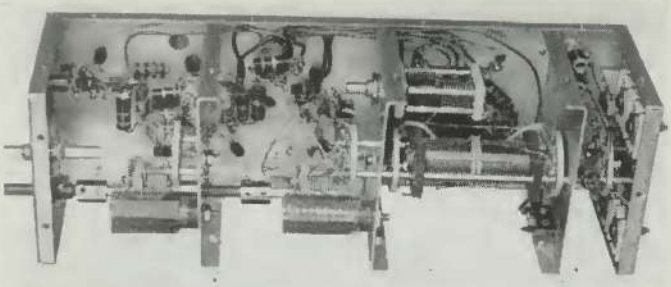


Fig. 1 — Simplified schematic of the balanced modulator circuit used in the 51SB. The r.f. phase shift is obtained by proper constants at L_1 and C. In the actual unit, these constants are switched for each band change, as is L_2. Sideband selection is obtained by reversing the polarity of one of the audio channels. One cathode of each balanced modulator is opened for carrier unbalance when tuning the following r.f. stages.



The r.f. subassembly of the 51SB, with the bandswitch shaft and the balanced-modulator tuning shaft removed to permit better visibility of the parts. The compartments, from left to right, are 6V6 amplifier (the shield straddles the socket), 6CL6 amplifier, balanced modulators, and r.f. phase-shift networks.

point, the front panel carries the VFO knob (a large one), bandswitch, meter switch for measuring grid and plate current of the output stage and plate current of the modulator, a CW-VFO-PH switch for selecting the mode and for spotting frequency, and A.C., Tune-Operate and Plate switches. Once the band is selected, the operator has only to set the VFO and adjust the plate tuning and loading controls of the output stage, touching up the excitation control also, if necessary. The VFO frequency can be easily read on the slide-rule type scale.

The 51SB Single-Sideband Generator

The companion s.s.b. generator for the 5100 is a small 10 × 11½ × 14¾-inch package that is placed to the right of the transmitter and tied in electrically with interconnecting cables and mechanically with bolts. Once it is properly connected to the 5100, it is a relatively simple matter to change from s.s.b. to a.m. or c.w. and back again.

The 51SB takes r.f. *at the output frequency* from the 5100 multiplier section and generates s.s.b. at the output frequency through audio and r.f. phase shifts. Fig. 1 shows a simplified schematic of the two balanced modulators. The audio section of the 51SB uses 1½ sections of 12AT7s in cascade before the audio is introduced into the audio phase-shift network. A 3500-cycle cut-off low-pass filter ahead of the network protects the network from audio frequencies beyond its range. From here the signal is amplified and then transformer-coupled into the two 12AT7 balanced modulators. The voice-controlled break-in and antitrip (for loudspeaker operation) circuits use 12AT7s and a 6AL5. The output of the balanced modulator is amplified through a 6CL6-6V6 chain to build up the amplitude to the point where it is sufficient to drive the pair of 6146s in the 5100 transmitter. Two tuning controls are included in the s.s.b. generator: the balanced-modulator output circuit and a ganged control for the 6CL6 and 6V6 plate circuits. The r.f. phase-shift networks are broadbanded and do not require adjustment. Consequently, the tune-up procedure of the 51SB is quite similar to the tune-up of any series of r.f. stages, and the operator does not have to be familiar with how s.s.b. works to put the rig on the air. A switched meter in the unit monitors the grid current of the 6146s and, by using a pair of germanium diodes, the output of the 6VG driver. The r.f. output position is used to set up the two carrier-balance panel controls.

The voice-operated control circuit closes a three-pole double-throw relay that provides a keying circuit for the transmitter, an antenna relay control circuit, and a receiver-silencing channel. Adjustable voice-control threshold and hold-in controls are available inside the unit, as is the antitrip sensitivity control. The unit can be used "push-to-talk" from a switch on the microphone or with full voice-controlled break-in, as desired.

Most of the panel controls have been mentioned, but in addition there is a carrier-unbalance switch (for tune-up), upper or lower sideband selector switch, bandswitch, tune-operate switch, and an audio gain control. In operation it is necessary, of course, to make sure that the bandswitches on the 51SB and the 5100 are set to the same band. A minor inconvenience, but nothing to worry anyone who has gone this far in equipping a complete station, is the necessity for changing microphone from unit to unit when going from s.s.b. to a m., but this could be solved by using two microphones or a shielded switch.

All of the power leads leaving or entering the 51SB are filtered, in keeping with the TVI precautions in the 5100. A 5Y3G in the power supply handles the plate-power requirements of the exciter.

General

In both the 5100 and 51SB, considerable use has been made of subassembly type construction. This is illustrated in the accompanying photographs. The subassemblies are a production expedient, of course, but they also contribute to shielding within the unit.

Instruction books for both units are careful to give step-by-step instructions for all operations, and anyone who takes the time to read them should have no trouble.

Of special interest to home constructors of s.s.b. gear is the little audio phase-shift network used in the 51SB. It is similar to others on the market in that it provides a 90-degree shift over the 300–3000-cycle range, but this one is completely enclosed in a metal-tube envelope of the size used for a 6J5. Thus, plug-in convenience and good shielding are provided in a very small package. This unit, the B & W Model 350, is marketed separately.

— *B. G.*