BALANCED MODULATOR

When the audio signal from V1B and the RF signal from carrier oscillator V11B is applied to the 4-diode balanced modulator, two different frequencies are produced. This ring-type balanced modulator uses diodes CR1 through CR4.

One of the two signals produced by the balanced modulator is the sum of the audio and carrier frequencies; the other signal is the difference between the audio and carrier frequencies. These signals are the upper and lower sidebands.

The carrier signal is applied across the modulator diode ring in a balanced circuit, consisting of one winding of transformer T1, capacitors C1 and C2, resistors R3 and R4, and the Carrier Null control. The Carrier Null control is used to balance out the carrier signal in the modulator, leaving only the upper and lower sideband signals at the modulator output.

The output from the balanced modulator is the result of combining the audio and carrier signals. Neither the audio or carrier signals appear in the output, but the effect of the audio signals unbalancing the nulled circuit at an audio rate produces the sum-and-difference frequencies called sidebands. With no audio, there is no output from the balanced modulator.

With the Function switch in the Tune position, a DC voltage is applied to the balanced modulator through resistors R1 and R2. This voltage can be adjusted with the Tune Level control. This DC voltage is used to unbalance the modulator to provide a steady output signal for transmitter tuning purposes.

TRANSMITTER IF AMPLIFIER

The sideband signals from the balanced modulator are coupled through transformer T1 and then are amplified by transmitter IF (intermediate frequency) amplifier V2A. These signals are then applied to the crystal filter, consisting of crystals Y2 through Y5, and coil L1. The crystal filter eliminates the upper sideband, and permits the lower sideband to pass through to common IF amplifier V3 for additional amplification.

Stage V2 is turned off while receiving by applying additional negative DC voltage to its grid through the secondary of transformer T1. This control voltage is impressed on the ALC (automatic level control) line, which is also used to control the gain in a number of other transmitter stages to prevent overloading. Overloading can be detected by observing the action of the meter. Normally the meter rests at or slightly below zero; however, if the operator talks too loud or if the Mic Gain control is set too high, the transmitter section would overload. This causes a change in ALC voltage which increases the bias, reducing transmitter gain and causing meter deflection to indicate ALC action.

COMMON IF AMPLIFIER V3

When transmitting, V3 amplifies the lower sideband signal from the crystal filter and then applies this signal to IF transformer T2. When receiving, the receiver IF signal is amplified by V3 and is then applied to receiver IF amplifier V9.

TRANSMITTER MIXER V4

Transmitter mixer V4 receives two signals simultaneously; one is the SSB signal from T2, and the other is the VFO (variable frequency oscillator) signal from V13 and V14, through the secondary of transformer T2. Tube V4 produces the frequency sum of these signals, which is at the proper operating frequency. This signal is applied to the primary of coil L2. (Tube V4 is cut off by bias voltage from the ALC line when receiving.) Coil L2, which has two windings, is broad-tuned to cover the 80 meter band. This coil is also used when receiving, and is then connected to receiver RF amplifier V8A and receiver mixer V8B.

DRIVER V5

Driver V5 receives the signal voltage from coil L2 through parasitic suppressor resistor R50. The ALC line is also connected to V5 to control transmitter gain, and to cut off the driver when receiving. Single-tuned coil L3 and the double-tuned coil L2 form a bandpass device that covers the frequencies of the 80 meter band without the necessity of tuning the driver stage. Voltage for bridge neutralization of final amplifier tubes V6 and V7 is fed through capacitors C63 and C64 to the bottom of coil L3, and across C55. The small winding of coil L3 is used for the input signal from the antenna when receiving.