

I. MODEL 350 TRANSCIVER

A. Circuit Theory (Cont)

RECEIVE (cont)

that to which the transmitter is tuned, nor to detect the wrong sideband. This simple single conversion design results in an extremely stable signal, and an image response down more than 80 db.

FREQUENCY CALIBRATION

Frequency calibration of the Model 350 is in increments of 5 kc. Two red lines are marked on the tuning dial to indicate the proper tuning for USB and LSB. All five frequency bands are covered in 500 kc segments. On 80-, 40-, 15-, and 10 meters, the dial reads directly in kilocycles above the lower frequency limit of the band. The calibrations must be added to the low frequency to arrive at the correct frequency. On 20 meters the red scale must be used to read the direct increment on this range.

Because of the extreme frequency coverage of the various bands, sometimes it is difficult to achieve perfect tracking across the entire 500 kc segment. On 80 meters, for example, the calibration is exact at 3800 and 4000 kc, but may be a few kc off at 3500 kc. If the optional calibrator kit is not installed, it is essential that some external means of monitoring exact frequency be available if the extreme lower portions of the bands, particularly the band edges, are to be used.

TRANSMIT AND RECEIVE SWITCHING

All transmit and receive switching is performed through K1, the transmit-receive switching relay. In TRANSMIT position, only those tubes that operate in the transmit mode are operative, all others being biased to cutoff through the relay contacts. In the RECEIVE position, with the relay de-energized, the tubes that are normally used only in transmitting are cut off in the same manner. Relay K2, which, when de-energized, feeds signals from the output pi-network to the receiver, also controls the S-Meter switching circuit. In the transmit position the meter indicates the combined cathode current of the two power amplifiers. In the receive position, it indicates the voltage across R902 in the cathode of the Second IF Amplifier, V9, which is inversely proportional to the AGC voltage used to control the gain of the tube. Thus, the meter reads left to right on transmit, and right to left on receive.

POWER RATING

The Swan 350 is capable of 400 watts, PEP in-

put under steady state two-tone test conditions, when operated with any of the recommended power supplies. The peak envelope power, when voice modulated, is considerably more, typically 500 watts, or more.

Recommended power supplies produce a no-load plate voltage of approximately 925 volts. Under TUNE conditions, or CW operation, this voltage may drop to as little as 720 volts. Under steady state two tone modulation, the voltage will drop to approximately 750 volts. If the power amplifier idling current is 50 ma, and the two-tone current, just before flat-topping, is 375 ma, the peak two-tone current will be 560 ma. Under these conditions the PEP input will be 750 volts times 560 ma = 420 watts. Under voice modulation, because the average power is considerably less, the power amplifier plate and screen voltages will be maintained higher, even during voice peaks, by the power supply filter capacitors. Peak voice plate current will therefore also be higher than with two-tone test conditions. Under typical operating conditions, peak plate current before flat-topping will be 625 ma at 800 volts, to result in an input of 500 watts, PEP. Readings of cathode current will not reflect this 500 watt power input, however, because of the damping in the cathode current meter. The meter damping is such that the meter is unable to respond to variations of cathode current in the audio range. Cathode current readings under normal voice input should not exceed approximately 150 to 200 ma.

POWER AMPLIFIER PLATE DISSIPATION

There is often a misunderstanding about the plate dissipation of tubes operated as AB₁ amplifiers under voice modulation. In the Swan 350, while in the transmit position, and with no modulation, the plate voltage will be 880 volts, the plate current 50 ma, and the power input will be 44.5 watts.

Authorities agree that the average voice power is 10 to 20 db below peak voice power. Normally some peak clipping in the power amplifier can be tolerated, and a peak to-average ratio of only 6 db may sometimes occur. Under such a condition, the average power input will be 125 watts, and plate current will be about 156 ma. With an average power amplifier efficiency of 55 percent, plate dissipation will be 57 watts, or 28.5 watts per tube. The 6HP5 is rated at 28 watts, continuous duty cycle, in normal TV service. Thus it can be seen that under normal operating conditions, the power amplifier tubes in the Swan 350 are not being driven very hard. Only during tuneup is there any need to limit the length of time the unit is held in TUNE position to about 30 seconds at a time.