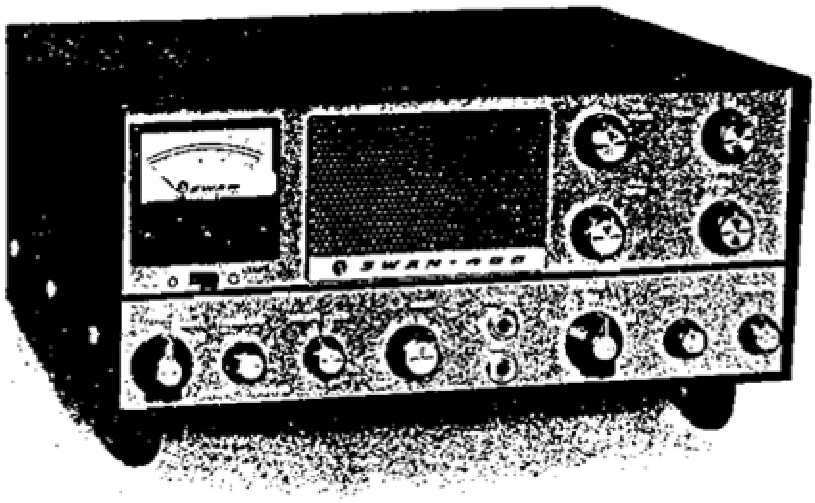
PART I MODEL 400 TRANSCEIVER



A. CIRCUIT THEORY

GENERAL DISCUSSION

The Swan 400 Transceiver provides single sideband, suppressed carrier transceive operation, and generates the single sideband signal by means of a crystal lattice filter. To permit a logical discussion of this mode of operation, certain definitions are necessary. In a normal AM signal (double sideband with carrier), a radio frequency is modulated with an audio frequency signal. This is considered by many to be merely a case of varying the amplitude of the carrier at an audio rate. In fact, however, there are actually sideband frequencies generated which are the results of mixing the RF and AF signals. These sidebands are the sum of, and the difference between the two heterodyned signals. For detection by means of conventional diode detectors, the two sidebands are mixed with the carrier to detect and to demodulate the audio intelligence. This inefficient means of transmission permits only approximately 25 percent of the full transmitted power to be used to transmit intelligence. There are other attendant drawbacks, also. The bandwidth of the transmitted signal is on the order of 6 kc, while the actual demodulated audio is less than 3 kc. The result is very limited use of the band, and over half of the allotted frequency range is unusable because of heterodynes, interference, and congestion.

In the single sideband, suppressed carrier mode of transmission, only one sideband of the RF and AF heterodyned signal is transmitted, the other sideband and the carrier being suppressed to a level which effectively permits using only the audio intelligence bandwidth. This results in increasing the transmission efficiency many times over, and permits an effective doubling of the use of the allocated frequencies.

It must be remembered that in the single sideband, suppressed carrier mode of transmission, both the unwanted sideband and the carrier are only suppressed, not entirely eliminated. Thus, with a transmitted signal from a transmitter with 40 db sideband suppression, the other, or unwanted sideband is present, and it is transmitted, but its level is 40 db below the wanted sideband. When this signal is received at a level of 20 db over S9, the unwanted sideband will be present at a level of approximately S5. The same is true of carrier suppression. With carrier suppression of 50 db, and a signal level of 50 db over S9, carrier will be present at a level of approximately S3 to S4.

In the Model 400 Transceiver, the single sideband, suppressed carrier signal is generated by the crystal lattice filter method. Refer to the schematic diagram, and to Figures 1 and 2, Block Diagrams.

SIGNAL GENERATION

In the TRANSMIT position (i.e., when the push-to-talk switch on the microphone is pressed or when the Function Switch is moved to TRANSMIT), the transmitter portion of the transceiver is activated, and generates a single sideband, suppressed carrier signal in the following manner: Carrier is generated by V15, Carrier Oscillator, which is a Pierce oscillator, with the crystal operating in parallel resonance. This stage operates in both the transmit and receive modes. When transmitting, the RF output of the oscillator is injected into the control grid of the Balanced Modulator, V14. This balanced modulator is a beam deflection type, and operates simi-