This tube is used because of its low noise and good sensitivity characteristics at high frequencies.

The control grid of this stage is tuned on all bands, the tuned circuit being selected by r-f switch, S103. The antenna is capacitively coupled to the tuned circuits in the control grid through r-f switches, S101, and S102.

When operating in the American broadcast band (band 1), the plate circuit of the r-f amplifier is impedance-coupled to the grid circuit of the first mixer by resistor R105 and capacitor C117. On bands 2 and 3 the plate of the r-f amplifier tube is switched directly to the primary coils of the variable i-f tuner, where additional selectivity is obtained. Single conversion is used on these bands. When operated on bands 4 to 30, the plate circuit is tuned and capacitively coupled to a corresponding tuned circuit in the grid of the first mixer stage.

The r-f coils and associated trimmers in the plate circuit are selected by the BAND CHANGE knob and tuned through the various band ranges via the slug table arrangements. The r-f coils for bands 1, 2, and 3 are mounted on the variable i-f slug table which is at the extreme right hand edge of the receiver as viewed from the front. See figure 5-1. The coils for bands 4 to 30 are clustered at the rear of the chassis and are tuned by slugs mounted on the three r-f and mixer slug tables.

4.2.3. MIXER STAGES.

(a) FIRST MIXER. - The first mixer stage uses a type 6BE6 miniature pentagrid converter tube, V102. This stage is used on all bands except bands 2 and 3, where only one conversion stage is necessary.

The grid 1 circuit (pin 1) receives the r-f signal from the r-f amplifier stage. On band 1, this grid circuit is tuned by L110, C118, and C119, and impedance coupled to the plate of the r-f amplifier through C117 and R105. On bands 4 through 30, the circuit is tuned by the proper coil and trimmer groups selected by the r-f switch S104, and capacitively coupled to corresponding tuned circuits in the plate of the r-f amplifier stage.

The grid 3 (pin 7) input is obtained from the plate of the hfo (V105). On bands 4 through 30, the frequency of the heterodyning signal applied to this grid is such as to produce an output frequency which falls in one of the two variable i-f ranges, (2.5 to 1.5 mc or 3.5 to 2.5 mc), depending on which of the bands between 4 and 30 is being operated. On band 1, a 12-mc heterodyning signal is applied to this grid, the output of the stage then being in the range of 11.5 to 10.5 mc, which is again heterodyned in the Band 1 Mixer.

The plate output frequency of this stage is then shown to be in the variable i-f spectrum on bands 4 through 30, and the output applied directly to the tuned variable i-f coils. On band 1, the plate circuit is tuned to the range of 11.5 to 10.5 mc by components L114, L115, C139, and C140, and the output applied for further conversion to the Band 1 Mixer, V103.

(b) SECOND MIXER STAGE. - The second mixer stage, V106, also employs a 6BE6 miniature converter tube. Input to this stage is always either 3.5 to 2.5 mc or 2.5 to 1.5 mc from the variable i-f coils L116/L118 and L117/L119. The 3 to 2 mc output of the permeability tuned oscillator is fed into the second mixer tube at grid number one to heterodyne against the input signal to produce a 500 kc intermediate frequency. This mixer stage is always used for all bands.

(c) THIRD MIXER STAGE. - The third, or band 1, mixer stage is used only when receiving on band 1. A type 6BE6 miniature converter tube is used in this application also. Grid number 3 of this tube is excited by a 11.5 to 10.5 mc signal from the plate circuit of first mixer tube V102, and grid number one is excited by a heterodyning 8 mc signal from the crystal oscillator. The output of the third mixer is then 3.5 to 2.5 mc, which is then fed to the grid of the second mixer through the variable i-f coils. This, of course, takes place only when receiving on band 1 as this stage is not used on the other bands.

4.2.4. HIGH FREQUENCY OSCILLATOR. - The high frequency oscillator uses a 6AK5 miniature pentode tube in a piezoelectric oscillator circuit. No tuned coils are needed to make the circuit oscillate because in phase feedback voltage is produced across r-f choke L120. Ten quartz crystals are used to control the frequency of the oscillator output for the various bands. At the minimum, each crystal is used for two adjacent bands, i.e. 1-2, 3-4, 5-6 and so on, since the crystal switch S109 changes position only on odd-numbered bands. For instance, the 8 mc crystal used for bands 5 and 6 is also used for bands 13 and 14 by utilizing its second harmonic at 16 mc. In those instances where harmonic operation is used, a tuned circuit picks off the correct harmonic. This tuned circuit is in the plate circuit of the hfo, V105, and consists of the section of coil L121 in the hfo plate circuit and a number of tuning capacitors. The latter are selected by switch pie S108.