

employs one-half (pins 1, 2, and 3) of a type 12AX7 dual triode tube, V112. Refer to figure 4-7. Due to a-c loading of the second detector, heavy noise impulses are automatically clipped from the positive audio peaks in the detector. The noise appearing on the negative side of the audio cycle is clipped by the noise limiter. In operation, a negative voltage produced by rectification of the carrier is developed across capacitor C205C. This voltage cannot change rapidly due to the value of C205C and R152. This negative potential is placed upon the cathode of the noise limiter tube through R153. The cathode is then negative with respect to the plate of the noise limiter tube, due to voltage divider action of R150 and R151 and current flows. This current is modulated by the audio which then appears on the noise limiter cathode to which the grid of the audio amplifier section of V112 is connected. The noise limiter diode will conduct as long as the cathode is negative in respect to the plate. However, should a heavy noise impulse be received, the plate would be driven negative faster than the cathode could follow due to the time constant of R152 and C205C. If the plate is driven more negative than the cathode, the tube will cease to conduct and no audio will reach the grid of the following audio tube. The audio cannot reach the cathode of the limiter tube directly from the diode load because of the filtering action of R152 and C205C. The value of modulation at which the limiter clips can be adjusted by changing the value of some of the components in the circuit. In this receiver, limiting starts between 50% and 85% modulation. Switch S116 bypasses the signal around the noise limiter when receiving conditions do not require its used.

4.2.11. AUTOMATIC VOLUME CONTROL. - The problem of blocking that is created by strong signals or heavy static is eliminated by use of an amplified AVC system and a low impedance AVC line. Refer to figure 4-8. The second triode section of V110 is used as an AVC rectifier to produce control voltage for the AVC amplifier which uses one half of dual triode V111. The AVC voltage that is applied to grids of the controlled tubes is produced when plate current flowing through one-half of AVC amplifier tube V111 causes a voltage drop across resistor R146. Plate voltage for the amplifier half of V111 is obtained from the voltage drop across resistors R165 and R166, which are in series with the center tap of the power transformer to ground. However, V111 will not draw plate current when there is no signal input to the receiver because of approximately 11 volts of bias that is placed upon its grid by the voltage drop through R164. This bias voltage for V111 is taken from the end of R145 through which the

rectified carrier flows in opposition to the bias voltage. Thus, when the rectified carrier becomes strong enough to overcome the bias voltage on V111, V111 will draw plate current and produce a voltage drop across R146, thereby producing AVC voltage in proportion to the strength of the received signal. The bias on the grid of V111 is high enough to produce a delay in the generation of AVC voltage and thus allows the receiver to function at full sensitivity on weak signals. Resistor R144 and capacitor C205B form the time constant in the AVC circuit. R171, C208, and R167 are used in a degenerative circuit to prevent the AVC amplifier tube from responding to low audio frequencies. AVC is turned off by opening the plate circuit of AVC amplifier tube V111. Tubes controlled by AVC bias include the r-f amplifier V101, and the 500 kc i-f amplifier tubes, V301, V108 and V109.

4.2.12. AUDIO AMPLIFIER. - Two stages of audio amplification are employed in the 51J-4 Receiver. The first stage utilizes the second triode section of V112 in a resistance-coupled amplifier arrangement. A type 6AQ5 miniature pentode power amplifier tube is used in the audio output stage. This stage has fixed bias obtained from the voltage drop produced across R166 in the center tap lead of the high voltage transformer secondary. The secondary of the audio output transformer has both 600-ohm and 4-ohm outputs. Both the outputs are terminated on the rear of the chassis at terminal strip E102. Plug-in connections to both outputs are also made on the front panel.

4.2.13. 50 OHM I-F OUTPUT. - One-half of dual triode V111 supplies 50-ohm 500-kc i-f to coaxial connector J104 on the rear of the chassis. This section of V111 is used as a cathode follower. Excitation is obtained from the voltage drop across R178, which is connected in a series circuit across the secondary of i-f transformer T105.

4.2.14. 100 KC CALIBRATOR. - This calibrator is included with the receiver for use when extreme accuracy of calibration in the order of 200 cycles is desired. It is coupled to the grid r-f amplifier tube V101, and is made operable when CALIBRATOR ON-OFF switch S111 is turned on. The calibrator utilizes a 6BA6 tube in a piezoelectric circuit, a low drift 100 kc crystal between the control grid and screen, and a 5-25 uuf capacitor C169 between grid and ground. The capacitor permits the making of small frequency corrections that set the calibrator to zero beat with a primary frequency standard. Variable capacitor C224 on the front panel provides for fine adjustment of frequencies.