# Section IV CIRCUIT DESCRIPTION

## 4.1 General

The schematic diagram of the receiver chassis is shown in Figures 25 and 26 and the schematic diagram of the power supply chassis is shown in Figures 27 and 28. For purposes of illustration it will be assumed that the circuits are set up for reception on the Broadcast (BC) Band for AM reception.

## 4.2 AM-RF and Mixer Circuits

Signal input to the receiver through AM antenna connector strip E1 is connected to the primary winding of BC band antenna primary coil L1 through switch SW2A. An electrostatic shield, at ground potential, separates the secondary winding from the primary. The secondary coil L2, together with variable air capacitor C5A1 constitutes the first tuned circuit. Transfer of RF signal at the resonant frequency of this tuned circuit, from the antenna to the control grid of RF amplifier tube V1, is accomplished by inductive coupling through the antenna transformer L1, L2. Variable capacitor C5 is a three unit capacitor, each unit being split into two sections. The larger sections C5A1, C5B1 and C5C1 being used for tuning the AM-RF and oscillator circuits and the small sections C5A2, C5B2 and C5C2 being used for tuning the FM-RF and oscillator circuits. The secondary winding L2 is provided with an adjustable powdered iron core E3 for inductance trimming and a shunt connected variable capacity trimmer C1. These trimmers allow accurate alignment of the tuned circuit at both ends of the frequency band and are accessible for adjustment at the bottom of the receiver as shown in Figure 14. The high potential end of the tuned circuit is connected to the control grid of RF amplifier tube V1 through switch SW2A, switch SW1 and through coupling capacitor C3. The low potential end of the circuit is returned to chassis ground. The DC bias return from the control grid of RF amplifier tube V1 to the AVC line is closed through resistor R1. Switch SW1 located at the rear of the receiver chassis is provided so that a loop antenna, connected through loop receptacle J7, may be used in place of an outside antenna as outlined under Antenna Requirements, Paragraph 1.5.

Plate potential from the high voltage DC line is applied to the plate of RF amplifier tube V1 through filter resistor R11, bypassed to ground by capacitor C18A. One section of switch SW3A is used to cut off DC voltage from the plate and screen of RF amplifier tube V1 and the screen of mixer tube V3 when the Selectivity control is set at PHONO or TELEVISION positions in order to keep any RF signal from leaking through when using the audio amplifier of the receiver for record player reproduction or television sound broadcasts.

Screen potential is applied to RF amplifier tube V1 through filter resistor R4 bypassed to ground by capacitor C4B. Resistor R3 is connected from screen to ground to provide more stable screen potential with fluctuations in AVC voltage, this providing better AVC characteristics on strong signals. The suppressor of V1 is connected to ground. Initial grid bias is obtained by means of cathode resistor R2 bypassed by capacitor C4A. Grid bias on V1 can be increased when full sensitivity is not required, by means of Sensitivity control R5 which also controls the bias on first IF amplifier tube V4. One side of the heater circuit of V1 is grounded at the socket.

The amplified signal from the plate of RF amplifier tube V1, is transferred to the signal grid of mixer tube V3 through RF transformer L7. The primary of L7 is untuned. The secondary winding together with variable capacitor C5C1 constitutes the second and final tuned circuit operating at signal frequency. The high potential end of the tuned circuit is connected to the signal grid of mixer tube V3 by switch SW2C, through coupling capacitor C17. The low potential end of the tuned circuit connects to ground. Adjustable iron core E7 and parallel connected trimmer capacitor C15 are provided for circuit alignment. The DC bias return from the control grid of mixer tube V3 to the AVC line is closed through resistor R8. Screen potential from the high voltage DC line is applied through resistor R12 bypassed to ground by capacitor C18B. The suppressor is internally connected to the shell of the tube. Initial bias is obtained by cathode resistor R10 bypassed by C18C.

### 4.3 AM-Oscillator Circuit

The AM-oscillator circuit is of the electron coupled type. The tuned circuit consists of tapped inductor L5 shunted with variable trimmer capacitor C6 and is tuned by variable capacitor C5B1 which is shunted by fixed capacitor C13 provided to increase the fixed minimum capacity of the circuit. The inductor L5 is provided with a variable iron core for inductance adjustment. Fixed capacitor C7 shunted by variable padder capacitor C8 is provided to modify the tuning of the oscillator circuit so that it will maintain a fixed frequency difference of 455 kilocycles with respect to the signal frequency circuits when the main tuning capacitor C5A1, C5B1 and C5C1 are varied from minimum to maximum capacity. On both the BC and SW-AM bands the oscillator frequency is maintained 455 kilocycles higher in frequency than the signal frequency.

The high potential end of the tuned circuit is connected to the control grid of AM oscillator tube V2, through switch SW6B mounted on the FM-AM relay K1, and through switch SW2B and fixed capacity C11. The low potential end of the coil returns to ground. The grid of V2 is returned to ground through resistor R6. The cathode of V2 is connected to the tap on inductor L5 through switch SW2B and through capacitor C14 to oscillator injector grid (Pin #5) of mixer tube V3. This grid is returned to ground through resistor R9. The plate of the oscillator tube V2 is connected to the 150 volt regulated high voltage DC line through resistor R7, bypassed by capacitor C12, and through switch SW6A on the FM-AM relay K1. This switch removes voltage from the plate of oscillator tube V2 when the receiver is adjusted for FM reception. One side of the heater of V2 is grounded at the socket.

### 4.4 AM-IF Amplifier Circuits - 455 Kilocycles

The signal frequency arriving at the control grid of mixer tube V3 and the oscillator frequency fed to the injector grid of this tube or mixed (or heterodyned) and the resultant difference frequency (455 kilocycles) is fed to the input of the IF amplifier.

Transfer of IF signal from the plate of the mixer tube V3 to second detector tube V9 is accomplished by inductive coupling through IF transformers T1, T2 and T3 and amplified by tube V4 and V5. The first IF transformer T1 consists of two tuned circuits, primary and secondary with the secondary circuit operating in conjunction with switch SW3A and a tapped tertiary winding to provide three degrees of selectivity by changing the co-efficient of coupling with the primary circuit. The primary and secondary windings are each tuned to 455 kilocycles by fixed capacitors C20 and C21 and adjustable iron cores E9 and E10. These iron cores are accessible for adjustment through the top of the shield can for E10 and at the bottom of the receiver for E9. The high potential end of the primary tuned circuit connects to the plate of mixer tube V3 through a shielded conductor while the low potential end connects to the high voltage DC line through resistor R13 bypassed to ground by C19. The high potential end of the secondary tuned circuit is connected to the grid of first IF amplifier tube V4 while the low potential end is connected to the AVC line through switch SW3A and resistor R16, bypassed to ground by C22. DC potential from the high voltage DC line is applied to the screen of V4 through resistor R18 bypassed to ground by C23B. Plate potential is applied through the primary tuned circuit of second IF transformer T2 and through resistor R19 bypassed to ground by C23C. Initial grid bias is obtained through resistor R17, bypassed to ground by capacitor C23A. Resistor R17 is returned to ground through sensitivity control R5 so that the bias on V4 may be increased when maximum sensitivity is not desired.

Second IF transformer T2 is similar to first IF transformer T1 in respect to design, construction and operating characteristics. Therefore except for differences in symbol designations the circuit description of first IF transformer T1 is applicable to this transformer. The low potential end of the secondary tuned circuit of T1 is returned to ground through switch SW3B. Grid bias for second IF amplifier tube V5 is obtained through resistor R22, bypassed to ground by C26A. Screen potential is applied through resistor R23, bypassed by C26B. Plate potential is applied through the primary winding of third IF transformer T3 and resistor R24, bypassed to ground by C26C.

Third IF transformer T3 consists of a tuned primary circuit and an untuned secondary. The primary circuit consists of the primary winding shunted by fixed capacitor C27 and adjustable iron core E13 which is accessible for adjustment at the bottom of the receiver. The high potential end of the secondary winding feeds the second detector diode, while the low potential end returns to ground through diode load resistors R31 and R32.

### 4.5 AM Second Detector Circuits

The second detector tube V6 is a twin diode tube, one section being used as a second detector diode the plate of which is connected to the high potential end of the secondary winding of T3. The cathode is connected to ground, thus the tube acts as a half wave rectifier. The voltage developed across diode load resistors R31 and R32 is filtered by resistor R34 and capacitor C29B to remove all audio components, and the resultant direct current AVC voltage is used to control the gain of amplifier tube V1, V3 and V4; the degree of control being dependent on the strength of the incoming signal.

The second section of the twin diode tube V6 is utilized as a peak noise limiter which is effective only on the AM shortwave band where interference from ignition or similar peak noise may be encountered. The audio voltage appearing at the junction of R31 and R32 as a result of the demodulating action of the second detector diode, is normally coupled to the input of the audio amplifier. When the Sensitivity control is advanced to maximum rotation, switch SW4 connects the audio input to the cathode of V6 and the noise limiter circuit is in operation.

DC potential from the AVC line is further filtered by resistor R35 and capacitor C29C and applied to the control grid of tuning eye tube V7-6E5. This DC voltage regulates the shadow angle of the tube to indicate when the receiver is tuned to resonance with the received signal.

### 4.6 Audio Amplifier Circuits

The 1st and 2nd audio amplifier circuits are located on the receiver chassis while the phase inverter and output amplifier are on the power supply chassis. The audio voltage developed across the diode load resistors R31 and R32 is applied to the control grid of first AF amplifier tube V9-6J5, through capacitor C30 and volume control R37.

Switch section SW6A on the FM-AM relay actuates to connect the output of either the AM detector or the FM discriminator to the audio input switch section SW3C. This switch connects the input circuit of 1st audio amplifier V9-6J5 to radio input. Phono input or television sound input, depending on the setting of the Selectivity control.

Initial bias for 1st audio amplifier V9-6J5 is obtained through resistor R38 bypassed by C31. Plate potential is applied through filter resistor R40, bypassed by 1 section of dual capacitor C33, and through load resistor R39.

Audio signal from the plate of V9 is fed through capacitor C32 to the grid of 2nd audio amplifier tube V10-6J5. The grid of V10 is returned to ground through resistor R41 and R47. Initial bias is obtained through resistor R42 bypassed by C34. Plate potential is applied through filter resistor R44, bypassed by the second section of C33; and through load resistor R43.

Signal from the plate of V10 is coupled to the grid of 3rd audio amplifier tube V19-6SL7GT, located on the power supply chassis, through capacitor C35, to terminal #3 of audio plug P2, through terminal 3 of audio receptacle J4 and through audio compensating network R80, C87.

The tone control circuit consisting of treble control R45 and associated capacitor C36; bass control R46 and associated audio choke L14, and capacitor C37. Both R45 and R46 are centertapped controls and when the controls are both set at the position of the tap the audio response curve is flat. By tuning the treble control clockwise the high frequency response is boosted and when turned counterclockwise the high frequency response is cut. When the bass control is turned clockwise the low frequency response is boosted and when turned counter clockwise it is cut; thus the frequency response of the audio amplifier can be controlled over a wide range.

The grid of 3rd audio amplifier V19A which is one section of a dual triode tube 6SL7GT, is returned to ground through R81. Capacitor C97 is used in conjunction with audio compensating network R80, C87 which is provided to compensate for loss of high frequency response in the long connecting lead from the plate of V10 to the grid of V19A. Initial bias for both sections of V19 is obtained through resistor R82 bypassed by capacitor C88. Plate potential is applied to V19A through R84 and to V19B through R83.

Audio signal from the plate of V19A is fed to the grid of audio output amplifier V20, through capacitor C89; this grid is returned to ground through R85 and R87.

Audio signal from the plate of V19B is fed to the grid of audio output amplifier V21 through capacitor C90; this grid is returned to ground through R86 and R87.

Audio voltage appearing at the junction of resistors R85, R86 and R87 is fed to the grid of V19B. Since this voltage is 180 degrees out of phase with that appearing at the grid of V19A the audio voltages appearing at the plates of V19A and V19B will be 180 degrees out of phase, thus providing push pull amplification.

Initial grid bias for V20 and V21 is obtained through resistor R88 bypassed by C91. Screen potential for V20 and V21 is applied direct from the power supply. Plate potential is applied through the centertapped primary of output transformer T8. Capacitor C92 and resistor R90 are connected in series across the plates of V20 and V21 to prevent parasitic oscillation in the output amplifier circuit.

### 4.7 FM-RF Oscillator and Mixer Circuits

The FM-RF amplifier, mixer and oscillator circuits are located on the receiver chassis, the FM-IF amplifier and discriminator circuits are located on the power supply chassis. Input signal from the antenna is fed through FM-antenna terminal strip E2, located at the rear of the receiver, through antenna coil L9 to the grid of FM-RF amplifier V11-6AG5 which is a miniature type tube. The secondary of antenna coil L9 is connected to the grid of V11 through a parasitic suppressor R26, the low potential end of the coil being grounded. It is tuned by variable air capacitor C5-A2. Variable trimmer capacitor C39 and adjustable iron core E14 are provided as trimmer adjustments. Shunt connected capacitor C38 is provided to increase the minimum capacity of the tuned circuit. Initial grid bias is obtained through R48 bypassed by C40. Screen potential is applied through resistor R49 bypassed by C41. Plate potential is applied through the primary of mixer coil L11 and resistor R51 which is bypassed by C47.

Signal from the plate of V11 is fed to the grid of FM-mixer tube V13-6AG5, through mixer coil L11 and parasitic suppressor R53. The secondary tuned circuit of L11 is tuned by variable air capacitor C5 and C2. Air trimmer C49 and adjustable iron core E16 are provided as trimmer adjustments while fixed capacitor C48 is provided to increase the minimum capacity of the tuned circuit. Initial bias for V13 is obtained through R54 bypassed by C45. This circuit is returned to ground through a small portion of the secondary winding of FM oscillator coil L10. This impressing a voltage on the cathode of V13 at the frequency to which the oscillator circuit is tuned. This signal which is always 10.7 megacycles lower in frequency than the signal frequency, is heterodyned or mixed with the signal frequency appearing on the grid of mixer tube V13 and the resultant frequency 10.7 megacycles appears at the plate of FM mixer tube V13.

Screen potential is applied to V13 through R55 bypassed by C51. Plate potential is applied through IF primary coil L12 and resistor R56 bypassed by C53. One side of the heater of V13 is bypassed to ground by C50.

FM oscillator tube V12-6C4 is a miniature type triode. The tuned circuit consists of FM oscillator coil L10 and variable air capacitor C5B2; variable trimmer capacitor C43 and adjustable iron core E15 are provided as trimmer adjustments. Fixed capacitor C42 is provided to increase the minimum capacity of the tuned circuit. The high potential end of L10 connects to the grid of V12 through coupling capacitor C44. The grid is returned to ground through R50. The cathode of V12 is connected to a tap on coil L10. Plate potential is applied through R52 bypassed by C46.

### 4.8 FM-IF Circuits

The IF signal appearing at the plate of FM mixer tube V12 is fed to the primary of 1st FM-IF transformer L12. This coil is tuned to 10.7 megacycles by capacitor C52 and adjustable iron core E17. The primary winding is then link coupled to the secondary winding, located on the power supply chassis, through FM-IF input plug P3 and jack J5 and through another small winding coupled to the secondary coil L13. The 1st FM-IF secondary coil L13 is tuned to 10.7 megacycles by capacitor C54 and adjustable iron core E20 and is connected to the grid of 1st FM-IF amplifier V14-6AC7 through parasitic suppressor R57.

Bias is obtained through R58, bypassed by C55. Screen potential is applied through R59 bypassed by C57. Plate potential is applied through the primary winding of 2nd FM-IF transformer T4 and resistor R60 bypassed by C58. One side of the heater of V14 is bypassed to ground by C56.

The primary of T4 is tuned to 10.7 megacycles by capacitor C59 and adjustable iron core E21. The primary is inductively coupled to the secondary which is tuned by capacitor C60 and iron core E22. The high potential end of the secondary connects to grid of 2nd FM-IF amplifier V15-6AC7 through capacitor C61 and parasitic suppressor R62. The low potential end returns to ground. The grid of V15 returns to ground through R61. Through the use of coupling capacitor C61 and grid leak R61 second FM-IF amplifier tube V15 will act as a limiter on extremely strong signals.

Second FM-IF amplifier V15-6AC7 is identical to first FM-IF amplifier tube; therefore except for symbol designations the circuit description is the same.

Third and fourth FM-IF transformer T5 and T6 are similar to second FM-IF transformer T4 and except for symbol designations the circuit description is the same.

The third and fourth FM-IF tubes are used as limiter amplifiers. By employing the proper plate and screen voltages and correct values of grid leak and coupling capacitors these tubes will reach full limiting action with approximately 10 microvolts input signal, effectively shunting any amplitude signals such as ignition noise or impulse interference signals. The values of grid leak and coupling capacitor used were chosen to insure fast limiting action on noises possessing a steep wave front.

### 4.9 FM Discriminator Circuit

The fifth FM-IF transformer or discriminator transformer is provided to couple the second limiter tube V17 to the discriminator diode V18. A phase bridge type of discriminator circuit is used with both primary and secondary circuits being tuned by air dielectric trimmers C80 and C82. The primary and secondary windings are inductively coupled so that the peaks of the discriminator are approximately 300 kilocycles apart. The discriminator is linear up to plus or minus 100 kilocycles from the IF frequency of 10.7 megacycles, in order that over-modulation beyond plus or minus 75 KC at the transmitter will not cause distortion in the receiver.

The balanced detector action of the discriminator tube diode acts to cancel any amplitude modulation present on weak signals. Signal voltage appearing across the primary of T7 is induced into the secondary of this transformer which reacts with the voltage coupled from the primary through capacitor C81 to produce frequency discriminating action. When the frequency of the signal flowing through T7 is exactly 10.7 megacycles the voltage across resistors R77 and R78 are equal and opposite. A change in the frequency in one direction produces a positive difference between the voltages across R77 and R78; a frequency change in the opposite direction produces a negative voltage difference. In this way frequency modulation of the carrier signal produces a similar audio frequency voltage across resistors R77 and R78. This audio voltage is fed to the audio amplifier input through a de-emphasis network consisting of resistor R7 and capacitor C85. RF choke L16 and capacitor C86 are provided to filter out any RF components which may be picked up in the audio input lead.

### 4.10 Rectifier Power Supply Circuits

The rectifier power supply of the Model 800-B Radio-Phonograph is designed to operate from a 115-120 volt 50-60 cycle AC source. The power supply chassis is provided with a 6 foot two conductor cord with plug for connection to the AC source.

One side of the primary circuit of power transformer T9 is fused with a 3 amp fuse and one side of the primary circuit of the pushbutton tuning transformer T10 is fused with a 1 amp fuse. The primary of T10 is connected across the AC line at all times so that voltage is always available to operate the AC-ON-OFF relay.

The primary circuit of the power transformer T9 is closed when the power ON-OFF relay K2 is thrown to the ON position by pushing the ON button at the front panel. One side of this primary circuit connects to terminal 10 of speaker receptacle J2. When the speaker plug P4 is inserted into the receptacle, the jumper wire between terminals 9 and

10 of the speaker plug completes the AC circuit to terminal 1 of the receiver receptacle J3 through the switch on relay K2 then back through terminal 4 of receiver receptacle J3 to the power transformer. The AC power circuit is fed through the speaker receptacle J2 so that if the speaker plug is removed when the power is on, the primary circuit is automatically broken and no damage can be done to the high voltage rectifiers. Capacitor C96 is provided to filter out any noise entering through the primary circuit of the power transformer. Receptacle J1 is provided for connection of the AC plug on the record changer. This receptacle is connected across the primary circuit of the power transformer and is active only when the receiver is turned ON.

One secondary of the power transformer furnishes high voltage for the full wave rectifier plates. Another winding furnishes filament voltage for the rectifier tubes V23 and V24. A third winding furnishes heater voltage for all tubes in the power supply chassis except the rectifiers. A fourth winding furnishes heater voltage for all tubes on the receiver chassis.

The rectified voltage from the rectifier tubes V23 and V24 is filtered by a two section filter and fed to the plate of the power output tubes V20 and V21 through the primary of output transformer T8. This voltage is also fed through terminal 2 of speaker receptacle J2 and plug P4 to the 675 ohm field of the loudspeaker; from the field it feeds back through the speaker plug and receptacle terminal 4 and fed to the plates of V19A and V19B and the screens of V20 and V21. From this point a dropping resistor R92 reduces the voltage to the proper potential for all other tubes in the receiver.

The voltage regulator tube V22-OD3 (VR-150) is included in the power supply circuit to provide stabalized voltage for the AM and FM oscillator tubes so that variations in line voltage will not affect the frequency setting of the oscillator circuits.

### 4.11 Loudspeaker Circuits

The loudspeaker used with the Model 800-B Radio-Phonograph may be either a coaxial type or an extended range single speaker. Both speakers have the same field characteristics. A 675 ohm series field connected to terminals 2 and 4 of speaker plug P4 and a 9000 ohm shunt field connected to terminals 4 and 6. The coaxial speaker consists of a 15 inch low frequency speaker with a 5 inch PM tweeter mounted in the center. A network is used with the high frequency tweeter so that it will reproduce only the higher frequencies. The voice coil impedance of the coaxial speaker is 8 ohms and is connected to terminals 3 and 5 of speaker plug P4. One side of the tweeter circuit is connected to terminals 7 and 8 of the speaker plug which feed through the speaker receptacle J2 to terminals 8 and 11 of the receiver power receptacle J3; then through the cable to switch SW6A on the FM-AM relay. When the switch is thrown to FM position this circuit is closed and the tweeter is effective but when the relay is thrown to AM position the tweeter circuit is open and only the 15 inch low frequency is effective. Since the low frequency speaker will reproduce all frequencies desired for AM broadcasts or record reproduction the tweeter is not used to prevent reproduction of undesirable back ground noise. The 15 inch extended range single speaker has a voice coil impedance of 16 ohms and is connected to terminals 1 and 5 of speaker plug P4, since no tweeter is used, terminals 7 and 8 are open.

## 4.12 Pushbutton Tuning System Circuits

The pushbutton tuning system in the Model 800-B Radio-Phonograph utilizes 14 pushbuttons, 12 of which are used for station selection and 2 being used to turn the receiver ON and OFF. Figures 29 and 30 depict the circuit diagrams of the systems used in the early models and the present models. The switches used are all single pole single throw, momentary contact pushbutton type. Seven switches are used in each gang located at the right and left side of the panel. Details on setting up and adjusting the pushbutton system are explained in Section V - Adjustments.

Each of the twelve pushbutton switches is connected by a color-coded lead to a terminal board E27 mounted on the under side of the receiver chassis. This terminal board is used as a common tie-point for wires leading to the switches, the backplate contacts and the remote box receptacle.

The backplate is the nerve center of the pushbutton tuning system. It consists of two semi-circular disks insulated from each other by a bakelite strip which has a narrow protrusion rising above the contact surfaces of the disks. The two disks are connected to the two windings of a reversible type motor which is coupled directly to the tuning shaft of the dial. The two disks which form the backplate rotor are coupled directly to the shaft of the main tuning capacitor. On the stator of the backplate are mounted twelve contact fingers with numbered, adjustable knobs. Each of these contacts are connected to a switch on the front panel as shown in Figure 9. On the early Model 800-B Receiver the backplate operates as follows, taking contact No.1 as an example. When pushbutton No. 1 is pushed the switch contacts close and potential from the 36 volt tap of pushbutton tuning transformer T10 is fed through the coil of muting relay K3 to terminal 3 of receiver power receptacle J3, then through receiver plug P1, terminal 3 to switch SW5 on the power ON-OFF relay, then to switch section SW2D of the band change control, to switch section SW3D of the selectivity control, then through lead No. 1 to the common terminal of the tuning motor. The voltage could then flow through either winding of the motor but since contact No. 1 is on the left side of the backplate rotor the voltage will be applied only to that side of the rotor through contact No. 1 to switch No. 1 then through lead No.5 and through coil L18 of the FM-AM relay to chassis ground. It is then returned to the other side of the 36 volt winding of the transformer through chassis ground. When the circuit is energized by closing a pushbutton switch as above the voltage across the coil L22 of muting relay K3 will energize the relay, closing the contacts and muting the audio circuit so that signals are not audible as the dial tunes across them. The voltage flowing through the motor winding causes it to rotate, actuating the dial mechanism and turning the backplate rotor, until the insulated segment rides under the active contact, at this instant the voltage in the circuit is interrupted and the motor stops running releasing the contacts on the muting relay. Since pushbutton No. 1 is connected to the AM common lead, the AM coil of the FM-AM relay would be energized when the circuit was closed thereby switching the AM circuits ON and making the FM circuits ineffective. If pushbutton switches 5, 6 or 7 or any switch which may be connected to the FM common lead were energized, the relay would automatically switch over as the FM coil of the relay would then be energized.

Figure 30 depicts the pushbutton tuning system used in the later model 800-B Receivers. The pushbutton switches are provided with two rows of dummy lugs, one row connected to the AM common lead, the other row connected to the FM common lead, and all that is necessary to use any pushbutton for FM or AM is to connect that switch to the corresponding common lead. It will be observed that the numbers opposite the pushbuttons have been rearranged so that they are in sequence - 1 to 12. Pushbuttons 5, 6 and 7 are still wired for FM when the receivers leave the factory as most of the FM stations are located in the center of the tuning scale but in locations where a frequency at some other part of the dial has been allocated, another pushbutton may be used by disconnecting the jumper wire of that particular switch from the AM common lead and connecting it to the FM common lead. The next item to be observed is the addition of two relays in series with the backplate rotor disk. When either of these relays are energized by voltage applied through the rotor disk, switches SW10 or SW11 are closed completing the motor circuit and turning the dial mechanism. By means of this arrangement very little current is required to pass through the backplate movable contacts thus prolonging their life. It will be noted also that the 36 volt tap of the pushbutton tuning transformer T10 is no longer required, all necessary potential being supplied from the 24 volt tap.

The pushbutton system drive motor is a 24 volt reversible type motor geared directly to the dial drive mechanism.

The power ON-OFF relay is a double solenoid relay with 1 rotary type switch section. When one of the solenoid coils is energized by pushing the ON pushbutton the relay actuates the switch to close the AC primary circuit of the power transformer and also closes the 24 volt circuit to the drive motor. When the other solenoid coil is energized by closing the OFF pushbutton, both of the above circuits are opened. Both solenoid coils operate at 24 volts AC.

The FM-AM relay is a double solenoid relay with 2 rotary type switch sections that operate 6 circuits. When one coil is energized by closing any AM pushbutton switch all circuits close to operate for AM reception, when the other solenoid coil is energized by closing any FM pushbutton switch, the circuits close to operate for FM reception. Both solenoid coils operate at 10 volts AC on the early model receivers and on all late model receivers with the relays in the drive motor circuit. The solenoid coils of the FM-AM relay operate at 22 volts AC.

The muting relay used in the 800-B Receiver is actuated by the voltage used to run the drive motor. The switch is a S.P.S.T. with contacts normally open. The coil operates on 2.4 volts AC.

The drive motor relays are identical in electrical characteristics to the muting relay although in some receivers the mechanical construction will be different.

The remote keyboard receptacle J6 is a 21 contact receptacle provided for the connection of a remote keyboard when it is desired to tune the receiver from a remote position. By means of this remote keyboard it is possible to tune in up to 12 stations, control the volume and turn the receiver ON and OFF. When the remote keyboard is to be used, a motorized volume control with the necessary connections is installed in the 800-B Receiver.


Figure 9 Front View 800-B Receiver Showing Pushbutton Sequence

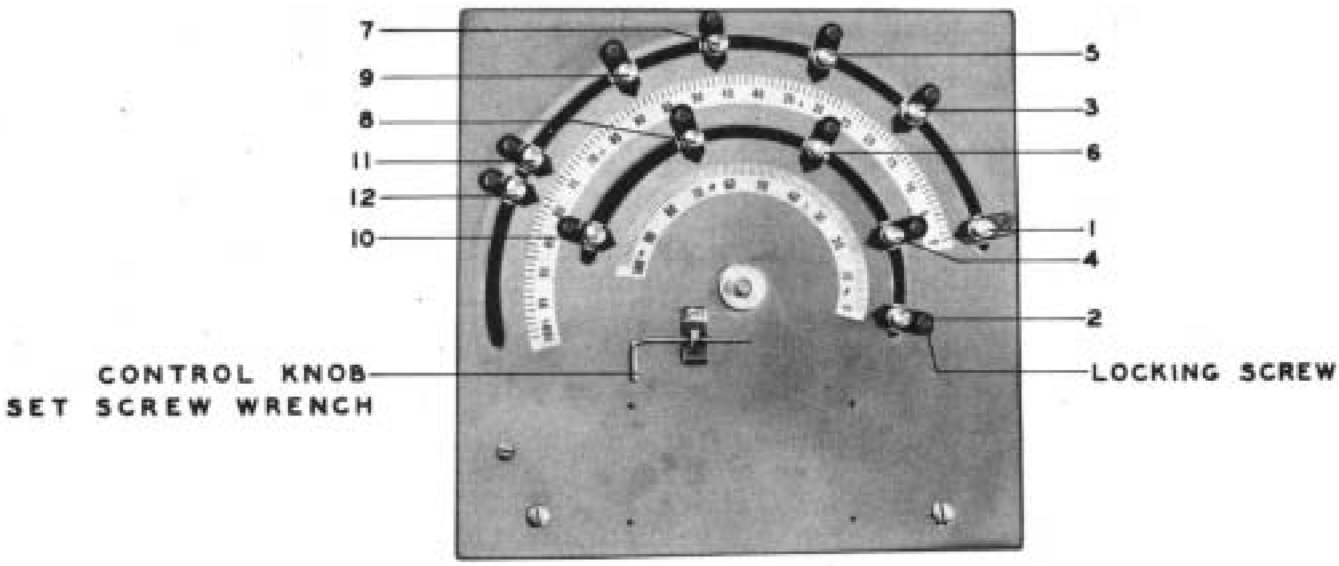



Figure 10 Back View of Pushbutton Tuning System Backplate

## Section V ADJUSTMENTS

### 5.1 Setting up Pushbutton Tuning System

The pushbutton tuning system in the 800-B Receiver has been designed to provide maximum flexibility in order to permit setting up for 6 or more AM stations and 1 to 6 FM stations, the only limitations being the spacing of the stations on the tuning dial or the setting for an AM station falling on the same spot as that for an FM station. At the factory the receivers are wired so that 4 buttons on the left side of the panel and the 5 top buttons on the right side are wired for AM stations and the lower button on the right side with the two top buttons on the left side are wired for FM stations as shown in Figure 9. No attempt should be made to set up the pushbutton tuning system for weak distant stations as poor results will be obtained because of background noise.

The switch over from AM to FM reception is done automatically in the receiver, that is, with the receiver adjusted for pushbutton tuning, when any AM button is pushed the receiver is automatically set for AM reception and when any FM button is pushed the receiver is automatically switched for FM reception.

The pushbutton tuning drive unit is located at the rear of the receiver chassis. This unit has 12 adjustable knobs which are numbered 1 to 12. These knobs are set to the desired position by turning them clockwise or counter-clockwise with a rotary motion. They are locked in position by means of a small screw, adjacent to the knob. These small lock screws should never be tightened more than one turn past the point where the screw touches the backplate. If tightened more the setting of the knob will be changed. Two calibrated scales located below the two rows of knobs, are provided to enable setting the knobs in conjunction with the logging scale at the top of the front dial scale. Each of the pushbuttons on the front panel is wired to the corresponding knob on the backplate in the sequence shown in Figure 9. The following procedure should be followed in setting up the pushbutton tuning system.

1. Set the Selectivity control to "M" position and the AM-Band control to "BC" position.

2. Select the lowest frequency AM station to be set up and insert the tab for this station in pushbutton No. 1.

3. Tune in the desired station manually and note the setting of the dial pointer on the logging scale at the top of the dial.

4. Set knob No. 1 on the backplate to the corresponding number noted on the logging scale, and lock the knob in place by means of the small screw directly above it. CAUTION: Never tighten the small locking screw more than one turn past the point where it touches the backplate; if tightened more the setting of the knob will be changed.

5. As a check to ascertain that the knob is set correctly, manually set the dial pointer to a higher frequency, then push button No. 1 until the pointer stops and check this setting against the original reading on the log scale. Repeat this operation after

setting the dial to a lower frequency. If the both readings are higher or both readings lower than the original log scale reading for this station then the No. 1 knob must be moved slightly to correct for the error in reading. If the two readings are spaced equally one-half a division or less on both sides of the original station setting, as read on the log scale, the adjustment has been correctly made.

6. The above operation should be repeated for each pushbutton to be set up, starting with button No. 1 for the lowest frequency station and working up consecutively to button No. 12 for the highest frequency station. Pushbuttons 5, 6 and 7 can be used only for FM reception and when any of these buttons are pushed the receiver will automatically switch over to FM reception.

NOTE: The pushbutton tuning system will work only when the Selectivity control is set at "M" or "B" positions and the AM-Band control is set at "BC" position. If the pushbutton system does not work when the controls are set as above, replace the 1 amp fuse in the power supply. Refer to Figure 21 for location.

## 5.2 Connecting Pushbutton Switches for AM or FM Operation

When more than 3 FM stations or more than 9 AM stations are desired, by connecting the pushbutton switches as outlined below, any of the 12 pushbuttons may be set up for either an AM or FM station.

On the first Model 800-B Radio-Phonographs produced, the pushbutton switches were connected as shown in Figure 11. It will be noted that on the left hand switch gang, one side of switches 1-2-3-4-8-9 are all connected to the black AM common lead, therefore, all these switches will operate on AM stations. If it is desired to connect one or more of the switches on the left hand side for FM stations, it will be necessary to disconnect the switch or switches required from the black AM common lead and connect them over to the white FM common lead on the right hand switch.

On the right hand switch gang, one side of switches 5-6-7 are connected to the white FM common lead, therefore, these three switches are used to set up FM stations. One side of switches 10-11-12 are connected to the white-red dot AM common lead and are used to set up AM stations. In order to use anyone of these switches for an FM station, disconnect that switch from the AM common lead and connect it to the FM common lead. In this manner any one of the twelve pushbutton switches may be connected for operation on either AM or FM.

On the later Model 800-B Radio-Phonograph, the switch gangs have been provided with 2 dummy lugs on each section; one row of dummy lugs are connected to the AM common lead, the other row of dummy lugs are connected to the FM common lead and all that is necessary to connect any pushbutton for operation on AM, is to connect that switch to the AM common lug and for FM operation connect it to the FM lug. It will be noted by observing Figure 12 that the pushbuttons are now numbered in sequence 1 to 12 starting at the bottom pushbutton on the left side of the panel.

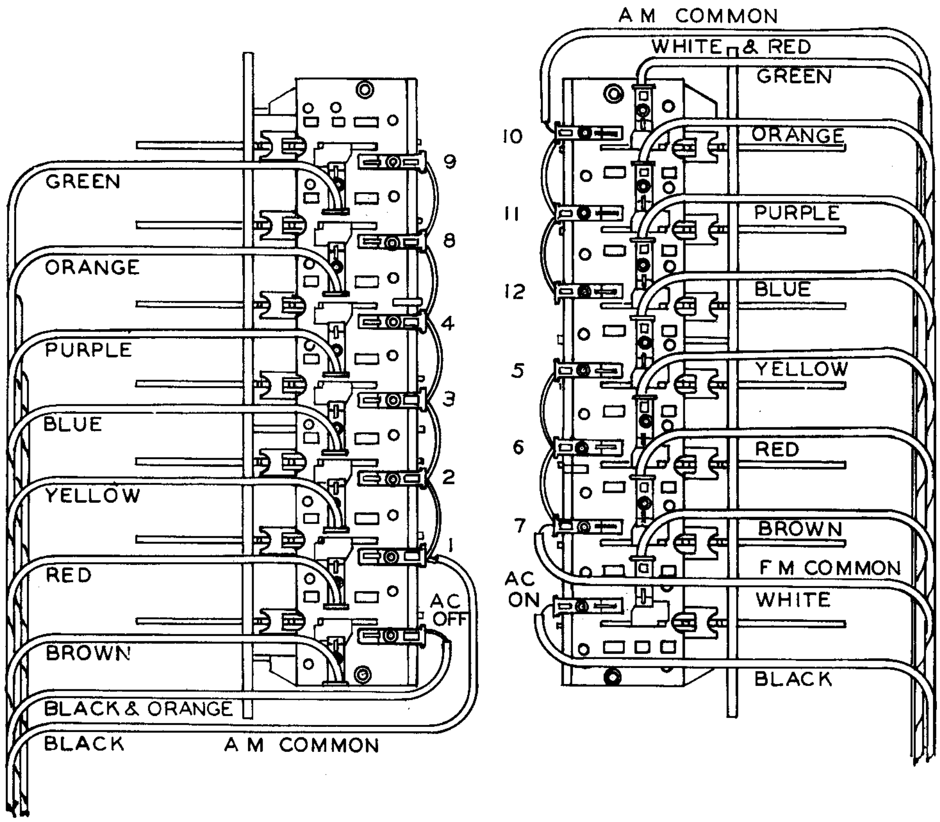



**Figure 11 Pushbutton Switch Detail**

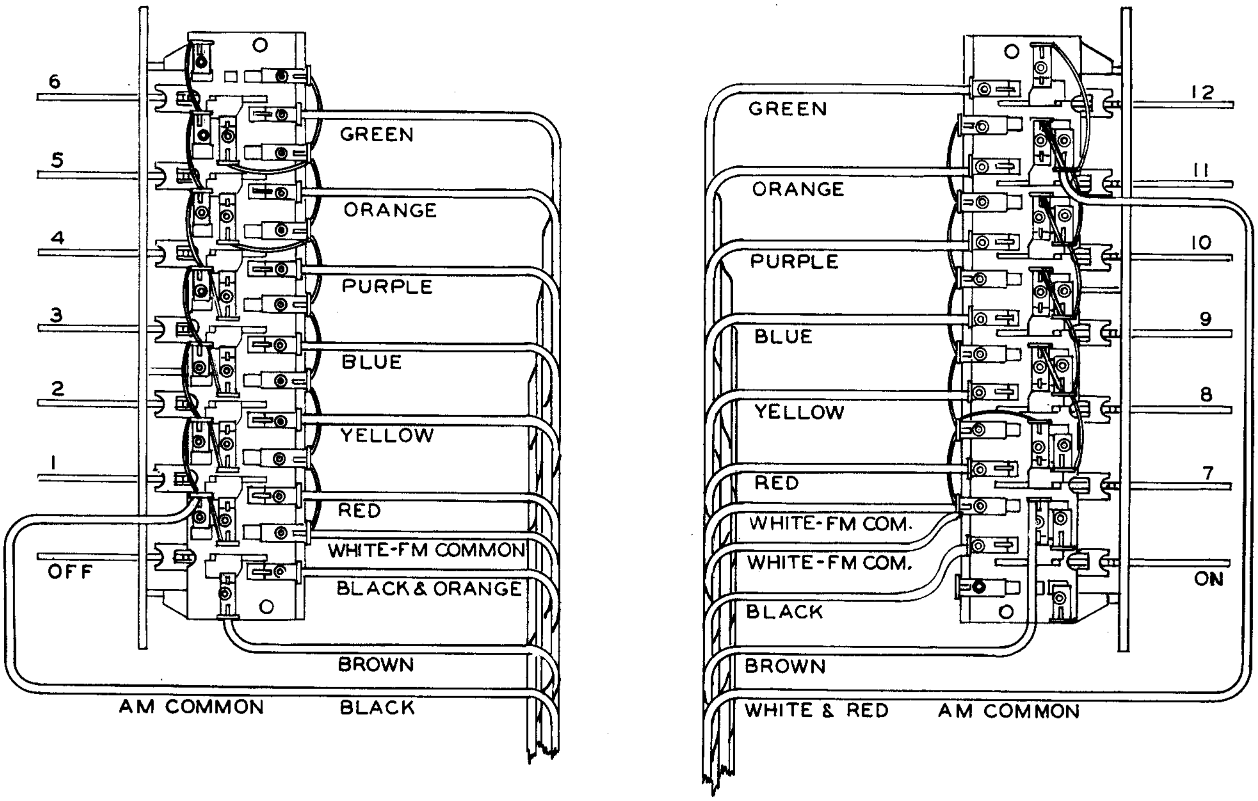



**Figure 12 Pushbutton Switch Detail Modified**

Table 1 Trouble Location Chart

| Symptom | Cause | Remedy |
|---|---|---|
| Set fails to switch ON or OFF | Blown 1 amp or 3 amp fuse | Replace defective fuse |
| | Defective switch contacts on ON-OFF relay | Adjust contacts on switch or replace switch section |
| | AC ON-OFF relay inoperative | Check relay connections |
| | | Put drop of light oil on rotor shaft bearing |
| Set operates but pushbutton system fails to operate | Blown 1 amp fuse | Replace defective fuse |
| | Defective switch contacts on ON-OFF relay | Adjust contacts on switch or replace switch section |
| Set weak or dead on all bands | Blown 3 amp fuse | Replace defective fuse |
| | Defective tube in audio amplifier or rectifier | Replace with good tube |
| | Defective speaker | Check continuity of voice coil |
| | | Check continuity of field coils |
| | | Check components and connections of network on coaxial speakers |
| | Socket voltages wrong | Check associated bypass capacitors |
| | | Check associated resistors |
| | | Check continuity of associated wiring |
| | Defective switch contact | Clean and adjust defective switch or replace switch section |
| Set weak or dead on one band only | No signal | Check all coils on specific band |
| | | Check switch contacts on specific band |
| | | Check all tubes used for specific band |
| | | Check FM-AM relay |

Table 1 Trouble Location Chart (Continued)

| Symptom | Cause | Remedy |
|---|---|---|
| Noisy reception | Defective tube | Tap all tubes lightly and replace any that are noisy |
| | Defective component | Tap all components lightly with insulated rod. Check carefully suspected parts |
| | Defective antenna | Check antenna installation, lead-in and connections |
| Oscillation | Defective tube | Replace tubes one at a time |
| | Open bypass capacitor | Connect good capacitor across suspected unit temporarily Replace defective unit |
| Hum | Defective tube | Replace tubes one at a time |
| | Defective electrolytic filter capacitor | Replace defective unit |
| | Defective bypass capacitor | |
| | Transformer lamination buzz | Tighten screws on power transformer and 46 volt transformer |
| | | Insulate 46 volt transformer from bottom cover plate with tape |
| | | Mount power supply on rubber or felt |

## Section VI MAINTENANCE AND REPAIRS

### 6.1 General

When servicing the Model 800-B Radio-Phonograph the first step should be a complete check of all tubes. This can be accomplished easily by replacing one at a time with tubes of known good quality. All tubes which are not defective should be reinserted in the socket from which they were taken. Failure of a vacuum tube in the receiver may reduce the sensitivity, cause intermittent operation or cause the receiver to be completely inoperative.

### 6.2 Failure of the Receiver

In case of failure or breakdown of the receiver the fault must first be localized in one portion of the circuit, this can be accomplished by observation of some peculiar action of one of the controls or by checking the receiver against test data tabulated in Tables 2 and 3. It must be remembered that resistance or voltage checks will not positively locate certain faults. For instance, an open circuited by-pass capacitor will not appear in point to point resistance tests and may introduce regeneration or oscillation in certain circuits which effect the stage gain of other circuits. Similarily, a short circuit occuring in a low resistance inductor will not appear in a point to point resistance test and if the short appears in an R.F. coil, a false indication of the necessity for realignment may result.

Bypass or filter capacitors, which develop poor internal connections or which become open-circuited, will cause decreased sensitivity and/or poor stability. An open unit can be located by temporarily connecting a good capacitor in parallel with the unit under suspicion. Failures of any bypass or filter capacitor may seriously overload resistors of associated circuits. Overloads of sufficient magnitude to permanently damage a resistor will cause the painted surface of the resistor to be scorched, making the defective unit easy to locate by visual inspection.

Loose connections, causing intermittent or noisy operation, and which cannot be found by point to point resistance tests, can usually be located by individually testing each circuit element, or by tapping or shaking the component under suspicion, when the receiver is adjusted for normal operation.

### 6.3 Lubrication

There are very few moving parts on the Model 800-B Radio-Phonograph that will require lubrication more often than once a year with the possible exception of the record changer and this will depend on the amount of use the record changer receives. The manufacturers recommendations on lubrication as outlined in the instruction book packed with each record changer should be followed. A drop or two of #10 oil on the receiver slide rails and record changer compartment once a year will keep these parts working smoothly. In addition a drop of #10 oil should be applied to the dial tuning shaft bearing and the FM-AM relay and power ON-OFF relay bearings.

## 6.4 Pushbutton Tuning System Maintenance

Although there are very few moving parts in the pushbutton tuning system which will require frequent adjustment or maintenance the following information is outlined to assist in keeping the system in good working condition.

1. Pushbutton switches

A little carbon-tetrachloride, applied with a clean cloth or a small brush while the switch is worked back and forth, will keep the contacts clean.

2. Drive motor and remote volume motor

The clutch release spring on the back of these motors at the end of the rotor shaft may need adjusting to keep the clutch from chattering. A pair of long nose pliers should be used for this adjustment. If the clutch chatters when the motor is driving the dial, apply more pressure by bending the spring in toward the motor frame. If the clutch fails to release soon enough when the backplate insulator segment reaches the contact, the disk may override the contact and start to reverse. To remedy this fault pressure on the clutch release spring should be loosened by bending the spring out slightly. These same adjustments apply to the remote volume control motor on receivers which have this motor installed.

3. FM-AM relay and power ON-OFF relay

The switch contacts on these relays should be cleaned by applying carbon-tetrachloride with a clean cloth or small brush. The contacts may need slight adjustment at times for if they are too loose, poor contact will result and some of the circuits will not work or if they are too tight the relay may stick and refuse to throw to the proper position. Caution should be exercised when adjusting these contacts in order to maintain proper contact.

4. Muting relay and motor control relays

Since these relays are of very simple construction no adjustment should ever be necessary on them, however the switch contacts may need cleaning at times and the best method of doing this is to use a narrow strip of clean cloth with a little carbon-tetrachloride, burnishing the contacts with a back and forth motion.

5. Backplate contacts and rotor disk

The backplate contacts and rotor disk will be subjected to more wear than any other part of the tuning system. Maintenance will consist essentially in keeping the contacts and rotor disk surfaces clean and maintaining proper contact between the rotor disk and the movable contacts.

In order to clean or adjust the backplate contacts it is necessary to remove the backplate and the rotor disk from the receiver as follows:

1. Remove the horseshoe clamp washer from the end of the rotor disk shaft.

2. Remove the two screws holding the bottom of the backplate to the chassis and the two screws holding the brackets of the backplate to the top of the chassis base.

3. Loosen the two set screws which hold the rotor disk to the flexible coupling.

4. Pull the backplate away from the receiver chassis and remove the rotor disk.

5. The contacts and rotor disk can be cleaned by wiping them with a clean cloth using carbon-tetrachloride. The contacts should then be adjusted so that the tip of the contact is 11/16" from the inside surface of the backplate.

   If the insulating segment is badly worn it can be easily replaced by removing the segment at the end of the insulating strip marked with the Figure 1 and replacing with a new segment.

6. The rotor disk can now be reinserted into the backplate bearing and the flexible coupling, and the backplate fastened back onto the receiver chassis. Then insert the clamp washer back onto the rotor shaft.

7. In order to properly position the rotor disk so that the original setting of the contact knobs will still be the same, proceed as follows:

   1. Set the No. 1 contact knob at the extreme end of the top slot in the backplate.

   2. Set the dial at approximately 600 kilocycles or 20 on the logging scale.

   3. Set the rotor disk so that the end with the insulated segment marked 1 is slightly above center and tighten down one of the set screws in the flexible coupling.

   4. With the receiver turned ON, press pushbutton No. 1 and run until the backplate rotor disk stops.

   5. Loosen up the set screw in the coupling being careful not to change the position of the rotor disk, then while holding the rotor disk firmly so that it will not move, turn the dial tuning knob until the dial pointer is at the extreme left side of the scale.

   6. Tighten down both set screws in the flexible coupling. The backplate will now be in the original position as set at the factory and if the contacts have not been moved all the previous contact knob settings should remain the same.

## 6.5 Record Changer Maintenance

For information on adjustments and lubrication the instruction manual furnished with the record changer should be consulted.

On most of the pickup cartridges furnished with the record changers, the needle is held in place by means of a set screw. If this set screw becomes loose the needle may turn sideways in the cartridge and will not seat properly in the needle groove or will sound distorted. The needle furnished is of the precious metal, long life type and if it is found necessary to replace it or if it becomes loose in the cartridge, remove the two screws holding the cartridge in the pickup arm and drop the cartridge out of the arm. The set screw can be loosened and the needle either replaced or set at the proper position again. The bent shank portion of the needle should face straight out from the pickup cartridge. Caution should be used in replacing the needle not to apply too much pressure on the set screw as this may cut through the plastic shank of the needle and ruin the reproduction.

## 6.6 Voltage and resistance tests

Table 2 lists the tube socket voltages for various settings of the controls. All voltages are measured between the chassis and socket terminals. Voltage measurements listed are made with a DC voltmeter of 1000 ohms per volt using the highest range scale that can be easily read. The receiver should be connected for normal operation and the controls adjusted as listed in Table 2. Line voltage should be 115 volts 50-60 cycles. Resistance measurements are listed in Table 3. All resistance measurements are made between chassis and terminals listed. The most suitable scale for the measurement being taken should be used. The receiver should be disconnected from the power source with controls adjusted as follows: Selectivity - sharp, Treble - max., Sensitivity - as listed, AM Band-as listed, Bass - max., Volume - as listed.

Table 2 Tube Socket Voltages

| Terminal | Pin | Variable | | Voltage DC Volts |
|---|---|---|---|---|
| | | Symbol | Setting | |
| V1 Grid | 4 | | | 0 |
| Cathode | 5 | R5 | Max. | 3 |
| | 5 | R5 | Min. | 21 |
| Screen | 6 | SW6A | AM Position | 85 |
| Plate | 8 | SW6A | AM Position | 240 |
| V2 Grid | 5 | | | 0 |
| Cathode | 8 | | | 0 |
| Plate | 3 | SW6A | AM Position | 130 |
| V3 Grid #1 | 5 | | | 0 |
| Cathode | 6 | | | 2.5 |
| Grid #3 | 8 | | | 0 |
| Grid 2 & 4 | 4 | SW6A | AM Position | 100 |
| Plate | 3 | SW6A | AM Position | 240 |
| V4 Grid | 4 | | | 0 |
| Cathode | 5 | R5 | Max. | 3.5 |
| | 5 | R5 | Min. | 21 |
| Screen | 6 | SW6A | AM Position | 80 |
| Plate | 8 | SW6A | AM Position | 240 |
| V5 Grid | 4 | | | |
| Cathode | 5 | | | 3.5 |
| Screen | 6 | SW6A | AM Position | 75 |
| Plate | 8 | SW6A | AM Position | 240 |
| V6 Cathode #1 | 8 | | | 0 |
| Plate #1 | 5 | | | 0 |
| Cathode #2 | 4 | | | 0 |
| Plate #2 | 3 | | | 0 |
| V7 Grid | 3 | | | 0 |
| Cathode | 5 | | | 0 |
| Target | 4 | SW6A | AM Position | 240 |
| Plate | 2 | SW6A | AM Position | 20 * |
| V8 Grid | 3 | | | 0 |
| Cathode | 5 | | | 0 |
| Target | 4 | SW6A | FM Position | 240 |
| Plate | 2 | SW6A | FM Position | 10 * |
| V9 Grid | 5 | | | 0 |
| Cathode | 8 | | | 2.5 |
| Plate | 3 | | | 58 |
| V10 Grid | 5 | | | 0 |
| Cathode | 8 | | | 18 |
| Plate | 3 | | | 64 |

* Measured on 500 volt scale

Table 2 Tube Socket Voltages (Continued)

| Terminal | Pin | Variable | | Voltage DC Volts |
|---|---|---|---|---|
| | | Symbol | Setting | |
| V11 Grid | 1 | | | 0 |
| Cathode | 2-7 | | | 1.5 |
| Screen | 6 | SW6A | FM Position | 125 |
| Plate | 5 | SW6A | FM Position | 235 |
| V12 Grid | 6 | | | 0 |
| Cathode | 7 | | | 0 |
| Plate | 5 | SW6A | FM Position | 120 |
| V13 Grid | 1 | | | 0 |
| Cathode | 2-7 | | | 2.5 |
| Screen | 6 | SW6A | FM Position | 90 |
| Plate | 5 | SW6A | FM Position | 235 |
| V14 Grid | 4 | | | 0 |
| Cathode | 5 | | | 1.5 |
| Screen | 6 | SW6A | FM Position | 110 |
| Plate | 8 | SW6A | FM Position | 220 |
| V15 Grid | 4 | | | 0 |
| Cathode | 5 | | | 1.5 |
| Screen | 6 | SW6A | FM Position | 120 |
| Plate | 8 | SW6A | FM Position | 220 |
| V16 Grid | 4 | | | 0 |
| Cathode | 5 | | | 0 |
| Screen | 6 | SW6A | FM Position | 55 |
| Plate | 8 | SW6A | FM Position | 60 |
| V17 Grid | 4 | | | 0 |
| Cathode | 5 | | | 0 |
| Screen | 6 | SW6A | FM Position | 52 |
| Plate | 8 | SW6A | FM Position | 45 |
| V18 Cathode#1 | 8 | | | 0 |
| Plate #1 | 5 | | | 0 |
| Cathode #2 | 4 | | | 0 |
| Plate #2 | 3 | | | 0 |
| V19A Grid | 1 | | | 0 |
| Cathode | 3 | | | 2 |
| Plate | 2 | | | 130 |
| V19B Grid | 4 | | | 0 |
| Cathode | 6 | | | 2 |
| Plate | 5 | | | 105 |
| V20 Grid | 5 | | | 0 |
| Cathode | 8 | | | 20 |
| Screen | 4 | | | 270 |
| Plate | 3 | | | 340 |

Table 2 Tube Socket Voltages (Continued)

| Terminal | Pin | Variable | | Voltage DC Volts |
|---|---|---|---|---|
| | | Symbol | Setting | |
| V21 Grid | 5 | | | |
| Cathode | 8 | | | |
| Screen | 4 | | | |
| Plate | 3 | | | |
| V22 Cathode | 2 | | | |
| Anode | 5 | | | |
| V23 Filament | 2-8 | | | |
| Plate | 4-6 | | | |
| V24 Filament | 2-8 | | | |
| Plate | 4-6 | | | |

Table 3 Point to Point Resistance
Terminal to Chassis

| Terminal | | Pin | Variable Symbol | Variable Setting | Resistance Ohms Plus or Minus 10% |
|---|---|---|---|---|---|
| V1 | Grid | 4 | | | 1.39 megohms |
| | Cathode | 5 | R5 | Min. | 10,560 ohms |
| | | | R5 | Max. | 560 ohms |
| | Suppressor | 3 | | | 0.0 ohms |
| | Screen | 6 | SW6A | AM Position | 7,300 ohms |
| | | 6 | SW6A | FM Position | 10,000 ohms |
| | Plate | 8 | SW6A | AM Position | 9,250 ohms |
| | | 8 | SW3A | PH or Tel. | 26,000 ohms |
| V2 | Grid | 5 | | | 47,000 ohms |
| | Cathode | 8 | SW2B | BC Band | 1 ohm |
| | | 8 | SW2B | SW Band | .4 ohm |
| | Plate | 3 | SW6A | AM Position | 17,400 ohms |
| | | 3 | SW6A | FM Position | Infinite |
| V3 | Grid #1 | 5 | | | 20,000 ohms |
| | Cathode | 6 | | | 240 ohms |
| | Grid #3 | 8 | | | 1.39 megohms |
| | Grid 2 & 4 | 4 | SW6A | AM Position | 26,250 ohms |
| | | 4 | SW6A | FM Position | 43,000 ohms |
| | Plate | 3 | SW6A | AM Position | 9,250 ohms |
| | | | SW6A | FM Position | 26,000 ohms |
| V4 | Grid | 4 | | | 1.134 megohms |
| | Cathode | 5 | R5 | Min. | 10,560 ohms |
| | | 5 | R5 | Max. | 560 ohms |
| | Suppressor | 3 | | | 0.0 ohms |
| | Screen | 6 | SW6A | AM Position | 108,250 ohms |
| | | 6 | SW6A | FM Position | 125,000 ohms |
| | Plate | 8 | SW6A | AM Position | 9,250 ohms |
| | | 8 | SW6A | FM Position | 26,000 ohms |
| V5 | Grid | 4 | SW3B | Sharp (S) | 0.0 ohms |
| | | | SW3B | Medium (M) | 47 ohms |
| | | | SW3B | Broad (B) | 47 ohms |
| | | | SW3B | PH or Tel. | Infinite |
| | Cathode | 5 | | | 560 ohms |
| | Suppressor | 3 | | | 0.0 ohms |
| | Screen | 6 | SW6A | AM Position | 108,250 ohms |
| | | 6 | SW6A | FM Position | 125,000 ohms |
| | Plate | 8 | SW6A | AM Position | 9,250 ohms |
| | | 8 | SW6A | FM Position | 26,000 ohms |
| V6 | Cathode #1 | 8 | | | 0.0 ohms |
| | Plate #1 | 5 | | | 9,400 ohms |
| | Cathode #2 | 4 | | | 1.734 megohms |
| | Plate #2 | 3 | | | 47,000 ohms |

Table 3 Point to Point Resistance (Continued)
Terminal to Chassis

| Terminal | Pin | Variable | | Resistance Ohms Plus or Minus 10% |
|---|---|---|---|---|
| | | Symbol | Setting | |
| V7 Grid | 3 | | | 3.114 megohms |
| Cathode | 5 | | | 0.0 ohms |
| Target | 4 | SW6A | AM Position | 8,250 ohms |
| | 4 | SW6A | FM Position | 25,000 ohms |
| Plate | 2 | SW6A | AM Position | 1 megohm |
| | 2 | SW6A | FM Position | 1 megohm |
| V8 Grid | 3 | R29 | Min. | .47 megohms |
| | 3 | R29 | Max. | .88 megohms |
| Cathode | 5 | | | 0.0 ohms |
| Target | 4 | SW6A | AM Position | 54,000 ohms |
| | 4 | SW6A | FM Position | 10,000 ohms |
| Plate | 2 | SW6A | AM Position | 1.054 megohms |
| | 2 | SW6A | FM Position | 1.010 megohms |
| V9 Grid | 5 | R37 | Min. | 0.0 ohms |
| | 5 | R37 | Max. | 1 megohm |
| Cathode | 8 | | | 1,300 ohms |
| Plate | 3 | SW6A | AM Position | 102,250 ohms |
| | 3 | SW6A | FM Position | 104,000 ohms |
| V10 Grid | 5 | | | 110,000 ohms |
| Cathode | 8 | | | 11,300 ohms |
| Plate | 3 | SW6A | AM Position | 102,250 ohms |
| | 3 | SW6A | FM Position | 104,000 ohms |
| V11 Grid | 1 | | | 5 ohms |
| Cathode | 2-7 | | | 150 ohms |
| Screen | 6 | SW6A | AM Position | 110,000 ohms |
| | 6 | SW6A | FM Position | 66,000 ohms |
| Plate | 5 | SW6A | AM Position | 55,000 ohms |
| | 5 | SW6A | FM Position | 11,000 ohms |
| V12 Grid | 6 | | | .1 megohm |
| Cathode | 7 | | | 0.0 ohms |
| Plate | 5 | SW6A | AM Position | Infinite |
| | 5 | SW6A | FM Position | 20,400 ohms |
| V13 Grid | 1 | | | 5 ohms |
| Cathode | 2-7 | | | 1,000 ohms |
| Screen | 6 | SW6A | AM Position | 274,000 ohms |
| | 6 | SW6A | FM Position | 230,000 ohms |
| Plate | 5 | SW6A | AM Position | 56,400 ohms |
| | 5 | SW6A | FM Position | 12,400 ohms |

Table 3 Point to Point Resistance (Continued)
Terminal to Chassis

| Terminal | Pin | Variable | | Resistance Ohms Plus or Minus 10% |
|---|---|---|---|---|
| | | Symbol | Setting | |
| V14 Grid | 4 | | | 56 ohms |
| Cathode | 5 | | | 160 ohms |
| Suppressor | 3 | | | 0.0 ohms |
| Screen | 6 | SW6A | AM Position | 110,000 ohms |
| | 6 | SW6A | FM Position | 66,000 ohms |
| Plate | 8 | SW6A | AM Position | 56,400 ohms |
| | 8 | SW6A | FM Position | 12,400 ohms |
| V15 Grid | 4 | | | 56 ohms |
| Cathode | 5 | | | 160 ohms |
| Suppressor | 3 | | | 0.0 ohms |
| Screen | 6 | SW6A | AM Position | 110,000 ohms |
| | 6 | SW6A | FM Position | 66,000 ohms |
| Plate | 8 | SW6A | AM Position | 56,400 ohms |
| | 8 | SW6A | FM Position | 12,400 ohms |
| V16 Grid | 4 | | | 27 ohms |
| Cathode | 5 | | | 0.0 ohms |
| Suppressor | 3 | | | 0.0 ohms |
| Screen | 6 | SW6A | AM Position | 93,000 ohms |
| | 6 | SW6A | FM Position | 49,000 ohms |
| Plate | 8 | SW6A | AM Position | 93,000 ohms |
| | 8 | SW6A | FM Position | 49,000 ohms |
| V17 Grid | 4 | | | 42,027 ohms |
| Cathode | 5 | | | 0.0 ohms |
| Suppressor | 3 | | | 0.0 ohms |
| Screen | 6 | SW6A | AM Position | 15,000 ohms |
| | 6 | SW6A | FM Position | 11,600 ohms |
| Plate | 8 | SW6A | AM Position | 154,000 ohms |
| | 8 | SW6A | FM Position | 115,000 ohms |
| V18 Cathode#1 | 8 | | | 0.0 ohms |
| Plate #1 | 5 | | | .156 megohms |
| Cathode#2 | 4 | | | .2 megohms |
| Plate #2 | 3 | | | .156 megohms |
| V19A Grid | 1 | | | 44,000 ohms |
| Cathode | 3 | | | 1,500 ohms |
| Plate | 2 | | | .232 megohms |
| V19B Grid | 4 | | | .22 megohms |
| Cathode | 6 | | | 1,500 ohms |
| Plate | 5 | | | .232 megohms |
| V20 Grid | 5 | | | .44 megohms |
| Cathode | 8 | | | 250 ohms |
| Screen | 4 | | | 12,000 ohms |
| Plate | 3 | | | 12,680 ohms |

Table 3 Point to Point Resistance (Continued)
Terminal to Chassis

| Terminal | Pin | Variable | | Resistance Ohms Plus or Minus 10% |
|---|---|---|---|---|
| | | Symbol | Setting | |
| V21 Grid | 5 | | | .44 megohms |
| Cathode | 8 | | | 250 ohms |
| Screen | 4 | | | 12,000 ohms |
| Plate | 3 | | | 12,680 ohms |
| V22 Cathode | 2 | | | 0.0 ohms |
| Anode | 5 | | | 15,300 ohms |
| V23 Filament | 2-8 | | | 12,800 ohms |
| Plates | 4-6 | | | 32 ohms |
| V24 Filament | 2-8 | | | 12,800 ohms |
| Plates | 4-6 | | | 35 ohms |

## Section VII ALIGNMENT DATA

### 7.1 General

Should realignment of the receiver become necessary the following data should be carefully studied before making any circuit adjustments so that correct alignment may be made quickly and accurately.

The complete alignment of the radio receiver may be divided into the following steps. The circuits should be checked in the order listed.

Amplitude Modulation Channel

1. AM-IF amplifier alignment
2. AM oscillator alignment
3. AM-RF amplifier alignment

Frequency Modulation Channel

1. FM-IF amplifier alignment
2. FM discriminator alignment
3. FM oscillator alignment
4. FM-RF amplifier alignment

The receiver must be removed from the cabinet and connected as for normal operation on the power source specified for the receiver. The bottom plates must be removed from the receiver and power supply chassis and for realignment of the FM-RF circuits, the cover over the main tuning capacitor must be removed.

### 7.2 AM Circuit Alignment

For alignment of the AM circuits the controls should be adjusted as follows:

1. Selectivity control set at "S" Sharp position.
2. Sensitivity control advanced to maximum point just before the noise limiter switch throws.
3. Band change control set to "BC" or "SW" band as noted.
4. Bass and treble controls set at maximum position.
5. Volume control set as noted.

### 7.21 AM-IF Amplifier Alignment

The intermediate frequency of the AM-IF channel is 455 kilocycles.

Tuning adjustments are provided in each transformer. These adjustments consist of adjustable powdered iron cores and are designated on the circuit diagram by symbols E9 to E13 inclusive. All adjustments for the AM-IF channel are on the receiver chassis.

An output meter must be connected across the voice coil leads of the speaker on terminals 3 and 5 of the speaker receptacle in the power supply chassis when the 15 inch Jensen coaxial speaker is used or across terminals 1 and 5 when the 15 inch Tru-sonic single speaker is used. This connection is changed for different speakers because of the difference in voice coil impedance which is 8 ohms for the Jensen coaxial speaker and 16 ohms for the Tru-sonic speaker.

The high potential lead of the signal generator should be connected to the control grid (terminal #8) of the AM mixer, tube V3-6SA7 through a .005 to .05 mfd capacitor and the ground lead of the signal generator connected to any metal part of the chassis. The volume control should be advanced to a point where the noise level of the receiver starts to indicate on the output meter.

The frequency of the signal generator should be carefully adjusted to 455 kilocycles, modulated 30% at 400 or 1000 cycles and the signal input to the mixer tube adjusted to provide a reading on the output meter. The signal input should be kept at a low level so as not to overload the second detector or audio circuits and to keep the AVC voltage as low as possible. If a high signal level is used the AVC voltage developed by the second detector may become so high as to cause the trimmer adjustments on the IF transformer to appear very broad in tuning and a false indication of true resonance will result.

Starting with the 3rd IF transformer the adjustments should be set for maximum output in the following order E13, E12, E11, E10 and E9.

The sensitivity of the IF amplifier can be checked against the following figures to ascertain that each stage is in proper working order.

| Input Terminal | Signal Input Microvolts | Output Mod. On | Output Mod. Off |
|---|---|---|---|
| 2nd IF V5 Grid | 6000 | 1 volt | .1 volt or less |
| 1st IF V4 Grid | 200 | 1 volt | .1 volt or less |
| Mixer V3 Grid | 35 | 1 volt | .1 volt or less |

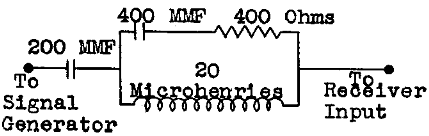
The above measurements are made at a 10 db signal to noise ratio with the output voltage shown measured across an 8 ohm voice coil. If the speaker has a 16 ohm voice coil the voltage with Mod. ON will be 1.4 volts and with Mod. OFF .14 volts.

The selectivity control should be set at "S" (Sharp) position, Sensitivity control at maximum with noise limiter switch off and Volume control at maximum. The oscillator tube V2-6J5 should be removed.

## 7.22 AM-RF and Oscillator Alignment

Caution: Readjustment of the oscillator circuit trimmers should not be attempted until after the need for such readjustment has been positively established. The following table gives the alignment frequency, trimmer adjustments and nominal sensitivity for the "BC" and "SW" bands. Sensitivity measurements are for a 6 db signal to noise ratio.

| Band | Freq. | Adjustment Osc. | Mixer | Ant. | Signal Input | Output Mod.ON | Output Mod. OFF |
|---|---|---|---|---|---|---|---|
| BC | 1500 KC | C6 | C15 | C1 | 5 uv | 1 Volt | .5 V or less |
| | 1000 KC | E5 | | | 5 uv | 1 Volt | .5 V or less |
| | 600 KC | C8 | E7 | E3 | 5 uv | 1 Volt | .5 V or less |
| SW | 16 MC | C10 | C16 | C2 | 8 uv | 1 Volt | .5 V or less |
| | 6.5 MC | E6 | E8 | E4 | 8 uv | 1 Volt | .5 V or less |




The signal generator should be connected through a standard RMA dummy antenna to the AM antenna input terminal E1. The center terminal of E1 should be connected to the ground terminal with a short jumper wire. The controls should be set as follows:

1. Selectivity control set to "S" (Sharp) position.
2. Sensitivity control set at maximum position with noise limiter switch off.
3. Bass and treble controls set at maximum.
4. AM Band control set to band desired.
5. Volume control set as noted.

It is important that the oscillator circuits operate on the high frequency side of the signal circuits, particularly on the SW Band where the trimmer will allow the oscillator circuit to be resonated on either the high or low side of the signal circuits. When properly aligned the image will appear 910 KC lower in frequency than the signal being received and it will be considerably weaker than the signal, therefore, it will be necessary to increase the output of the signal generator in order to check the image.

The following general procedure should be employed in the alignment of the AM oscillator and RF amplifier circuits.

1. Turn dial to extreme left side of scale and make certain that the pointer lines up with the zero designation on the top logging scale

2. Set the signal generator to the high frequency alignment point of the desired band.

3. Set the dial pointer of the receiver to the high frequency alignment point of the desired band.

4. Adjust the oscillator trimmer capacitor until the signal is tuned in to resonance, then adjust the mixer and antenna circuit trimmer capacitors for maximum reading on the output meter.

5. Set the signal generator and receiver dial pointer to the low frequency alignment point.

6. Set the low frequency oscillator trimmer adjustments outlined in chart on Page 42 until the signal is tuned to resonance, then adjust the mixer and antenna adjustments for maximum output.

7. Repeat this entire alignment procedure as a final adjustment.

On the BC band an adjustment E5 is provided for alignment of the oscillator circuit at 1000 KC. This adjustment should not be altered unless the calibration of the BC Band is still off frequency after the trimmer adjustments for the high and low frequency ends of the band have been adjusted.

7.3 Frequency Modulation Circuit Alignment

7.31 FM-IF Circuit Alignment

For alignment of the FM circuits the controls should be adjusted as follows:

1. Turn receiver on and push one of the FM pushbuttons to switch the receiver over to FM reception.

2. Set bass and treble controls at maximum position.

3. Adjust volume control as noted.

7.32 FM-IF Amplifier Alignment

The intermediate frequency of the FM channel is 10.7 megacycles. Tuning adjustments are provided in each IF transformer. These adjustments consist of powdered iron cores in the IF transformer and variable air capacitors in the discriminator transformer. These adjustments are designated by symbols E17 to E26 inclusive for the IF transformers and C80 and C82 for the discriminator transformer. The 1st FM-IF transformer primary adjustment E17 is located on the receiver chassis. The other adjustments are located on the power supply chassis.

The high potential lead of the signal generator should be connected to the control grid (Pin #4) of FM mixer tube V13-6AG5 through a .01 mfd capacitor, and the ground lead connected to the chassis frame. A high resistance DC voltmeter such as the RCA Volt-ohmyst should be connected across the second limiter filter resistor R72.

Set the signal generator to 10.7 megacycles and feed in a signal with modulation OFF until the meter reads 1.5 volts.

Starting with the 4th IF transformer T6, adjust the trimmers in the following order: E26, E25, E24, E23, E22, E21, E20 and E17. Each trimmer should be adjusted for maximum meter reading, keeping the input from the signal generator at a point where not more than 1.5 volts output is obtained on the meter. It is important to keep the signal input down so that meter does not read more than 1.5 volts as above this the limiters start to level off and the IF adjustments will act very broad and cannot be set to the true resonant position.

### 7.33 FM Discriminator Circuit Alignment

Set the signal generator at 10.7 megacycles and connect to the grid (Pin #4) of mixer tube V13-6AG5 through a .01 mfd capacitor. Connect the Volt-ohmyst or equivalent meter to the discriminator diode output at the junction of R78 and C84 to ground. If a volt-ohmyst or equivalent meter with polarity reversing switch is not available a zero center 50-0-50 microammeter can be used.

If the discriminator is correctly aligned the meter will read zero when the signal generator is set to 10.7 megacycles. If the meter reads either plus or minus realignment is necessary. The secondary trimmer C82 at the bottom of the discriminator transformer should be detuned so that the meter reads either plus or minus. The primary trimmer C80 at the top of the transformer should then be realigned for maximum output. The secondary trimmer C82 should now be carefully adjusted for zero reading on the meter.

Next adjust the signal generator 75 KC higher in frequency or 10.775 MC and record the reading of the meter. Then set the signal generator 75 KC lower in frequency or 10.625 MC and record this reading of the meter. These two readings should be identical, if they are not a slight readjustment of the primary trimmer C80 should be made to coincide these readings at plus and minus 75 KC from 10.7 megacycles. The zero voltage setting of the secondary trimmer C82 should then be rechecked for if this adjustment is not correctly made distortion on FM signals will result.

### 7.34 FM-RF and Oscillator Circuit Alignment

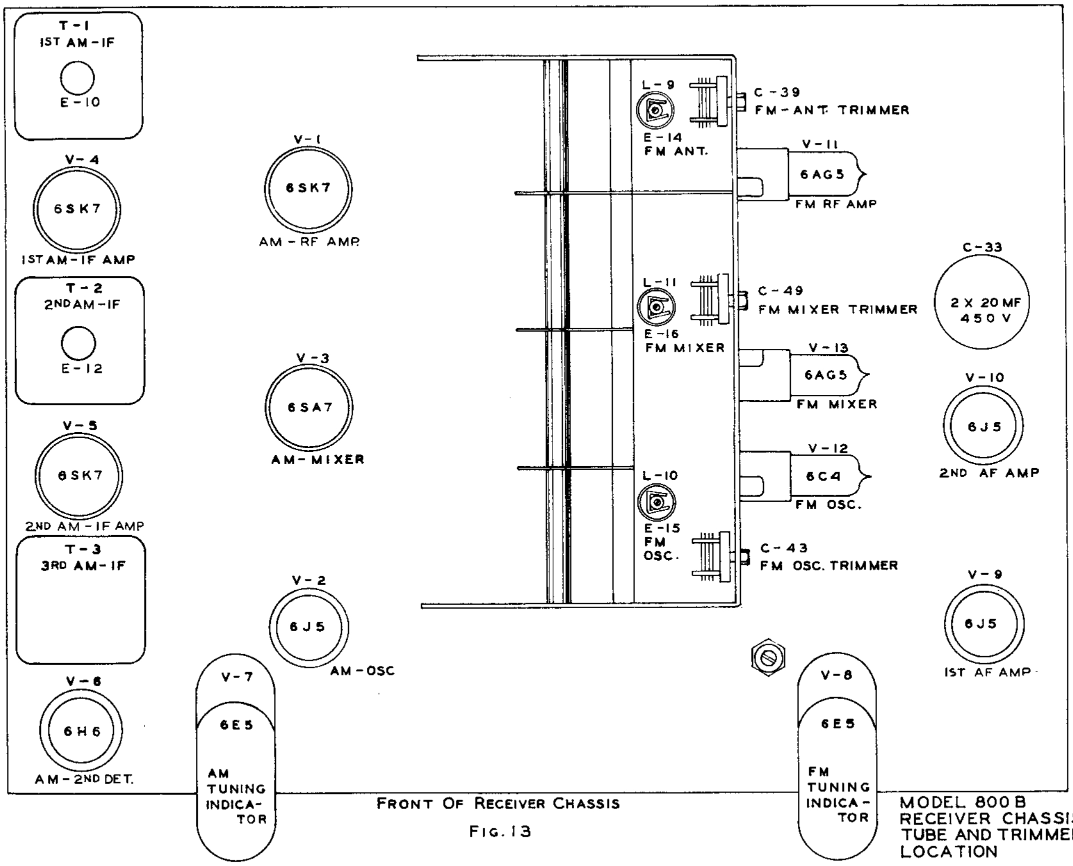
All the trimmer adjustments for the FM-RF and oscillator circuits are located on the top of the receiver chassis and it is necessary to remove the cover over the main tuning capacitor for access to these trimmer adjustments.

The signal generator should be connected to the FM antenna terminal E2 with a 50 ohm carbon resistor in series with the high potential lead of the generator and the center antenna terminal of E2 shorted to the ground terminal.

The FM oscillator circuit operates on the low side of the signal circuits and no trouble with aligning the oscillator circuit on the image should be encountered since it will be twice the IF frequency or 21.4 megacycles away from the signal frequency and the trimmer capacitor will not allow this much variation. The following chart lists the trimmer adjustments.

The high resistance DC voltmeter should be connected across the second limiter grid filter resistor R72. The sensitivity measurement given in the chart below is for 1.8 volts output as read on the high resistance DC voltmeter.

| Band | Freq. MC | Adjustment | | | Sensitivity |
|---|---|---|---|---|---|
| | | Osc. | Mixer | Ant. | |
| FM | 106 | C43 | C49 | C39 | 15 microvolts for 1.8 volts |
| | 90 | E15 | E16 | E14 | Across limiter resistor R72 |




FRONT OF RECEIVER CHASSIS

FIG. 13

MODEL 800 B
RECEIVER CHASSIS
TUBE AND TRIMMER
LOCATION

FRONT OF RECEIVER CHASSIS

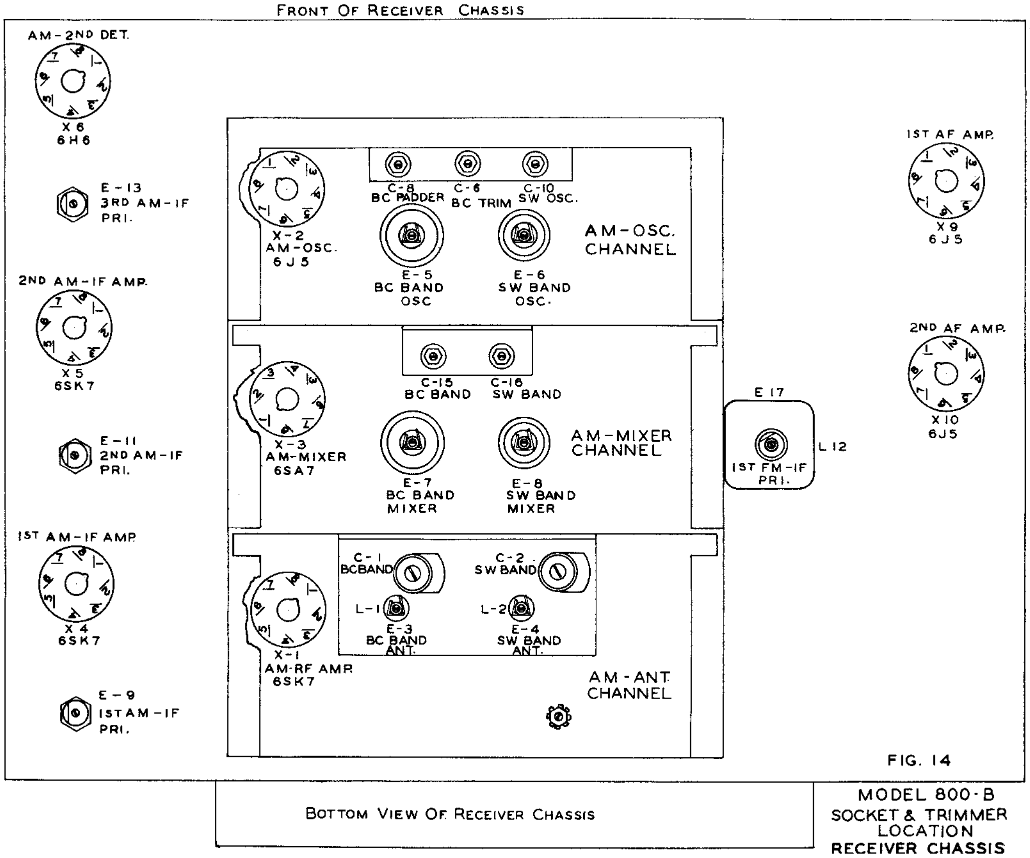
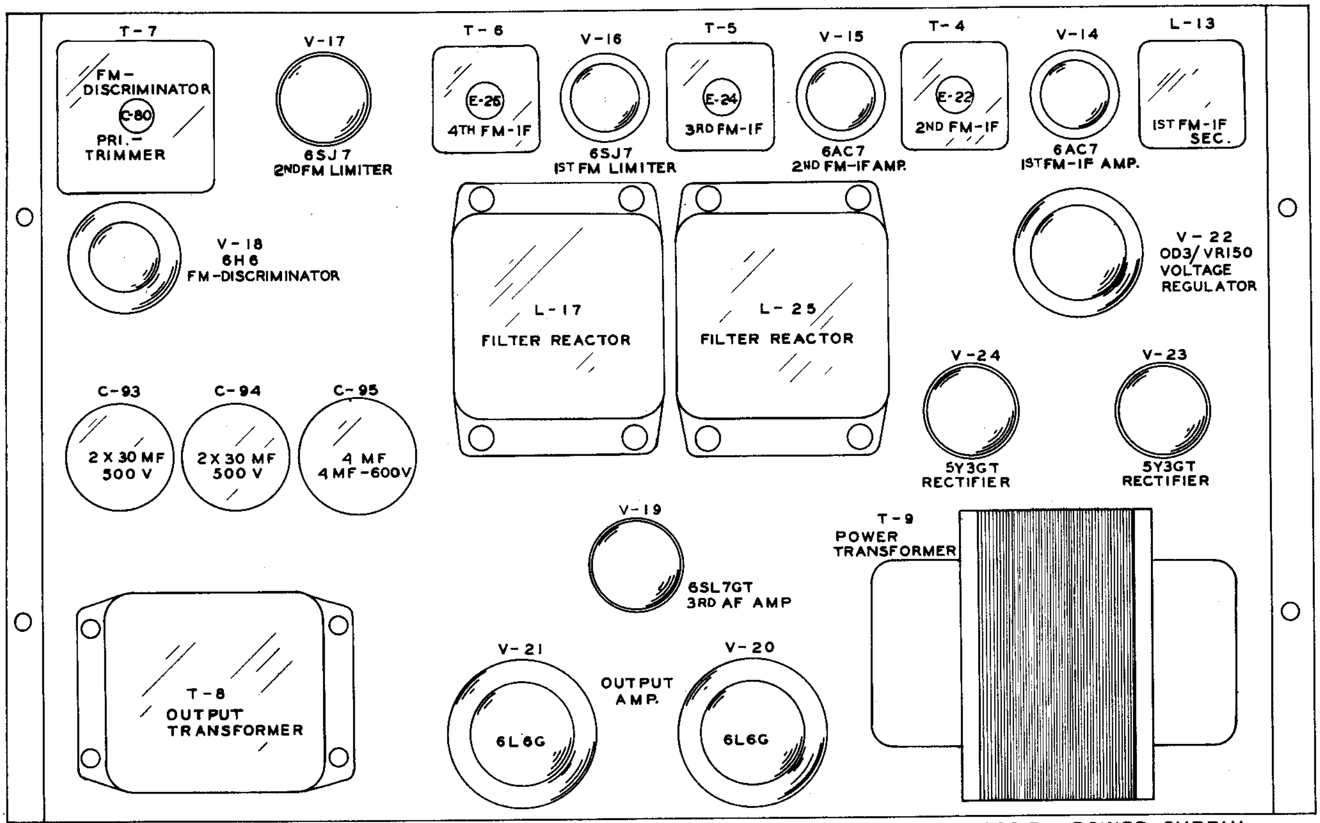



FIG. 14

BOTTOM VIEW OF RECEIVER CHASSIS

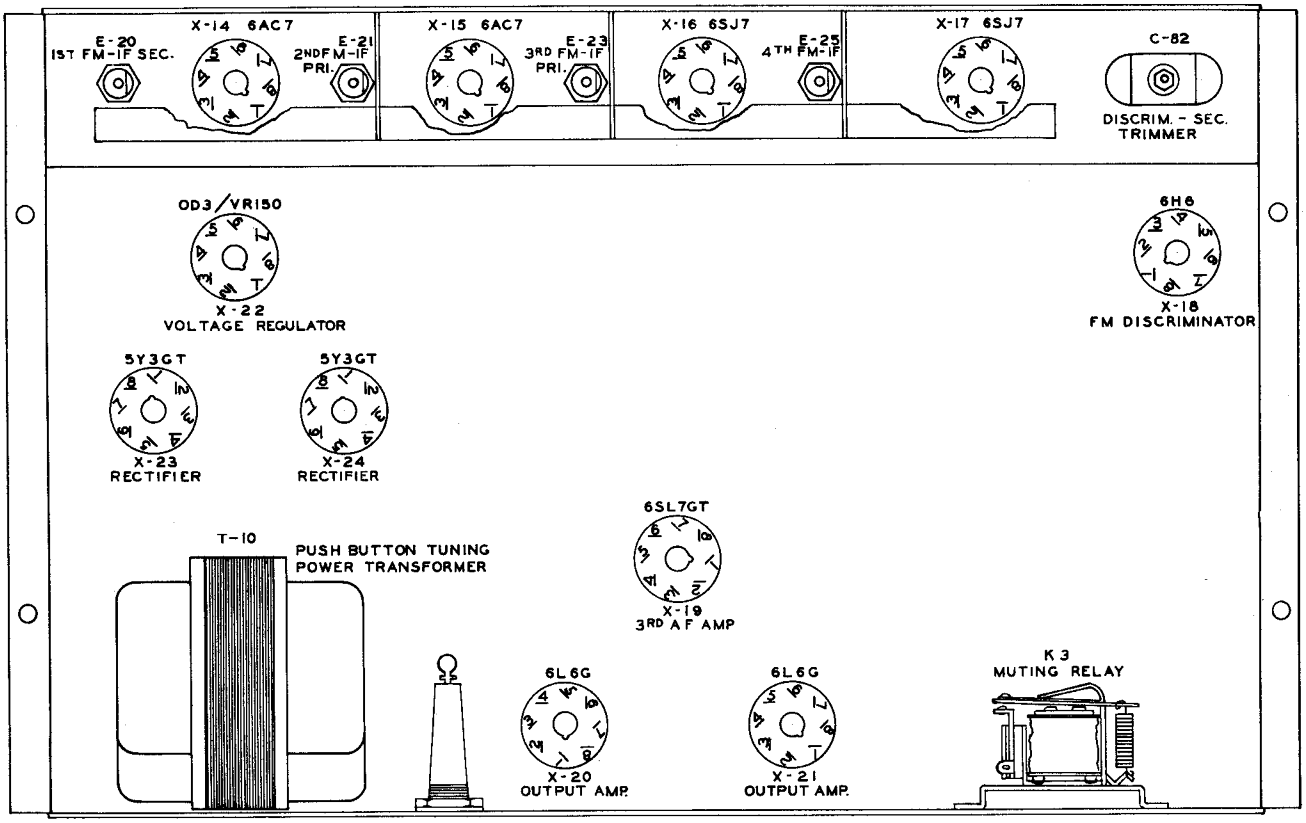
MODEL 800-B
SOCKET & TRIMMER
LOCATION
RECEIVER CHASSIS




Top View Power Supply Chassis

FIG. 15

MODEL 800 B - POWER SUPPLY TUBE AND TRIMMER LOCATION




Bottom View Power Supply Chassis

FIG. 16

MODEL 800 B - POWER SUPPLY SOCKET & TRIMMER LOCATION

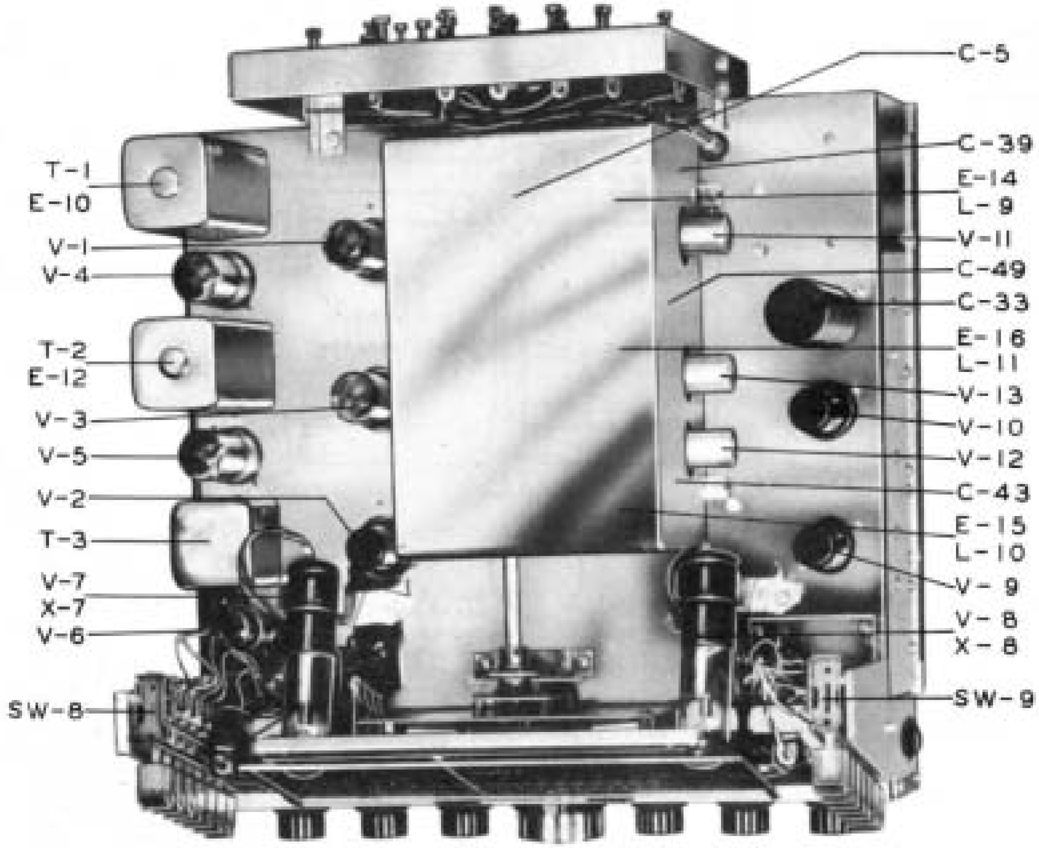



Figure 17 Top View Model 800-B Receiver Chassis

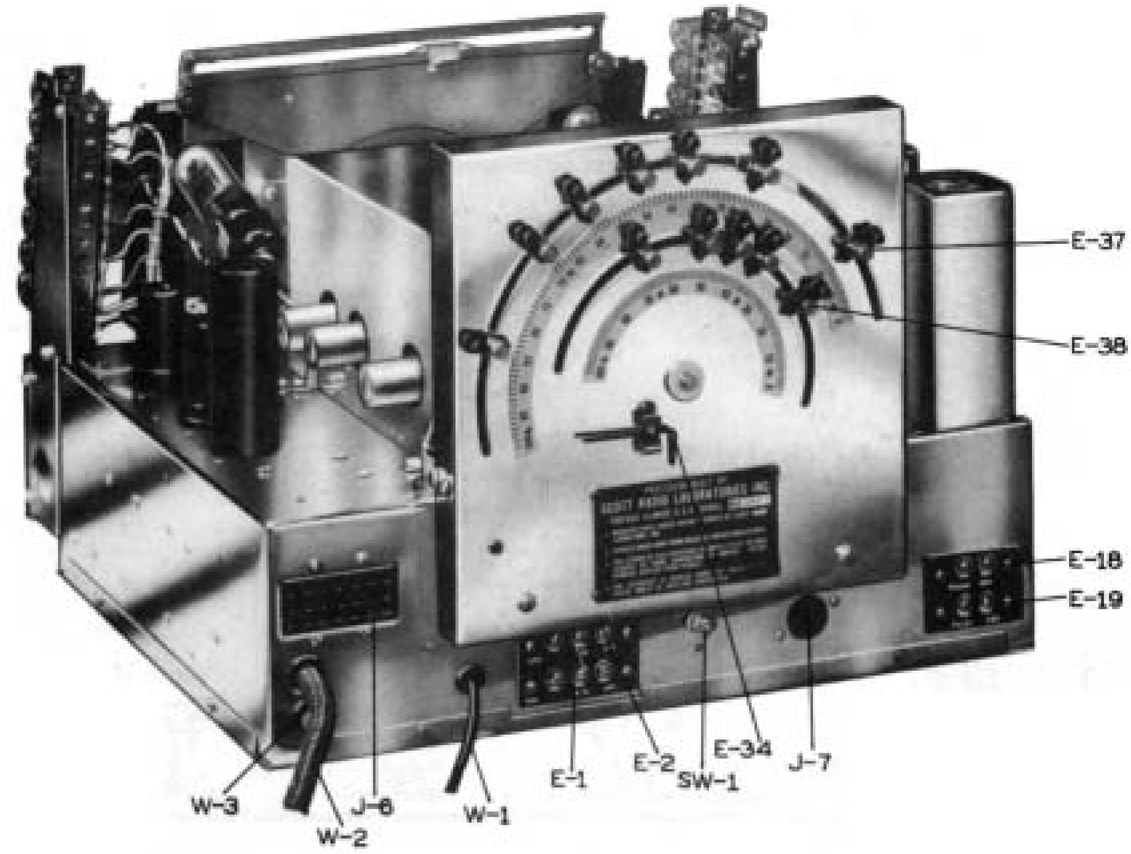



Figure 18 Rear View Model 800-B Receiver Chassis

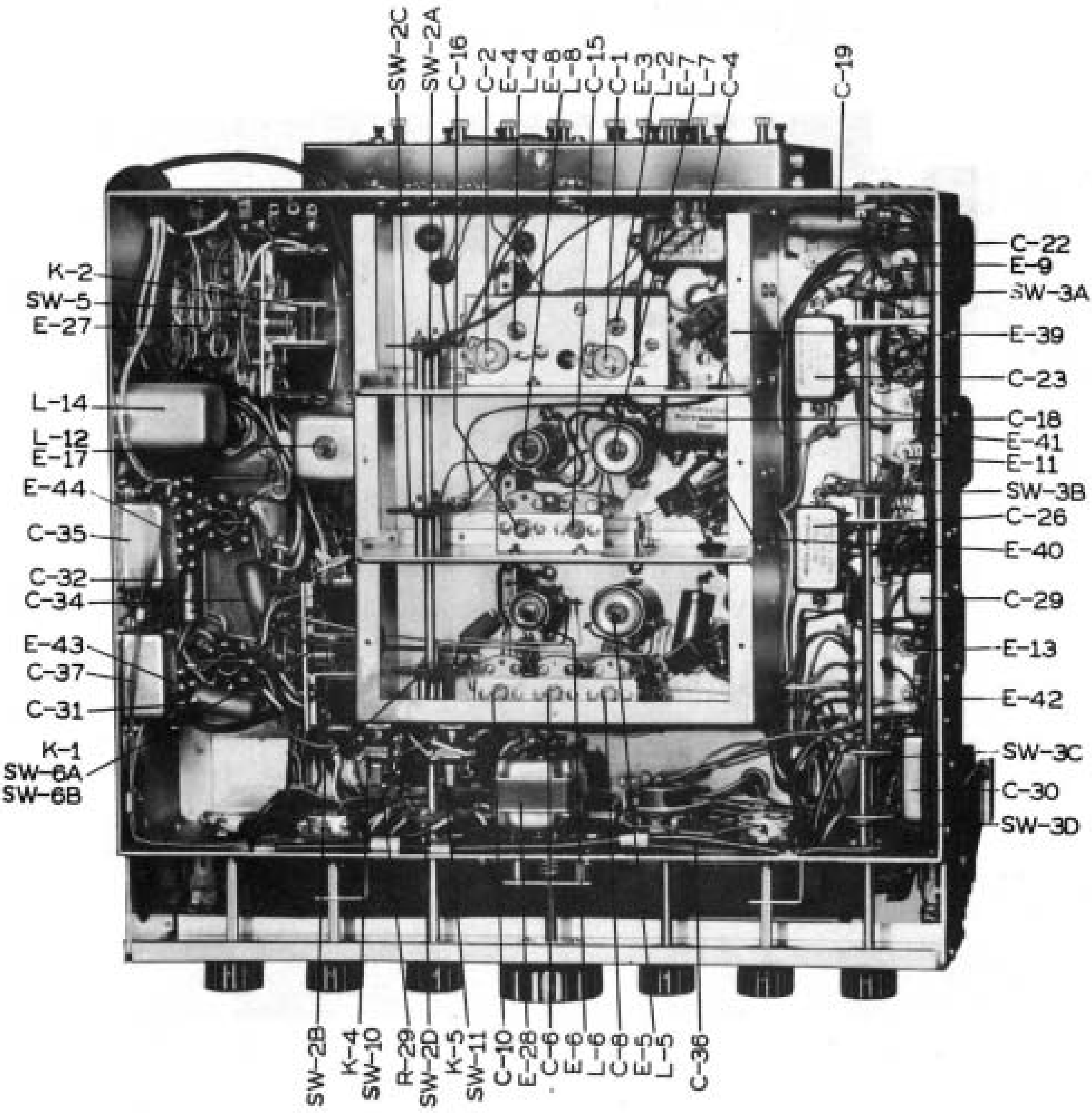



Figure 19 Bottom View Model 800-B Receiver Chassis

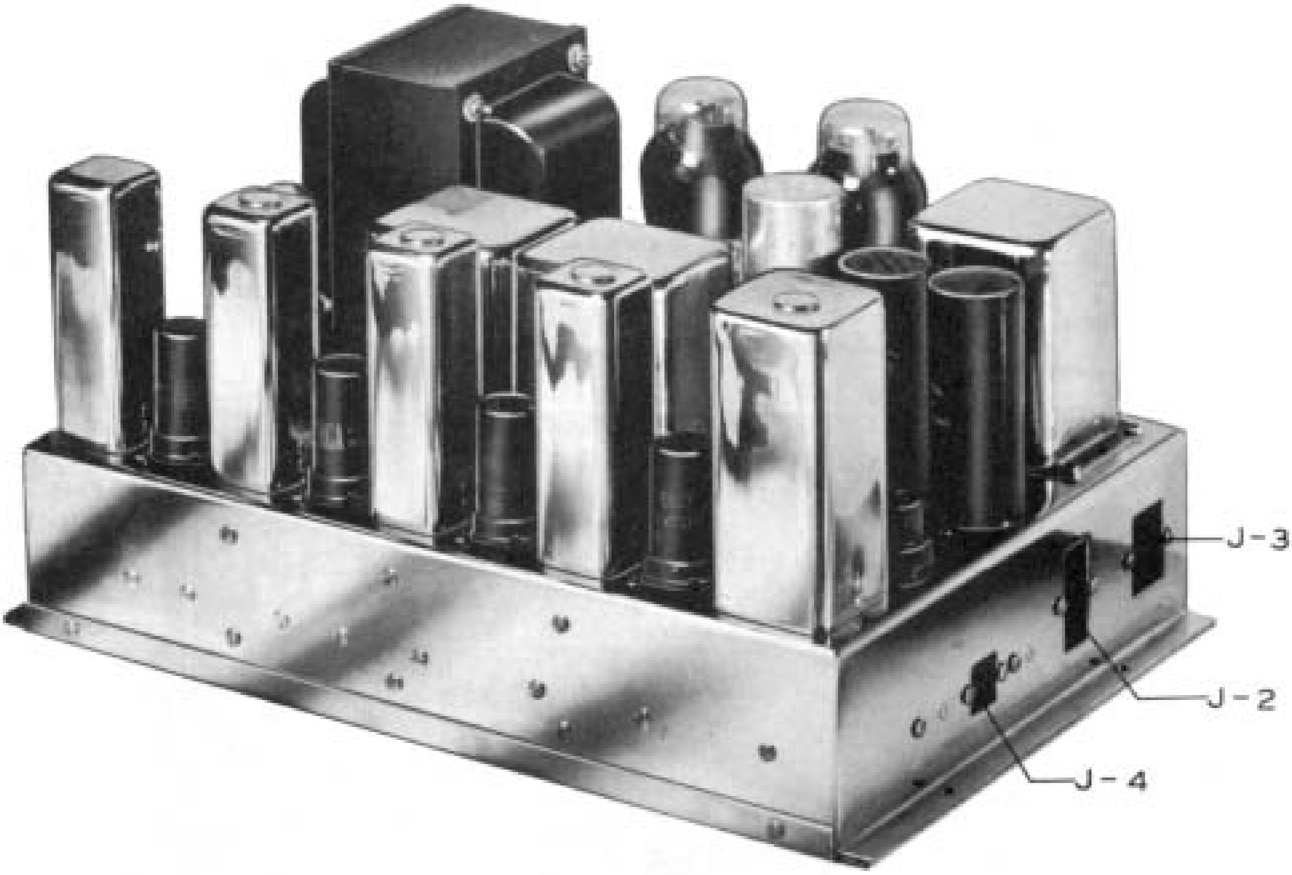



Figure 20 End View Model 800-B Power Supply Chassis

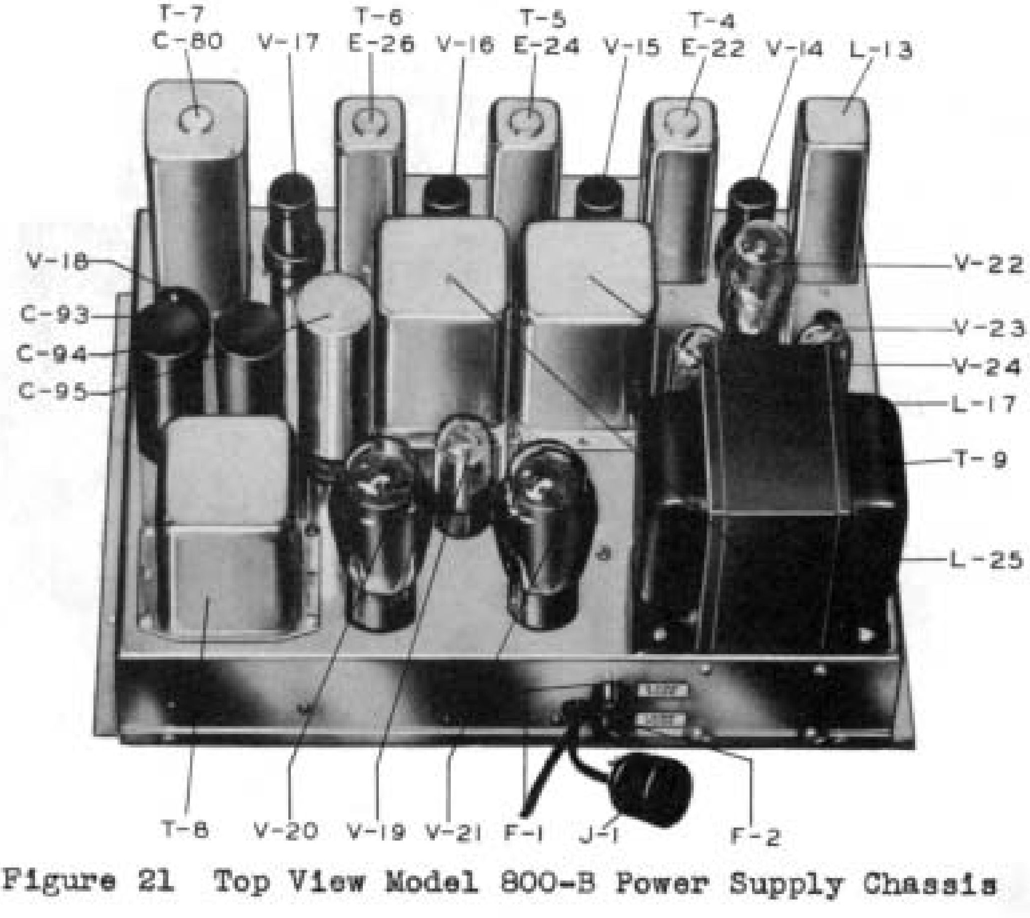



Figure 21 Top View Model 800-B Power Supply Chassis

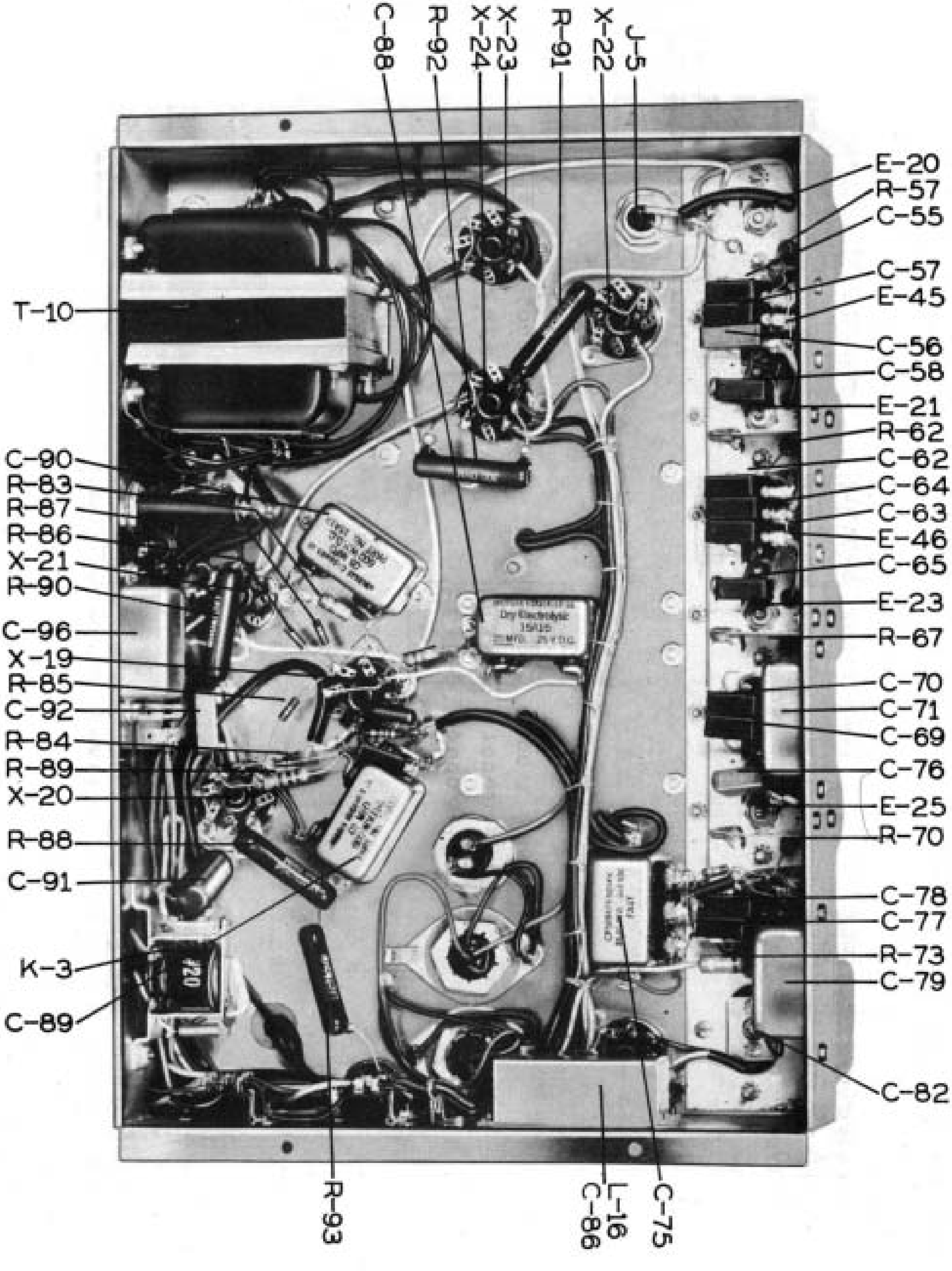



Figure 22 Bottom View Model 800-B Power Supply Chassis