POWER REQUIREMENTS
117 volt, 60 cycles, 2.0 watts
ANTENNA INPUT IMPEDANCE
200 ohms—Balanced to ground
SENSITIVITY
R.F. and I.F.—Detect signal at antenna terminals to produce 1 volt across video detector load resistance. Generator must be connected to antenna terminals with a 120 ohm carbon resistor in series with each lead to simulate proper impedance match.

Table:
<table>
<thead>
<tr>
<th>Type</th>
<th>Average</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Band</td>
<td>—9</td>
<td>—5 to 100 microvolts</td>
</tr>
<tr>
<td>High Band</td>
<td>—10</td>
<td>100 to 200 microvolts</td>
</tr>
</tbody>
</table>

Sound System—Inject 4.5 megacycle frequency modulated signal (400 cycle modulation) of grid of video amplifier and measure output at speaker voice coil. An input of 250 microvolts will produce approximately 52 millivolts or 0.42 volts across speaker voice coil.

INTERMEDIATE FREQUENCIES
Sound Carrier—22.25 Hz
Picture Carrier—28.75 Hz
L.F. SYSTEM
Four Stage—Suppressed carrier

FOCUS MAGNETIC
DEFLECTION ELECTROMAGNETIC
HIGH VOLTAGE POWER SUPPLY
R.F. type

FRAME ASSEMBLY
Selenium Rectifier
DEFLECTION YOKE
ADJUSTABLE SLUG
FOCUS COIL
ANTENNA TERMINALS

CAUTION

HIGH VOLTAGES are used in the operation of this receiver. The back cover, while in place, prevents accidental contact with this voltage and therefore should not be removed by anyone except a qualified television serviceman.

THE HIGH VOLTAGE LEAD, which supplies approximately 10,000 volts to the picture tube, should be shorted to the chassis whenever it is disconnected for service purposes. This discharge the high voltage filter condensers and prevents a shock hazard when working near the receiver after it has been turned off.

THE PICTURE VICE is highly evacuated and if broken, glass fragments will be violently expelled. Scratching, chipping, undue pressure, or careless handling such as lifting the tube by its neck is dangerous and should be avoided. If it is necessary to handle the picture tube, use smooth gloves and heavy gloves. Be sure to disconnect the voltage developed across the capacitor bound by the inner and outer coating of the picture tube. This can be done by connecting the high voltage socket on the tube to the outer coating with a well insulated metal conductor.

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INSTALLATION OF ANTENNA SYSTEM

To properly install an antenna system it is necessary to have some method of communication from the antenna site to the receiver. The communication shall be established before the final antenna site has been chosen. A pair of television telephone may be used to conveniently accomplish this purpose. Do not use the antenna transmission line as the means of transmitting this telephone data.

TYPE OF ANTENNA—Unless the ordinary broadcast receiver, the proper selection and installation of the antenna system is one of the most important factors determining picture quality. It is necessary to have an antenna system with a broad frequency response characteristic. Where impalement may exist, the input impedance of the receiver shall be below 50 ohms and the use of reflector elements may be required to eliminate reflections. In areas where both high and low band television stations are in operation, where the antenna is not located at distances which will permit optimum orientation of a single dipole antenna, use of the Stewart-Warner Combination Hi-Lo Band Antenna System is advantageous (see page 11). The standard single dipole antenna system includes:

- **Picture Tube**: 108P4 (used on Model 9100-A) 122P4 (used on Model 9100-F)
- **Focus Coil**: 507449 (for Model 9100-E) 507908 (for Model 9100-F)
- **yoY Locking Thumb Screw**: Ensure this screw is tight, otherwise, it is necessary for the focus to be adjustable.
- **Deflection Yoke**: 508050
- **Focus Coil**: 508050
- **Selenium Rectifier Assembly**: Mounted on left wall of cabinet
- **Antenna Terminals**: 508030
- **Chassis and Picture Tube Assembly**: 507449
- **Frame Assembly**: 507449
- **IOT Trap Assembly**: (used only on Model 9100-B) front strip—blue rear strip—black
- **High Voltage Power Supply**: Adjustable slug for Hi-Low Sync "Flywheel Circuit"}

507900 can be readily converted to a combination Hi-Lo line by the addition of Stewart-Warner High Band Adapter Kit 506666.

**USE OF INDOOR ANTENNA**—An indoor antenna may be used quite satisfactorily under certain conditions if the reception of an outdoor antenna is prohibited or is impractical. Where the antenna is in a room, the wall should be of sufficient thickness to eliminate any strong reflections from surrounding walls, or where an indoor antenna should yield satisfactory reception. Stewart-Warner Indoor Antenna, 507830 (capable of use on all line) or 507800 (capable of use on a line) has been specifically designed for indoor use with this receiver.

**ANTENNA ASSEMBLY**—Complete assembly and installation instructions are included with each indoor type antenna kit. These instructions should be followed very carefully. Indoor antennas are supplied completely assembled.

**LOCATING THE ANTENA**—Before attempting to install the antenna it is essential to correctly select a position which allows the following conditions to be fulfilled:

1. Absence of obstructions between the proposed antenna site and the receiving antenna, such as buildings, trees, power lines, other nearby antenna systems, etc.
2. Minimum distance between proposed antenna site and sources of electrical noise such as motors or lights which may cause interference from electrical noise sources.
3. Maximum distance between proposed antenna site and sources of electrical noise such as motors or lights which may cause interference from electrical noise sources.

**AVOIDING THE TRANSMISSION LINE**—The transmission line should be avoided in areas where strong reflections occur. It is often possible to obtain considerable improvement in performance by mounting the antenna as close as possible to the receiver. The length of line should be kept to a minimum in order to avoid difficulties with multiple reflections. Avoid using the transmission line as the means of interconnecting the antennas.

**ORIENTATION**—Since the responses of a dipole antenna have a directivity characteristic, it is necessary to orient the antenna for the position which will give the best reception performance. This is again necessary to maintain a direct communication with the main receiving recovery performance.

In the case where the signal is to be received from only one transmitter, the problem of orientation is relatively simple. Since the dipole is least responsive in the directions in which the radio waves are traveling, the antenna should be placed in the direction of the transmitter. However, in areas where more than one transmitter is operating, the problem becomes more complex. By using a wide-band frequency, the effect of the noise will be minimized and the performance improved, although the antenna bandwidth is non-linear and therefore subject to distortion.
type, heat reception is not always obtained with the antenna rod in a horizontal plane or with the mast in a vertical position.

In areas where a number of Television Stations exist, the problem of orientation becomes more acute and requires very careful consideration. In such a case, it is necessary to orient the antenna so as to obtain the earliest appearance of all the Stations within the system. This is true of the antenna system as the cable would then be susceptible to pick-up of external interference.

Length of line—The length of the transmission line should be kept as short as possible. The longer the line, the greater the possibility for non-modulated electrical disturbances undetectable to the receiver.

Adequate line terminations, when low, will reduce the energy lost to the receiver in direct proportion to length.

MOUNTING—Various methods of mounting the antenna must be noted and used. Several preferred methods are illustrated in the Figure included in the Installation instructions for Stewart-Warner Television Antenna Systems.

When using brackets to attach the mast to a wall, be sure that the wall surface of the building is in good enough condition to withstand the strain of supporting the mast and end section. Specifics from these brackets should be sufficient to hold the low end securely and spaced approximately 12" apart. The guy wire clamp must be installed as close to the wall as possible and mounted in the vertical plane on the wall which might cause the antenna to rotate. Turn bolt types must be used in each guy wire as recommended for a more rigid installation.

SAFETY AND LIGHTING PROTECTION—The antenna system should be properly grounded to a local building and its grounding system. Every precaution should be taken to adequately secure the mast to the building to avoid danger of antenna falling from the roof—use of wood is recommended wherever deemed necessary as an additional electrical safety measure.

Fixed, lightning protection may be obtained by connecting a heavy gauge wire to the vertical between the antenna mast and a good ground.

SELECTING, ROUTING AND SECURING TRANSMISSION LINE—A property of the transmission line should be measured to determine to the quality of the antenna system on the antenna itself. An improperly installed line causes reflections and high losses. Inadequate insulation will make it impossible to obtain clear picture, and a severe case, the lines may cause "static" and a picture appears out of focus even though the receiver is perfectly focused. In general, the longer the transmission line, the more care required in installation.

Television receiver models 910-D and 919-D are 8/0 copper insulated wire which is balanced in system to provide transmission to a 300 ohm antenna system. All Stewart-Warner Filled Duplex output of the transmission line must be balanced to maintain the balance of 300 ohms. This is to provide optimum results when connected to the receiver with "Rubber Type" transmission line having a lower input resistance. Failure to observe proper impedance match between antenna, transmisison line, and receiver may result in line loss and degradation to the receiver and undesirable effects of noise and interference may be accentuated.

Type of Transmission Line—Low loss "Rubber Type" 300 ohm transmission line is desired for use in a normal installation. However, under conditions where non-insulated wire may be picked up by the transmission line itself, it can be safely used. The transmission line is best balanced with respect to ground and its characteristic impedance 300 ohm can be readily matched to receiver input with a minimum of signal loss—see section entitled "Matching Shielded Cables to Receiver".

Single conductor coaxial cable should not be used for connection of more than one television receiver, as it is subject to lightening and high voltage storms. The coaxial cable system as the cable would then be susceptible to pick-up of external interference.

Connecting Line to Receiver—A terminal strip such as shown at the bottom of Figure 2 will be found on the rear of the chassis on Receiver Models 910-D and 919-D (see Figure 10). Connect the transmission line of the line to the lead terminals, so that when any interference is present, the receiver will be protected. The connection should be made before making any permanent connections of the transmission line. When using RG-2/2-U shielded cable, connect the shield to chassis (see Figure 2).

MATCHING SHIELDED CABLE TO RECEIVER—To use RG-2/2-U shielded cable, a minimum pick-up of external interference, the cable should be matched to the receiver by a special impedance matching network (consisting of three resistors) as shown in Figure 3. Do not use wire wound around metal pipes. In exceedingly low signal areas, make it easy to dispense with the network entirely. If the pipe is made of metal, good contact must be made to the cable receiver terminals, thereby tolerating the effects of the manhole.

RECEIVER CONTROLS

The various controls on the receiver may be divided into two classes, Operating and Preset. Operating controls on which control programs select as well as sound and picture quality. These controls are located on the front panel and their positions are indicated in Figure 3.

CONTROL ADJUSTMENT PROCEDURE

The television receiver contains circuits which produce high voltage waves. Exercise care to avoid contact with the high voltage terminals of the chassis.

The picture tube is highly evacuated, and if broken, glass fragments will be violently expelled.

Adjustments of the focus control and deflection position should be made carefully to avoid undesirable static on the screen of the tube.

Although the preset controls have been factory adjusted for optimum performance, it is usually necessary to make some fine adjustments of these controls at the time of installation.

The preset controls may be obtained for optimum performance, it is usually necessary to make some fine adjustments of these controls at the time of installation.

The target area of the control adjustments and the targets used to the Mode 910-G only, it will be necessary to remove the front casing by taking off the screws around the rim.

The use of the sidetone device used to hold the live coil in position during shiping, a removed before attempting to reposition the coil as described in the following procedure. Instructions for removal of the locking devices were given on the first page of this pamphlet.

The receiver is now ready for an operating check, proceed as follows:

1. SETTING BRIGHTNESS AND CONTRAST CONTROLS—Turn both of these controls to the fullest clockwise position so that intense illumination of the screen of the screen is obtained when receiver is turned on first.

2. TURN ON—Rotate the "On-Off Switch and Volume" knob approximately 3/4 turn clockwise to obtain a maximum picture signal and volume in the process. Allow several minutes for all tubes in the receiver to warm up and for circuitry to stabilize before attempting to obtain a picture on the screen.

3. ADVANCE BRIGHTNESS CONTROL—Turn "Brightness" control clockwise until picture screen is moderately illuminated. In the case of Model 910-E the screen may remain dark or dimly illuminated until the target loop is saturated as described in the next step.

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The correct setting of the fine tuning control is now obtained by turning it away from the minimum volume position for just enough to eliminate the sound interference and permit sharp reproduction of the picture. If no image is slightly distorted or parts into a series of black and white streaks as shown in Figure 6, reduce the setting of the "Contrast" control and operate the horizontal hold control knob until picture appears stable and undistorted.

## AUXILIARY FINE TUNING ADJUSTMENT

If it is found that the tuning range of the "Fine Tuning" control is inadequate to permit correct tuning of a station in its assigned channel, then adjustment of the "Auxiliary Fine Tuning" screw will be necessary. This special screw is accessible after removal of the channel selector topchips as shown in Figure 5. This can be accomplished by first taking off the "Channel Selector" knob and then the "Fine Tuning" knob by carefully pulling them for word. Group of wavefrons to pull away from the channel Selector knob.

Adjustment of the "Auxiliary Fine Tuning" screw may now be undertaken in accordance with the following procedure.

1. Set the "Channel Selector" to desired channel; then remove this knob as well as the "Fine Tuning" knob and channel selector topchips.

2. Note location of "Auxiliary Fine Tuning" adjustment screw on receiver chassis—see Figure 5. Also note that on the main tuning shield (outer brass shield) is rotated, the torque of a holes in the turning of the screws adjust the torques of the holes in the locking disc to be approaching the lower side of the opening as illustrated in Figure 5.

3. Using a thin screwdriver, preferably non-metallic, adjust the setting of "Auxiliary Fine Tuning" screw for correct tuning of the desired television station—CAUTION: Do not attempt to rotate this screw more than two full turns in either direction, as further rotation may release it from the threaded clip within the tuning mechanism and the chassis would then have to be removed from the cabinet in order to restore the screw to the correct position. If a non-metallic screwdriver is used, detuning occurs when the screwdriver is removed but it will be noted that the degree of tuning may now be compensated by readjusting the "Fine Tuning" control as desired. Then the scope of the "Fine Tuning" control which is retained on the shield will be adequate to tune in the station.

4. This completes the adjustment of the "Auxiliary Fine Tuning" screw for one channel. Identical screws are provided on each channel and they are all accessible thru the same opening in the tuning mechanism and each successively moves into position when the "Channel Selector" knob is rotated.

5. When replacing the channel number selector, it should be replaced in the cabinet with such that channel 2 & 4 are at the top position. Failure to observe this requirement may permit the channel numbers to be incorrectly indexed with the position of the "Channel Selector" mechanism.

6. SOUND VOLUME—Adjust the setting of the "Volume" control by rotating it clockwise until the sound accompanying the television broadcast is received at a satisfactory level.

**FIG. 4—SOUND INTERFERENCE CAUSED BY INCORRECT TUNING**

![Fig. 4—SOUND INTERFERENCE CAUSED BY INCORRECT TUNING](image)

**FIG. 5—LOCATION OF PRESET CONTROLS**

![Fig. 5—LOCATION OF PRESET CONTROLS](image)
ALIGNMENT

Alignment of all RF and IF tuned circuits in this receiver may be accomplished by utilizing the procedures described in the following chapters.

SEQUENCE OF ALIGNMENT: These procedures should preferably be applied in the order in which they are presented here, as alignment of the Sound Channel or IF Channel may be accomplished individually if desired.

The RF Amplifier and Mixer alignment may be accomplished independently of Sound or IF Channel alignment. However, oscillographic calibration can only be done after IF Channel has been correctly aligned. Preferr IF band pass characteristics is necessary for Oscilloscope alignment as results of RF Circuit tuning are observed on the means of an oscilloscope connected to the output of the detector stage.

REMOVAL OF CHASSIS: The receiver chassis must be removed from the cabinet in order to accomplish alignment of all tuned circuits as there are adjustment points located on the underside of all chassis. On table models the chassis and selenium rectifier assembly should be removed from the cabinet without disturbing the picture tube or speaker. Interconnection of focus coil, r.f. picture tube, speaker and chassis may be conveniently achieved by using special extension cables which are available for this purpose. These cables can be obtained through the nearest Stewart-Warner distributors by ordering as follows:

50443 High Voltage Ext. Cable & Plugs
50444 Deflection Yoke Ext. Cable & Plugs
50445 Picture Tube Ext. Cable & Plugs
50446 Focus Coil Ext. Cable & Plugs
50447 Speaker Ext. Cable & Plugs

On console models the picture tube must be removed from the cabinet below the chassis can be taken out. The picture tube, speaker, focus coil, r.f. support frame can be removed as a complete assembly by taking off the wing nuts which hold the frame to the top panel of cabinet. Allow speaker to remain in the cabinet. After picture tube and chassis have been removed it will be 4 convenient to later-mount all units by means of the special extension cables listed above.

CAUTION

The picture tube is highly evacuated and if broken, glass fragments will be violently expelled. Handle with care, using safety goggles and gloves. Avoid contact with high voltage terminal at side of tube even after it has been disconnected from the receiver—this precaution is necessary as inner and outer coatings on the tube form a capacitor which may carry a high voltage charge for an extended period of time after disconnection from the receiver.

The metal plate which covers the side of the RF tuner unit must be removed for alignment as RF signal injection is accomplished at a terminal located behind this plate (see Fig. 2). That plate must be replaced when RF alignment is undertaken.

INSTRUMENTS: The instruments will be required as standard signal sources and output indicators during the alignment process. Since accurate alignment of a television receiver is heavily dependent upon the performance of your instruments, it is imperative that they meet the essential specifications described here.

1. STANDARD SIGNAL GENERATOR: To provide modulated (QPSK RF) signals with the following frequencies. Maximum output in all ranges should be at least 1 volt with provision for attenuation as desired. This instrument must have good frequency stability and be accurately calibrated. Generators which incorporates a separate crystal controlled oscillator and helium circuit are self-calibrating and therefore capable of providing the accuracy of frequency calibration required for television circuit alignment.
   - 4.5 Mc. Sound Channel
   - 22.5 Mc. Sound IF marker
   - 22.4 Mc. IF Trap Coil
   - 33 Mc. IF zero end 3rd IF stages
   - 24.7 Mc. IF 4th IF stages
   - 28.5 Mc. IF converter and 3rd IF stages
   - 28.75 Mc. Focus IF marker
   - 56 to 88 Mc.
   - 174 to 216 Mc.

RF SWEEP GENERATOR: To provide frequency modulated signals at the following frequencies with a 500 Mc. sweep width.
   - 4.5 Mc. with 500 Mc. sweep width.
   - 50 to 230 Mc. with 10 Mc. sweep width.
   - 14 to 88 Mc. with 10 Mc. sweep width.
   - 74 to 216 Mc. with 15 Mc. sweep width.

Output adjustable at least to 1 volt maximum.

Set output to "Off" (amplitude) for all settings at the sweep width control.

Provision for connection of generator modulating voltage to horizontal deflection system of an oscilloscope.

Provision for blanking the output signal on each return sweep so that oscilloscope will not show noise.

CATHODE RAY OSCILLOSCOPE: Preferably a unit with vertical amplifier having wide range frequency response and low capacity pickup probes.

VACUUM TUBE VOLTMETER: The lowest voltage range of this instrument should preferably permit a 1.0 volt reading to be indicated at not less than one inch of full scale deflection.

INSTRUMENT CONNECTIONS: The method of connection, including details of switching and coupling networks, for instruments used in this alignment procedure is given in Fig. 7 to 10 inclusive. Specific instructions for each instrument application will be found in various sections of the Circuit Notes.

GENERAL INSTRUCTIONS: When aligning IF and RF circuits it is necessary to apply a fixed bias voltage to the AGC system of the receiver. This fixed bias is obtained by using a 0.5 volt battery and connecting it as described in Fig. 12.

IMPORTANT

When observing the receiver bandwidth pass characteristics on an oscilloscope, it is exceedingly important to avoid distortion of that characteristic which would occur when using a large input signal from the sweep generator or standard generator (marker signal). Always set attenuator on sweep generator so that the reading on the vacuum tube voltmeter does not exceed one volt (when meter is connected from high side of control center, symbol 211, to receiver chassis). Standard generator output should also be attenuated to prevent marker signal from pulling or tearing the band pass characteristic as shown on the 'scope.

4.5 Mc. sound Channel Fig. 1

4.5 Mc.

Set vertical amplifier of scope for maximum amplification.

4.5 Mc. Sweep Generator

Fig. 1

SOUND DISCRIMINATOR RESPONSE CURVE

If the characteristic is not shaped properly, attempt to obtain symmetry. If necessary, repeat until symmetry is obtained. For second pass, use normal output for sweep generator and select high sensitivity at the output of discriminator circuit.

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IF CHANNEL ALIGNMENT PROCEDURE

1. Turn receiver Channel Selector to television channel 21 and about
2. Remove metal plate which covers the lead of RF tuner unit nearest to
6. Add a 0.1 volt battery to the receiver AGC system so that
6. Add a 0.1 volt battery to the receiver AGC system so that

STANDARD SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>SWEEP GENERATOR</th>
<th>VTVM CONNECTIONS</th>
<th>OSCILLOSCOPE CONNECTIONS</th>
<th>MISCELLANEOUS INSTRUCTIONS</th>
<th>TRIMMER OR SLID</th>
<th>TYPE OF ADJUST</th>
<th>MEASUREMENT AND OUTPUT INDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.3 MC</td>
<td>Connect as shown in Fig. 10 and adjust to have approximately 255 lines forming vertical lines.</td>
<td>Not used.</td>
<td>-</td>
<td>-</td>
<td>#5</td>
<td>Adjust for maximum reading on VTVM.</td>
<td></td>
</tr>
<tr>
<td>24.7 MC</td>
<td>Same as above.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>#6</td>
<td>Adjust for maximum reading on VTVM.</td>
<td></td>
</tr>
<tr>
<td>22.4 MC</td>
<td>Same as above.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>#7</td>
<td>Adjust for maximum reading on VTVM.</td>
<td></td>
</tr>
<tr>
<td>26.75 MC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>#10</td>
<td>Adjust for maximum reading on VTVM.</td>
<td></td>
</tr>
<tr>
<td>25 MC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Adjust for maximum reading on VTVM.</td>
<td></td>
</tr>
</tbody>
</table>

RF AMPLIFIER AND MIXER ALIGNMENT

1. Replace metal plate which covers exposed terminal of RF tuner unit. This plate was previously removed for IF channel alignment. 2. Connect a 0.1 volt battery to the receiver AGC system so that

RF CHANNEL ALIGNMENT PROCEDURE

1. Remove metal plate which covers RF tuner unit nearest to

STANDARD SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>FREQUENCY</th>
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<th>TYPE OF ADJUST</th>
<th>MEASUREMENT AND OUTPUT INDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.3 MC</td>
<td>Connect as shown in Fig. 10 and adjust to have approximately 255 lines forming vertical lines.</td>
<td>Not used.</td>
<td>-</td>
<td>-</td>
<td>#5</td>
<td>Adjust for maximum reading on VTVM.</td>
<td></td>
</tr>
<tr>
<td>24.7 MC</td>
<td>Same as above.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>#6</td>
<td>Adjust for maximum reading on VTVM.</td>
<td></td>
</tr>
<tr>
<td>22.4 MC</td>
<td>Same as above.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>#7</td>
<td>Adjust for maximum reading on VTVM.</td>
<td></td>
</tr>
<tr>
<td>26.75 MC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>#10</td>
<td>Adjust for maximum reading on VTVM.</td>
<td></td>
</tr>
<tr>
<td>25 MC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Adjust for maximum reading on VTVM.</td>
<td></td>
</tr>
</tbody>
</table>

OSCILOSCOPE CONNECTIONS

ITEM | PROCEDURE
--- | ---
| DETENT SPRING | When servicing the Detent Spring, or when replacing Stator Contact Assembly, it will be necessary to correctly set the position of this spring so that coil contacts will properly engage contact points.

To replace the Detent Spring, loosen mounting screw. Then, position the Detent Spring and Roller so that the contacts on the Stator Contact Assembly engage coil contacts (upper contact positions in coil cutout when contact springs are either free, or in the coils). The Detent Spring is now locked in position. Lower the spring, and the device is ready for installation.

Other items should be treated with the same precautions as those described above for Models 9100-A, 9100-B, 9100-C, 9100-D, 9100-E, 9100-F, 9100-G, 9100-H.
HIGH VOLTAGE POWER SUPPLY SERVICING

The High Voltage Power Supply used with this receiver is located in the shielded compartment adjacent to the right rear corner of the chassis. It includes a high voltage oscillator (using two 555T2 tubes, connected in parallel) and a high voltage rectifier circuit using 18037T/816T tube.

**CAUTION**
The high voltage lead, which supplies approximately 10,000 volts to the picture tube, should be shorted to the chassis whenever it is disconnected for service purposes that is, after receiver has been turned off. This discharge the high voltage filter condensers and prevents a shock hazard when working on the set.

**CLOSETLY SPACED COMPONENTS**

A shorting of any component or lead on H.V. components or leads can cause a spark to occur which will damage the set. The high voltage lead to the picture tube is connected to the set in such a manner that a spark can occur on high voltage leads, causing a possible shock hazard to personnel who attempt to service this set.

The entire High Voltage power supply may be separated from the receiver by removing the four mounting screws and disconnecting five leads from the unit to the main chassis. Access to the three tubes and "hot" leads of H.V. Oscillator Coil is accomplished by removing the rear cover of the housing. This cover is held in place by six knurled nuts.

Access to the remainder of the circuit components is obtained by removing the five screws which hold the front cover of the housing in place. When reassembling the power supply, be sure insulating sheet is correctly positioned so that the shielded compartment does not contact the receiver case.

**NOTE:** A common ground terminal is used in the H.V. Power Supply to provide only one ground connection between the supply and the main chassis. This method of ground return prevents currents of power supply frequency from circulating in the receiver chassis where these currents might disturb performance of other circuits.

---

CORONAS AND ARC-OVER.

Coronas or arc-over can best be detected by observing the operation of the power supply in a dark room. Several conditions may cause these phenomena.

**POOR CONNECTIONS**

An arc or corona may be due to poorly soldered connections (wire joints or other contacts in tube socket pins). Connections which hold the high voltage filter condensers do not grip these components securely. If the "hip-up" contacts which hold the high voltage filter condensers do not grip these components securely, wire will also fail and power supply regulation will be poor.

**HORIZONTAL SYNC SYSTEM ADJUSTMENT**

If picture "wears" horizontally and cannot be synchronized by operating the Horizontal Hold control on front panel of receiver, this action may be due to incorrect setting of the slug in the Horizontal Sync Coil.

---

**SOCKET VOLTAGES**

**NOTE:**

- THE SOCKET PINS are readily accessible and if broken, glass fragments will be violently expelled. Handle with care and if it is necessary to change this tube, use safety goggles and gloves.

**HIGH VOLTAGE** (approximately 18,000) is applied on a supply circuit of the receiver. Exercise care to avoid contact with any portion of this circuit and particularly the tube terminals which are labeled "CAUTION" in the adjoining voltage chart. For measurement of voltage at these points, see procedure given below under note "M".

**INTERMEDIATE B+ VOLTAGES** are dangerous and caution should be observed when the receiver chassis components are exposed for service purposes.

The voltages shown on the adjoining chart were measured under the following conditions:

1. Power supply — 117 volt 60 cycle AC.
2. All voltages are measured between socket terminals and chassis unless otherwise indicated on adjusting chart.
3. Measurements made with voltmeter having a sensitivity of 1000 ohms per volt except where indicated by (?). The (?) symbol designates a vacuum tube voltmeter measurement.
4. No input signal — antenna terminals shorted together.
5. Channel Selector set to channel 13 unless otherwise indicated by note "T".
6. All other controls were set to their CENTER CLCKWISE position unless the voltage shown on the chart is followed by letter "T" to indicate a specific condition of measurement as outlined in Step 7.
7. Certain voltages were measured with different settings of a specific control. It should also be understood that in these instances all controls, with exception of one, were set to their center-clockwise position — a letter following the voltage shown on the chart indicates this exception and is explained below.

**A**

Vertical Input control max. clockwise

**B**

Brightness control max. clockwise

**C**

Contrast control max. clockwise

**D**

Horizontal Solenoid control max. clockwise

**E**

Width control max. clockwise

**F**

Focus control max. clockwise

**G**

Vertical Hold control max. clockwise

**H**

Height control max. clockwise

**I**

Channel Selector set to Chmn #2

**NOTE:** This measurement should NOT be made with a conventional type voltmeter as circuit may break openvaluation due to coupling thru instrument leads; use a vacuum tube voltmeter with short leads.

**NOTE L:** Do not attempt to measure the voltages at the tube emr. There is a high R F. potential at this point.

**NOTE M:** If you do not have an instrument capable of directly measuring voltages in this range, the voltage can be measured by using a voltage divider network consisting of twenty 2,2 megohm 1 watt resistors connected in series. Avoid using resistors of higher values, as their individual voltage rating may be exceeded. It is also important to use resistors of equal wattage. Solder all connections between resistors. Accurately measure the overall resistance of the entire combination as well as the resistance of each 1 megohm section.

With the set turned off, connect the 1 megohm end of the resistance voltage divider to the filament of the 18037T/816T tube, or R. V. terminal of the linesource, and connect the 1 megohm end to chassis. Now, turn the set on and measure the voltage drop across the 1 megohm resistor with a vacuum tube voltmeter. The voltage at the tube terminal can then be calculated as follows:

\[
\text{Volts Measured} \times \frac{1 \text{ megohm}}{18037T/816T} = \frac{\text{Volts Measured Across 1 megohm}}{18037T/816T}\]

**NOTE N:** Grounding of center earth on tube socket is necessary to reduce capacity coupling between other pins. Oscillation may result if this ground is omitted.
PRODUCTION CHANGES

The following tabulation furnishes complete details on changes which occurred during production. Sequence of these changes is indicated by coding in alphabetical order; that is, "SERIES A" "SERIES B", etc., stamped on back surface of chassis.

The circuit shown on this page applies to "SERIES B" chassis.

CHANGE DESIGNATION STAMPED ON CHASSIS

DESCRIPTION OF CHANGE

ENCODER

SERIES "A"

1. Resistor 269, in AGC circuit of tube V7 (6AL5), was changed from 1.8k ohms to 660 ohms, = 10%.
2. Resistor 266 was removed from the circuit.
3. High potential side of condenser 264, in AGC circuit of tube V7 (6AL5), was disconnected from pin 5 of V7 and reconnected to high side of resistor 265.
4. Choke coil 262 was added from pin 5 of tube V7 to the junction of condenser 264 and resistor 269.
5. Output side of condenser 264 which formerly connected to pin 2 of tube V7 (6AL5) was disconnected from this terminal and reconnected to pin 5 of the same tube.
6. Resistor 264, in AGC circuit of tube V7 (6AL5), was changed from 0.1 microhm to 10k ohms.
7. Resistor 263, in AGC circuit of tube V7 (6AL5), was changed from 68k ohms to 10k ohms.
8. Condenser 268 (15 milfd.) was added from pin 2 of tube V7 (6AL5) to chassis ground.
9. Condenser 265, in AGC circuit of tube V7 (6AL5), was changed from 2.0 mfd. to 10 mfd. IMPORTANT: The positive terminal of this electrolytic condenser must connect to chassis ground.
10. Condenser 266 (0.5 milfd.) was added in series between high side of Control control and resistor 265 in grid circuit of V14A (12AU7—Sync. Amp.).
11. Resistor 267 (1 megohm) was added between pin 2 of tube V14A (12AU7—Sync. Amp.) and chassis ground.
12. Resistor 77, in plate circuit of V14A (12AU7—Sync. Amp.), was changed from 160 kohms to 240 kohms ± 10%.
13. Resistor 59, in grid circuit of V14A (12AU7—Sync. Clipper), was changed from 1 megohm to 470k ohms.
14. Resistor 61, in plate circuit of V13B (12AU7—Sync. Clipper), was changed from 470k ohms to 20k ± 10%.

SERIES "B"

For models using 15K4, 15K4 or 15K4 picture tube.

1. Condenser 232, in plate circuit of tube V21B (Kenotone—Vertical Blocking Osc.), was changed from 2.0 mfd. to 0.001 mfd. and 0.05 mfd. ± 10%.
2. Condenser 24, in grid circuit of tube V31 (15K10C—Vertical Synchronizing Osc.), was changed in voltage rating from 200 volts to +100 volts.
3. Condenser 292 (60 milfd.) was added in series between the arm of the Contrast control and signal grid (pin 1) of tube V9 (6AG5—Video Amp.).
4. Resistor 295 (1.0 megohm) was added between signal grid (pin 2) of tube V9 (6AG5—Video Amp.) and chassis.
5. Chassis having this coding incorporate the four items listed above under the heading "SERIES B" for models using 15K4, 15K4 or 15K4 picture tube, plus the following additional revisions:

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