92A2716

Figure 1. Hallicrafters SX-101 Receiver

# SECTION I
# GENERAL

Your new Hallicrafters SX-101 Selectable Sideband Receiver is precision built to bring you the finest in amateur radio reception. This fifteen tube dual conversion superheterodyne receiver lenes the 160, 80, 40, 20, 15 and 10-11 meter amateur bands plus several of the MARS frequencies on a large 10-1/2 inch slide-rale type dial. You'll heur many difficult amateur signals which would not be readable on most other receivers. The receiver provides for the reception of CW, AM, and single-sideband signals on all bands, the upper or lower sideband being readily selectable by means of a front panel control. This selectable sideband feature not only greatly simplifies tuning of siegle-sideband signals bot is also useful is eliminating hsterodyne interference whan receiving AM signals.

Ualike the ordinary dual-conversion receiver, your SX-101 receiver employs dual conversion on all bands. As a result, images are practically non-existent. "Razor-sharp" selectivity is made possible by the use of an adjustable 50.5 kc second IF with four high-Q, permeability-tnoed circuits. Receiver selectivity is veriable in five steps from 500 cycles to 5 kc at 6 db down and from 5 to 20 kc at 60 db down.

A tuned r-f stage ansures maximum sensitivity and a high signal-to-noise ratio for outstanding reception of weak and distant signals. A manual seanitivity control prevents overloading by strong signals. An antenna trimmer, adjustable from the front panel, permits peaking of the r-f stage to compensate for loading effecis of varioes antennas. A notch filter circuit allows rejection of an extremely narrow portion of the IF pessband. With the antch filter, an interfering signal can easily be "antched out". The position and the degree of notch rejection are adjustable from the front panel.

Outstanding frequency stability is achievad by the use of ceramic trimmers and coil forms in the 1st conversion oecillator, extensive lemperature compensantion, voltage regulation of all oscillators, and the use of a crystal-controllad 2nd conversion oscillator.

Tuning is accomplishad by a precision gear drive tuning mechanism to insure extremely close calibration and accurate resetability. Smooth flywheel tuning affords maximum traverse speed and operating ease. The tunable portion of the receiver is designad to spread each amateur band over most of the dial, for easy and accurate tuning. Dial graduations are providad for 5 kc on the 160, 40, 20, and 15 meter amateur bands. On 80 meters there is a dial graduation for every 10 kilocycles, and ou the 10-11 meter amateur bands there is a dial graduation for every 50 kilocycles. A built-in 100-kc crystal calibrator provides marker signals el every 100 kc on the dial for checking calibration accuracy. A trimmer capacitor, accessible from

the top of the chassis, permits adjustment of the calibrating oscillator to exactly 100 kc by comparison with the frequency transmitted by station WWV on ten megacycles. Band 7 of this receiver has a 10-megacycle mark for tuning in WWV for the purpose of zero-beating the 100-kc crystal calibrator.

An automatic series noise limiter circuit, controlled by a switch on the front panel, very effectively reduces interference from electrical equipment, ignition noise, and other forms of pulse type noise.

An "S" meter is used when receiving AM signals to indicate the accuracy of tuning and the relative strength of received signals. The meter is calibrated in microvolts, "S" units from 1 to 9, and in decibels above S9 to +80 db. Unlike most receivers, the "S" meter is operative when AVC is turned off, and thereby renders the same tuning accuracy indication as when the AVC is turned on.

The Receive-Standby switch on the front panel silences the receiver but leaves the heater and plate power on to provide instant reception between transmission periods. Provision has also been made in the receiver for remote receive-standby control, and for transmitter switching from the front panel.

Audio output connections include terminals for a 3.2-ohm speaker and a 500/600 - ohm output for line or speaker. A front panel jack for headphones is also provided and the speaker is automatically silenced when the headphone plug is inserted. A phono input jack at the rear of the receiver permits attachment of a record player.

Another useful feature of the receiver is the VFO signal output provided. A connector on the rear of the receiver makes available the first conversion oscillator output signal which may be used for transmitter excitation. This signal is 1650-kc above the receiver dial frequency, and can be fed into a converter with the addition of a 1660-kc signal to heterodyne it back to the receiver dial frequency. The output impedance of this circuit is 100 ohms. To properly match the VFO output at the rear of chassis use RG62 coax, terminated with a 100 ohm resistor. The same type of plug used on the phono input jack can be used for the VFO output jack.

Band 7 on the receiver is used to check and adjust the 100 kc calibration oscillator. This is accomplished by tuning in the ten-megacycle WWV signal and comparing it with the calibration oscillator signal. In addition, band 7 can be used to tune in the IF output from a two or six meter amateur converter. The converter IF output in the vicinity of ten megacycles is simply fed into the antenna circuit of the receiver. A special mark (dot) is provided on the band 7 dial scale to indicate the proper dial setting for a frequency of 10.05 mc.

A heating element (Dampp Chaser) has been incorporated in the receiver to provide optimum performance by reducing the effects of moisture and humidity. Electrically, the heating element is wired across the AC line. Thus, it is in operation at all times while the receiver is connected to a 117V AC outlet, even when the Response Control is in the Power-Off position.

NOTE

IT IS IMPORTANT THAT THE RECEIVER BE PLUGGED IN A LIVE OUTLET AT ALL TIMES IN ORDER TO OBTAIN OPTIMUM RESULTS FROM THE HEATING ELEMENT. THE EXCELLENT DESIGN INCORPORATED IN THIS SET WILL BE REALIZED ONLY AFTER IT HAS BEEN PLUGGED INTO SUCH AN OUTLET A MINIMUM OF 24 HOURS.

CAUTION

Your new Communications Receiver has been packed in a vapor barrier with a dehydrating agent to eliminate the possibility of moisture damage. For best performance, do not open the sealed plastic covering until you are ready to place the set in operation.

The receiver is designed to operate on 105 to 125 volt, 50/60 cycle AC current. Provision is also made in the receiver for operation from an external DC power supply or batteries in areas where AC power is not available.

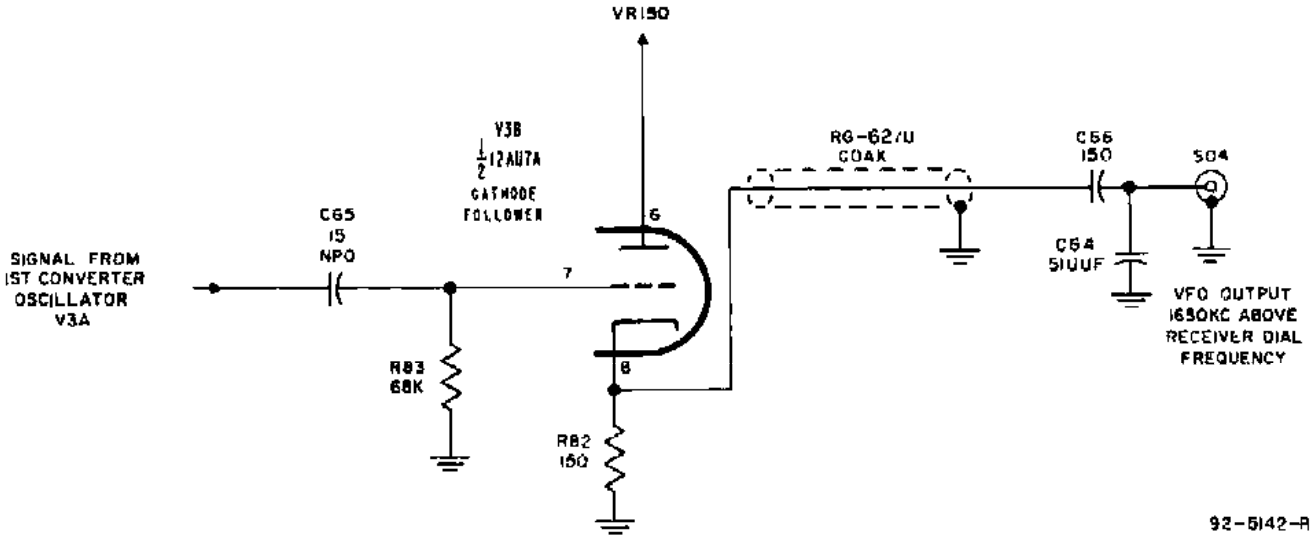



Figure 2. VFO Output Circuit

# SECTION II
# INSTALLATION

## 2-1. UNPACKING

After unpacking the receiver, examine it closely for damage which may have occurred in transit. Should any sign of damage be apparent, file a claim immediately with the carrier stating the extent of damage. Carefully check all shipping labels and tags for instructions before removing or destroying them.

## 2-2. LOCATION

The receiver may be placed in any location that will permit free air circulation through the ventilation holes and openings in the cabinet. Avoid excessively warm locations such as those near radiators and heating vents. The external speaker may be located in any convenient position although it is recommended that it not be placed on top of the receiver for reasons of ventilation.

## 2-3. ANTENNAS

The r-f input of the receiver is designed for operation from either a single-wire antenna, or a half-wave doublet or other tuned antenna. The design of the input circuit is versatile to permit the use of transmission lines having an impedance up to 600 ohms. Optimum matching will be effective however, when using transmission line having an impedance in the range of 50 to 70 ohms. Antenna connections are made to a three-terminal strip at the rear of the receiver marked "A1", "A2", and "G". An AN type SO-239 connector for coaxial cable installations is also provided.

### A. SINGLE WIRE ANTENNA

The simplest antenna and one which will provide satisfactory results throughout all bands is a conventional single-wire antenna. In most localities, good results can be obtained with just the 15-foot of antenna wire supplied with the receiver. (See Fig. 3.) Simply attach one end of this wire to terminal "A1", connect the jumper link between terminals "A2" and "G", and then run the wire about the room in any convenient manner. If the receiver is operated in a steel constructed building or where receiving conditions are exceptionally poor, an outside antenna, 50 to 100 feet long may be necessary. The outside antenna should be erected as high as possible and kept free from surrounding objects. In some locations, reception may be improved by connecting a ground wire (ordinary copper wire) from terminal "G" to a cold water pipe. While the use of an outside ground rod installed in accordance with Insurance Underwriter's Laboratories requirements is adequate protection against lightning, we strongly recommend an additional connection to the nearest cold water pipe to eliminate any shock hazard.

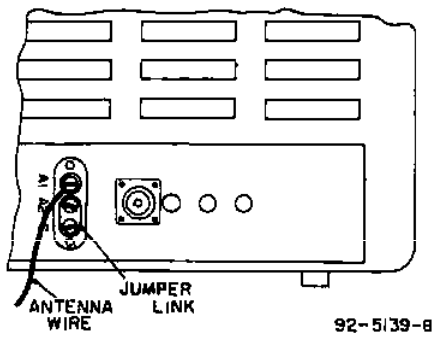



Figure 3. Single Wire Antenna

### B. HALF-WAVE DOUBLET ANTENNA

For top performance on a particular amateur band, the use of a half-wave doublet or other type of antenna employing a 50 to 70 ohm transmission line is recommended. A typical doublet antenna installation is shown in Fig. 4. The overall length in feet of a doublet antenna is determined by the following formula:

$$\text{Length in feet} = \frac{468}{\text{Frequency in megacycles}}$$

The doublet antenna is directional and should be erected with its entire length facing a desired station for maximum signal pickup.

The doublet antenna may be fed with either a balanced or unbalanced transmission line. When a balanced line such as "twin-lead" or a twisted pair is used, the line connects to terminals "A1" and "A2" and the jumper link between "A2" and "G" is disconnected (see Fig. 4). When using an unbalanced line such as coaxial cable, the inner conductor connects to terminal "A1", the outer metal braid to terminal "A2", and the jumper link connects between terminals "A2" and "G". A ground wire may improve reception when using an unbalanced type line.

The doublet antenna provides optimum performance only for the amateur band for which it is cut. Therefore, when using such a doublet antenna, it may be desirable for reception on other amateur bends to utilize the antenna as a single wire type. This is accomplished by connecting the two transmission line leads together and connecting them to terminal "A1". The jumper link in

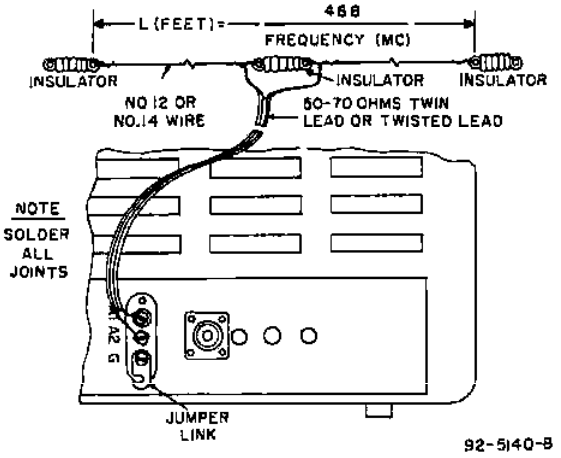



Figure 4. Doublet Antenna Using Twin-Lead Transmission Line

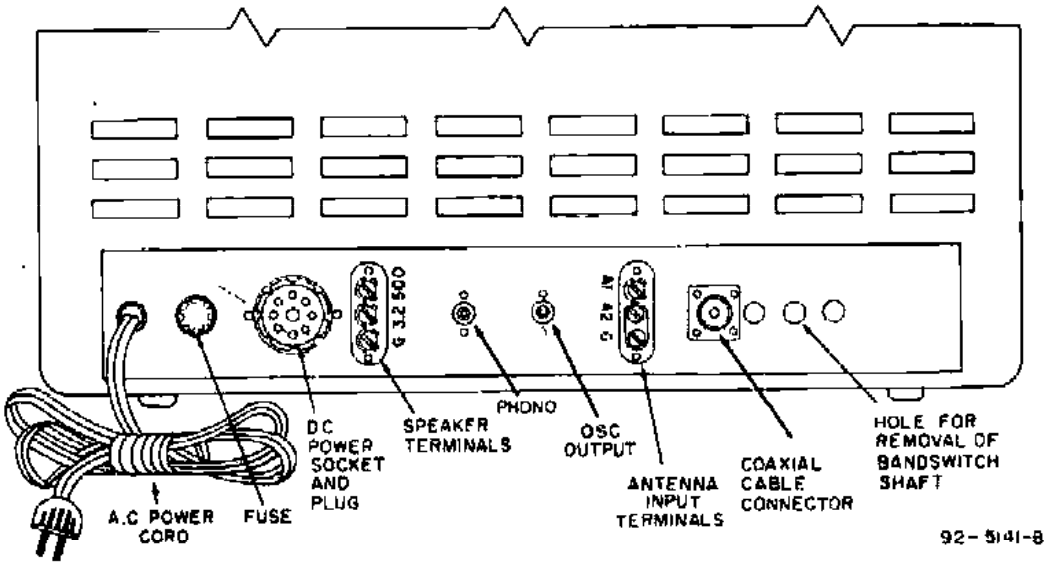



Figure 5. Rear View of Receiver

this case should be connected between terminals "A2" and "G".

In an installation where the receiver is used in conjunction with a transmitter, it may be advantageous to use the same antenna for receiving as for transmitting. This is especially true when a directive antenna is used since the directive effects and power gain of the transmitting antenna are the same for receiving as for transmitting. Switching of the antenna from the transmitter to the receiver may be accomplished with a double-pole, double-throw antenna changeover relay or knife switch connected in the antenna leads.

For further information regarding receiving antennas and antenna matching schemes, refer to the "Radio Amateur's Handbook" or the "A.R.R.L. Antenna Book", both published by the American Radio Relay League, West Hartford, Conn., U.S.A.

## 2-4. POWER SOURCE

The receiver is designed to operate directly on 105 to 125 volt, 50-60 cycle AC current. Provision has also been made in the receiver for operation from an external DC power source for portable or emergency service in areas where AC power is not available. Connections to the DC source are made through the DC POWER SOCKET at the rear of the receiver. (See Fig. 5.)

### A. AC OPERATION

Insert the power cord into any convenient AC power outlet of the proper rating. If in doubt about your power source, contact your local power company before plugging in the receiver. The wrong power source can cause serious damage.

IMPORTANT: The receiver will not operate from an AC source unless the JUMPER PLUG is inserted in the DC POWER SOCKET. (See Fig. 5.)

### B. DC OPERATION

The receiver may be operated from an external DC source, such as a vibrator power supply or batteries by removing the JUMPER PLUG normally located in the DC POWER SOCKET at the rear of the receiver and replacing it with a similar octal plug wired as shown in Fig. 6. This plug is available from your Hallicrafters dealer under Part No. 035-10003-01. The voltage and current requirements for DC operation are as follows: "B" supply, 280 volts at 110 ma; "A" supply, 6.3 volts at 4.4 amps.

## 2-5. SPEAKER

A three-terminal strip, marked "G", "3.2" and "500", is provided at the rear of the receiver for connecting the external speaker that is required with the receiver. (See Fig. 5.) Any permanent magnet speaker with a 3.2-ohm voice coil can be used by simply connecting the two leads from the speaker voice coil to the terminals marked "3.2" and "G". If it is desired to use a speaker with a voice coil impedance other than 3.2 ohms, a matching transformer should be employed to insure optimum performance. The transformer should be mounted on or near the speaker, and should have a 5-watt power rating, a 500-ohm primary impedance, and a secondary impedance to match the impedance of the speaker voice coil. Connect the primary of the transformer to the terminals marked "500" and "G" and the secondary to the speaker voice coil terminals.

The Hallicrafters R-46 and R-46A speakers are both designed for use with your receiver. The R-46 connects to the terminals marked "500" and "G"; the R-46A connects to the terminals marked "3.2" and "G".

## 2-6. HEADPHONES

The headphone jack, marked PHONE, is located on the front panel of the receiver and is wired so that the

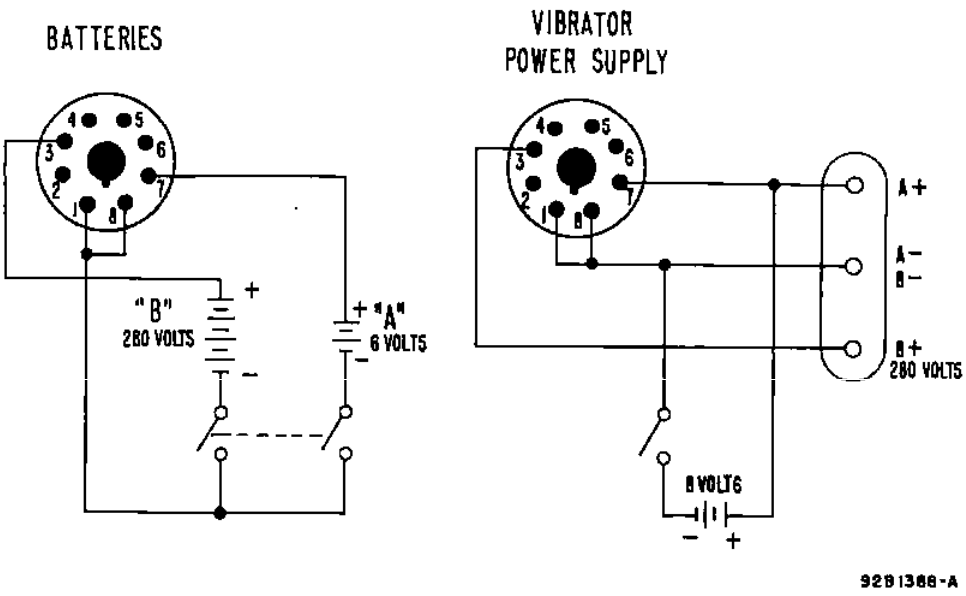



Figure 6. Wiring Diagram for DC Operation

speaker is automatically silenced when the headphones are plugged in. The headphone output impedance is not critical, and any commercial low-impedance headphones ranging from 50 ohms to 5000 ohms will provide satisfactory performance.

## 2-7. RECORD PLAYER CONNECTIONS

A phono jack is provided at the rear of your receiver for attaching a record player. (See Fig. 5.) Any record player using a crystal cartridge - or a magnetic cartridge with suitable preamplifier - will provide satisfactory results. For phono operation, insert the pin-plug from the record player or preamplifier into the phono jack and set the SELECTIVITY control on the front panel at "PHONO". Adjust the VOLUME control for the desired volume level and set the RESPONSE control at either "NORMAL" or "TREBLE CUT" for the desired tone. The remaining controls are inoperative and will have no effect on phono operation.

## 2-8. RELAY AND TRANSMITTER SWITCHING

One half of the dpst RECEIVE-STANDBY switch on the front panel connects to pins 2 and 5 of the DC POWER SOCKET at the rear of the receiver, and is available for transmitter switching. (See Fig. 7.) This half of the switch is in the open position when the RECEIVE-STANDBY switch is set at "STANDBY" and closed when set at "RECEIVE".

## 2-9. REMOTE RECEIVE-STANDBY SWITCH

The receiver may be disabled from a remote location by connecting a remote spst switch between pins 1 and

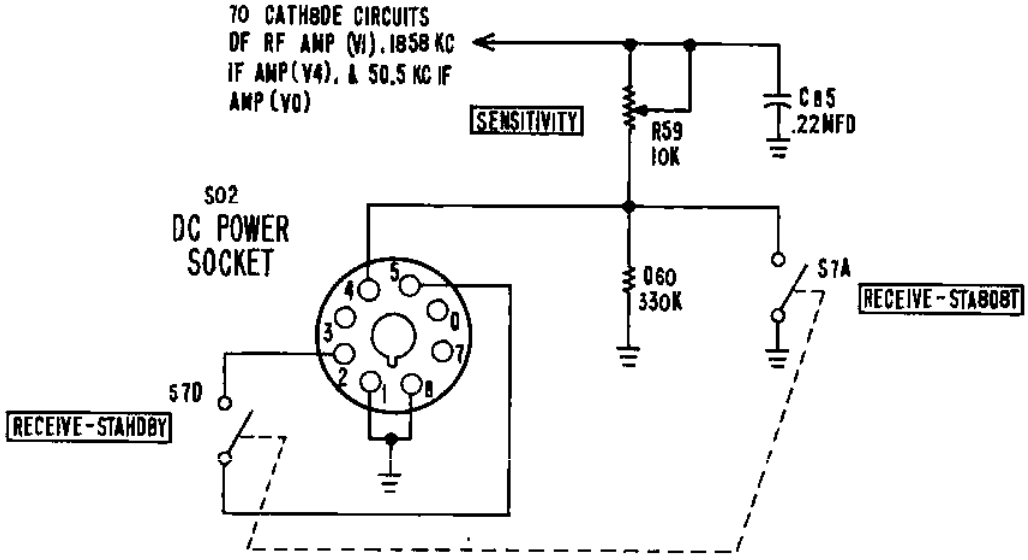



Figure 7. Schematic Diagram of Sensitivity and Receive-Standby Circuits

4 of the JUMPER PLUG located in the DC POWER SOCKET at the rear of the receiver. (See Figs. 5 and 7.) To operate the receiver with the remote switch, the RECEIVE-STANDBY switch on the front panel must be left at "STANDBY".

### 2.10. VFO OUTPUT

If the receiver is to be used as the source of a vfo signal for transmitter excitation, it is necessary to understand that this output signal is 1650 kc above the receiver dial frequency. Since in radio amateur operation, it is common practice to transmit on or near the receiver frequency, it is necessary to convert the receiver vfo frequency back to or near the receiver dial frequency. This can be accomplished with the use of a converter and stable 1650-kc oscillator. A unit such as this should be located at the rear of the receiver, since the vfo output signal from the receiver is at a high impedance and low signal level. The output at the vfo jack will be as low as one and one-half volts rms on the 10-11 meter band, and a long connection between the receiver and converter will attenuate the signal to a lower level. The 1660-kc oscillator used with the converter described above must be stable and should be adjustable in frequency a few kilocycles above and below 1650 kc.

# SECTION III
# FUNCTION OF OPERATING CONTROLS

### 3-1. SENSITIVITY CONTROL

The SENSITIVITY control varies the gain of the RF amplifier, 1650-kc IF amplifier, and the 6BA6 50.5-kc IF amplifier stages. Maximum sensitivity is obtained with the control set at "10" (fully clockwise). In this position, the tubes being controlled are operated at maximum gain with minimum cathode bias. As the control is rotated counterclockwise, the bias on the tubes increases with a resultant decrease in gain.

### 3-2. BAND SELECTOR CONTROL

The BAND SELECTOR control operates the band switch to place the proper set of coils and capacitors into the circuit to cover the desired amateur band. The band covered by each position of the BAND SELECTOR control is indicated directly on the control. The first six positions are the 160, 80, 40, 20, 15 and 10-11 meter amateur bands, respectively. The seventh position tunes in the 10-mc WWV signal, and is indicated on the 10-11 meter scale with a special marking. This band is available for calibrating the 100-kc crystal calibrator, and for use as a first IF for a six or two-meter amateur band converter.

### 3-3. ANTENNA CONTROL

The ANT. TRIMMER control operates a variable capacitor connected across the secondary of the antenna coil of the band in use. This capacitor adjustment compensates for loading effects of various types of antenna installations. The control is adjusted for maximum signal after the tuning control is adjusted to the desired frequency. Once adjusted, the ANT. TRIMMER control usually requires no further adjustment until the BAND SELECTOR control is operated to select another amateur band.

### 3-4. VOLUME CONTROL

The VOLUME control adjusts the audio level at the speaker terminals and PHONE jack. Clockwise rotation of the control increases the signal applied to the grid of the audio amplifier tube, thus increasing receiver volume; counterclockwise rotation decreases volume. In some cases when receiving CW or SSB signals, it may be advantageous to advance the VOLUME control one-half to three-quarters clockwise, and control receiver volume with the SENSITIVITY control.

### 3-5. AVC SWITCH

The AVC switch, when set at "ON", places the AVC circuit in operation to maintain the output level of the receiver constant regardless of normal input-signal variations. AVC voltage is applied to the RF amplifier stage and the 1650 kc IF amplifier stage.

### 3-6. "NOISE LIMITER" SWITCH

This switch, when set at "ON", places the automatic series noise limiter circuit in operation to reduce pulse type noise such as ignition noise and electrical interference. The limiter circuit allows the signal to pass through the receiver unaffected, but makes the receiver inoperative for noise amplitudes greater than those of the signal. It will work equally well on AM or CW signals and is self-adjusting, i.e., it automatically adjusts itself to the signal level.

The noise limiter circuit "chops" noise peaks received at the detector by means of a biased diode which becomes non-conducting above a predetermined signal level. When the limiter circuit is in operation, the audio output of the detector must pass through the limiter diode to the grid of the audio amplifier. The limiter diode normally acts as a conductor for the audio signal as long as the diode plate is positive with respect to its cathode. When a noise peak is higher in amplitude than the signal, it instantaneously swings the cathode positive with respect to the plate, conduction ceases, and that portion of the signal is automatically cut off from the audio amplifier. The point at which

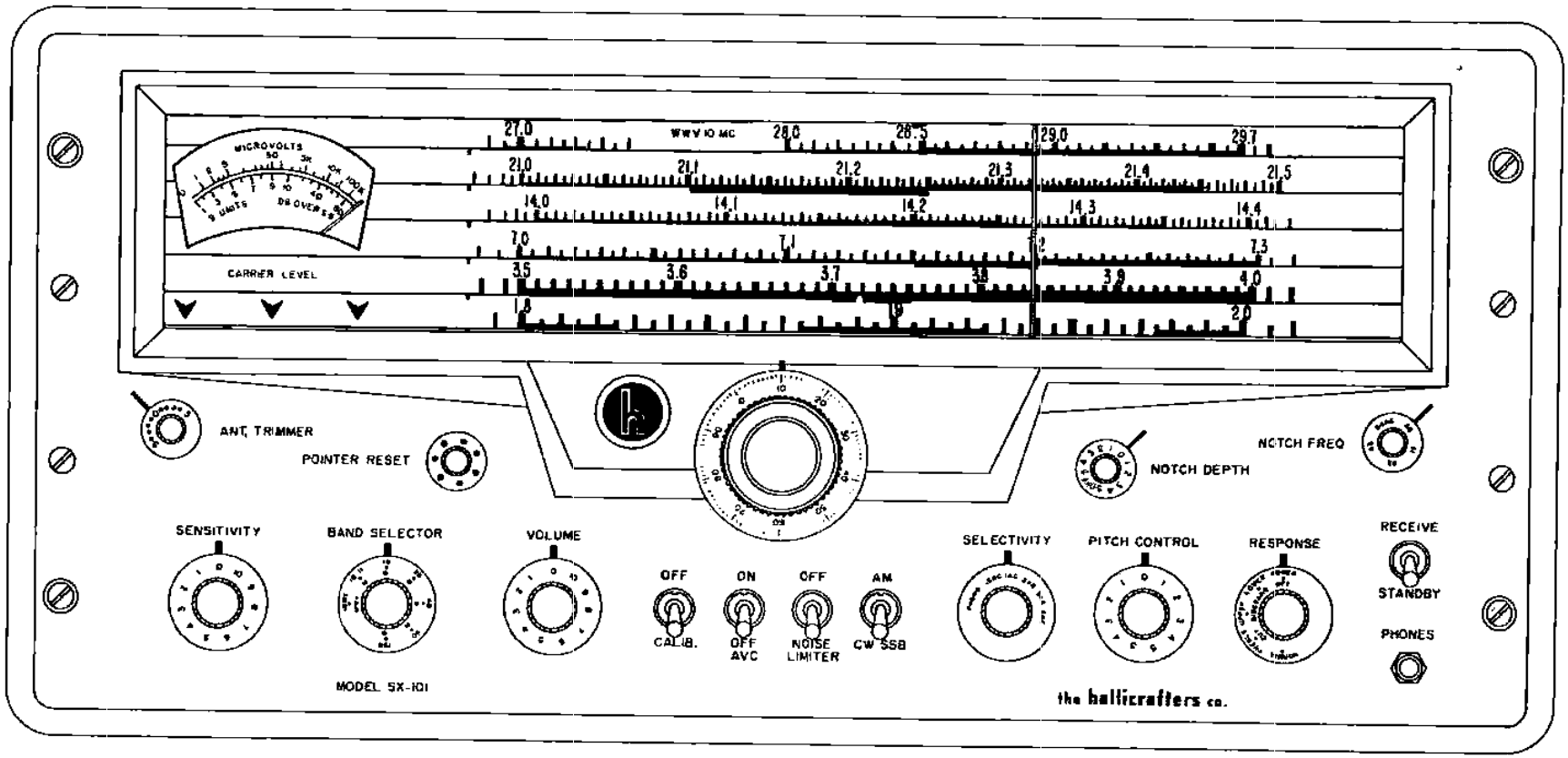



Figure 8. Operating Controls

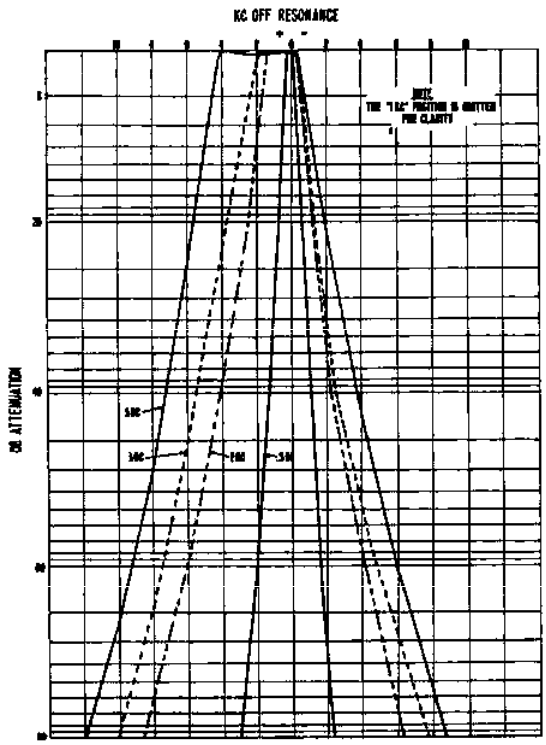



Figure 9. IF Selectivity Curves

the limiter diode becomes non-conducting is made sufficiently high so that the diode will not clip modulation peaks and thus impair intelligtbility, but yet low enough to limit the noise peaks effectively.

This type of efficient noise limiter circuit greatly reduces "listening fatigue" which can accompany long periode of reception.

### 3-7. "AM/CW-SSB" SWITCH

This switch, when set at "CW-SSB", applies plate voltags to the beat frequency oscillator (BFO) to render it operative for the reception of CW or single-sideband signals. The beat frequency oscillator employs a Hartley oscillator circuit and is voltage regulated to insure highly sinble operation. The "AM" position of the AM/CW-SSB switch disables the BFO for normal reception of AM phone signals.

### 3-8. "SELECTIVITY" CONTROL

The SELECTIVITY control is used to vary the selectivity of the receiver to fit receiving conditions. Five degrees of selectivity are availabls, ranging from 500 cycles, for CW reception under crowded amateur band conditione, to 5 kilocycles for maximum fidelity when amateur band conditione permit. The five selectivity positions are indicated on the SELECTIVITY control and indicate receiver selectivity at 6 db down. A sixth position on the control, marked PHONO, disables all the receiver circuits except the audio system. The output from a simple radio detector circuit connected to the PHONO INPUT will permit the use of the audio system for the reception of Conelrad radio signals. The detector must be capable of receiving 640 kc and/or 1240 kc.

As mentioned above, and when conditione permit, the SELECTIVITY control is normally set at 5 KC, the position affording broadest selectivity. Selectivity may be progressively increased and passband decreased by turning the control to the positions marked "3 KC", "2 KC", "1 KC", and ".5 KC". For reception of the crowded amateur bands, it is generally advisable to sacrifice some fidelity for greater selectivity, since the added selectivity reduces both adjacent-channel interference and background noise by attenuating the higher audio frequencies. Too much selectivity on AM signals, however, will attenuate the high audio frequencies to such an extent that the signal may become unintelligible as a result of excessive sideband cutting. When receiving CW signals, the sharpest selectivity position may be used without the loss of intelligibility experienced in AM reception.

### 3-9. "T" NOTCH FILTER

The notch filter circuit provides a means of eliminating or reducing the interfering effect of certain types of heterodynes or CW signals. To obtain maximum results from this feature of your receiver the use of the two controls associated with the notch filter circuit are fully explained below.

#### GENERAL

The manner in which the notch filter will affect the IF selectivity of the receiver is illustrated in Fig. 10. The filter will suppress an extremely narrow band of frequencies within the IF bandpass range of the receiver. The effectivensss of this notch is many times greater than the notch of a quartz crystal filter at 400 kc to 2 mc. The NOTCH FREQ. control will move the band of suppressed frequencies represented by the notch in the selectivity curve, to any point within the IF passband. The NOTCH DEPTH control will vary the depth of the notch in the selectivity curve to control the degree of rejection of the interfering signal.

Extensive field testing of this feature has shown that the notch filter is highly effective in suppressing the type of interference for which this type of circuit is intended. It must be appreciated, however, that any selective IF filter circuit, including the phasing notch of quartz crystal circuits, affects only a limited range of interfering frequencies. The effectiveness of the notch filter is therefore somewhat dependent upon the exact nature of the interfering signal. For example: a heterodyne within the IF range that is less than 900 cycles in width and has little harmonic content is readily notched out. If the same interfering heterodyne is rich in harmonics it would only be possible to completely suppress the fundamental frequency and the remaining harmonic content may remain almost equally objectionable. It logtcally follows that if two interfering heterodynes should appear within the IF passband that are separated in frequency by more than 500 to 900 cycles it would be possible to notch out only one of the heterodynes. The interfering signal may also vary in frequency beyond the range of the notch filter and thus reduce the effectiveness of the circuit. Under these conditions, increasing selectivity will gsnerally elimlnete its heterodyne. If this haterodyne interference varies in frequency about some mean value it may be

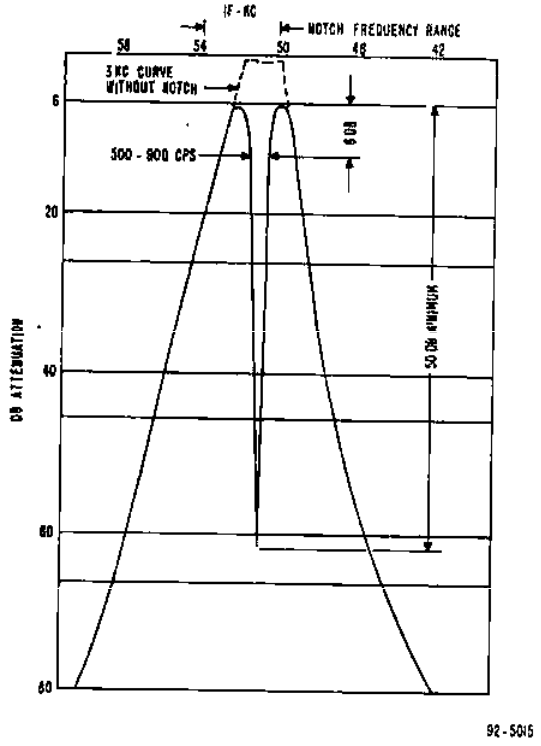



Figure 10. IF Selectivity Curve with Notch

necessary to adjast the NOTCH DEPTH control to Increase the broadness of the notch. It has been found, howevar, that the notch filter is sufficientiy effective in many instances to make an otherwise useless signal entirely readable.

## 3-10. USE OF CONTROLS

To activate the Notch Filter circuit advance the NOTCH DEPTH control from the "OFF" position.

"NOTCH FREQ." CONTROL—This control tunes the notch in the IF passband and may be set anywhere in the rangs of from 50 kc to 54 kc. The approximate frequency is calibrated on the knob skirt. While tuning this control for maximum suppression of the interfering heterodyne with minimum distortion to the desired signal, try to visualize the notch moving across the selectivity curve, Fig. 10. It is then readily apparent that improper tuning may notch out the desired signal instead of the heterodyne. It may be necessary to move the notch across the desired signal in order to reach the heterodyne that you desire to suppress. The important consideration is to tune the NOTCH FREQUENCY control for maximum heterodyne suppression with minimum distortion to the desired signal.

"NOTCH DEPTH" CONTROL—As the position of the NOTCH FREQ. control is changsd, the depth of the notch will vary. The NOTCH DEPTH control is provided to readjust the notch for maximum depth at any setting of the NOTCH FREQ. control. Maximum notch ing occurs at the "O" setting when the frequency is set to the center of the IF passband. The ase of the NOTCH DEPTH control is simply a matter of tuning it for maximum suppression each time the position of the NOTCH FREQ. control is changsd.

## 3-11. PITCH CONTROL

The PITCH CONTROL operates the tuning slug in the BFO coil to vary the frequency of beat frequency oscillator approximately 2 kc each side of iis center frequency of 50 kc. The primary function of the PITCH CONTROL is to vary the pitch of the audible beat note when receiving CW signals. It is also used when receiving single-sideband signals to vary the frequency of the reinserted carrier in the receiver.

## 3-12. "RESPONSE" CONTROL

The RESPONSE control performs three functions: (1) it turns the receiver on and off, (2) it switches the 2nd conversion oscillator to operate at the required frequency for reception of CW, AM, and single-sideband signals (1600 kc in the "LOWER SIDEBAND" position and 1700 kc in the "UPPER SIDEBAND", "TREBLE CUT", and "NORMAL" positions), and (3) it serves as a two-position tone control for AM reception and phono operation.

In the "POWER OFF" position, the receiver is completely shut down. As the control is turned clockwise to any of the other four positione, the receiver power is turned on.

The "LOWER SIDEBAND" and "UPPER SIDEBAND" positions of the control are used when receiving single-sideband signals or when it is desired to receive one or the other sideband of an AM signal.

The "TREBLE CUT" and "NORMAL" positions are used for phono operation and for normal AM reception where both sidebands are received. In the "NORMAL" position, the audio response is essentially flat at the low- and mid-frequencies and slighily attenuated at the high frequencies. The response in the "TREBLE CUT" position is essentially the same except that the high frequsncies are attenuated considerably more than in the "NORMAL" position.

For CW reception, the setting of the RESPONSE control is immaterial although a slight improvement in signal-to-noise ratio will be obtained In the "LOWER SIDEBAND" and "UPPER SIDEBAND" positions.

To illustrate how selectable sideband reception is accomplished in the receiver, a numerical example is given. Conaider an incoming signal at 7000 kc, modulated 1 kc. Since modulation of a carrier causes the generation of sideband frequencies numerically equal to the carrier frequency plus or minus the modulation frequency, the incoming signal consists of the carrier at 7000 kc, a lower sideband at 6999 kc, and an upper sideband at 7001 kc. (See Fig. 11A.)

The incoming signal is first heterodyned with the output of the 1st conversion oscillator in the 1st mixer stags. The 1st converston oscillator operates at a frequency higher than the incoming signal by an amount equal to the first-intermediate frequency of 1650 kc. As a result of the frequency conversion process, three new lower frequencies are produced in the output of the 1st mixer: the carrier at 1650 kc, the lower sideband at 1651 kc, and the upper sideband at 1649 kc. (See Fig. 11B.) These signals are amplified by the 1650 kc IF amplifier stage and then heterodyned with the output of the 2nd conversion oscillator in the 2nd mixer stage.

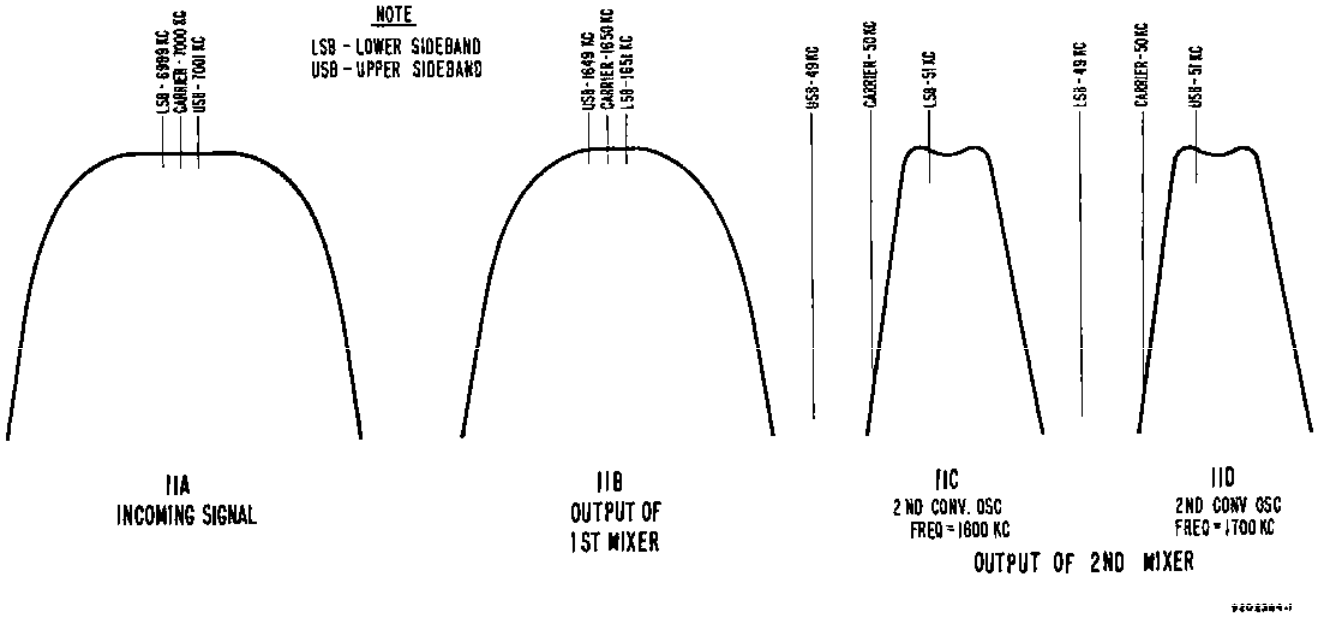



Figure 11. Selectable-Sideband Response Curves

The 2nd conversion oscillator is crystal controlled and can be set to operate at either 1600 kc for reception of the lower sideband, or 1700 kc for the reception of the upper sideband, selection being made by means of the RESPONSE control. When the RESPONSE control is set at "LOWER SIDEBAND", the 1600-kc signal from the 2nd conversion oscillator is heterodyned with the incoming signal at the first-intermediate frequency of 1650 kc to produce three new frequencies: the carrier at 50 kc, the lower sideband at 51 kc, and the upper sideband at 49 kc. By referring to Fig. 11C, it can be seen that the lower sideband falls within the IF passband and the upper sideband falls outside of the passband. Thus the lower sideband is accepted and the upper sideband is rejected. When the RESPONSE control is set at "UPPER SIDEBAND", the 1700 kc signal from the 2nd conversion oscillator is heterodyned with the incoming signal. In the frequency conversion process, the carrier still remains at 50 kc, but now the upper sideband appears at 51 kc, and the lower sideband appears at 49 kc. (See Fig. 11D.) Thus, the upper sideband is accepted and the lower sideband is rejected.

Under conditions of crowded amateur bands, the sideband which is most affected by other interfering signals can be rejected, thereby greatly eliminating much of the interference or "QRM". When receiving an AM signal from an amateur station, it is possible to change sidebands during the course of reception, in order to offset changing "QRM" conditions due to adjacent signals disappearing and reappearing within the band.

## 3-13. "CALIB.-OFF" SWITCH

The CALIB. -OFF switch controls the operation of the built-in 100-kc crystal calibrator. When the switch is set at "CALIB.", the crystal calibrator is turned on to provide marker signals at every 100-kc point on the receiver. The crystal calibrator employs a crystal controlled, pentode oscillator circuit. The output of the crystal calibrator is capacitively coupled to the antenna input circuit. A trimmer capacitor, adjustable by the CRYSTAL ADJ control on the top of the calibrator unit, permits adjustment of the calibrating crystal to exactly 100 kc by comparison with the 10-mc signal (band 7, WWV 10 MC) transmitted by WWV. This capacitor has been set at the factory and should normally not require periodic readjustment unless extreme calibration accuracy is required. If adjustment is required, proceed as outlined in Section 4-6.

## 3-14. RECEIVE-STANDBY SWITCH

The RECEIVE-STANDBY switch, when set at "STANDBY", permits disabling of the receiver during transmission periods, at the same time maintaining the heater and plate supplies operative for instant use when reception is again resumed. The receiver operates normally when the RECEIVE-STANDBY switch is at "RECEIVE".

One section of the RECEIVE-STANDBY switch is available for relay or transmitter switching. For connections and details, refer to Section 2-8.

## 3-15. TUNING CONTROL

The tuning control is used to tune the desired signals within the selected amateur band. The vertical pointer on the slide-rule dial is operated by this control. This dial has six calibrated and individually illuminated scales, one for each of the 160, 80, 40, 20, 15 and 10-11 meter amateur bands covered by the receiver. A seventh band, which uses the dial area used by the 10-11 meter band scale, has a mark for zero-beating the 10-mc WWV signal for purposes of checking and adjusting the 100-kc crystal calibrator. All bands are illuminated in this position. This band is also useful for use as the first IF when the receiver is used with a six or two meter converter which has an IF output in the vicinity of 10 megacycles.

It should be noted that the large slide rule dial spreads the amateur bands over most of the total length of the calibrated dial. When checked against the 100-kc crystal calibrator, and dial correction made with the

POINTER RESET control, the dial calibration is extremely accurate. This is especially true on the narrower 160, 40, 20 and 15 meter amateur bands. On these bands the receiver has a dial graduation every 5 kilocycles. The dial accuracy is somewhat less on the 80 and 10-11 meter bands, where there is a dial graduation every 10 kc and 50 kc, respectively.

# SECTION IV
# OPERATION

## 4-1. AM RECEPTION

1. Set the front panel controls to their starting positions as outlined below.

   SENSITIVITY.....10 (maximum sensitivity)
   BAND SELECTOR. At the desired amateur band
   VOLUME .....0 (minimum volume)
   AVC ON-OFF .....ON
   NOISE LIMITER-OFF ..... OFF
   AM/CW-SSB ..... AM
   SELECTIVITY.....5 KC
   RESPONSE.....POWER OFF
   RECEIVE-STANDBY ..... RECEIVE
   NOTCH DEPTH..... OFF
   CALIB.-OFF..... OFF
   POINTER RESET ..... As adjusted
   ANT. TRIMMER..... As adjusted
   PITCH CONTROL..... As adjusted
   NOTCH FREQ..... As adjusted

2. Turn the receiver on by rotating the RESPONSE control clockwise and set it at either the "NORMAL" or "TREBLE CUT" position. The tuning dial and "S" meter will light up indicating the receiver is operative, and the amateur band selected by the "BAND SELECTOR" will be the only band on the slide rule dial illuminated. Rotate the VOLUME control clockwise for the desired volume level.

3. Tune in an AM signal with the tuning control, tuning for maximum indication on the "S" meter. Adjust the ANT. TRIMMER control for maximum indication on the "S" meter. After the signal has been accurately tuned in, readjust the VOLUME control as desired.

**NOTE**

The "S" meter indications will he correct only when the AVC switch is set at ON, and the SENSITIVITY control is set at 10 (maximum sensitivity). Setting the SENSITIVITY control at a setting other than "10" will also somewhat restrict AVC action.

4. Set the SELECTIVITY control for the desired degree of selectivity. For AM reception, the control can be set to 5 KC for maximum fidelity. The positions marked 3 KC, 2 KC, 1 KC, .5 KC provide progressively increasing steps of selectivity. Note that as the selectivity of the receiver is increased, the background noise and interference from adjacent signals is reduced. Too much selectivity, however, may cause excessive sideband cutting. While sideband cutting reduces fidelity, it may be frequently preferable to sacrifice naturalness of reproduction in favor of communications effectiveness. When changing the position of the SELECTIVITY control from a broad to a narrower response (for example: from "2 KC" to "1 KC"), a slight readjustment of the tuning controls may be necessary to recenter the signal in the IF passband.

5. Set the RESPONSE control at either "LOWER" or "UPPER SIDEBAND" position.

6. If it is desired to operate with AVC off, set the VOLUME control to a well advanced position, and vary the receiver volume level by meana of the SENSITIVITY control, taking care not to advance the control to a point where strong signals will cause "blocking".

7. If severe electrical disturbances, ignition or other types of pulse type noise interfere with reception, set the NOISE LIMITER switch at "ON" to place the automatic noise limiter circuit in operation.

8. The receiver may be disabled without turning it off by setting the RECEIVE-STANDBY switch at "STANDBY". In this position, the RF and 50.5-kc IF stages are cut off cut the heater and plate supplies remain operative for instant reception. To resume reception, simply return the switch to the "RECEIVE" position.

9. An undesired signal near the frequency of the desired signal will heterodyne with it to produce an audible beat note equal to their frequency difference. This type of heterodyne interference can be eliminated by using the selectable sideband feature of the receiver to position the undesired signal out of the IF passband. The detailed procedure for eliminating heterodyne interference is as follows:

   a. Set the AM/CW-SSB switch at "CW-SSB", the PITCH CONTROL to "O", and the RESPONSE control at either "LOWER SIDEBAND" or "UPPER SIDEBAND".

   b. Carefully tune in the desired signal for "zero beat". Then set the AM/CW-SSB switch at "AM".

c. If the RESPONSE control has been set to the proper sideband position, the amount of heterodyne interference will be eliminated or minimized. If the interference is still present, simply switch the RESPONSE control to the opposite sideband position.

10. An alternate method of eliminating an interfering signal is to use the notch filter circuit. Simply rotate the NOTCH DEPTH control clockwise to "O" and adjust the NOTCH FREQ control to "notch out" the interfering signal. Readjust the NOTCH DEPTH control as necessary to obtain maximum rejection of the interfering signal.

**CAUTION**

It is possible to eliminate the heterodyne by notching out the desired carrier in place of the undesired signal or carrier. When this occurs an AM signal will sound like a single sideband suppressed carrier transmission (monkey chatter).

11. In shortwave reception, it frequently happens that transmission conditions are different for waves of slightly different frequencies. As a result, in the case of voice-modulated transmissions, which involve sideband frequencies differing slightly from the carrier frequency, the carrier and sideband components may not be received in the same relative amplitude and phases they had at the transmitter. This effect, known as selective fading, causes severe distortion of the signal. This type of distortion can be reduced somewhat by tuning the receiver to accept only one of the two sidebands being transmitted as previously outlined in steps 9(a) and (b). After tuning is completed, switch the RESPONSE control from "LOWER SIDEBAND" to "UPPER SIDEBAND" and leave it in the position providing the least distortion.

## 4-2. CW RECEPTION

For CW reception, the receiver may be operated with AVC on or off, as desired. Operation of the receiver with AVC on is highly desirable since it not only minimizes fading but also prevents blasting when tuning from a weak to a strong signal. To operate with AVC on, set the AVC switch at "ON", set the SENSITIVITY control to a well advanced position, and regulate the receiver volume level by means of the VOLUME control. To operate with AVC off, set the AVC switch at "OFF", set the volume control at a well advanced position, and vary the receiver volume level by means of the SENSITIVITY control, taking care not to advance the control to a point where strong signals cause excessive "thumping" (overloading).

CW signals are made audible by the heterodyning action of the beat oscillator with the incoming signal. The beat oscillator is set at a frequency slightly different from the second-intermediate frequency of 50.5 kc, the difference being equal to the pitch of the audible note desired.

For the reception of CW signals, set the AM/CW-SSB switch at "CW-SSB", set the SELECTIVITY control at one of the sharper selectivity positions (2 kc, 1 kc, or .5 kc), set the RESPONSE control at "UPPER SIDEBAND", and set the PITCH CONTROL at any setting from "2" to "4" on either side of zero, and then tune in the signal for a pleasing beat note.

**NOTE**

Because of the effective band spread of the amateur bands on this receiver, CW signals are easily tuned when the SELECTIVITY control is set at ".5 KC".

The beat oscillator may be set on either the high- or low-frequency side of zero beat. (The oscillator operates on the low side when the PITCH CONTROL is set at a position to the left of zero and on the high side when the PITCH CONTROL is set at a position to the right of zero.) It may be necessary, after setting the PITCH CONTROL, to readjust the receiver tuning slightly to properly position the signal in the IF passband. Alternately adjust the PITCH CONTROL and the receiver tuning for a maximum audible signal. With the receiver in the sharpest selectivity position, CW signals will drop in and out more rapidly and a slower rate of tuning is recommended. Once the PITCH CONTROL has been set, it need not be reset for each CW signal unless a change of pitch is desired.

**NOTE**

If the SELECTIVITY control is changed to a different position, it may be necessary to readjust the receiver tuning slightly when changing to a narrower selectivity position in order to properly position the signal in the IF passband.

The setting of the SELECTIVITY control for CW reception is generally best determined by receiving conditions. Note that as the selectivity of the receiver is increased (SELECTIVITY control varies from the "5 KC" to the ".5 KC" position), the background noise and adjacent-channel interference is conaiderably reduced and tuning is sharper. For CW reception, the sharpest selectivity position may be used without the loss of intelligibility experienced in AM reception.

The automatic noise limiter circuit can be used to great advantage on CW reception, just as an AM reception, to reduce the effects of background noise and electrical interference. To place the noise limiter circuit in operation, turn the NOISE LIMITER switch on. The notch filter may be used to eliminate or attennate an interfering signal during CW reception.

## 4-3. SINGLE SIDEBAND RECEPTION

Single-sideband signals are transmittad with little or no carrier, and it is necessary to reinsert the carrier in the receiver before proper reception is obtained. In the SX-101 receiver, this is accomplished in the 50.5 kc IF system by injecting the beat oscillator signal at the input of the second-detector. A single-sideband signal (SSB) can be identified by its unintelligibility, or monkey chatter, and by severe variation in the "S" meter indication corresponding to the speech modulation.

For the reception of single-sideband signals, set the PITCH control at "O", AVC switch at "ON", AM/CW-SSB switch at "CW-SSB", and SELECTIVITY control at either "1 KC" or "2 KC", depending upon adjacent

channel interference and noise. Set the SENSITIVITY control at a well advanced position clockwise and vary the receiver volume level by means of the VOLUME control, taking care not to advance the SENSITIVITY control to a point where strong signals will cause distortion (overloading). Set the RESPONSE control at either "LOWER SIDEBAND" or "UPPER SIDEBAND". The single-sideband signal will be intelligible in only one of these two positions, the proper position depending upon the sidehand being transmitted. If the signal is not intelligihle after tuning is completed ns outlined below, set the RESPONSE control to the other sideband setting and repeat the tuning procedure. It is suggested that the RESPONSE control be initially set at "LOWER SIDEBAND" since most single-sideband transmissions are of this type.

After the controls have been properly set as outlined in the preceding parngraph, very carefully tune in the single-sideband signal for maximum intelligibility. It will be noticed that with incorrect tuning of a single-sideband signal, the speech wtll sound high- or low-pitched or very distorted but no trouble should be encountered in tuning once a little experience has been gained.

The "1 KC" position of the SELECTIVITY control permits reception of mndulation frequencies up to about 1000 cycles. For reception of modulating frequencies higher than 1000 cycles, set the SELECTIVITY control to the positions marked "2 KC", "3 KC" and "5 KC", depending on the degree of fidelity desired; maximum fidelity is obtained in the "5 KC" position. Unlike CW on AM reception, it is not necessary to retune the receiver slightly when receiver selectivity is varied. The notch filter is especially useful during reception of single-sideband signals. An undesired AM or CW signal close in frequency to the desired signal will heterodyne with the beat oscillator to produce an audible beat. The undesired signal may be "notched out" with the notch filter, just as in AM or CW reception.

## 4-4. USE OF CRYSTAL CALIBRATOR

The built-in 100-kc crystal calibrator permits accurate checking of dial calibration on every band by a comparison of the dial calibrations with the marker signals which appear at every multiple of 100 kc on the dial.

### A. CALIBRATION OF THE DIAL

1. Set the tuning dial at a convenient multiple of 100 kc at the high frequency end of the amateur hand in use (or nearest any particular frequency within the band it is desired to tune). Examples of high frequency end check are: 2000 kc on 160 meters, 4000 kc on 80 meters, 7300 kc on 40 meters, 14,400 kc on 20 meters, 21,500 kc on 15 meters, and 29,700 kc on 10 meters.

2. Set the AM/CW-SSB switch at "CW-SSB", the PITCH control at "O", and the CALIB.-OFF switch at "CALIB.".

3. Very carefully adjust the tuning control for the exact 100-kc frequency mark as indicated by "zero beat". If the vertical pointer on the dial does not fall exactly on this 100-kc mark, adjust the POINTER RESET control until the pointer falls right on the mark. For example, on the 80 meter amateur hand, a "zero beat" should be obtained at 3500, 3600, 3700, 3800, 3900, and 4000 kc.

4. The procedure outlined in steps 1 through 3 above provides average calibration accuracy over the entire frequency range of the band in use. For precise calibration accuracy over a particular section of the amateur band, the procedure is identical except that the dial is set at a multiple of 100 kc nearest the desired frequency or range of frequencies, instead of at the high end of the band as in step 1.

## 4-5. USE OF "S" METER

The "S" meter provides a visual means of determining whether or not the receiver is properly tuned, as well as an indication of the relative signal strength. The "S" meter circuit consists of a DC milliammeter connected in the cathode circuit of the "S" meter tube (V-15), the grid of which is controlled by AVC voltage. Since the cathode current of this tube varies with the strength of the incoming signal, the meter will indicate relative signal strength. The "S" meter is calibratad in microvolts, and also in "S" units from 1 to 9, and in decibels ahove S-9 to +80 db. The indications on the "S" meter will be correct only when the SENSITIVITY control is set at "10" (maximum sensitivity), and the AVC switch is set at "ON".

**NOTE**

The "S" meter will also indicate relative signal strength when the AVC switch is at OFF, and/or when the SENSITIVITY control is not fully clockwise.

The limitations of the microvolt scale should be fully understood before any assumption as to the indicated signal voltages is accepted. The meter indicates approximate microvolts of signal strength as developed at the antenna input terminals when terminated in a 50-70 ohm load, at 14.3 mc. This approximation will have a variation on a new receiver and, obviously, as the tubes age the variations may be greater. The indicated microvolt readings at other frequencies will vary approximately from that at 14.3 mc. Also, alt readings 50 microvolts or less will be more eccurate and correlate more closely than those higher.

Variations in the microvolt indications between receivers is not indicative of the overall sensitivity but is caused by normal tolerances in vacuum tube conductances which are reflected as variations in the AVC/"S" Meter curve. Thus, two receivers with identical sensitivities could, under the same signal conditions indicate signal levels of 5 microvolts and 25 microvolts and yet each be a perfect receiver.

## 4-6. BFO FREQUENCY CHECK

The beat frequency oscillator (BFO) has been carefully adjusted at the factory so that its frequency is 50.0 kc when the PITCH CONTROL knob is set at "O". Readjustment of the BFO will normally not be required unless the 6SC7 BFO tube (1/2 of V-8) or components in the BFO circuit have been replaced. A slight readjustment sometimes may be necessary occasionally

as a result of normal aging of the BFO tube. A simple check can be made to determine if adjustment is necessary as follows:

With the AM/CW-SSB switch at "CW-SSB", SELECTIVITY control at "5 KC", RESPONSE control at "UPPER SIDEBAND", and PITCH CONTROL at "O", very carefully tune in an AM signal for "zero beat". (See Note A below.) Leaving the receiver tuning unchanged, switch the RESPONSE control to the "LOWER SIDEBAND" position. If the beat oscillator frequency is correct, a "zero beat" will be obtained in both the "UPPER SIDEBAND" and "LOWER SIDEBAND" positions. If, however, the beat oscillator is slightly off frequency, a beat note will be heard when switching from the "UPPER SIDEBAND" to the "LOWER SIDEBAND" position. Adjustment of the beat frequency oscillator is necessary only if the frequency of the audible beat note exceeds 200 cycles.

**NOTE A**

In instances where the beat oscillator is considerably off frequency, it may not be possible to obtain a "zero beat" when tuniug in the signal. In this case, it will be necessary to first "roughly" set the beat oscillator to operate at approximately 50 kc as follows: With the AM/CW-SSB switch at "CW-SSB", SELECTIVITY control at ".5 KC", and RESPONSE control at "UPPER SIDEBAND", tune the receiver to a noisy part of the band (not to a signal). Remove the PITCH CONTROL knob and adjust the BFO slug for minimum noise on the noise signals. Then set the SELECTIVITY control at "5 KC" and make the BFO frequency check as outlined in the preceding paragraph.

If the BFO frequency check indicates adjustment is necessary, proceed as follows:

Remove the PITCH CONTROL knob and turn the BFO slug a few degrees to the left or right so as to lower the beat note frequency, and repeat the BFO frequency check. If the heat note obtained is higher in frequency than that obtained originally, it is an indication that the slug is being turned in the wrong direction. Continue varying the setting of the slug in small steps and repeating the BFO frequency check until "zero beat" is obtained in both the "UPPER SIDEBAND" and "LOWER SIDEBAND" positions. After the correct slug setting is determined, replace the PITCH CONTROL knob with "O" in the top center position, being careful not to disturb the slug setting.

## 4-7. NOTCH FREQUENCY CHECK

Readjustment of the notch filter circuit is not normally necessary unless the components in the notch filter circuit are replaced. To check the circuit, proceed as follows:

Check the BFO frequency as instructed in Section 4-6. Set the PITCH CONTROL at "O", AVC to "ON" and the SELECTIVITY control at "3 KC". Tune in an unmodulated carrier, from a station, amateur transmitter VFO, or a signal generator, for a "zero beat". Place the AM/CW-SSB switch in the "AM" position to de-energize the BFO. Rotate the NOTCH DEPTH control to "O". Tune the NOTCH FREQ. for a minimum reading on the "S" meter. The NOTCH FREQ. dial should be set at "50 KC".

If the notch frequency check indicates that an adjustment is necessary, proceed as follows:

Loosen the NOTCH FREQ. knob and reset it to indicate "50 KC". Rotate the control to approximately "51 KC". Tune across an unmodulated carrier while observing the "S" meter. (Use an approximate S-9 signal.) The meter will indicate two peaks. Readjust the NOTCH FREQ. control as necessary to approximately equalize the peaks. Then tune the receiver for a minimum reading on the "S" meter between the two peaks. Adjust the NOTCH ADJ. control R75, located on top of the SX-101 receiver chassis, for a minimum reading on the "S" meter. Refer to Fig. 12 for the location of R75.

## 4-8. CRYSTAL CALIBRATOR CHECK

The CRYSTAL ADJ. control on the calibrator chassis operates a trimmer capacitor connected across the 100-kc calibrating crystal. This trimmer capacitor permits slight adjustment of the calibrating crystal to exactly 100 kc by comparison with the 10-mc signal transmitted by station WWV. This is done by setting the BAND SELECTOR to "WWV 10 MC" and tuning the receiver to the WWV 10 MC mark on the top scale of the slide rule dial. This capacitor has been set at the factory and should not require periodic readjustment unless extreme calibration accuracy is desired. If adjustment is required, proceed as outlinad below.

Set the RESPONSE switch to "NOR", the CALIB.-OFF switch at "OFF", and all other front panel controls as for normal AM reception. Tune in the 10-mc WWV signal and wait for the period during which the signal from WWV is unmodulated. Then switch on the crystal calibrator by setting the CALIB.-OFF switch at CALIB. and adjust its frequency, by means of the CRYSTAL ADJ. control (C105), until the crystal calibrator signal "zero beats" with the signal received from WWV. If the adjustment is attempted during periods that WWV is modulated, an erroneous zero beat may be obtained with the modulating frequency instead of the desired carrier frequency.

## 4-9. SERVICE OR OPERATING QUESTIONS

For any further information regarding operation or servicing of your SX-101 receiver, contact your Hallicrafters dealer. The Hallicrafters Company maintains an extensive system of Authorized Service Centers where any required service will be performed promptly and efficiently at a nominal charge. All Hallicrafters Authorized Service Centers display the sign shown below.

For the location of the one nearest you, consult your local dealer or telephone directory. Make no service shipments to the factory as The Hallicrafters Company will not accept the responsibility for unauthorized shipments.

The Hallicrafters Company reserves the privilege of making revisions in current production of equipment and assumes no obligation to incorporate these revisions in earlier models.

# SECTION V
# ALIGNMENT

This receiver has been carefully aligned at the factory by specially trained and experienced personnel using precision equipment. Alignment of the receiver should not be attempted until all other possible causes of faulty operation have been investigated. Alignment should not be required unless the receiver has been tampered with or component parts have been replaced in the RF or IF stages. Alignment should be made only by persons familiar with communications receivers and experienced in their alignment. Refer to Figs. 12 and 13 for location of all alignment adjustments.

## 5-1. EQUIPMENT REQUIRED

1. Signal generator covering 50 kc to 30 mc.
2. Vacuum tube voltmeter (VTVM) or other high impedance DC voltmeter.
3. Output meter (or AC scale of VTVM). Connect output meter to appropriate speaker output terminals. If a VTVM is used, connect it to terminals "500" and "G" and terminate the output with a 500-ohm resistive dummy load.

## 5-2. INITIAL CONTROL SETTINGS

BAND SELECTOR..... As indicated in chart
SENSITIVITY and VOLUME ..... 10 (maximum)
AVC and NOISE LIMITER ..... Off
AM/CW-SSB..... AM
SELECTIVITY ..... As indicated in chart
RESPONSE ..... LOWER SIDEBAND
RECEIVE-STANDBY ..... RECEIVE
Tuning ..... Gang half meshed
NOTCH DEPTH ..... OFF
ANT. TRIMMER ..... Mid point
POINTER RESET ..... Mid point
CALIB. - OFF..... OFF
PITCH CONTROL..... 0
NOTCH FREQ ..... As indicated in chart

## 5-3. ALIGNMENT PROCEDURE

| Step | Signal Generator Connections | Signal Generator Frequency | Band Selector Setting | Output Connections | Selectivity Setting | Remarks |
|---|---|---|---|---|---|---|
| | | | 50.5 KC IF ALIGNMENT | | | |
| 1 | High side directly to aligument point "A" (terminal 1 of T2). See Fig. 13. Low side to chassis. | 50.5 KC (unmod.) | 160 M | VTVM DC probe to alignment point "B" (junction of R48, R49, and C81). See Fig. 13. | .5 KC | Remove 1st conv. oscillator tube V3 from its socket to prevent signal interference. Adjust top slug of T3, T4, T5 and T6 (50.5 KC IF's) for maximum indication, maintaining approx. 1 volt reading on VTVM. |
| | | | ALIGNMENT OF 1600 KC 2nd CONV. OSC. & 1650 KC IF'S | | | |
| 2 | High side directly to alignment point "C" (pin 7 of V2). Low side to chassis. | 1650 KC (mod) | 160 M | Output meter across appropriate speaker terminals. (VTVM to alignment point "B" if it is desired to monitor detector voltsge.) | 5 KC | Replace V3 removed in step 1. Tune generator slowly thru 1650 KC to determine IF passband. Then set generator to center of passband, using sufficient generator output to obtsin approx. 1/2 watt receiver output. If no output is obtained, the 1600 KC crystal oscillator may not be oscillating and it will be necessary to turn up the generator output and adjust the 1600 KC crystal activity adjustment (top slug of T9) until output is obtained. Adjust for maximum output by adjusting the signal generator frequency, crystal activity (top slug of T9) and the 1650 KC IF's (top and bottom slugs of T1 and T2). Note that the signal suddenly disappears when the crystal activity slug is turned into the coil and gradually |

| Step | Signal Generator Connections | Signal Generator Frequency | Band Selector Setting | Output Connections | Selectivity Setting | Remarks |
|---|---|---|---|---|---|---|
| ALIGNMENT OF 1600 KC 2nd CONV. OSC. & 1650 KC IF'S (cont) | | | | | | |
| drops in level when the slug is backed out of the coil. Set the crystal activity adjustment (top of slug of T9) for half output on the gentle slope side of maximum response. Then set the generator as near the center of the IF passband as possible and adjust the top and bottom slugs of T1 and T2 for maximum response. Tune through the passband and observe the shape of the response. If it is symmetrical, the adjustment is completed; if not, reset the generator frequency near the center of the passband and repeak T1 and T2. | | | | | | |
| | | ALIGNMENT OF 1700 KC 2nd CONV. OSC. | | | | |
| 3 | High side directly to alignment point "C" (pin 7 of V2). Low side to chassis. | 1650 KC (mod) | 160 M | Output meter across appropriate speaker terminals. (VTVM to alignment point "B" if it is desired to monitor detector voltage.) | 5 KC | Set RESPONSE control at "UPPER SIDEBAND". Tune generator slowly thru 1650 KC to determine IF passband. Then set generator to center of passband, using sufficient generator output to obtain approx. 1/2 watt receiver output. If no output is obtained, the 1700 KC crystal oscillator may not be oscillating and it will be necessary to turn up the generator output and adjust the 1700 KC crystal activity adjustment (bottom of slug of T9) until output is obtained. Adjust for maximum output by adjusting the signal generator frequency and the crystal activity (bottom of slug T9). Note that the signal suddenly disappears when the crystal activity slug is turned into the coil and gradually drops in level when the slug is backed out of the coil. Set the crystal activity adjustment (bottom slug of T9) for half output on the gentle slope side of maximum response. |
| | | IF SENSITIVITY CHECK | | | | |
| 4 | With the generator modulated 30% at 400 cycles and connected thru a .05 mfd capacitor to the grid (pin 1) of the 1st mixer tube V2, the IF input required for 1/2 watt receiver output should be approximately 20 microvolts. This assumes the crystal activity is set for half of maximum response as outlined in steps 2 and 3 above. | | | | | |

## RF ALIGNMENT

- Before proceeding with the RF alignment, check the tuning dial for proper indexing. The dial should index with the low frequency end of the bands when the tuning gang is fully closed.
- Use an amplitude modulated (30%) signal.
- Set SENSITIVITY and VOLUME at "10", AVC and NOISE LIMITER at "OFF", SELECTIVITY at "2 KC", RESPONSE at "LOWER SIDEBAND", and RECEIVE-STANDBY at "RECEIVE".
- Connect the output meter across the appropriate speaker terminals. (Connect the VTVM to alignment point "B" if it is desired to monitor the detector voltage.) Maintain a 1/2 watt receiver output.
- Connect high side of generator thru 50 to 70-ohm carbon resistor to antenna terminal "A1". Connect jumper between "A2" and "G".
- The oscillator frequency is higher than the signal frequency on all bands.

| Step | Band Selector Setting | Generator & Receiver Frequency | Adjust for Maximum |
|---|---|---|---|
| 5 | 160 M (Band 1) | 2.0 MC | C47 (osc trimmer)<br>C39 (mixer trimmer)<br>C41 (ANT. TRIMMER at mid point) |
| | 160 M (Band 1) | 1.8 MC | L20 (osc. slug)<br>L8 (mixer slug)<br>L1 (ant slug) |
| 6 | 80 M (Band 2) | 4.0 MC | C49 (osc trimmer)<br>C38 (mixer trimmer)<br>C41 (ANT. TRIMMER at mid point) |

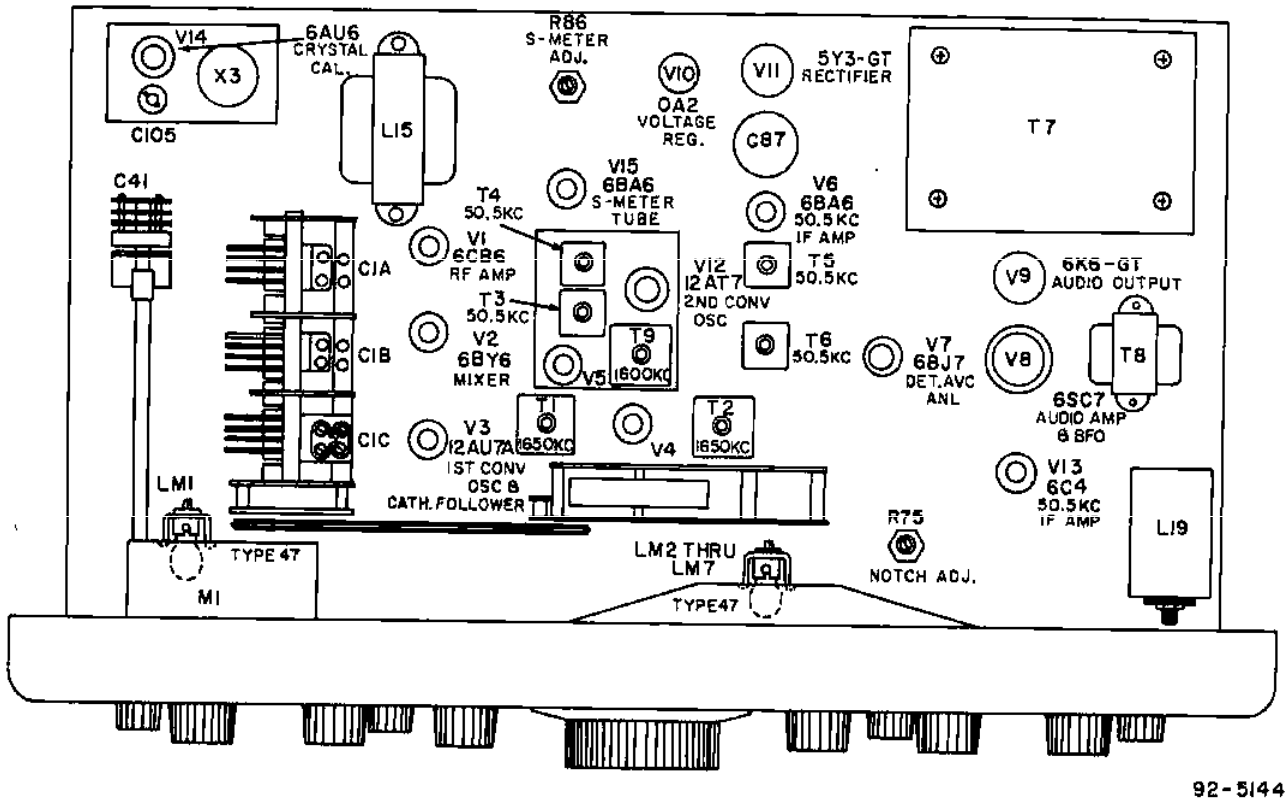
| Step | Band Selector Setting | Generator & Receiver Frequency | Adjust for Maximum |
|---|---|---|---|
| R-F ALIGNMENT (cont) | | | |
| | 80 M (Band 2) | 3.5 MC | L21 (osc slug)<br>L9 (mixer slug)<br>L2 (ant slug) |
| 7 | 40 M (Band 3) | 7.3 MC | C53 (osc trimmer)<br>L10 (mixer slug)<br>C41 (ANT. TRIMMER at mid point) |
| | 40 M (Band 3) | 7.0 MC | L22 (osc slug)<br>C67 (mixer pad)<br>L3 (ant slug) |
| 8 | 20 M (Band 4) | 14.4 MC | C55 (osc trimmer)<br>L11 (mixer slug)<br>C41 (ANT. TRIMMER at mid point) |
| | 20 M (Band 4) | 14.0 MC | L22 (osc slug)<br>C68 (mixer pad)<br>L4 (ant slug) |
| 9 | 10-11 M (Band 6) | 29.7 MC | C60 (osc trimmer)<br>L12 (mixer slug)<br>C41 (ANT. TRIMMER at mid point) |
| | 10-11 M (Band 6) | 27.0 MC | L25 (osc slug)<br>C70 (mixer pad)<br>L5 (ant slug) |
| 10 | 15 M (Band 5) | 21.5 MC | C58 (osc trimmer)<br>C10 (mixer trimmer)<br>C41 (ANT. TRIMMER at mid point) |
| | 15 M (Band 5) | 21.0 MC | L24 (osc slug)<br>C69 (mixer pad)<br>C2 (ant pad) |
| 11 | 10 MC WWV (Band 7) | 10.0 MC | C43 (osc trimmer)<br>C11 (mixer trimmer)<br>C4 (ant trimmer) |

BFO ADJUSTMENT
Refer to Section 4-6.

NOTCH FILTER ADJUSTMENT
Refer to Section 4-7.

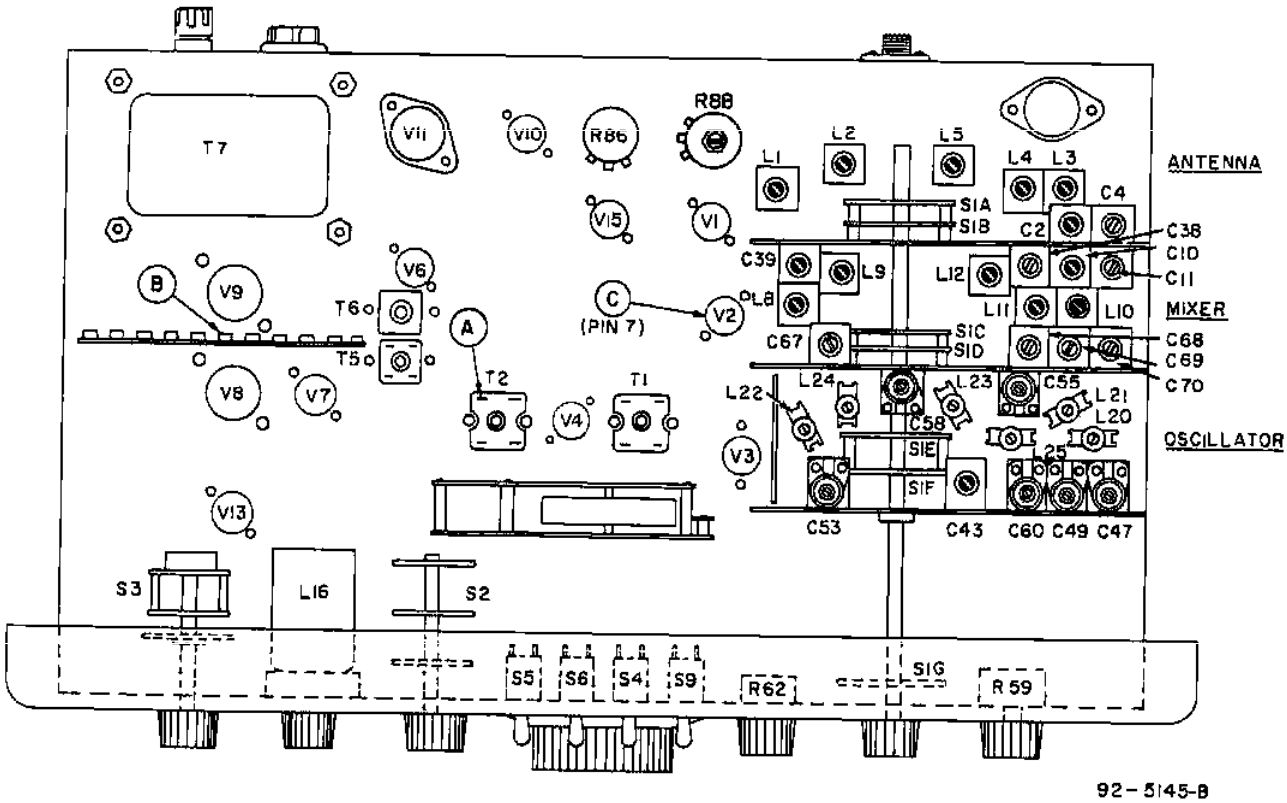
"S" METER CALIBRATION
See Section 6-5.

- Make both the mechanical and the electrical "S" meter zero adjustments.
- Connect the signal generator as for RF ALIGNMENT above. Use a 14.3 mc, 50 uv, modulated signal.
- Set the receiver controls for AM reception on the 20 M band and accurately tune in the signal.
- Set SENSITIVITY to "10" (maximum), AVC to "ON" and SELECTIVITY to "2KC".
- Adjust R88 for S9 reading on "S" Meter.




92-5144

Figure 12. Top View of Receiver




92-5145-B

Figure 13. Bottom View of Receiver

# SECTION VI
# SERVICE DATA

## 6-1. TECHNICAL SPECIFICATIONS

TUBES..... 13 plus voltage regulator and rectifier
SPEAKER OUTPUT..... 3.2 and 500 ohms
HEADPHONE OUTPUT ...500 ohms (See Section 2-6)
ANTENNA INPUT..... 50-70 ohms
PHONO INPUT.....High impedance
*POWER SOURCE.....105-125 volts, 50/60 cycles
POWER CONSUMPTION ..... 115 watts
RECEPTION..... AM, CW, and SSB
INTERMEDIATE FREQUENCIES.....(Double Conversion): 50.5 KC and 1650 KC
DIMENSIONS (overall) ..... 20" wide, 10-1/2" high, 16" deep
SHIPPING WEIGHT..... approximately 74 lb.
NET WEIGHT..... approximately 70 lb.

| NOMINAL FREQUENCY COVERAGE | | | |
|---|---|---|---|
| Band No. | Amateur Band | Calibrated Range | Frequency Between Dial Graduations |
| 1 | 160 meters | 1.6 - 2.0 mc | 5 kc |
| 2 | 80 meters | 3.5 - 4.0 mc | 10 kc |
| 3 | 40 meters | 7.0 - 7.3 mc | 5 kc |
| 4 | 20 meters | 14.0 - 14.4 mc | 5 kc |
| 5 | 15 meters | 21.0 - 21.5 mc | 5 kc |
| 6 | 10-11 meters | 27.0 - 29.7 mc | 50 kc |
| 7 | WWV 10 MC | Dot is at 10.08 Mc | -- |

* See Section 2-4 for DC Operation

## 6-2. 50.5 KC IF SYSTEM

Fig. 14 shows the type uf coupting used in the 50.5 kc IF system. Note that inductive coupling is avoided by careful shielding of the IF coils and signal transfer occurs only through capacitance and resistance. By increasing the value of "C" and decreasing "R", the selectivity is made sharper while by decreasing "C" and increasing "R", the selectivity is made broader. The proper values of "C" and "R" are switched in the circuit by means of the SELECTIVITY control. "R" varies the "Q" of the tuned circuit and "C" varies the coupling. This R-C coupling arrangement affords a more accurate means of selectivity control than that readily obtainable by any other method.

## 6-3. CHASSIS REMOVAL

The chassis and front panel assembly are removable from the cabinet as a unit by removing two screws (Top & Bottom) at each side of the front panel and the three screws on the underside of the cabinet.

## 6-4. TUBE AND DIAL LAMP REPLACEMENT

To gain access to the tubes and dial lamps, raise the hinged top cover of the cabinet. The tube locations and their functions are shown in Fig. 12.

## 6-5. "S" METER ADJUSTMENTS

The mechanical adjustment of the "S" meter is accessible at the rear of the meter. The mechanical adjustment has been accurately set at the factory and will normally not require any further adjustment. Adjustment can be made, if required, by turning off the receiver and carefully rotating the adjustment screw until the meter pointer is in line with the right-hand index mark.

The electrical adjustment is made by carefully turning the "S" METER ADJ control R86 on the top of the receiver chassis (Fig. 12), entil the pointer is in line with the left-hand index mark. The electrical adjustment should be made with the receiver on, antenna terminals shorted, SENSITIVITY at "10", AM/CW-SSB switch at "AM", AVC switch at "ON", and RECEIVE-STANDBY switch at "RECEIVE". The settings of the remaining controls do not affect the "S" meter reading.

## 6-6. DIAL CABLE RESTRINGING

1. Remove the chassis from the cabinet (par. 6-3).
2. Remove the knobs and front panel. This is done by removing four screws from the front panel, and the locknuts from the five toggle switches and the phone jack.

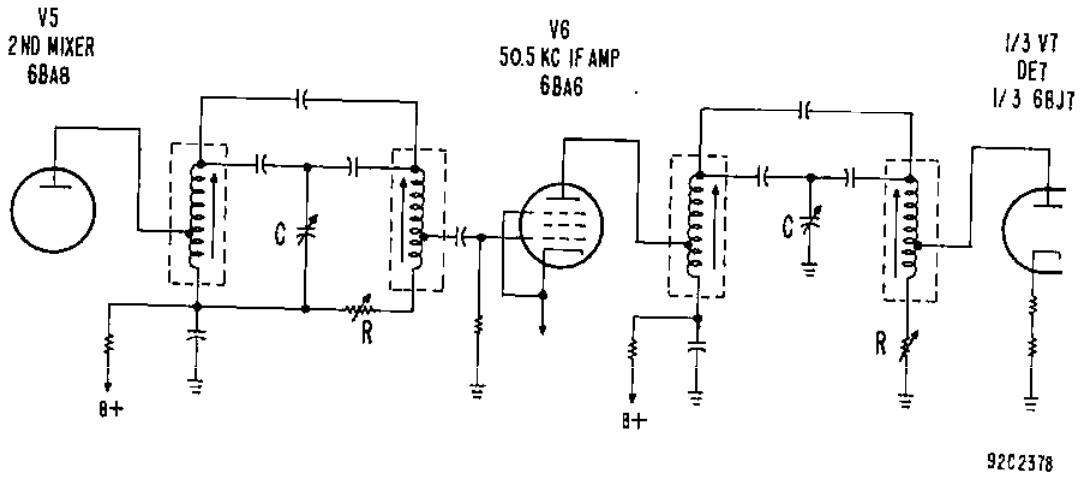



Figure 14. Equivalent Schematic Diagram of 50.5 KC IF System

3. Remove the dial panel assembly by removing two screws, nuts and lockwashers at each side of the chassis. Carefully lift the dial panel assembly upward and lay it on the chassis; take care not to damage the gears or IF cans and slugs.

4. Turn the tuning shaft fully counterclockwise so that the tuning gang capacitor is fully meshed.

5. Restring the dial cord as follows (Fig 15):

   a. Attach the end of the cord to the tab (1) and pull the cord down and around the wheel. Proceed clockwise around the wheel (2 and 3) down behind wheel A (4).

   b. Continue up over wheel B (6) up to wheel C (7). Proceed across pointer rail to wheel D (8).

   c. Continue around wheel D to the left and over wheel E (9). Proceed down bshind wheel F (10).

   d. Finish up by routing the cord into the wheel slot (11) and attach the spring on the tab (12).

6. Set the POINTER RESET shaft at the halfway point of its travel.

7. Set the pointer on the pointer rail and engage the dial cord. Do not crimp the tabs on the pointer at this time.

8. Temporarily set the dial panel assembly in place to line up the pointer. The tuning shaft should be fully counterclockwise and the tuning gang capacitor fully meshed.

9. Line up the pointer on the left-hand low frequency marks on the dial.

10. Remove the dial panel assembly and crimp the tabs on the pointer. Place a drop of cement on the pointer tabs and dial cord to permanently secure the pointer and dial cord.

11. Rotate the tuning shaft from the low end to the high end, and back to the low end. Do this several times. Check for backlash or jerky motion of the pointer. If this occurs, it may be necessary to shorten and tighten the dial cord, straighten the pointer, or both.

12. Replace the dial panel assembly, front panel, knobs, and return the chassis to the cabinet.

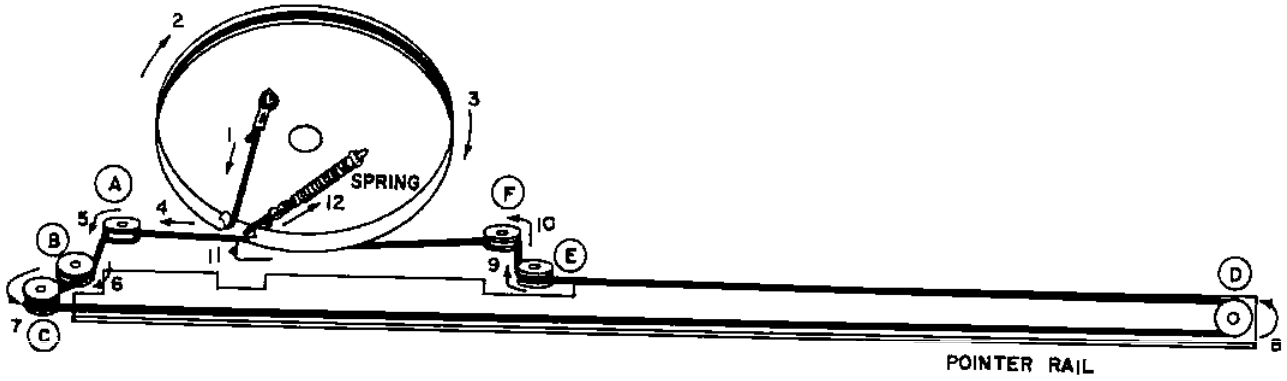



Figure 15. Dial Cord Stringing Diagram

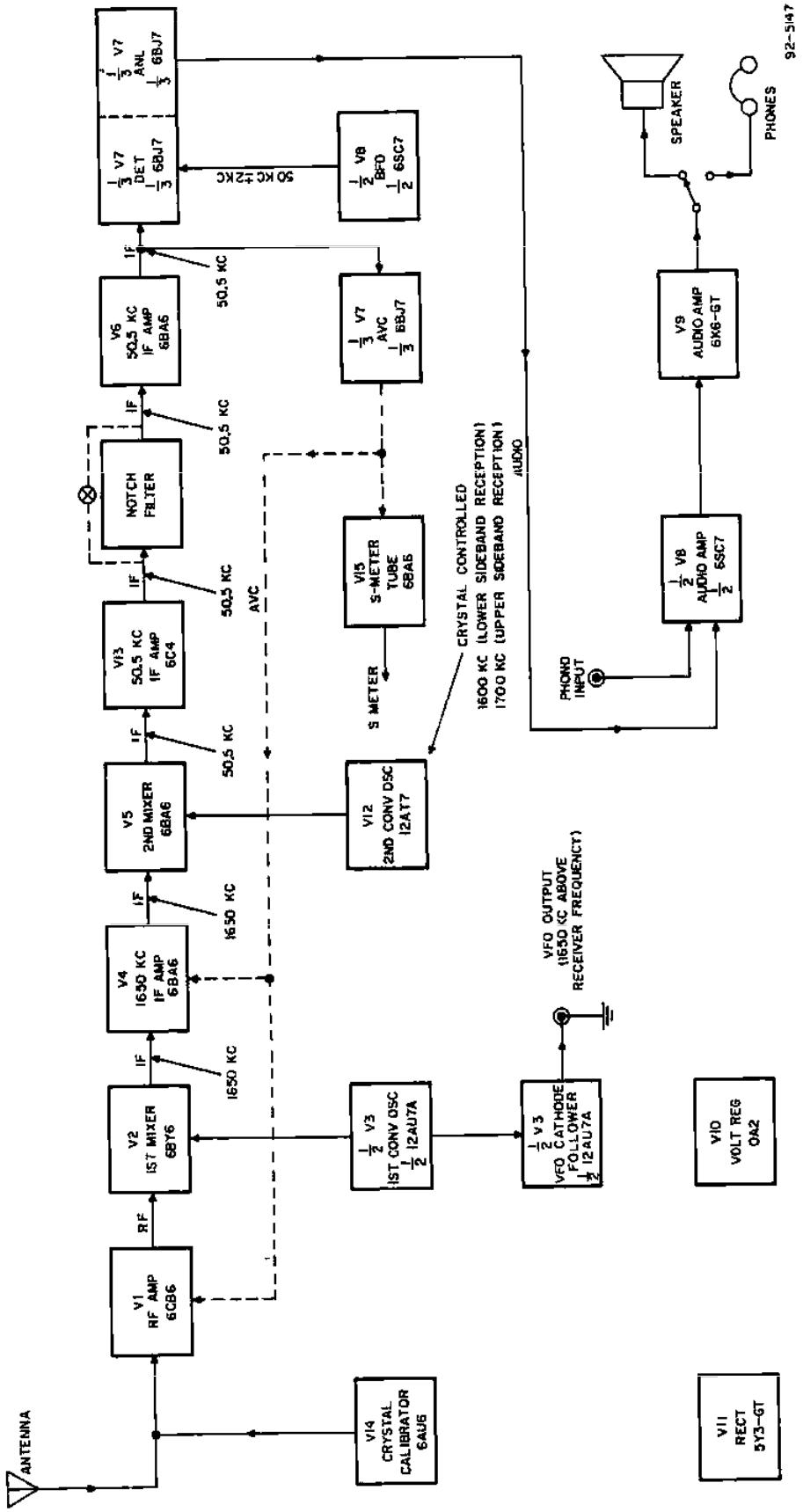



Figure 18. Block Diagram of SX-101 Receiver

# SERVICE PARTS LIST

| Schematic Symbol | Description | Hallicrafters Part Number |
|---|---|---|
| | **CAPACITORS** | |
| C-1 | Tuning | 048-400367 |
| C-2, 4 | 5-80 mmf and 100-450 mmf, dual trimmer; mica compression | 044-200479 |
| C-3 | 20 mmf, 10%, N750; cermaic | 491-106200-95 |
| C-5, 64, 114, 121, 123 | 51 mmf, 10%, N750 ceramic | 491-106510-95 |
| C-6, 15, 17, 22, 24, 25, 26, 125, 128, 129 | .02 mfd +80-20%, 500V; cer. disc. | 047-100242 |
| C-7, 14, 16 | .005 mfd +80-20%, 500V; cer. disc. | 047-100168 |
| C-8, 33, 37, 40, 101, 116 | .047 mfd, 600V; molded paper | 499-034473 |
| C-9 | 1500 mmf, 10%, 500V; mica | 470-213152 |
| C-10, 11, 38 | 5-50, 100-350, 5-50 mmf, triple unit compression; mica | 044-100480 |
| C-12, 115 | .005 mfd; ceramic disc. | 047-200529 |
| C-13, 90, 92, 99 | .022 mfd, 600V; molded paper | 499-034223 |
| C-16 | 15 mmf, 10%, N750; ceramic | 491-106150-95 |
| C-19, 30, 23, 106, 108 | .01 mfd +80-20%, 500V; cer. disc. | 047-100224 |
| C-27, 129 | 100 mmf, 10%, 500V; ceramic | 491-026101-94 |
| C-28, 29, 34, 35 | 390 mmf, 5% mica | 482-262391 |
| C-30, 36, 109, 118 | 2.2 mmf, 10%, 500V; ceramic | 047-200403-04 |
| C-31, 95, 102 | 470 mmf, 10%, 500V; mica | 470-213471 |
| C-32, 85 | .22 mfd, 20%, 200V; molded paper | 499-014224 |
| C-39, 43 | 4-80 mmf, mica compression | 044-250077 |
| C-41 | 3-50 mmf, ant. trimmer | 048-200313 |
| C-42, 54 | 51 mmf, NPO, 5%; ceramic | 491-145510-22 |
| C-44 | 110 mmf, 2%, 500V; mica | 482-161111 |
| C-45 | 15 mmf, N470, 5%; ceramic | 491-005150-83 |
| C-46 | 100 mmf, N150, 2%; cermaic | 491-064101-52 |
| C-47, 49, 53, 55, 58, 89 | 4.5-25 mmf, ceramic | 044-200476 |
| C-48 | 82 mmf, NPO, 2%; ceramic | 491-054820-22 |
| C-50 | 10 mmf, N330, 0%; ceramic | 491-005100 |
| C-51, 52 | 180 mmf, 2%, 500V; mica | 482-161181 |
| C-57, 59 | 100 mmf, N80, 2%; ceramic | 491-064101-42 |
| C-61 | 82 mmf, N330, 2%; ceramic | 491-054820-73 |
| C-62, 63, 66 | 150 mmf, NPO, 5%; mica | 482-162151 |
| C-65 | 15 mmf, 10%, NPO; ceramic | 491-006150-22 |
| C-67 | 3-30 mmf, mica, compression insulated | 044-200478 |
| C-68, 69, 70 | 5-50 mmf, each section mica; compression insulated | 044-100475 |
| C-73, 82 | 4700 mmf, 10%; 600V; molded paper | 499-031472 |
| C-74, 83 | .01 mfd, 10%, 600V; molded paper | 499-031103 |
| C-75, 84, 91 | .022 mfd, 10%, 600V, molded paper | 499-031252 |
| C-76 | .001 mfd, 20%; 500V; ceramic | 047-100503 |
| C-78, 79, 88 | 220 mmf, ceramic | 478-026221 |
| C-81, 89, 131 | .047 mfd, 20%, 200V; molded paper | 499-014473 |
| C-87A, B, C | 05-20-20 mfd, 450V, 450V, 400V; electrolytic | 045-200113 |
| C-93 | 300 mmf, 10%, 500V; mica | 470-223301 |
| C-94 | 560 mmf, 5%, 500V; mica | 479-042100 |
| C-95 | 10 mmf, N4700; cer. | 499-034102 |
| C-97, 98, 111 | .001 mfd, 20%, 600V; molded paper | 499-034102 |
| C-100 | 10 mfd, 50V; electrolytic | 045-100211 |
| C-103, 104 | 7500 mmf, 5%, 500V; mica | 470-422752 |
| C-105 | 8-50 mmf, trimmer, N750 | 044-200437 |
| C-107 | 62 mmf, 10%, 500V; mica | 470-213620 |
| C-110 | .01 mfd, 20%, 600V; molded paper | 499-034103 |
| C-112 | 82 mmf, N470, 2%; ceramic | 491-024820-83 |
| C-113 | 210 mmf, N150, 2%; ceramic | 491-084211-52 |
| C-117 | 37 mmf, 2%; ceramic | 491-024470-22 |
| C-116 | 68 mmf, N150, 2%; ceramic | 491-064680-52 |
| C-123 | 82 mmf, N750, 10%, ceramic | 491-028820-84 |
| C-124 | 56 mmf, NPO, 2%; cermaic | 491-054560-22 |
| C-132 | .1 mfd 20%; 200V; molded paper | 499-014104 |
| | ***RESISTORS** | |
| R-1, 5, 27, 33, 48, 71 | 1 megohm | 451-262105 |
| R-2, 41, 56 | 180 ohms | 451-252181 |
| R-3, 8, 15 | 15K ohms, 2 watt | 451-552153 |
| R-4 | 3.9K ohms, 1 watt | 451-352392 |
| R-6, 72 | 12K ohms | 451-252123 |
| R-7 | 330 ohms | 451-252331 |
| R-9, 10 | 47K ohms, 1 watt | 451-352473 |
| R-11, 30 | 3.3K ohms | 451-252332 |
| R-12, 19 20, 21, 22, 23, 79 | 100K ohms | 451-252104 |
| R-13 | 15 ohms | 451-252150 |
| R-14, 28 | 100 ohms | 451-252100 |
| R-16 | 3.3K ohms, 1 watt | 451-352332 |
| R-24, 86 | 22K ohms | 451-252223 |
| R-25, 70 | 2.2K ohms | 451-252222 |
| R-26, 50 | 120K ohms | 451-252124 |
| R-29 | 39K ohms, 1 watt | 451-352393 |
| R-31 | 6.2K ohms, 1 watt | 451-352622 |
| R-34 | 10K ohms, 1 watt | 451-352103 |
| R-37 | 2K ohms, 10 watt, ww | 453-062202 |
| R-38 | 820 ohms | 451-252821 |
| R-39 | 470 ohms | 451-252471 |
| R-40, 67 | 470K ohms | 451-252474 |
| R-42, 57 | 220 ohms | 451-252221 |
| R-43, 58 | 390 ohms | 451-252391 |
| R-46 | 47 ohms, 1 watt | 451-352470 |
| R-47 | 10K ohms, 5%, 2W | 451-651103 |
| R-49 | 820K ohms | 451-352824 |
| R-51, 52 | 5.6 ohms | 451-252500 |
| R-53 | 270K ohms | 451-252274 |
| R-54, 65, 66 | 47K ohms | 451-252473 |
| R-59 | 10K ohms, Variable Sensitivity | 025-201100 |
| R-60 | 330K ohms | 451-252334 |
| R-61 | 10K ohms | 451-252103 |
| R-62 | 500K ohms, Variable Volume | 025-200534 |
| R-63, 80, 90 | 220K ohms | 451-252224 |
| R-64 | 15 megohms | 451-252156 |
| R-68 | 390 ohms, 1 watt | 451-352391 |
| R-69 | 560 ohms, 1 watt | 451-352561 |
| R-73 | 33K ohms, 1 watt | 451-352333 |
| R-74 | 1K ohm | 451-252102 |
| R-75 | 15K ohms, Variable Notch Adj. | 025-201231 |
| R-76 | 5K ohms, Variable w/switch Notch Depth | 025-101460 |
| R-77 | 680K ohms | 451-202484 |
| R-78 | 4.7K ohms | 451-252472 |
| R-82 | 150 ohms | 451-252151 |
| R-83 | 68K ohms | 451-252683 |
| R-84 | 10 ohms | 451-252100 |
| R-86 | 200 ohms, Variable "S" meter adj. | 025-200714 |
| R-88 | 2 megohms | 025-201052 |
| R-89 | Heater, 5 watts, 117V A.C. | 021-200357 |

*All resistors are 10%, 1/2W, carbon type unless otherwise specified.

| Schematic Symbol | Description | Hallicrafters Part Number |
|---|---|---|
| | **COILS** | |
| L-1 | Coil, Ant. (Band 1) | 051-202290 |
| L-2 | Coil, Ant. (Band 2) | 051-202291 |
| L-3 | Coil, Ant. (Band 3) | 051-202196 |
| L-4 | Coil, Ant. (Band 4) | 051-202197 |
| L-5 | Coil, Ant. (Bands 5, 6, & 7) | 051-202198 |
| L-7 | Choke, RF; 540 uh; 10 ohms DC | 053-100107 |
| L-8 | Coil, Mixer (Band 1) | 051-202286 |
| L-9 | Coil, Mixer (Band 2) | 051-202289 |
| L-10 | Coil, Mixer (Band 3) | 051-202201 |
| L-11 | Coil, Mixer (Band 4) | 051-202202 |
| L-12 | Coil, Mixer (Bands 5, 6, & 7) | 051-202203 |
| L-15 | Choke, Filter; 8H; 85 ma; 310 ohms DC | 056-200281 |
| L-16 | Coil, BFO | 054-200033 |
| L-17, 18 | Choke, RF | 053-400008 |
| L-19 | Coil, T-bridge | 051-102270 |
| L-20 | Coil, Osc. (Band 1) | 051-202285 |
| L-21 | Coil, Osc. (Band 2) | 051-202288 |
| L-22 | Coil, Osc. (Bands 3 & 7) | 051-202206 |
| L-23 | Coil, Osc. (Band 4) | 051-202207 |
| L-24 | Coil, Osc. (Band 5) | 051-202208 |
| L-25 | Coil, Osc. (Band 6) | 051-202287 |
| L-26 | Choke, RF 1.4 uh | 053-200442 |
| | **TRANSFORMERS** | |
| T-1, 2 | Transformer, 1st and 2nd IF (1650 KC) | 050-200468 |
| T-3, 4, 5, 6 | Transformer, IF (50.5 KC) | 050-200469 |
| T-7 | Transformer, Power | 052-400474 |
| T-8 | Transformer, Output | 055-100312 |
| T-9 | Transformer, 2nd Conversion Oscillator | 050-300689 |
| | **SWITCHES** | |
| S-1A | Wafer (Antenna Input) | 062-200109 |
| S-1B | Wafer (Antenna Grid) | 062-200110 |
| S-1C | Wafer (Mixer Grid) | 062-200105 |
| S-1D | Wafer (Mixer Plate) | 062-200106 |
| S-1E | Wafer (Osc. Plate) | 062-200107 |
| S-1F | Wafer (Osc. Grid) | 062-200108 |
| S-1G | Wafer (Pilot Light) | 062-200111 |
| S-2A, B | Switch, Selectivity | 060-200672 |
| S-3A, B | Switch, Response | 060-200672 |
| S-4, 5, 6 | Switch, SPST Toggle; AVC, AM/CW-SSB, and Noise Limiter | 060-100138 |
| S-7A, B | Switch, DPST Toggle; Receiver-Standby | 060-100192 |
| S-8 | Part of R76 | ---------- |
| S-9 | Switch, Toggle, SPDT (CALIB-OFF) | 060-100139 |
| | **JACKS, PLUGS AND SOCKETS** | |
| PL-1 | Line Cord and Plug | 087-104690 |
| PL-2 | Plug, Octal; Jumper | 035-100003-01 |
| | Socket, Tube; Min 7-Pin | 008-200633 |
| | Socket, Tube; Min 9-Pin | 008-200672 |
| | Socket, 5 Pin | 084-100186 |
| | Fuse, Holder | 006-100451 |
| | Socket, Min 7-Pin | 008-100844 |
| SO-1, 4 | Jack, Phono or Osc. Out. | 036-100041 |
| SO-2 | Socket, Tube; Octal | 008-500295 |
| SO-3 | Jack, Phone | 036-200048 |
| | Socket, Tube; Min 7-Pin | 008-100759 |
| | Plug, 5 Pin | 035-100038 |
| SO-5 | Connector, Coax | 010-100056 |
| | **TUBES AND LAMPS** | |
| V-1 | 6CB6, RF Amplifier | 090-901115 |
| V-2 | 6BY6; Mixer | 090-901114 |
| V-3 | 6680/12AUA7; 1st Conv. Osc/Cathode Follower | 090-901116 |
| V-4, 5, 6 15 | 6BA8; 1650 KC IF Amplifier; 2nd Mixer, 50.5 KC IF Amplifier, and "S" - Meter Tube | 090-901112 |

# SERVICE PARTS LIST (Cont)

| Schematic Symbol | Description | Hallicrafters Part Number |
|---|---|---|
| | **TUBES AND LAMPS (CON'T.)** | |
| V-7 | 6BJ7; Detector, AVC, and Noise Limiter | 090-901113 |
| V-8 | 6SC7; Audio Amplifier & BFO | 090-900874 |
| V-9 | 6K6GT; Audio Output | 090-900856 |
| V-10 | 0A2; Voltage Regulator | 090-900001 |
| V-11 | 5Y2GT; Rectifier | 090-901111 |
| V-12 | 12AT7; 2nd Conversion Osc. | 090-900034 |
| V-13 | 6C4; 1st Conversion Osc. 50. 5 KC IF Amplifier | 090-900830 |
| V-14 | 6AU6; Crystal Calibrator | 090-900868 |
| LM-1 thru 7 | Light, Pilot, Type #47 | 039-100004 |
| | **KNOB AND KNOB SKIRTS ASSEMBLY** | |
| .... | Knob, Pitch Control | 015-101185 |
| ..... | Knob, Volume or Sensitivity | 015-101194 |
| ..... | Knob, Selectivity | 015-101196 |
| .. | Knob, Response | 015-001196 |
| ..... | Knob, Notch Freq. | 041-150096 |
| ..... | Knob, Notch Depth | 041-150097 |
| ..... | Knob, Band Selector | 015-101197 |
| ..... | Knob, Pointer Reset | 015-101206 |
| ..... | Knob, Ant. Trimmer | 015-101208 |
| ..... | Knob, Tuning, Logging | 015-101207 |
| | **MISCELLANEOUS** | |
| ..... | Ball Bearing (1/8" Dia.) | 077-100505 |
| ..... | Ball Bearing (.093" Dia.) | 077-101090 |
| ..... | Ball Race | 077-201020 |
| ..... | Bracket, Dial Scale Mtg. | 067-104283 |
| ..... | Bracket, Diffuser Mtg. | 067-104296 |
| ..... | Bracket, Rear Antenna Trimmer | 067-104293 |
| ..... | Bracket, Front Antenna Trimmer | 067-104294 |
| ..... | Bracket, Gear Adj. (Second Plate Gear) | 067-103042 |
| ..... | Bracket, Gear Adj. | 067-204315 |
| ..... | Bracket, Gear Drive Mtg. | 067-103011 |
| ..... | Bracket, Left Band Chassis Support | 067-404127 |
| ..... | Bracket, Right Hand Chassis Support | 067-404128 |
| ..... | Bracket, Rail Pointer Assembly | 067-304279 |
| ..... | Bracket, Pot. Mtg. | 067-104280 |
| ... | Bracket, Roll Adj. | 067-204285 |
| ..... | Bracket, Roll Mtg. | 067-204280 |
| ..... | Bracket, "S" Meter Adj. | 067-104204 |
| ..... | Bracket, Gear (Left Mtg. Assembly) | 067-203092 |
| ..... | Bracket, Shield (Bandswitch) | 067-204314 |
| ..... | Bracket, Stop | 067-104281 |
| ..... | Bracket, Stop Arm | 067-104306 |
| ..... | Bracket, Trimmer | |
| | Capacitor (Single) | 067-204320 |
| ..... | Bracket, Trimmer | 067-204309 |
| ..... | Bushing, BFO Stop | 077-101023 |
| ..... | Bushing, Pointer Rail | 077-200465 |
| ..... | Bushing Stop | 077-101346 |
| ..... | Cabinet Assembly | 066-401446 |
| ..... | Cabinet, Top | 090-101444 |
| ..... | Cam Assembly (Main Tuning) | 077-200914 |
| ..... | Clip, Glass Mtg. | 076-101315 |
| ..... | Collar, Switch Shaft | 077-100043 |
| ..... | Connector, Dial Wire | 076-102084 |
| ..... | Core, Iron IF and RF | 077-100066 |
| ..... | Core, Iron, RF Osc. | 003-101543 |
| ..... | Coupler, Flexible | 029-100284 |
| ..... | Coupler, Solid | 029-100294 |
| ..... | Cover, Transformer | 066-200379 |
| ..... | Cover, Bottom | 063-201752 |
| ..... | Cover, Drive Assembly | 090-301428 |
| ..... | Cover, Gang Mtg. | 090-301438 |
| X-3 | Crystal Marker, 100KC | 019-101915 |
| ..... | Dial, Cable | 035-100034 |
| X1, 2 | Matched Crystal Pair, Consists of One 1600 KC Crystal and One 1700 KC Crystal | 019-301902 |
| ..... | Escutcheon, Front Panel | 007-400664 |
| ..... | Foot, Typewriter | 016-100029 |
| ..... | Flywheel | 071-100305 |
| F-1 | Fuse, 3 Amp. Slo-Blo | 038-100428 |
| ..... | Gear, Drive (Idler) | 026-200238 |
| ..... | Gear (99 Toma, 48 Pitch) Fixed | 026-200514 |
| ..... | Gear (99 Tooth, 48 Pitch) Lonae | 026-200515 |
| ..... | Gear (55 Tooth, 48 Pitch) | 026-200516 |
| ... . | Glass, Dial Scale (Calibrated) | 022-300563 |
| ..... | Grommet, Meter | 016-100200 |
| ..... | Index Plate | 063-202384 |
| .... | Insulator, Bakelite; .156" ID, .05" OD, 1/4" Th. | 500-100723 |
| ..... | Light Diffuser | 069-300954 |
| ..... | Line Cord | 087-203577 |
| ..... | Lock, Line Cord (Male) | 076-100953-01 |
| ..... | Lock, Line Cord (Female) | 076-100953-02 |
| ..... | Medallion "h" | 007-100869 |
| ..... | Pad, Brake (Flywheel) | 008-102866 |
| ..... | Panel, Front | 066-400523 |
| ..... | Pilot Light Assembly (Meter) | 096-200255 |
| ..... | Pilot Light Assembly (Dial) | 026-200256 |
| ..... | Plate, Gear (First) | 063-202382 |
| ..... | Plate, Gear (Second) | 063-202383 |
| ..... | Plate, Gear (Taird) | 063-202384 |
| .... | Plate, Gear (Frexd Gang Mtg.) | 063-202386 |
| ..... | Plate, Gear (Baar Gang Mtg.) | 063-202387 |
| ..... | Plate, Pointer Adj. | 063-202365 |
| ..... | Pointer | 062-300322 |
| TS-1 | Post, Binding (Antenna) | 068-100032 |
| TS-2 | Pam, Binding (Speaker) | 068-100578 |
| ..... | Pulley, Idler | 028-100052-03 |
| .... | Pulley, Gear and Bushing Assembly | 041-350140 |
| ..... | Roll Pin (3/8" Long) | 074-100738 |
| ..... | Roll Pin (7/16" Long) | |
| ..... | Roll Pin, Tuning and Bandspread Hub | 074-100619 |
| ..... | Rubber Channel, Escutcheon | 016-100755 |
| ..... | Rubber Tubing (Specify Length) | 016-100756 |
| M-1 | "S" Meter | 052-300323 |
| ..... | Screw, Set (#10-32 x 21/64", Sit. Hd.) | 090-101712 |
| ..... | Screw, Set (#6-32 x 3/16", Bristol Hd.) | 003-101714 |
| ..... | Screw, Set (#8-32 x 1/4") | 003-103177 |
| ..... | Screw, Set (#6-32 x 1/8" Bristol Hd.) | 003-103178 |
| ..... | Screw, Set (#8-32 x 3/16", Bristol Hd.) | 003-103182 |
| ..... | Screw, Set (#6-32 x 3/8", Bristol Hd.) | 003-103188 |
| ..... | Screw, Set (#8-32 x 1/2" Pointer) | 003-103290 |
| .. | Screw (#8-32 x 1/4", Hex Hd.) | 003-103547 |
| ..... | Separator, Light Diffuser | 032-300713 |
| ..... | Shaft, Gear | 074-201271 |
| ..... | Shaft, Bandswitch | 074-201275 |
| ..... | Shaft, Pinion Dial | 074-101270 |
| ..... | Shaft, Rail Adj. | 074-201269 |
| ..... | Shaft, Variable | 074-101275 |
| ..... | Shield, Cover | 069-200843 |
| .... | Shield, Switch Assembly Mtg. | 069-109053 |
| ..... | Shield, Light | 069-400951 |
| ..... | Shield, Tube (7 Pin) | 069-100097 |
| ..... | Shield, Tube (9 Pin) | 069-100855 |
| ..... | Spring, Anti-backlash | 075-100231 |
| ..... | Spring, Compression | 075-100332 |
| ..... | Spring, Dial Wire | 075-100570 |
| ..... | Spring, Flywheel | 075-150045 |
| ..... | Spring, Take-up | 075-100511 |
| ..... | Spring, Rail Hold Down | 075-100816 |
| .... | Stop Arm Assembly | 074-201280 |
| ..... | Trimmount Stud | 005-150006 |
| ... . | Washer, Finishing (1/4" ID x 9/16" OD x 3/32" th.) | 064-100268 |
| ..... | Washer, Spring Steel (1/4" ID x 1/2" OD x .010 Th.) | 004-100490 |
| ..... | Washer, Flat (.139" ID x 1/2" OD x .031 Th.) | 004-101675 |
| ..... | Washer, Flat (.127"/.133" ID x 3/8" OD x .031" Th.) | 004-101741 |
| .... | Washer, Lock (#8 Ext.) | 426-003643 |
| ..... | Washer, Lock (#6 Int.) | 426-001543 |
| ..... | Window, Escutcheon | 022-300537 |
| ..... | 100-KC Marker Xtal Assembly | 001-902508 |

# ERRATA SHEET
# FOR
# MODEL SX-101 MARK 2

After the instruction manual for your SX-101 Mark 2 Selectable Sideband Receiver was published, electrical modifications were made for improved performance. The amendments to the Schematic and Serivce Parts List should be made at this time to conform to the following changes. When ordering parts, refer to the list below FIRST, then refer to the parts list in the instruction manual.

1. Delete Schematic Symbol C-54 from C-42. Add C-54, 68 mmf, NPO, 2% ceramic ..... 491-054680-22

2. Correct C-81, 89, 131 description and part number to read . 047 mfd, 20%, 600V; molded paper ..... 499-034473

3. Correct C-112 description and part number to read 100 mmf, N150, 2%, ceramic ..... 491-064101-52

4. Correct C-132 description and part number to read . 1 mfd, 20%; 600V; molded paper ..... 499-034104

5. Add R-91, a 220 ohm, 5%, 1 watt resistor, part number 451-351221. R-91 is wired in series from the top of the secondary of L22 with contacts 2 and 6 of SIF (Rear).

6. Correct L-22 part number to read 051-202320.

Pack with Instruction Manual
#094-901629
Form number 094-901838-A

NOTES:

VOLTAGE READINGS TAKEN UNDER THE FOLLOWING CONDITIONS:

1. LINE VOLTAGE — 117 VOLTS, 60 CYCLES AC.
2. ANTENNA TERMINALS SHORTED, SENSITIVITY AT "10", RECEIVE-STANDBY AT "RECEIVE", AM/CW-SSB SWITCH AT "AM", AVC AT "ON", NOISE LIMITER AT "OFF", RESPONSE AT "LOWER SIDEBAND", AND SELECTIVITY AT "5 KC", AND BAND SELECTOR AT "160M".
3. ALL VOLTAGES ARE DC AND POSITIVE UNLESS OTHERWISE SPECIFIED. DC VOLTAGES MEASURED WITH VTVM; AC VOLTAGES WITH 1000 OHMS-PER-VOLT METER
4. ALL VOLTAGES MEASURED BETWEEN TUBE SOCKET TERMINALS AND CHASSIS UNLESS OTHEWISE SPECIFIED.
5. VOLTAGES SHOWN FOR V12 ARE WITH RESPONSE CONTROL AT "LOWER SIDEBAND" IN THE "UPPER SIDEBAND" "TREBLE CUT", AND "NORMAL" POSITIONS. THE VOLTAGES OF THE TWO TRIODE SECTIONS ARE REVERSED. THE GRID VOLTAGE WILL VARY WITH CRYSTAL ACTIVITY.

* VOLTAGES FOR PINS 2 AND 3 OF V8 ARE TAKEN WITH AM/CW-SSB SWITCH AT "CW-SSB".

** 5 VAC MEASURED ACROSS PINS 2 & 8

*** MEASURED IN CALIBRATE POSITION

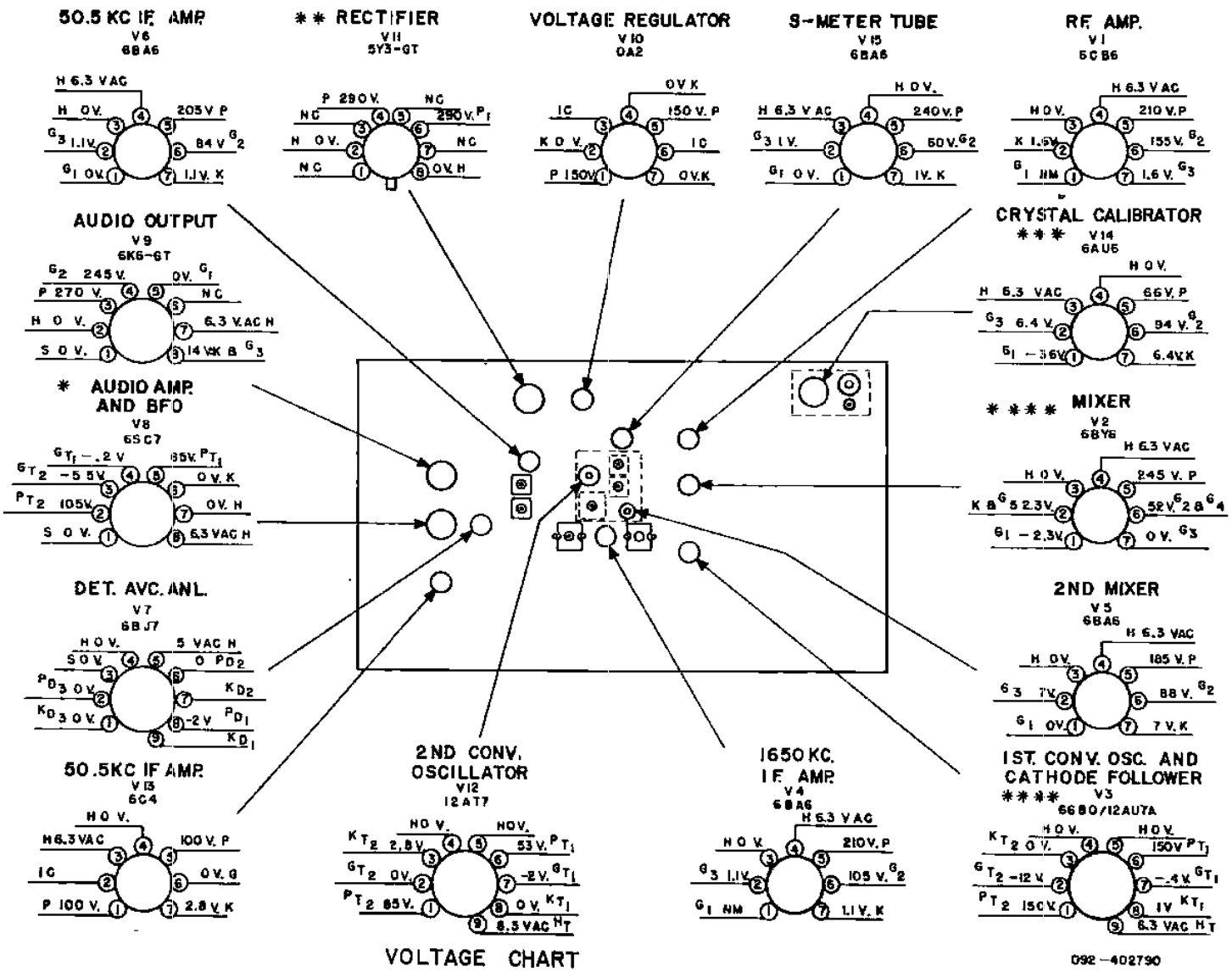
**** VOLTAGE VARIES WITH SETTING OF TUNING GANG AND BAND-SWITCH.

NM — NOT MEASUREABLE

IC — INTERNAL CONNECTION

NC — NO CONNECTION

$H_T$ — HEATER MID-TAP




VOLTAGE CHART

092-402790

NOTES

1. Resistor values in ohms and capacitor values in MMF unless otherwise specified. K = 1000.

2. Resistors are 1/2 watt and 10% unless otherwise specified.

3. Band Selector switch S1 shown in "160 M" position (fully counterclockwise). Switch sections are shown as viewed from front of set.

4. Selectivity switch S2 shown in "5 KC" position (fully counterclockwise). Switch sections are shown as viewed from front of set.

5. Response switch S3 shown in "Lower Sidehand" position. Section S3B is open in the "Power Off" position and closed in all other positions.

6. See Fig. 13 for location of all switch sections.

7. Values and tolerances are nominal and variations may be found. It is recommended that the value of any replacement correspond to the nominal value of the part being replaced.

⏚ Chassis

* Band selector switch contacts marked with * indicates these contacts are internally connected to the same numbered contacts on the other half of the switch wafer section.

VOLTAGES

Voltage readings taken under the following conditions:

1. Line voltage—117 volts, 60 cycles AC.

2. Antenna terminals shorted, Sensitivity at "10", Receive-Standby at "Receive", AM/CW-SSB switch at "AM", AVC at "On", Noise Limiter at "Off", Response at "Lower Sideband", and Selectivity at "5 KC".

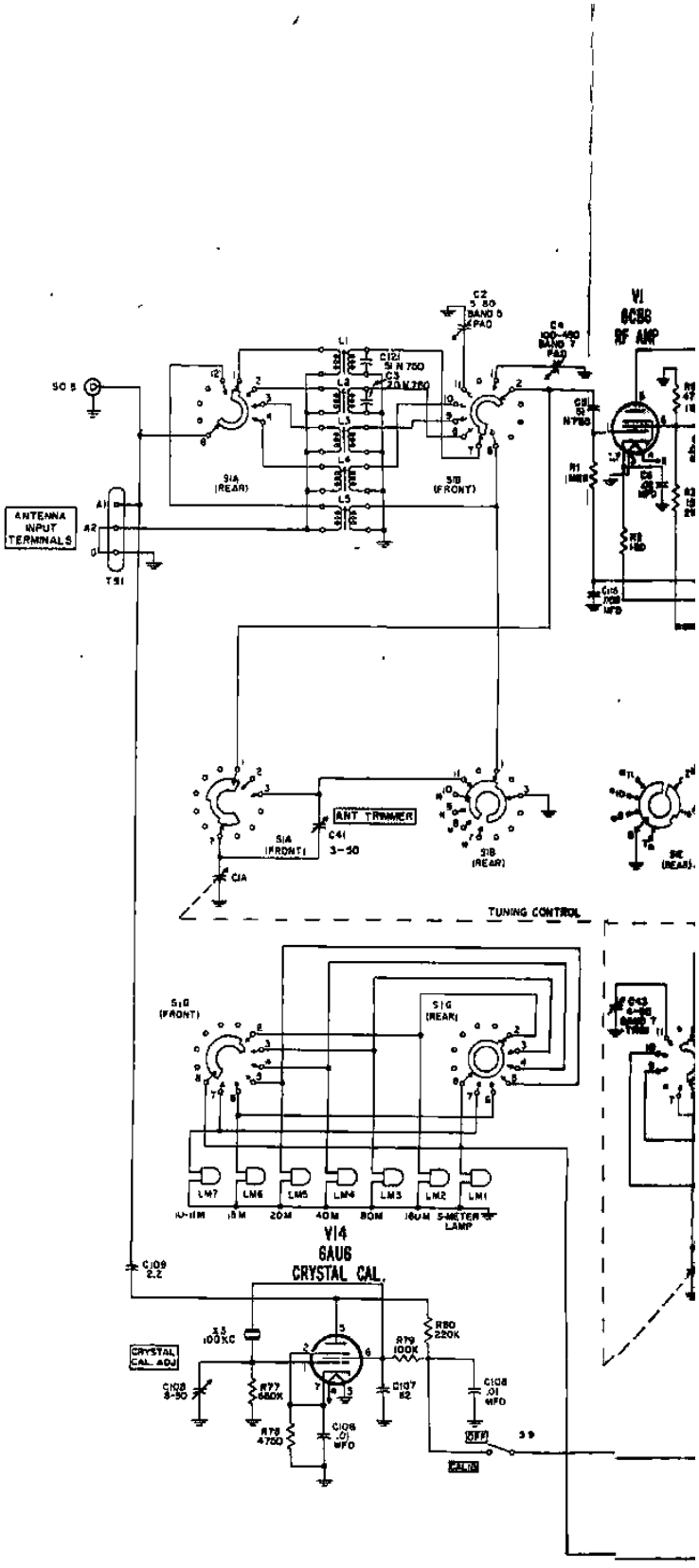
3. All voltages measured between tube socket terminals and chassis unless otherwise specified. See Fig. 12 for location of tubes.

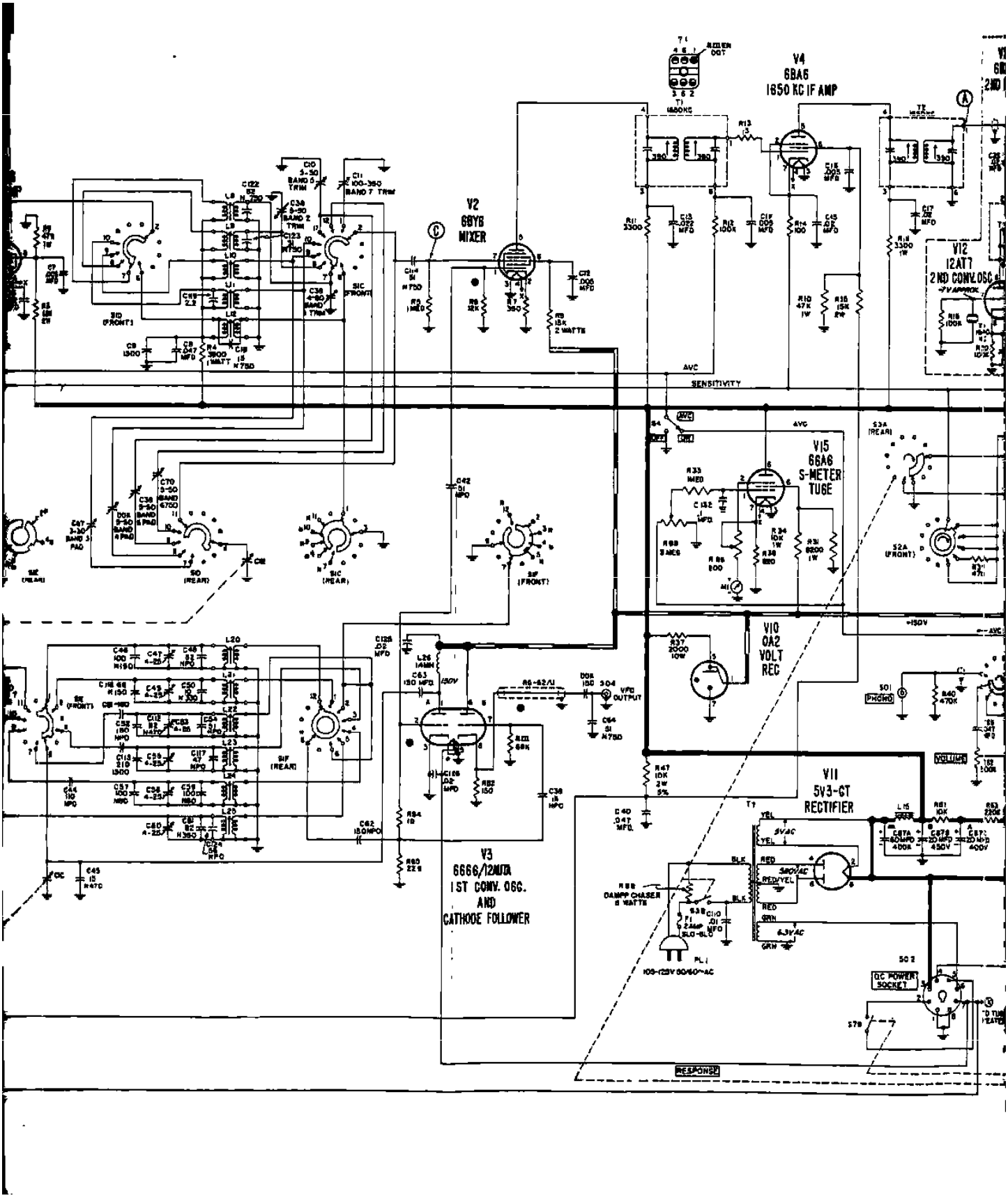
4. All voltages are DC and positive unless otherwise specified. DC voltages measured with VTVM; AC voltages with 1000 ohms-per-volt meter.

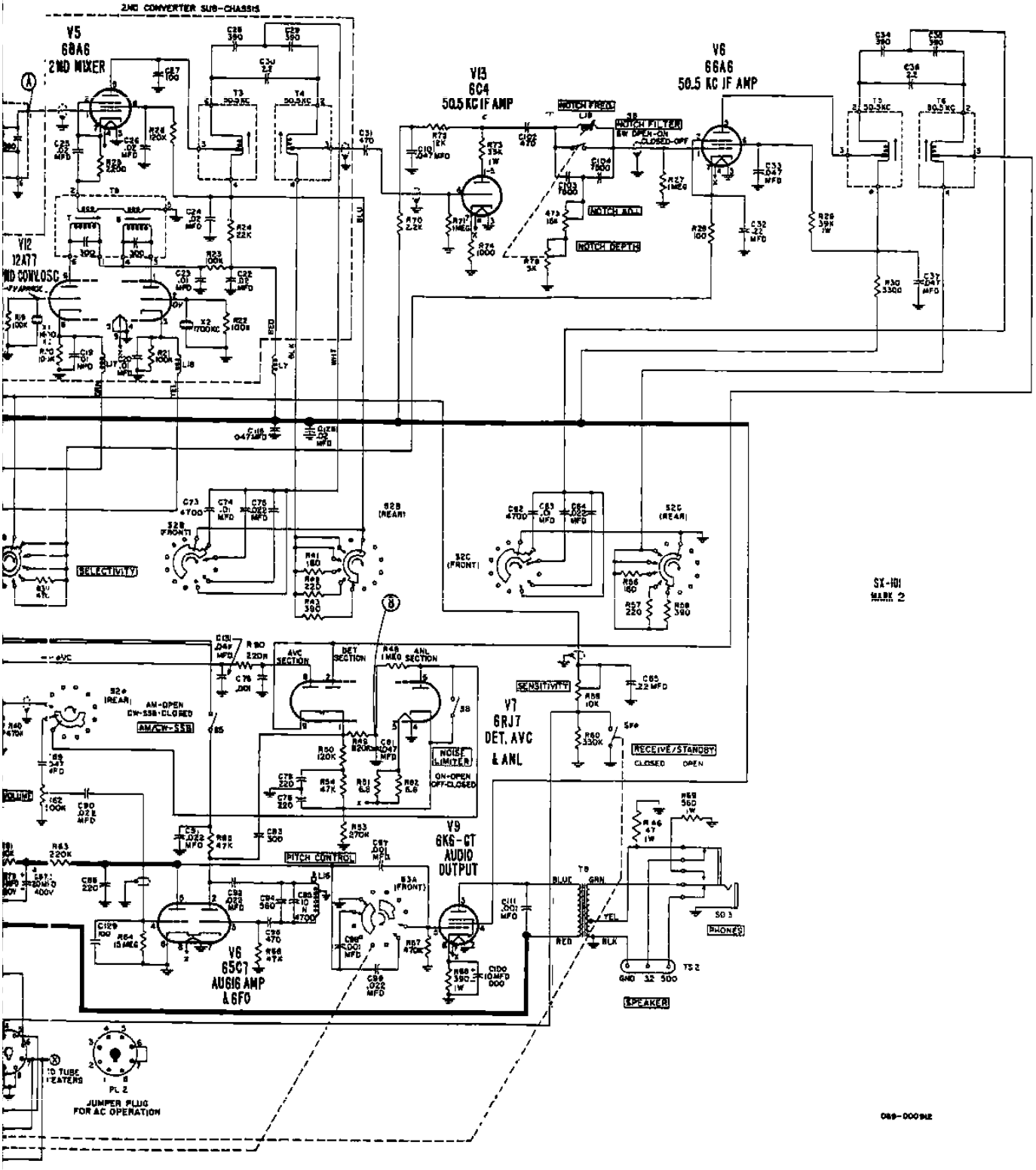
5. Voltages shown for V12 are with Response control at "Lower Sideband". In the "Upper Sidehand", "Treble Cut", and "normal" positions, the voltages of the two triode sections are reversed. The grid voltage will vary with crystal activity.

6. Voltages for pins 2 and 3 of V8 are taken with AM/CW-SSB switch at "CW-SSB".

◉ Voltage varies with setting of tuning gang and bandswitch.




V4
6BA6
1650 KC IF AMP
V2
6BY6
MIXER
V12
12AT7
2ND CONV. OSC.
V15
6AA6
S-METER
TUBE
V10
0A2
VOLT
REG
V11
5V3-GT
RECTIFIER
V3
6666/12AUTA
1ST CONV. OSC.
AND
CATHODE FOLLOWER
AVC
SENSITIVITY
+150V
VOLUME
PHONO
DC POWER
SOCKET
RESPONSE


2ND CONVERTER SUB-CHASSIS
V5
6BA6
2ND MIXER
V12
12AT7
2ND OSC/MIX
V13
6C4
50.5 KC IF AMP
V6
6BA6
50.5 KC IF AMP
NOTCH FREQ.
NOTCH FILTER
SW OPEN-ON CLOSED-OFF
NOTCH ADJ.
NOTCH DEPTH
SELECTIVITY
SENSITIVITY
RECEIVE/STANDBY
CLOSED OPEN
AVC SECTION
DET SECTION
ANL SECTION
V7
6RJ7
DET. AVC & ANL
NOISE LIMITER
ON-OPEN OFF-CLOSED
AM-OPEN CW-SSB-CLOSED
AM/CW-SSB
PITCH CONTROL
V9
6K6-GT
AUDIO OUTPUT
V6
6SC7
AUG16 AMP & 6F0
TO TUBE HEATERS
PL 2
JUMPER PLUG FOR AC OPERATION
SPEAKER
PHONES
SX-101
MARK 2

NOTES

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7. Values and tolerances are nominal and variations may be found. It is recommended that the value of any replacement correspond to the nominal value of the part being replaced.

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