OPERATING AND SERVICE INSTRUCTIONS

COMMUNICATIONS RECEIVER MODEL SX-140

the hallicrafters co.

A Subsidiary of Northrop Corporation

WARRANTY

"The Hallicrafter's Company warrants each new radio product manufactured by it to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part in exchange for any part of any unit of its manufacture which under normal installation, use and service discloses such defect, provided the unit is delivered by the owner to our authorized radio dealer, wholesaler, from whom purchased, or, authorized service center, intact, for examination, with all transportation charges prepaid within ninety days from the date of sale to original purchaser and provided that such examination discloses in our judgment that it is thus defective.

This warranty does not extend to any of our radio products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of instructions furnished by us, nor extended to units which have been repaired or altered outside of our factory or authorized service center, nor to cases where the serial number thereof has been removed, defaced or changed, nor to accessories used therewith not of our own manufacture.

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by the authorized radio dealer or wholesaler without charge to the owner.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our radio products."

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092-0145578



Figure 1. Hallicrafters Model SX-140

SECTION I

GENERAL INFORMATION

The new Hallicrafters Model SX-140 is a precision built, highly sensitive, communications receiver providing coverage within the frequency range of 3.5 megacycles to 54 megacycles. For ease and flexibility of operation, a single tuning control is provided which covers the easy-to-read slide-rule dial specifically calibrated for the 80, 40, 20, 15, 10 and 6 meter bands. Five tubes plus two silicon rectifiers are employed in the latest superheterodyne circuit and provision is made for the reception of amplitude modulation (AM), single-sideband (SSB), and continuous wave (CW) signals over the entire tuning range.

For control of selectivity, a regenerative intermediate-frequency stage is employed. This control of regeneration also provides a boost in sensitivity to bring in weak or distant stations that would ordinarily be lost in the background noise.

A carrier level meter provides an aid for accurate tuning and a means of determining the relative strength of received signals.

The alignment procedure for the receiver has been greatly simplified with the use of a built-in crystal oscillator circuit to generate the required signals for alignment. A 1650-KC crystal (not supplied), plugged into the crystal calibrator socket, will permit the IF transformers to be aligned with the use of the Carrier Level meter as an output indicator.

Other special features include: auxiliary switching, controlling an antenna changeover relay, turning on the transmitter, or shorting the speaker voice coil during transmitting (with the FUNCTION control set to STANDBY). The SELECTIVITY-BFO control, with its associated circuitry, permits continuously variable selectivity on AM reception to the point where the BFO starts. Beyond this point, the circuitry permits reception of CW and upper or lower SSB signals. The pitch of a CW signal may be varied with this control. The crystal oscillator circuit utilizes a 3.5-MC crystal which permits the operator to set the low frequency ends of the 80, 40, 20, 15 and 10 meter bands and 52.5 MC on the 6 meter band.

NOTE

Careful attention should be directed to the INSTALLATION and OPERATION instructions. They have been provided to insure satisfactory operation from this Hallicrafters precision built product. The receiver has an unusually high degree of sensitivity necessary to receive weak and distant stations. Careless operation of a high sensitivity receiver may result in excessive noise or background hiss. These undesirable effects can be held to a minimum by careful adjustment of the SELECTIVITY, TUNING, AUDIO GAIN and RF GAIN controls as well as the proper selection and arrangement of the antenna.

SECTION II

TECHNICAL DATA

TECHNICAL SPECIFICATIONS

TUBES	Five, plus two Silicon Rectifiers
HEADPHONE OUTPUT	Low to medium impedance (see para. 3-6)
ANTENNA INPUT	Single wire or any 50-75 ohms, unbalanced
POWER CONSUMPTION	47 watts
AUDIO OUTPUT IMPEDANCE	3.2 ohms
DIMENSIONS	13-3/8" wide, 8-1/4" deep, 7-3/16" high
NET WEIGHT	13.5 pounds
SHIPPING WEIGHT	14 pounds

RECEIVER FREQUENCY COVERAGE

BAND IN METERS	FREQUENCY RANGE	INTERMEDIATE FREQUENCY	OSCILLATOR FREQUENCY RANGE	FCC BAND LIMITS
80	3.5-4.0 MC	1650 KC	5150-5650 KC	3.5-4.0 MC
40	7.0-7.3 MC	1650 KC	8650-8950 KC	7.0-7.3 MC
20	14.0-14.4 MC	1650 KC	15650-16050 KC	14.0-14.35 MC
15	21.0-21.5 MC	1650 KC	11325-11575 KC	21.0-21.45 MC
10	28.0-29.9 MC	1650 KC	14825-15775 KC	28.0-29.7 MC
6	50.0-54.0 MC	1650 KC	24175-26175 KC	50.0-54.0 MC

On some bands the frequency range of the receiver has been extended above the actual FCC band limits to include the reception of some of the special service frequencies.

The oscillator frequency on the 80, 40, and 20 meter bands is higher than the received signal by the IF frequency. On the 15 and 10 meter bands, the oscillator second harmonic is used which is higher than the received signal by the IF frequency. On the 6 meter band, the oscillator second harmonic is used which is lower than the received signal by the IF frequency.

SECTION III

INSTALLATION

3-1. 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.

3-2. LOCATION

The receiver is equipped with rubber mounting feet for table or shelf mounting. When locating the receiver, avoid excessively warm locations such as those near radiators and heating vents. Allow at least one inch of clearance between the back of the receiver and the wall for proper ventilation.

3-3. POWER SOURCE

The SX-140 Receiver is designed to operate from a 105-125 volt, 60 cycle AC power source. Power consumption is 47 watts.

NOTE

If in doubt about your power source, contact your local power company prior to inserting the power cord into an AC power outlet. Connecting the receiver to the wrong power source may cause extensive damage to the unit and costly repairs.

3-4. ANTENNAS

The RF input of the receiver is designed for operation from either a single-wire antenna (fig. 2), a half-wave doublet or other tuned antenna with transmission line impedances from 50 to 75 ohms (fig. 3 and 4.). Antenna connections are made to a two-terminal strip at the rear of the receiver marked A (antenna) and G (chassis ground).

The single wire antenna (fig. 2) may be used in an area where antenna space is limited. When using this antenna, a ground lead from terminal G to a water pipe or other earth ground will improve reception.

For the best performance, however, a coaxial-fed dipole, tuned to the center of the desired band, is the recommended type of antenna to be used (fig. 3). The impedance of this antenna is approximately 75 ohms. When using this antenna, the center conductor of the coax is connected to terminal A and the outer conductor (braid shield) is connected to terminal G.

For further information regarding antennas, refer to the "A.R.R.L. Antenna Book", published by the American Radio Relay League, West Hartford, Conn., U.S.A.

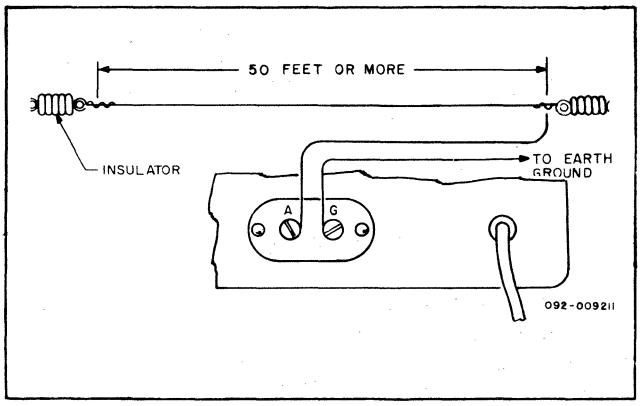


Figure 2. Single Wire Antenna.

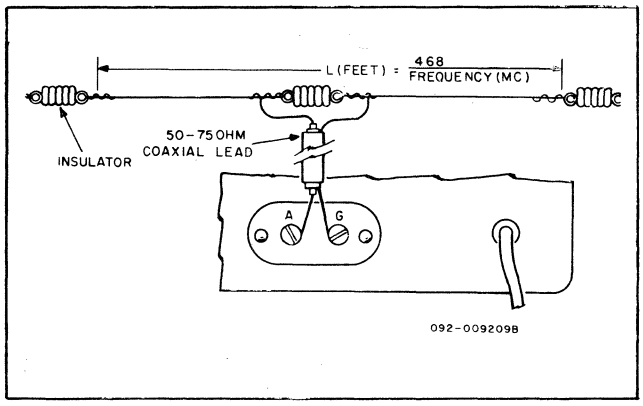


Figure 3. Dipole Antenna Using Coaxial Lead-in.

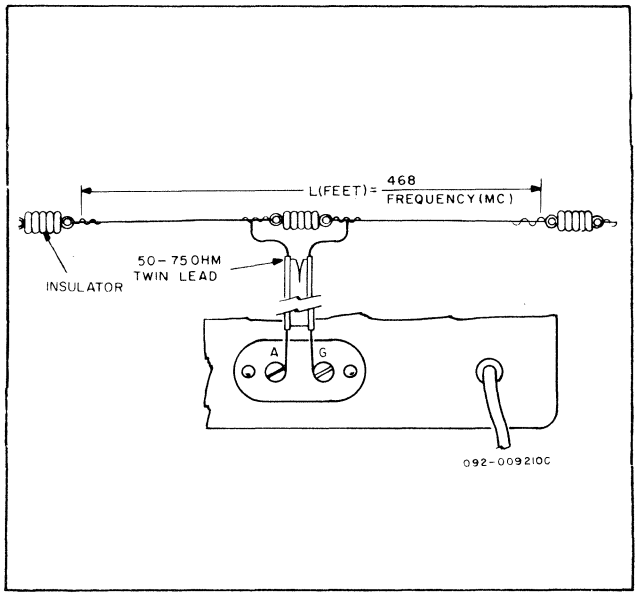


Figure 4. Dipole Antenna Using Twin Lead-in.

3-5. SPEAKER CONNECTION

The speaker terminal board is marked SPKR and GND. Internally, the hot lead from the output transformer is connected through the PHONES jack (J1) to the SPKR terminal; the other transformer lead is connected to chassis ground.

3-6. HEADPHONES

The headphone jack, marked PHONES, is located on the front panel of the receiver (as seen in figure 5) and is wired to automatically disable the speaker when the headphones are plugged in. The headphone output impedance is not critical, and any commercial headphones may be used, including crystal types, as no direct current flows in the headphone circuit. For maximum headphone output, the use of low-impedance magnetic phones (50 to 1000 ohm) is recommended.

3-7. TYPICAL SYSTEM CONNECTION

A four terminal strip is provided at the rear of the chassis to connect the Receiver into a station control system (see figs. 6 and 7). With the FUNCTION switch in the STANDBY position, terminals 1 and 2 are shorted together as are terminals 3 and 4, thus providing auxiliary switching functions. Figure 6 illustrates the receiver controlling the antenna changeover relay and the station transmitter (such as the HT-40). Figure 7 illustrates the Receiver controlling the station speaker and available contacts for another auxiliary switching function.

SECTION IV

FUNCTION OF OPERATING CONTROLS

4-1. GENERAL

Each control of the receiver performs a definite function which contributes to its reception capabilities. Full appreciation of the receiver is to be expected only after becoming familiar with each of the controls and the effect each control has on the performance of the receiver.

A brief description of each control is contained in the following paragraphs (see figure 5).

4-2. FUNCTION CONTROL

The FUNCTION control, a four-position rotary switch, is used to select the desired operating condition of the receiver. Auxiliary switching functions are also controlled by this switch, refer to paragraph 3-7. Operating conditions for each switch position are as follows:

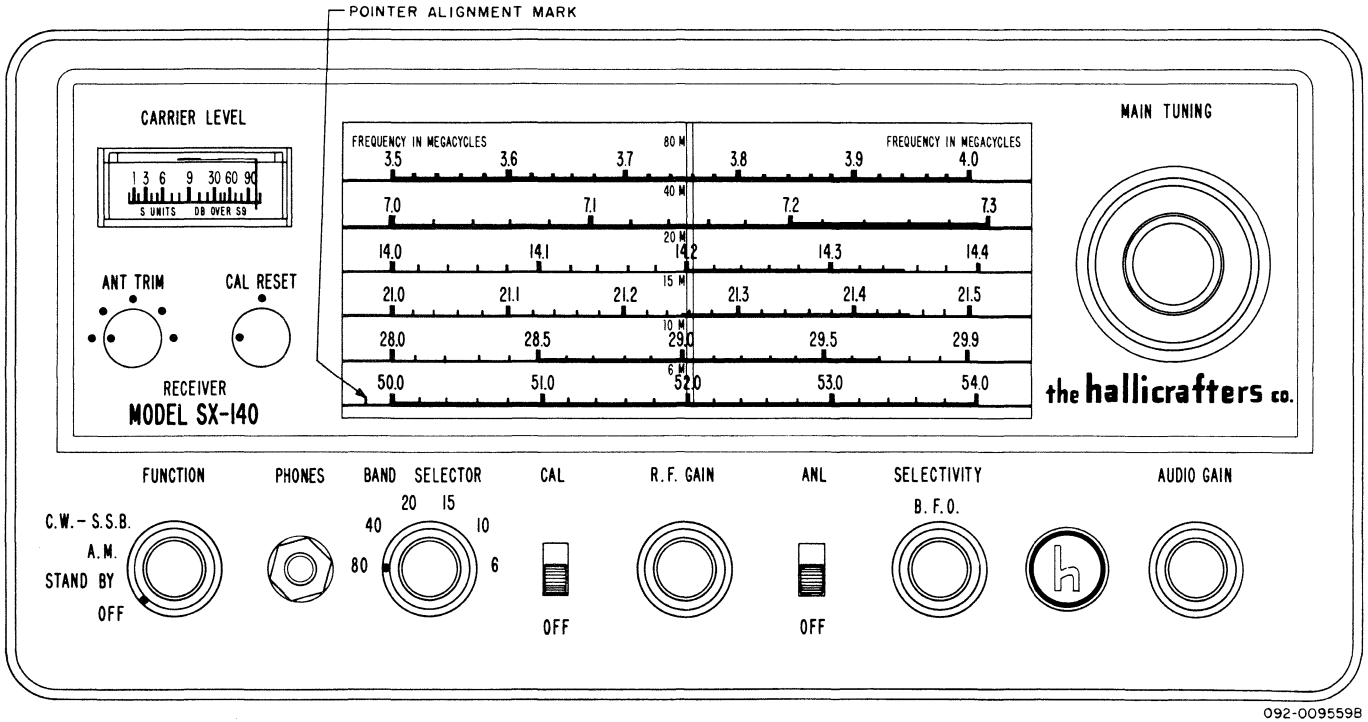
1. In the OFF position, no power is applied.
2. In the STANDBY position, power is applied to the receiver; however, a high negative bias is applied to the RF tube (V1A) grid to prevent the reception of signals.
3. In the AM position, amplitude modulated signals may be received and the AVC circuit is activated.
4. In the CW-SSB position, continuous wave and single-sideband signals may be received. The AVC is reduced for CW and SSB reception. The carrier level meter is disabled to prevent damage by a strong signal.

4-3. BAND SELECTOR CONTROL

The BAND SELECTOR control is a six-position rotary switch, permitting the receiver to receive signals on either the 80, 40, 20, 15, 10, or 6 meter band.

4-4. CAL-OFF CONTROL

The CAL-OFF control is a DPDT slide switch. In the CAL position, the 3.5-MC crystal marker circuit is actuated and provides beat signals at 3.5, 7.0, 14.0, 21.0, 28.0, and 52.5 MC. With the switch in the OFF position, the crystal marker circuit is disabled and no beat notes will be heard.



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Figure 5. Front Panel.

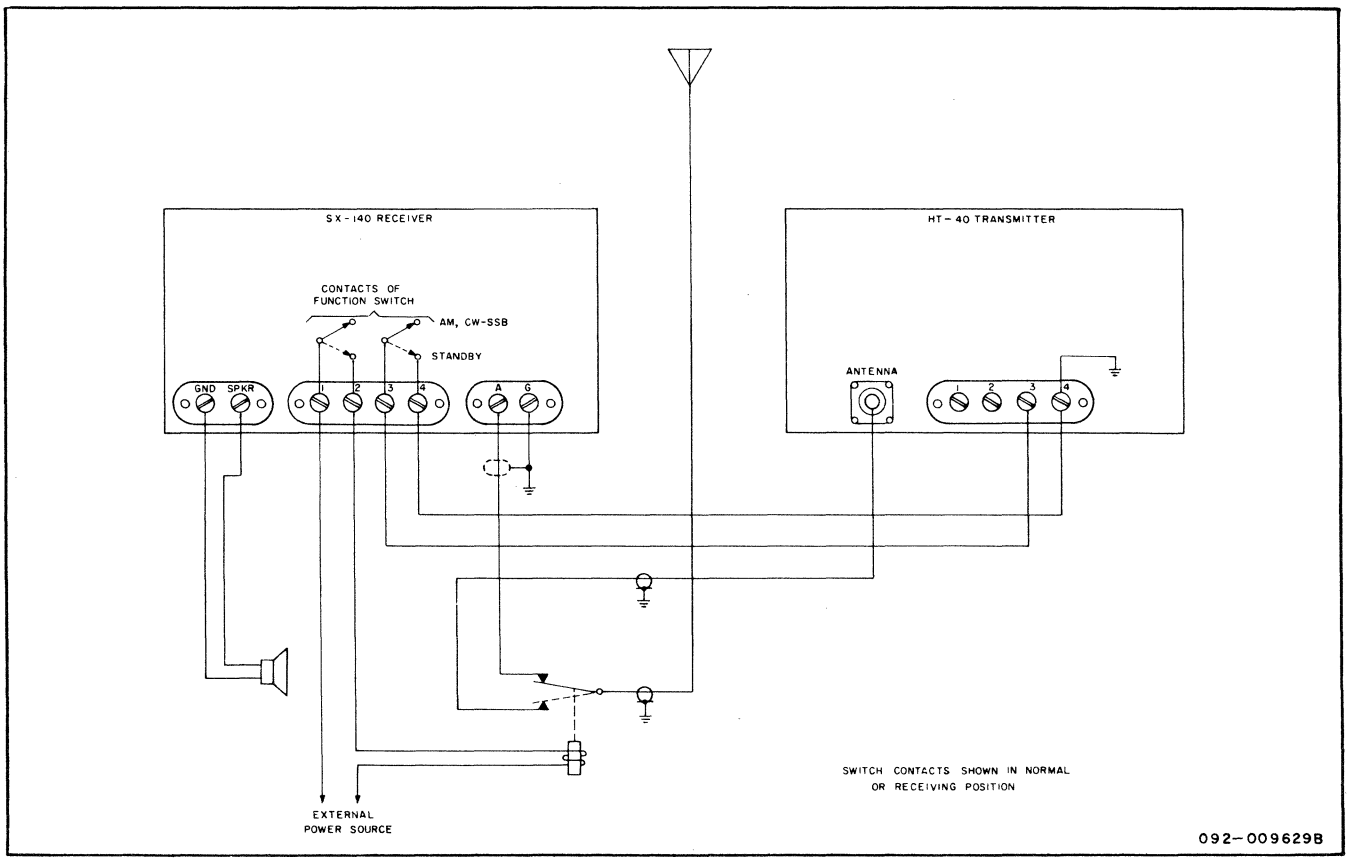


Figure 6. Station Control, Receiver Controlling Antenna Relay and Transmitter.

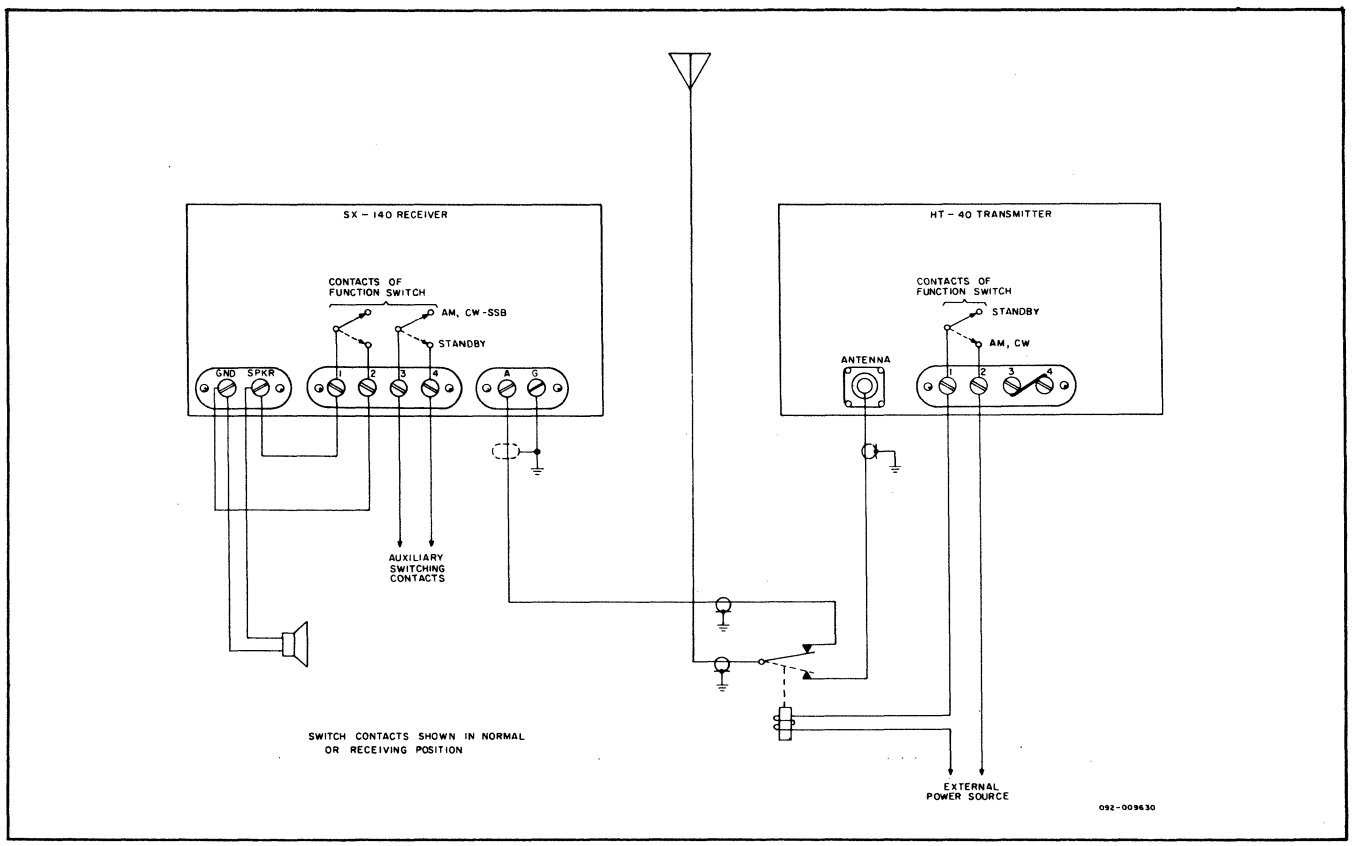


Figure 7. Station Control, Transmitter Controlling Antenna Relay.

4-5. ANL-OFF CONTROL

The ANL-OFF control is a SPDT slide switch. When the ANL-OFF switch is in the ANL position, the noise reducing circuit is actuated to improve reception of signals in the presence of high noise level, such as, ignition noise, atmospheric static, etc. When placed in the OFF position, the receiver resumes its normal reception of signals.

4-6. RF GAIN CONTROL

The RF GAIN control is a variable resistor in series with the cathode of the RF tube V1A. In the extreme counterclockwise position, maximum resistance is introduced into the cathode circuit thus developing maximum cathode bias to cut off the plate current. In the clockwise position, minimum cathode bias is developed, plate current increases, and RF gain is maximum.

4-7. AUDIO GAIN CONTROL

The AUDIO GAIN control, a variable resistor, regulates the receiver volume. Clockwise rotation increases the volume; counterclockwise rotation decreases the volume.

4-8. SELECTIVITY-BFO CONTROL

The SELECTIVITY-BFO controls the effective resistance connected between the IF tube (V3) suppressor and chassis ground. This control varies the regeneration capabilities of the IF stage up to and beyond the point of oscillation. During the reception of AM signals, the selectivity of the IF stage can be varied from approximately 8 KC (control fully counterclockwise) to approximately 2 KC (control advanced to the point just below the point of oscillation). For the reception of CW and SSB signals, advance the control to the point of oscillation or beyond. By varying the control beyond the point of oscillation, the pitch of a CW signal may be varied as desired.

4-9. MAIN TUNING CONTROL

The MAIN TUNING control is a variable capacitor which determines the oscillator frequency. It engages and moves the pointer on the slide-rule dial when tuning in stations.

4-10. CAL RESET CONTROL

The CAL RESET control is a variable capacitor connected in parallel with the MAIN TUNING capacitor to permit recalibration of the dial pointer on each band. This may be considered as an electrical pointer reset. It is used primarily in connection with the CAL-OFF switch when setting the low frequency limits of each band and the 52.5 MC point on the 6 meter band.

4-11. ANT TRIM CONTROL

The ANT TRIM control is a variable capacitor which is connected across the secondary of the antenna coils as each coil is switched into the circuit. It maintains perfect tracking of signals on all frequencies of each band.

4-12. USE OF THE CARRIER LEVEL METER

The carrier level meter is useful only when the FUNCTION switch is set in the AM position and permits the operator to obtain a relative signal strength indication of the AM signals received. When the FUNCTION switch is set to the CW-SSB position, the carrier level meter is disabled to prevent the pointer from being abused.

In the AM position, the carrier level meter is very sensitive and will permit an excellent visual display of the relative strength of the incoming signals.

4-13. SERVICE OR OPERATIONS QUESTIONS

For any further information regarding operation or servicing of the receiver, contact The Hallicrafters dealer from which the receiver was purchased. 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 the telephone directory.



Do not make any service shipments to the factory unless instructed to do so by letter. The Hallicrafters Company will not accept the responsibility for any 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

RECEIVER OPERATION

5-1. STANDBY

Rotate the FUNCTION control to the STAND-BY position. In this position,power is applied to the receiver, as indicated by illumination of the tuning dial, thus allowing the receiver to warm up prior to calibration or normal operation (reception of AM, CW or SSB signals).

5-2. CALIBRATION

A special crystal oscillator circuit (with crystal) has been incorporated into the receiver to enable the operator to accurately calibrate each band. A 3.5-MC crystal inserted into the crystal socket (see fig. 8) provides a signal that will zero-beat with the local oscillator to provide a calibration marker at the low frequency edge of the 80, 40, 20, 15 and 10 meter bands and at 52.5 MC on the 6 meter band. For calibration of the receiver preset the controls as indicated:

ANT TRIM. . . . . .Center of range

FUNCTION. . . . . .CW-SSB

CAL-OFF. . . . . .CAL

ANL-OFF . . . . . .OFF

RF GAIN . . . . . .Maximum counter-clockwise

AUDIO GAIN . . . . . .Maximum clockwise

BAND SELECTOR. 80

MAIN TUNING . . . . . .3.5 MC

SELECTIVITY-BFO. . . .Maximum clockwise

The band edge calibration points for the 80, 40, 20, 15 and 10 meter bands are 3.5, 7.0, 14.0, 21.0, and 28.0 MC respectively. These signals are

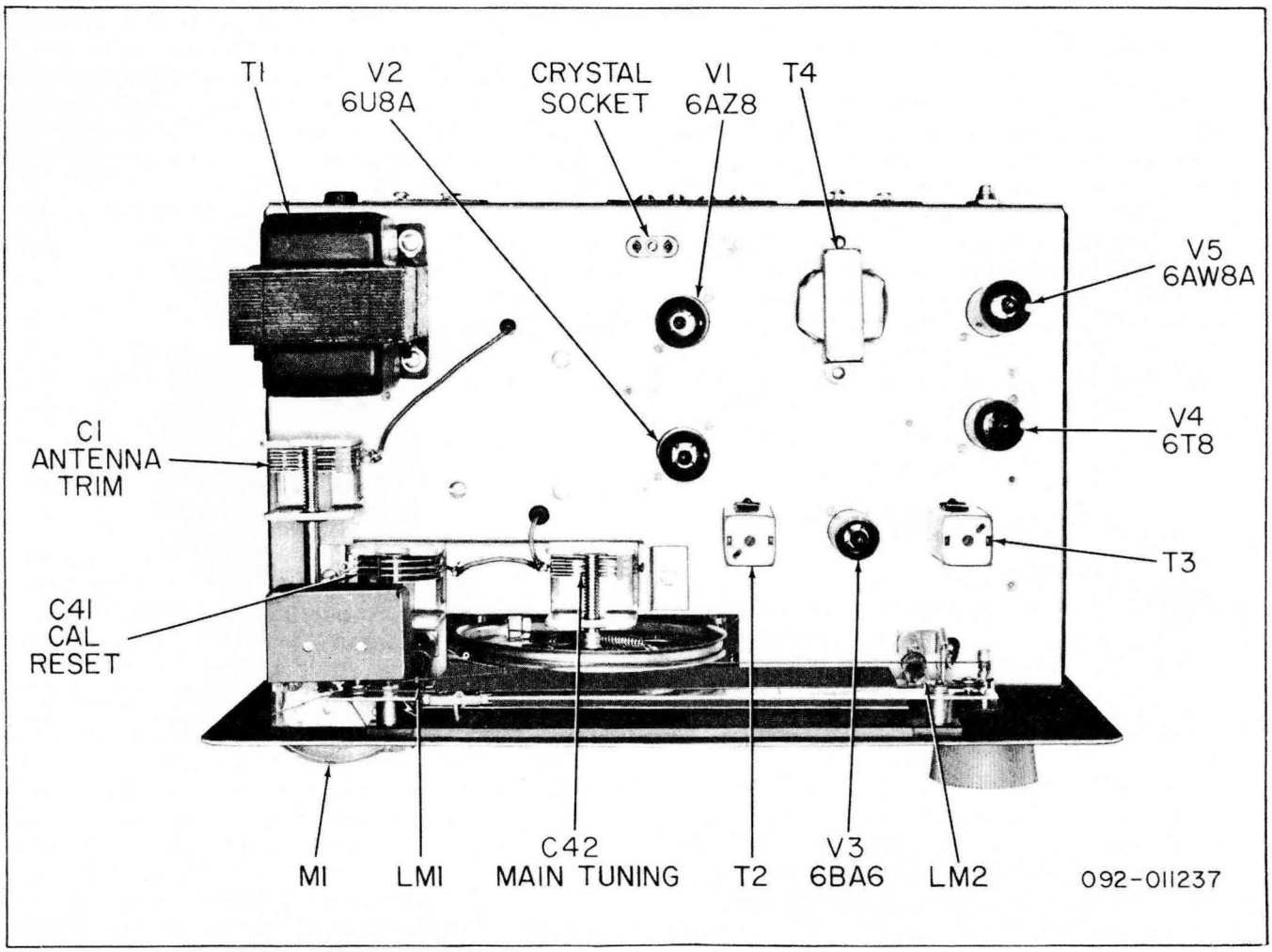


Figure 8. Top View Alignments.

available from the fundamental and even harmonics of the 3.5-MC crystal oscillator. Since no even harmonic of 3.5 MC will fall in the 6 meter band, an odd harmonic, 52.5 MC is used.

Beginning with the 80 meter band at 3.5 MC, rotate the CAL RESET control until a beat note is heard. It may be necessary to advance the RF GAIN control clockwise until the beat note is audible. Adjust the CAL RESET control to obtain a zero-beat which completes the calibration of the 80 meter band. As each band is calibrated from the 80 to the 6 meter band, it will be found that the harmonics become weaker, thus necessitating further advance of the RF GAIN control.

If on any band, during the calibration procedure, no beat note is heard with any setting of the CAL RESET control, it is assumed that this band is out of alignment and the alignment procedure should be followed (see section VI).

NOTE

Since all bands are calibrated with the CAL RESET control, only the last band calibrated is in proper calibration. Each time the receiver is switched to a different band for reception, the band calibration should be checked.

5-3. CW RECEPTION

1. For CW reception set the receiver controls as follows:

FUNCTION.	CW-SSB
BAND SELECTOR. . .	Desired band
CAL-OFF	OFF
RF GAIN	Maximum clockwise
ANL-OFF	OFF
SELECTIVITY-BFO. .	Maximum clockwise
AUDIO GAIN.	Center of range
ANT TRIM.	For maximum background noise
CAL RESET.	Previously set (para. 5-2)

NOTE

For practice in tuning in a CW signal, the 40 meter band is recommended as there are usually an abundance of CW stations on the air at all times of the day or night.

2. Starting at the lower frequency end of the band, rotate the MAIN TUNING control until a CW signal is located. Reduce or increase the volume if necessary (see step 3). Continue tuning until the zero-beat of the signal is reached. Either side of the zero-beat point may be used for the reception of CW signals. Signal pitch may be varied to a comfortable listening level by tuning nearer to or further from the zero-beat.

3. Rotate the AUDIO GAIN control to maintain a comfortable listening level throughout the tuning procedure.

4. Rotate the SELECTIVITY-BFO control counterclockwise to the point just above the point where the circuit drops out of oscillation. At this point, the receiver will have maximum selectivity for separating stations operating on frequencies near the frequency of the desired station. Slight readjustment of the MAIN TUNING control may be required.

5. Rotate the RF GAIN control counterclockwise to reduce background noise to a minimum while maintaining an adequate listening level.

6. Rock the ANT TRIM control to obtain maximum signal level.

5-4. SSB RECEPTION

The procedure for tuning in an SSB signal is identical to the above procedure for tuning a CW signal, with one important difference. Only one side of the zero-beat or zero signal point may be used for the reception of the SSB signal. When the transmitting station is operating on the lower sideband it will be necessary to use the high frequency side of the zero signal point; and conversely, when the transmitter is transmitting on the upper sideband the low frequency side of the zero-signal point must be used.

As a typical example, with controls set the same as outlined for the reception of a CW signal, rotate the MAIN TUNING knob until unintelligible speech is heard. Rotate the knob further, through zero-beat if necessary, until the speech becomes intelligible. Some stations will be intelligible on the high side of the zero-signal while others will be intelligible on the low side of the zero-signal point.

NOTE

It will be found that, on the average, the SSB stations on 40 meters will be transmitting lower sideband signals, while on the 20 and 80 meter bands, the stations will be transmitting on the upper sideband.

5-5. AM RECEPTION

1. For AM reception, set the receiver controls as follows:

FUNCTION	AM
BAND SELECTOR . . .	Desired band
CAL-OFF	OFF
RF GAIN	Maximum clockwise
ANL-OFF	OFF
SELECTIVITY-BFO. .	Maximum counterclockwise
AUDIO GAIN.	Maximum clockwise
ANT TRIM.	For maximum background noise
CAL RESET.	Previously set (para. 5-2)

2. Rotate the MAIN TUNING control to locate an AM signal. Reduce the volume as required (see step 3). Tune the MAIN TUNING control for maximum indication on the carrier level meter.

3. Rotate the AUDIO GAIN control to maintain the desired listening level throughout the tuning process.

4. The selectivity of the receiver may be increased by rotating the SELECTIVITY-BFO control clockwise. Maximum selectivity is attained at a point just below the point where the circuit begins to oscillate.

5. Rotate the RF GAIN control counterclockwise to reduce background noise to a minimum while maintaining an adequate listening level.

6. Rock the ANT TRIM control for maximum indication on the carrier level meter.

7. To reduce excessive noise, such as atmospheric static and ignition noise, set the ANL-OFF switch to the ANL position.

SECTION VI

SERVICE DATA

6-1. TUBE AND DIAL LAMP REPLACEMENT

To gain access to the tubes and dial lamps, remove the chassis from the cabinet (see para. 6-2). The location of the tubes and dial lamps are shown in figure 8.

6-2. CHASSIS REMOVAL

The chassis may be removed from the cabinet by removing the four screws from the rear of the cabinet. When removing the chassis from the cabinet, care should be taken not to damage any of the components.

6-3. CARRIER LEVEL METER ADJUSTMENT

To adjust the carrier level meter, disconnect antenna and short the antenna terminal to the ground terminal. Set the RF GAIN maximum clockwise, and the SELECTIVITY-BFO control maximum counterclockwise. Set the ANL-OFF switch to the OFF position and turn the receiver on by rotating the FUNCTION control to the AM position, allowing approximately five minutes to warm-up. Adjust the carrier level meter control on the rear of the chassis (see figure 9) until the carrier level meter reads "O".

6-4. DIAL CORD RESTRINGING

Remove the chassis from the cabinet to restring the dial cord (see paragraph 6-2). Rotate the tuning drum fully clockwise (tuning capacitor plates open). Care should be taken not to damage the capacitor plates. Referring to figure 10 for the stringing procedure, tie the dial cord to the dial cord spring and follow the arrows and the number sequence to restring the dial cord. Keep just enough tension on the dial cord during stringing to prevent it from slipping off the tuning drum or idler pulleys. When the other end of the dial cord is tied to the dial cord spring, the spring should be expanded about 1/4 inch.

Place the pointer on the pointer rail and engage the dial cord, but do not crimp the clips. Rotate the MAIN TUNING control fully counterclockwise to close the tuning capacitor. Keeping the tuning capacitor closed, align the pointer with the mark approximately 5/16 inch to the left of the 50-MC mark on the 6 meter band. Crimp the clips to prevent slippage. Replace the chassis in the cabinet.

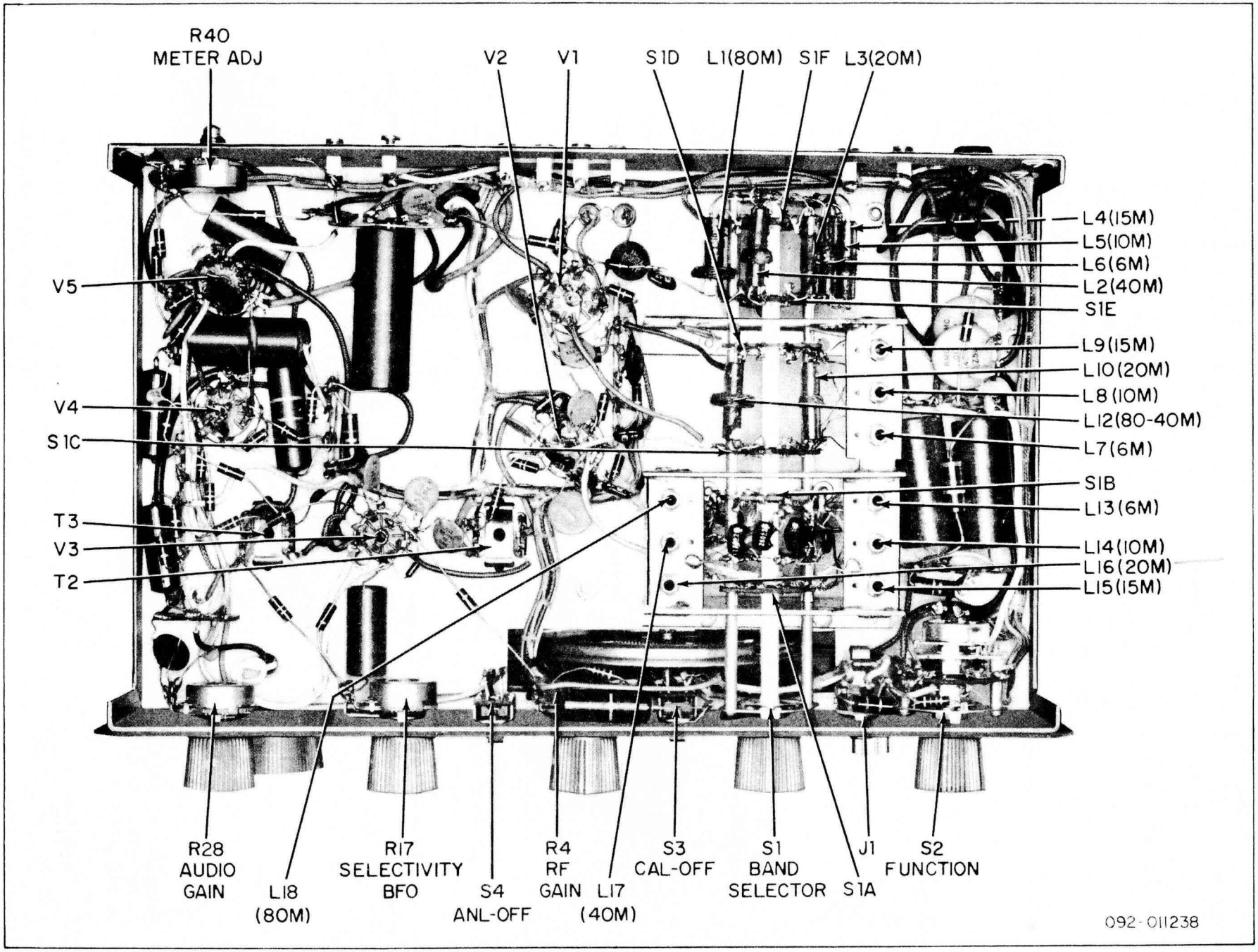


Figure 9. Bottom View Alignments.

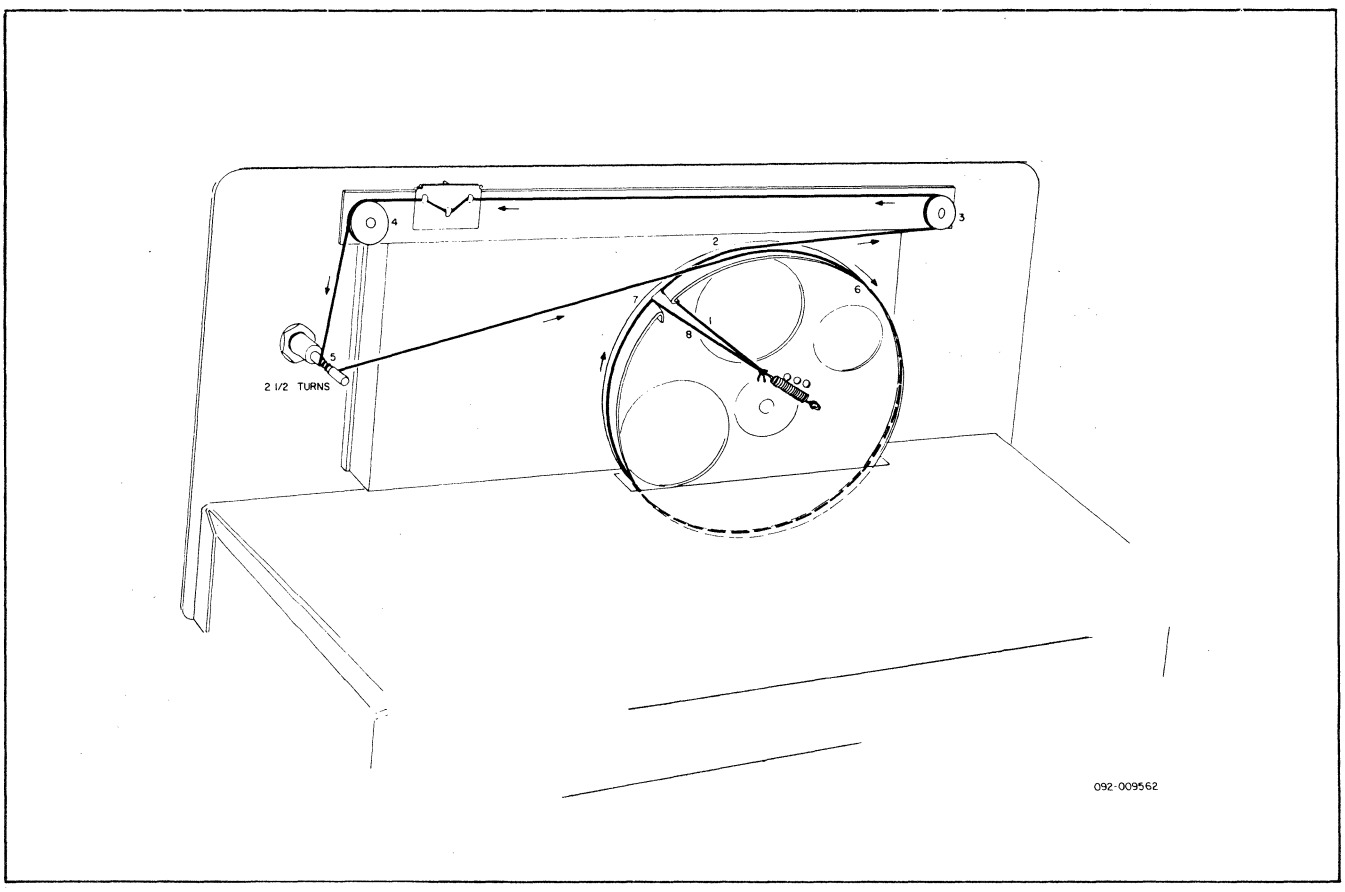


Figure 10. Dial Restringing.

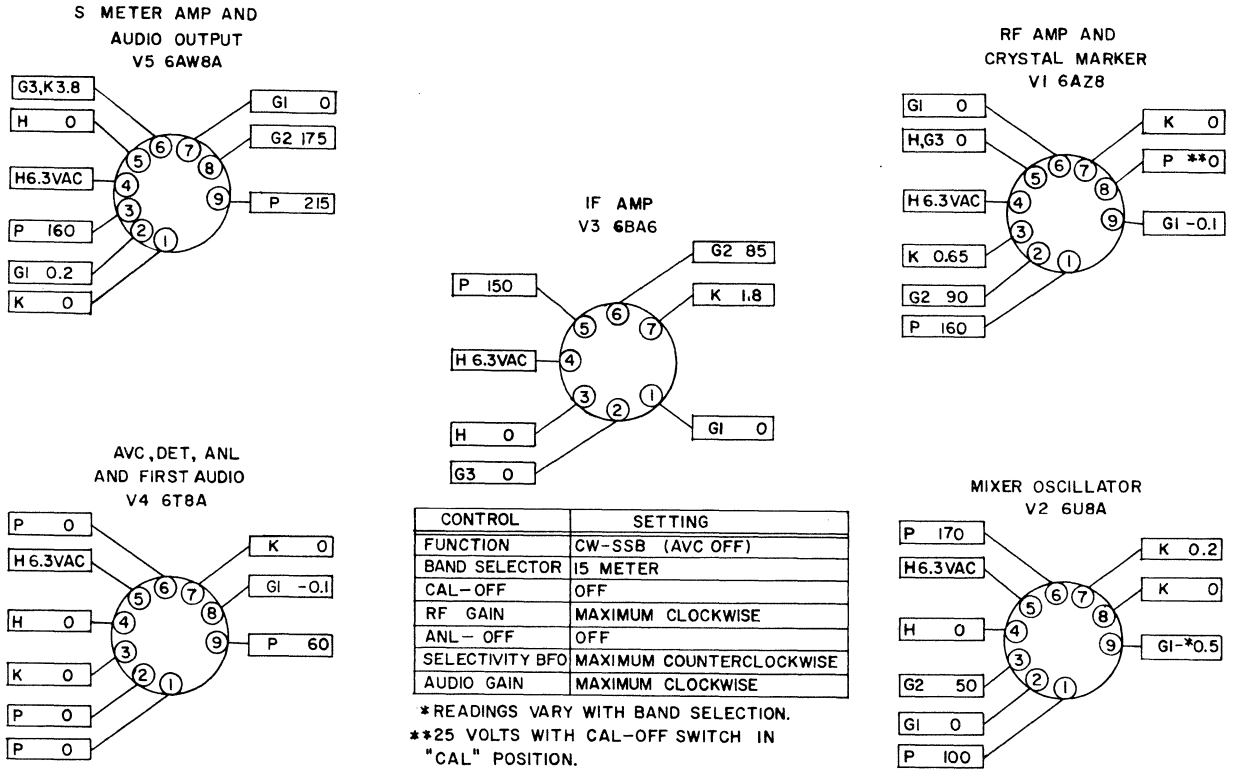
TROUBLESHOOTING CHART

Symptom	Probable Cause	Suggested Remedy
No reception of any signals on any band on speaker or phones but with tubes and pilot lights lighting.	V1, V2, V3, V4, V5 defective; CR2, CR3 defective. Open Audio Transformer. C52, C53, C54 shorted. Open Filter Resistor R46.	Replace defective tube. Replace defective diode rectifier. Replace Audio Transformer. Replace defective capacitor. Replace resistor.
	Any component associated with V1, V2, V3, V4, and/or V5 that may become defective and open or short the signal circuit.	Replace defective component after determining cause by referring to the voltage chart (figure 11) and the schematic diagram (figure 12), measuring voltages at various significant points, etc.
Reception of AM signals but no reception of intelligible CW or SSB signals.	Triode oscillator section of V2 6U8A defective.	Replace 6U8A tube.
No signals on any one band.	Antenna coils L1, L2, L3, L4, L5 and/or L6 open or shorted.	Replace defective coil.
	RF coils L7, L8, L9, L10, and/or L12 shorted or open.	Replace defective coil.
	Oscillator coils L13, L14, L15, L16, L17, and/or L18 open or shorted.	Replace defective coil.

TROUBLESHOOTING CHART Cont.

Symptom	Probable Cause	Suggested Remedy
No signals on any one band (cont.).	Also open or shorted capacitors associated in the circuit with the above Antenna, RF, or Oscillator coils (Refer to Schematic Diagram).	Replace defective capacitor.
	Defective Bandswitch contact on one or more wafers.	Replace defective section.
Weak signals on all bands.	V1, V2, V3, V4, and/or V5 defective.	Replace defective tube.

Numerous obscure troubles which may occur with any well-designed electrical equipment may occur in this receiver as well. Therefore, should any trouble occur that may not be readily corrected with the suggestions contained in the above trouble shooting chart, refer to service and operating questions, paragraph 4-13.



CONTROL	SETTING
FUNCTION	CW-SSB (AVC OFF)
BAND SELECTOR	15 METER
CAL-OFF	OFF
RF GAIN	MAXIMUM CLOCKWISE
ANL- OFF	OFF
SELECTIVITY BFO	MAXIMUM COUNTERCLOCKWISE
AUDIO GAIN	MAXIMUM CLOCKWISE

*READINGS VARY WITH BAND SELECTION.
**25 VOLTS WITH CAL-OFF SWITCH IN "CAL" POSITION.

NOTES:
VOLTAGE READINGS TAKEN UNDER THE FOLLOWING CONDITIONS
1. LINE VOLTAGE ; 117 VOLTS, 60 CPS, A.C.
2. ALL VOLTAGES MEASURED BETWEEN TUBE SOCKET TERMINALS AND CHASSIS UNLESS OTHERWISE SPECIFIED.
3. ALL VOLTAGES ARE D.C. AND POSITIVE UNLESS OTHERWISE INDICATED D.C. AND A.C. VOLTAGES MEASURED WITH A 20,000 OHMS-PER-VOLT METER.

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Figure 11. Voltage Chart.

SECTION VII

ALIGNMENT

7-1. GENERAL

This receiver has been carefully aligned at the factory by specially trained personnel using precision equipment. Alignment of the receiver should not be required unless the receiver has been tampered with or component parts have been replaced in the IF or oscillator stages.

Two methods of aligning the IF and oscillator stages are described in the following paragraphs of this alignment procedure. Method one requires only a non-metallic alignment tool for adjusting the slugs in the IF transformers and a 1650-KC crystal inserted into the crystal socket for IF alignment. A similar non-metallic alignment tool for adjusting the slugs in the oscillator coils and a 3.5-MC crystal inserted into the crystal socket provides an accurate method of oscillator alignment on all bands. Method two requires the same non-metallic alignment tools for adjusting the slugs in the IF transformers and oscillator coils, a signal generator, a 0.02-mfd capacitor, a 27-ohm resistor and an output meter (AC scale of a VTVM or a conventional output meter).

7-2. IF ALIGNMENT, METHOD ONE

EQUIPMENT REQUIRED

1. 1650-KC crystal
2. Non-metallic alignment tool for IF transformers

PROCEDURE

1. Disconnect antenna and remove the chassis from the cabinet (see para. 6-2).
2. Insert 1650-KC crystal in crystal socket (see fig. 8).
3. Set controls as follows:

ANT TRIM . . . . . Center of range

CAL RESET . . . . . Center of range

FUNCTION . . . . . AM

BAND SELECTOR . . 10

MAIN TUNING . . . . . 29.0 MC

CAL-OFF . . . . . CAL

RF GAIN . . . . . Center of range

ANL-OFF . . . . . OFF

SELECTIVITY-BFO . . Maximum counter-clockwise

AUDIO GAIN . . . . . Any position

4. Adjust RF GAIN control until carrier level meter reads approximately S9.
5. Adjust the slugs in the IF transformers, T3 and T2 (see figures 8 and 9), for maximum deflection on the carrier level meter; make adjustments in the following order.

   NOTE: After each adjustment, bring the meter reading back to S9.

   T3 secondary (top of can)
   T3 primary (bottom of can)
   T2 secondary (top of can)
   T2 primary (bottom of can)
6. Repeat step 5 for final peaking of IF transformers.
7. Set the CAL-OFF switch to the OFF position and remove the 1650-KC crystal.

7-3. OSCILLATOR ALIGNMENT, METHOD ONE

EQUIPMENT REQUIRED

1. 3.5-MC crystal
2. 2.2K ohm test resistor
3. Non-metallic alignment tool for the oscillator coils.

PROCEDURE

1. Insert 3.5-MC crystal in crystal socket.
2. Set controls as follows:

ANT TRIM . . . . . Center of range

CAL RESET . . . . . Center of range

FUNCTION . . . . . CW-SSB

BAND SELECTOR . . . As indicated in step 4

CAL-OFF . . . . . CAL

RF GAIN . . . . . Center of range

ANL-OFF . . . . . OFF

SELECTIVITY-BFO . . Maximum clockwise

AUDIO GAIN . . . . . Maximum clockwise

MAIN TUNING . . . . . As indicated in step 4

3. Set the indicated controls and install the 2.2K ohm test resistor across the 47K ohm resistor, R34. This resistor is connected between terminal 2 on crystal socket XY1 and GND lug 3 on tube socket XV1.

NOTE

The 2.2K ohm test resistor must be removed before calibrating the oscillator on the 15, 10, and 6 meter bands.

4. Slowly adjust the slug in each oscillator coil as indicated in the following table. Readjustment of the RF GAIN control will be required to maintain a comfortable listening level.

5. Set the RF GAIN control fully clockwise when adjusting the 15, 10 and 6 meter oscillator coils. Refer to Figure 9 for location of the oscillator coils. All oscillator coils should be adjusted for the loudest zero-beat signal.

6. Connect an antenna to the receiver and check each band's approximate calibration. Should any band's calibration not test correctly, you have selected an image zero beat and it will be necessary to recalibrate the band in error.

7. Set the CAL-OFF switch to OFF.

8. Connect the antenna; adjust the RF coils L7, L8, and L9 for maximum noise while readjusting the RF GAIN control as necessary to maintain a comfortable listening level.

BAND SELECTOR	MAIN TUNING	ADJUSTMENT SLUG IN	ADJUST FOR
80(OSC)	3.5 MC	L18	Zero-Beat
40(OSC)	7.0 MC	L17	Same as above
20(OSC)	14.0 MC	L16	Same as above
15(OSC)	21.0 MC	L15	Same as above
15(RF)	21.25 MC	L9	Maximum Noise
10(OSC)	28.0 MC	L14	Zero-Beat
10(RF)	28.75 MC	L8	Maximum Noise
6(OSC)	52.5 MC	L13	Zero-Beat
6(RF)	51.5 MC	L7	Maximum Noise

7-4. IF ALIGNMENT, METHOD TWO

EQUIPMENT REQUIRED

1. Signal generator
2. Output meter
3. 0.02 mfd capacitor
4. A non-metallic alignment tool for IF transformer slugs.

PROCEDURE

1. Disconnect the antenna and remove the chassis from the cabinet (see para. 6-2).
2. Preset the controls as follows:

ANT TRIM	Center of range
CAL RESET	Center of range
FUNCTION	CW-SSB
BAND SELECTOR	10
MAIN TUNING	29.0 MC
CAL-OFF	OFF
RF GAIN	Maximum clockwise
ANL-OFF	OFF
SELECTIVITY-BFO	Maximum counterclockwise
AUDIO GAIN	Maximum clockwise

3. Connect the high side of the signal generator through the 0.02 mfd capacitor to pin 2 of the oscillator mixer tube (V2A) and the ground side to the chassis (see figures 8 and 9).

4. Set the signal generator frequency to 1650 KC (1.65 MC).

5. Connect the output meter across the SPKR terminals with speaker connected and adjust the signal generator output (modulated 400 CPS) for adequate indication on the output meter, approximately 25 milliwatts.

6. Adjust IF transformer (T3 and T2) slugs for maximum indication on the output meter in the order listed below, readjusting signal generator output, if necessary, to maintain an indication on the output meter, of approximately 25 milliwatts.

   T3 secondary (top of can)
   T3 primary (bottom of can)
   T2 secondary (top of can)
   T2 primary (bottom of can)

7. Repeat step 6 for final peaking of IF transformers.

8. Disconnect the signal generator and the 0.02 mfd capacitor.

7-5. OSCILLATOR ALIGNMENT, METHOD TWO

EQUIPMENT REQUIRED

1. Signal generator

2. Output meter
3. 27-ohm resistor
4. A non-metallic alignment tool for the oscillator coil slugs.

PROCEDURE

1. Preset the controls as follows:

ANT TRIM	Center of range
CAL RESET	Center of range
FUNCTION	CW-SSB
BAND SELECTOR	80
MAIN TUNING	3.5 MC
CAL-OFF	OFF
RF GAIN	Maximum clockwise
ANL-OFF	OFF
SELECTIVITY-BFO	Maximum counterclockwise
AUDIO GAIN	Maximum clockwise

2. Connect the high side of the signal generator through the 27-ohm resistor to the antenna terminal and the ground side to chassis.
3. The output meter should still be connected across the SPKR terminals.
4. Set the signal generator frequency to 3.5 MC.
5. Adjust the signal generator output (modulated 400 CPS) for adequate output indication on the output meter, approximately 25 milliwatts.
6. Rotate the slug in oscillator coil L18 counterclockwise to end of travel; rotate the slug clockwise until the 400 CPS audio signal is heard in the speaker. Rock slug slowly back and forth until maximum deflection is indicated on the output meter, and the speaker audio level is maximum.
7. Adjust the oscillator coils for the remaining bands by setting the controls and making adjustments as indicated in the following table. Readjust signal generator output, if necessary, to maintain a reading of approximately 25 milliwatts on the output meter.
8. RF Alignment on 6, 10, and 15 meters.

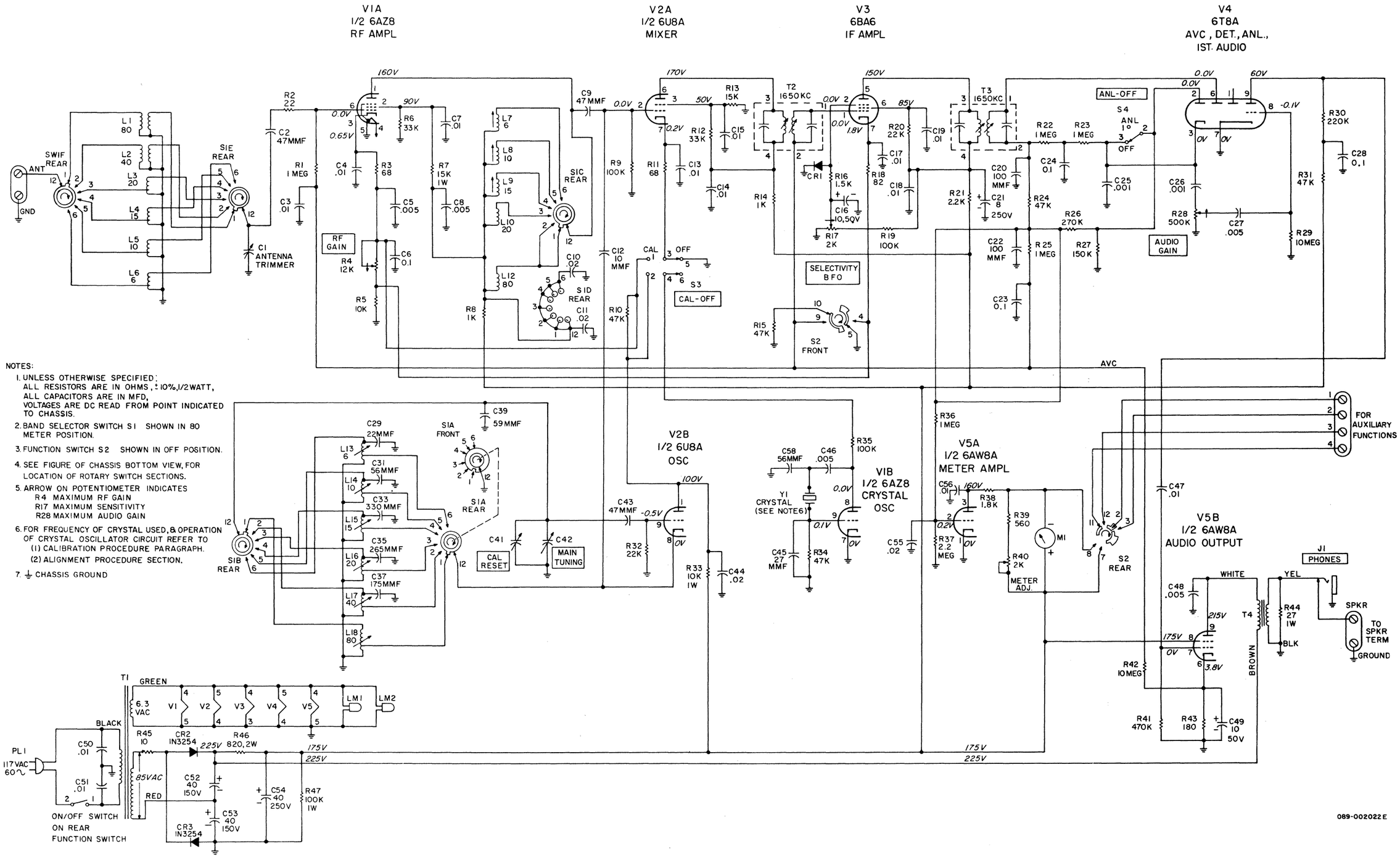
15 meters: After the oscillator alignment has been completed, set MAIN TUNING control to 21.25 MC. Tune signal generator until maximum output is noted at SPKR jack. Adjust the ANT TRIM for maximum output while slightly rocking the signal generator output back and forth. Adjust L9 for maximum output while slightly rocking signal generator output.

10 meters: Same as above; adjust L8 with main tuning and signal generator at 28.75 MC.

6 meters: Same as above; adjust L7 with main tuning and signal generator at 51.5 MC.

BAND SELECTOR	MAIN TUNING	SIG. GEN. FREQUENCY	ADJUST	ADJUST FOR
80	3.5 MC	3.5 MC	L18	Maximum deflection on the output meter.
40	7.0 MC	7.0 MC	L17	Same as above
20	14.0 MC	14.0 MC	L16	Same as above
15	21.0 MC	21.0 MC	L15	Same as above
10	28.0 MC	28.0 MC	L14	Same as above
6	*50.0 MC	50.0 MC	L13	Same as above

*If the signal generator to be used is not calibrated to 50 MC, it may be set to 25 MC, thus utilizing the second harmonic which is 50 MC.



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS ARE IN OHMS, ±10%, 1/2 WATT,
   ALL CAPACITORS ARE IN MFD,
   VOLTAGES ARE DC READ FROM POINT INDICATED TO CHASSIS.
2. BAND SELECTOR SWITCH S1 SHOWN IN 80 METER POSITION.
3. FUNCTION SWITCH S2 SHOWN IN OFF POSITION.
4. SEE FIGURE OF CHASSIS BOTTOM VIEW, FOR LOCATION OF ROTARY SWITCH SECTIONS.
5. ARROW ON POTENTIOMETER INDICATES
   R4 MAXIMUM RF GAIN
   R17 MAXIMUM SENSITIVITY
   R28 MAXIMUM AUDIO GAIN
6. FOR FREQUENCY OF CRYSTAL USED, & OPERATION OF CRYSTAL OSCILLATOR CIRCUIT REFER TO
   (1) CALIBRATION PROCEDURE PARAGRAPH.
   (2) ALIGNMENT PROCEDURE SECTION.
7. ⏚ CHASSIS GROUND

Figure 12. Schematic Drawing.

SERVICE PARTS LIST

Schematic Symbol	Description	Hallicrafters Part Number
	CAPACITORS	
C1	5.2-25.8 mmf., ANT TRIM	048-000492
C2, 9, 43	47 mmf., 500V, 2%; Duramica	482-151470
C3, 4, 7, 13, 14, 15, 17, 18, 19, 47, 56	.01 mfd., 500V, 20%; Cer. Disc	047-100224
C5, 8, 27, 46, 48	.005 mfd., 500V, 20%; Cer. Disc	047-100442
C6, 23, 24	.1 mfd., 200V, 20%; Moulded Paper	499-014104
C10, 11, 44, 55	.02 mfd., 500V, +80-20%; Cer. Disc	047-100242
C12	10 mmf., 500V, 2%; Duramica	482-131100
C16, 49	10 mfd., 50V; Electrolytic	045-000724
C20, 22	100 mmf., 500V; 10%; Cer. Disc	047-201182
C21	8 mfd., 250V; Electrolytic	045-000721
C25, 26	.001 mfd., 500V, GMV; Cer. Disc	047-200230
C28	.1 mfd., 400V, 20%; Moulded Paper	499-024104
C29	22 mmf., 500V, 2%; Duramica	482-151220
C31	56 mmf., 500V, 2%; Duramica	482-161560
C33	330 mmf., 500V, 2%; Duramica	482-161331
C35	265 mmf., 500V, 2%; Duramica	493-122650-334
C37	175 mmf., 500V, 2%; Duramica	493-121750-334
C39	59 mmf., 500V, ±2%; N470; Cer. Tub.	491-104590-83
C41	Capacitor, Var.; CAL RESET	048-000510
C42	Capacitor, Var.; MAIN TUNING	048-000494
C45	27 mmf., 500V, 2%; Duramica	482-151270
C50, 51	.01 mfd., 1400V, GMV; Cer. Disc	047-200752
C52, 53	40 mfd., 150V; Electrolytic	045-000725
C54	40 mfd., 250V; Electrolytic	045-000722
C58	56 mmf., N750, 5%; Cer. Tub.	491-105560-95
	***RESISTORS**	
R1, 22, 23, 25, 36	1 megohm	451-252105
R2	22 ohm	451-252220
R3, 11	68 ohm	451-252680
R4	Resistor, Var., R.F. GAIN, 12K ohm	025-002040
R5	10K ohm	451-252103
R6, 12	33K ohm	451-252333
R7	15K ohm, 10%, 1W	451-352153
R8, 14	1K ohm	451-252102
R9, 19, 35	100K ohm	451-252104
R10, 15, 24, 31, 34	47K ohm	451-252473
R13	15K ohm	451-252153
R16	1.5K ohm	451-252152
R17	Resistor, Var., SELECTIVITY; 2K ohm	025-001944
R18	82 ohm	451-252820
R20, 32	22K ohm	451-252223
R21	2.2K ohm	451-252222
R26	270K ohm	451-252274
R27	150K ohm	451-252154
R28	Resistor, Var., AUDIO GAIN; 500K ohm	025-001942
R29, 42	10 megohm	451-252106
R30	220K ohm	451-252224
R33	10K ohm, 10%; 1W	451-352103
R37	2.2 megohm	451-252225
R38	1.8K ohm	451-252182
R39	560 ohm	451-252561
R40	Resistor, Var., (Carrier Level Meter); 2K ohm	025-001943
R41	470K ohm	451-252474
R43	180 ohm	451-252181
R44	27 ohm, 10%; 1W	451-352270
R45	10 ohm	451-252100
R46	820 ohm, 10%; 2W	451-652821
R47	100K ohm, 10%; 1W	451-352104

*All RESISTORS are 10%, 1 2 watt, carbon type, unless otherwise specified.

Schematic Symbol	Description	Hallicrafters Part Number
	TRANSFORMERS	
T1	Transformer, Power	052-000853
T2, 3	Transformer, IF	050-000751
T4	Transformer, Audio Output	055-000460
	COILS	
L1	Coil, Antenna (80 Meter Band)	051-002970
L2	Coil, Antenna (40 Meter Band)	051-002971
L3	Coil, Antenna (20 Meter Band)	051-002972
L4	Coil, Antenna (15 Meter Band)	051-002973
L5	Coil, Antenna (10 Meter Band)	051-002974
L6	Coil, Antenna (6 Meter Band)	051-002975
L7	Coil, RF (6 Meter Band)	051-003156
L8	Coil, RF (10 Meter Band)	051-003157
L9	Coil, RF (15 Meter Band)	051-003158
L10	Coil, RF (20 Meter Band)	051-002966
L12	Coil, RF (80 Meter Band)	051-002964
L13	Coil, Oscillator (6 Meter Band)	051-002963
L14	Coil, Oscillator (10 Meter Band)	051-002962
L15	Coil, Oscillator (15 Meter Band)	051-002961
L16	Coil, Oscillator (20 Meter Band)	051-002960
L17	Coil, Oscillator (40 Meter Band)	051-002959
L18	Coil, Oscillator (80 Meter Band)	051-002958

Schematic Symbol	Description	Hallicrafters Part Number
	SWITCHES	
S1	Switch, Rotary, BAND SELECTOR	060-002388
S2	Switch, Rotary, FUNCTION	060-002267
S3	Switch, DPDT, CAL-OFF	060-002260
S4	Switch, SPDT, ANL-OFF	060-200967
	JACKS, PLUGS, AND SOCKETS	
J1	Jack, Phone	036-100002
PL1	Line Cord and Plug	087-10J078
XV3	Socket, Tube; 7 pin min.	006-000946
XV1, 2, 4, 5	Socket, Tube; 9 pin min.	006-000947
XY1	Socket, Crystal	006-100346
	Socket, Pilot light, left	086-000541
	Socket, Pilot light, right	086-000542
	TUBES AND LAMPS	
V1	6AZ8; RF Amplifier, Crystal Marker	090-901417
V2	6U8A; Mixer, Oscillator	090-901285
V3	6BA6; IF Amplifier	090-901112
V4	6T8A; AVC, Det, ANL, 1st Audio Amplifier	090-901403
V5	6AW8A; Carrier Level Meter Amplifier, Audio Output	090-901103
LM1, 2	Pilot Lamp #47	039-100019
	MISCELLANEOUS PARTS	
	Cabinet Weld Assembly	150-900785
	Clip, IF Transformer Mounting	076-100385
CR1	Diode, Silicon	019-102354
CR2, 3	Rectifier, Silicon, 1N3254	019-002939-02
	Dial Cord	038-000049
	Dial Plate	063-005042
	Dial Window (calibrated)	083-000915
	Front Panel Weld Assembly	150-000509
	Knob, ANT TRIM, CAL RESET	015-001564
	Knob, FUNCTION, BAND SELECTOR	015-001725
	Knob, R.F. GAIN, AUDIO GAIN, SELECTIVITY-BFO	015-001464
	Knob, MAIN TUNING	015-001736
	Lock, Line Cord	076-200397
	Pointer, Main Tuning	082-000489
	Pointer, Track Assembly	150-000711
	Ring, Retaining	076-100883
M1	Carrier Level Meter	082-000492
	Shaft, Main Tuning	074-002451
	Shield, Pilot Lamp	086-100037
	Spacer, Track	073-003695
	Spring, Dial Cord	075-000838
	Terminal Board, Antenna	088-202026
	Terminal Board, 4 contact	088-002411
	Terminal Board, Speaker	088-002412
	Washer, Spring	004-002408
Y1	Crystal, Quartz (Oscillator)	019-002720

094-902430F
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