

OPERATING
and
SERVICING
the

hallicrafters-kit

model SX-140K
Receiver



the hallicrafters co.

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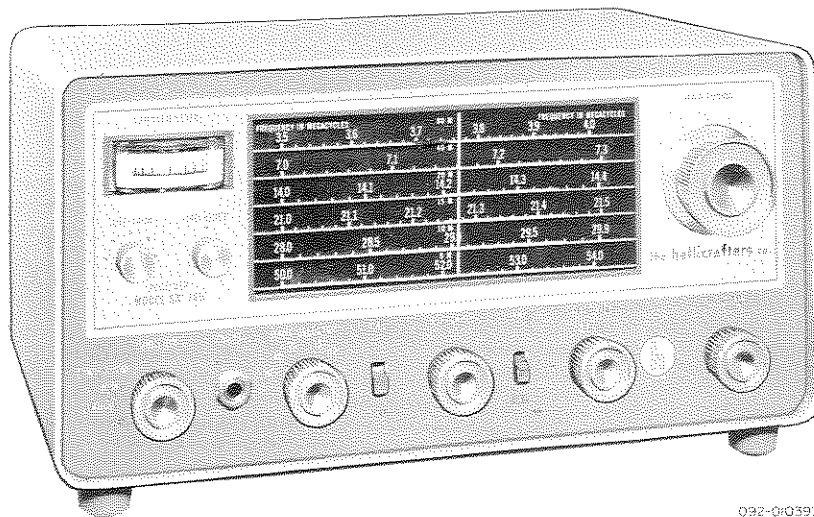


Figure 1. Hallicrafters Model SX-140K.

SECTION I

GENERAL INFORMATION

The new Hallicrafters Model SX-140K is a highly sensitive, communications receiver kit capable of 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 change over 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 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

Refer to the Unpacking Instructions contained within the assembly manual "Assembling The Halli-kit" for instructions on unpacking and checking the equipment parts.

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-140K 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.

INSTALLING THE CHASSIS IN THE CABINET

The chassis may be installed into the cabinet by carefully sliding the rear of the chassis

into the front of the cabinet. Making sure that the line cord is free, slowly push the chassis into the cabinet until the rear of the chassis comes in contact with the rear of the cabinet. Secure the chassis to the cabinet by inserting four No. 6-32 x 3/8-inch sems screws into the Tinnerman speed nuts mounted on the rear of the chassis.

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 coaxial lead-in 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.

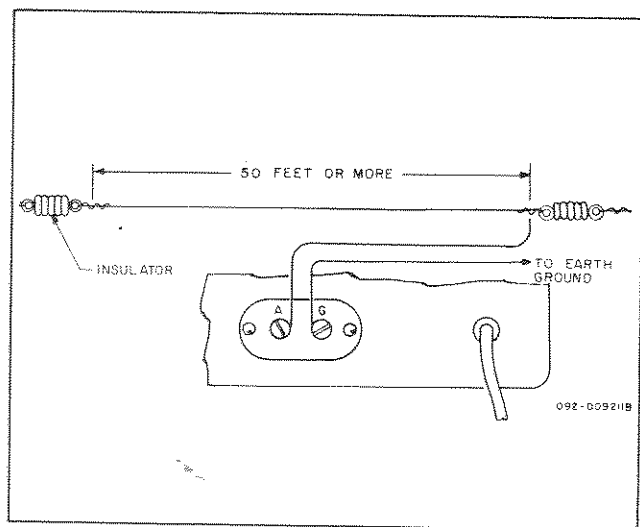


Figure 2. Single Wire Antenna.

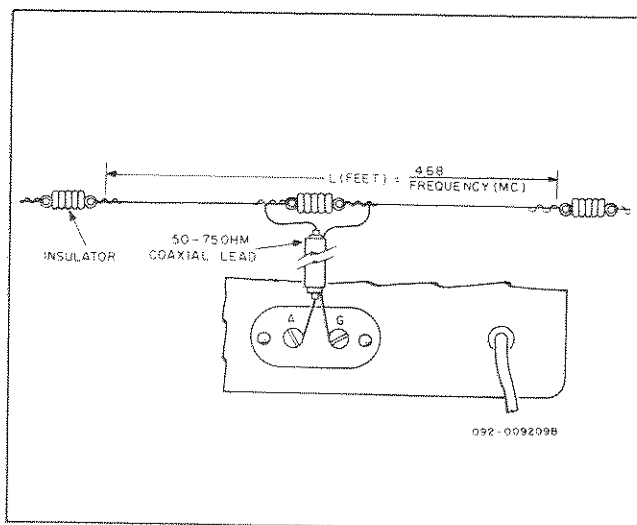


Figure 3. Dipole Antenna Using Coaxial Lead-in.

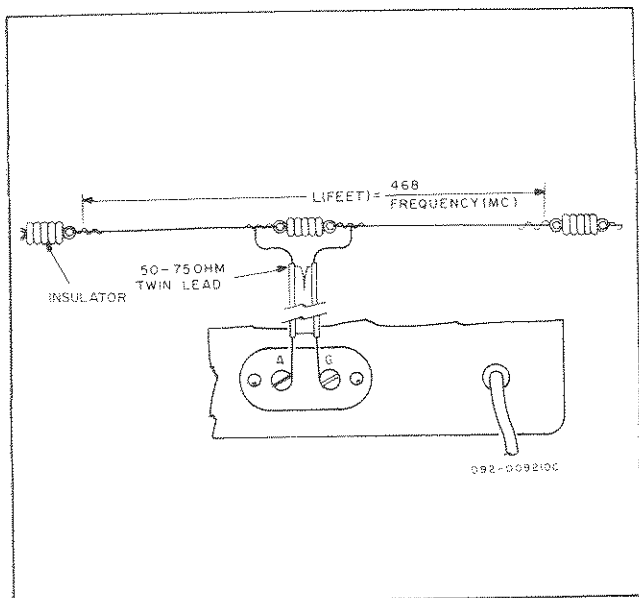


Figure 4. Dipole Antenna Using Twin Lead-in.

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.

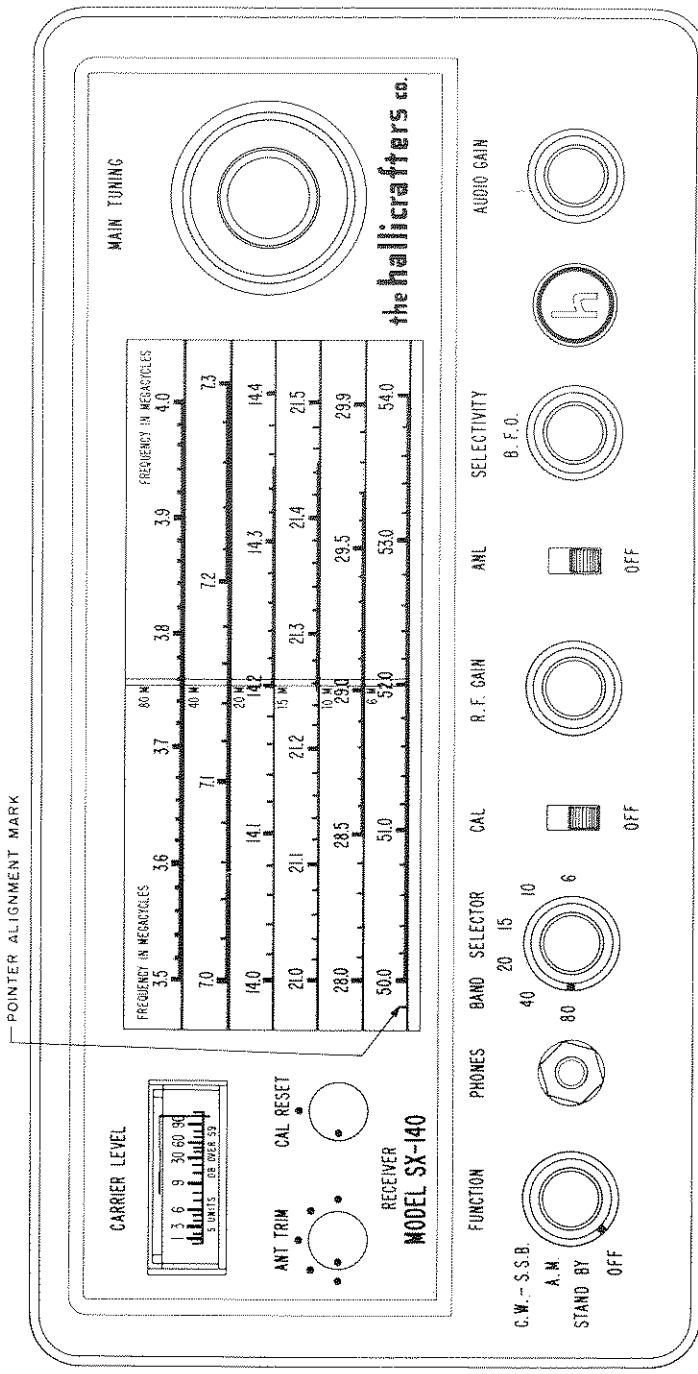
4. In the CW-SSB position, continuous wave and single-sideband signals may be received. The AVC is reduced for CW and SSB reception. The carrier level meter is disabled to prevent damage by a strong signal.

4-3. BAND SELECTOR CONTROL

The BANDSELECTOR 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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PICTORIAL 2

Figure 5. Front Panel.

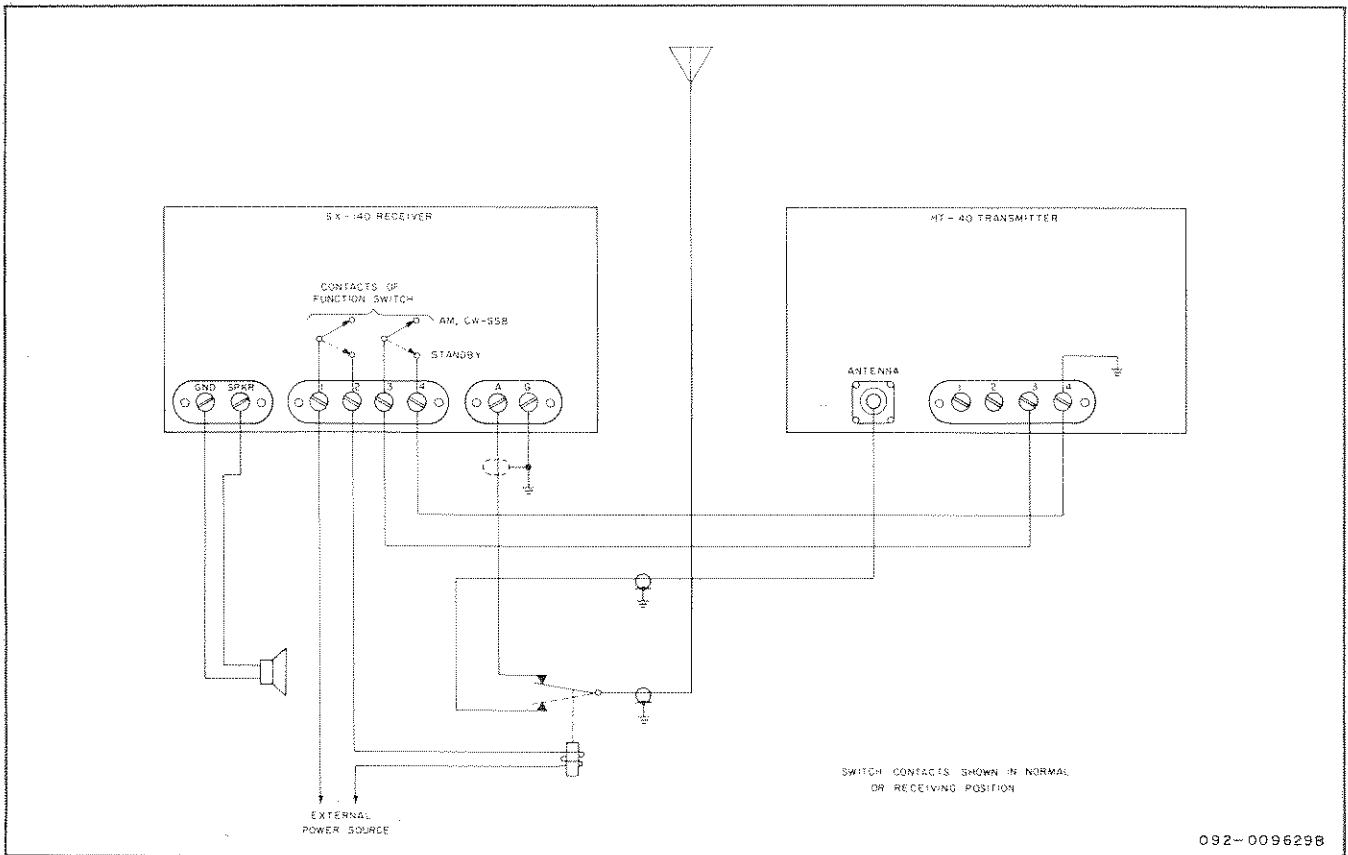


Figure 6. Station Control, Receiver Controlling Antenna Relay and Transmitter.

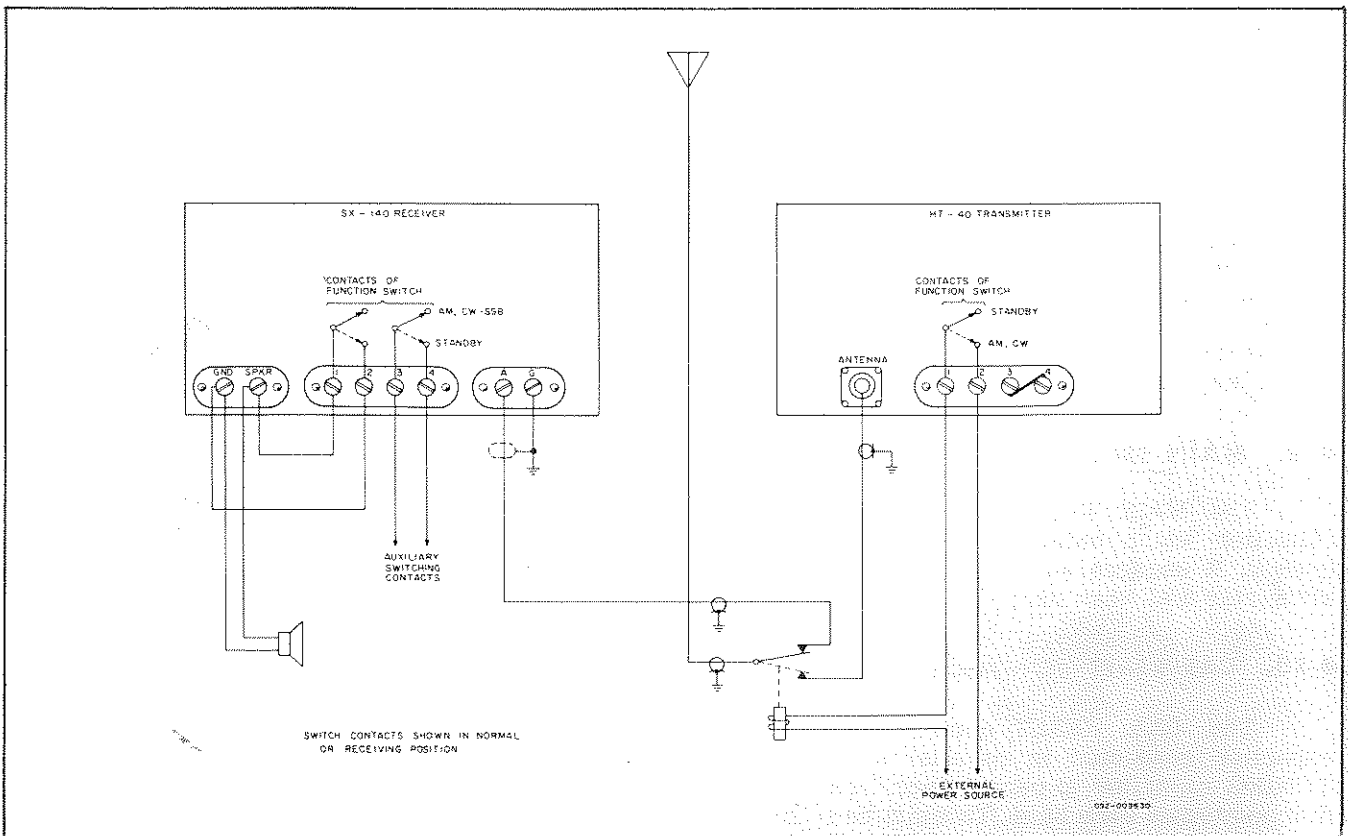


Figure 7. Station Control, Transmitter Controlling Antenna Relay.

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

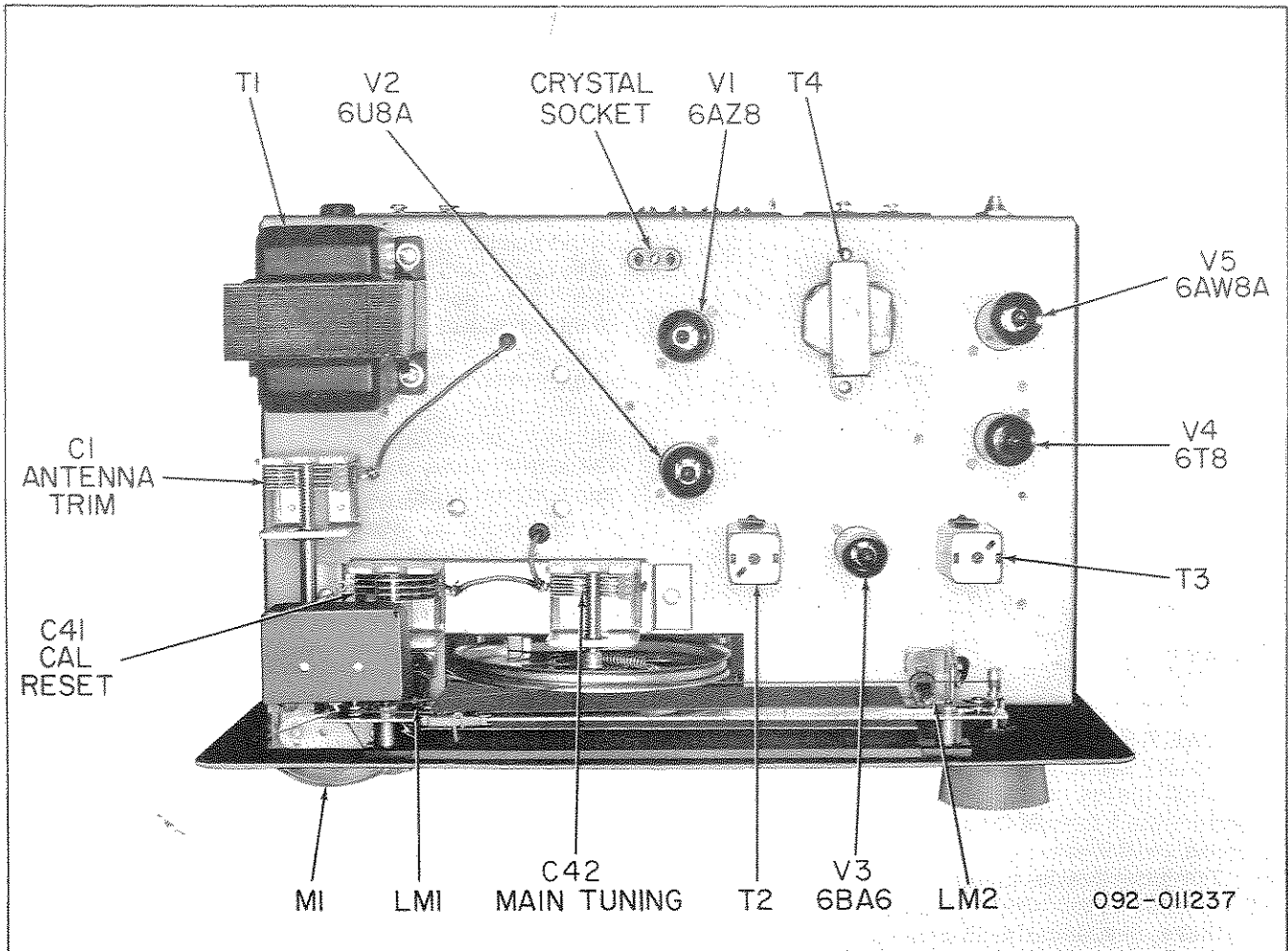


Figure 8. Top View Alignments.

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 counter-clockwise
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 counter-clockwise 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

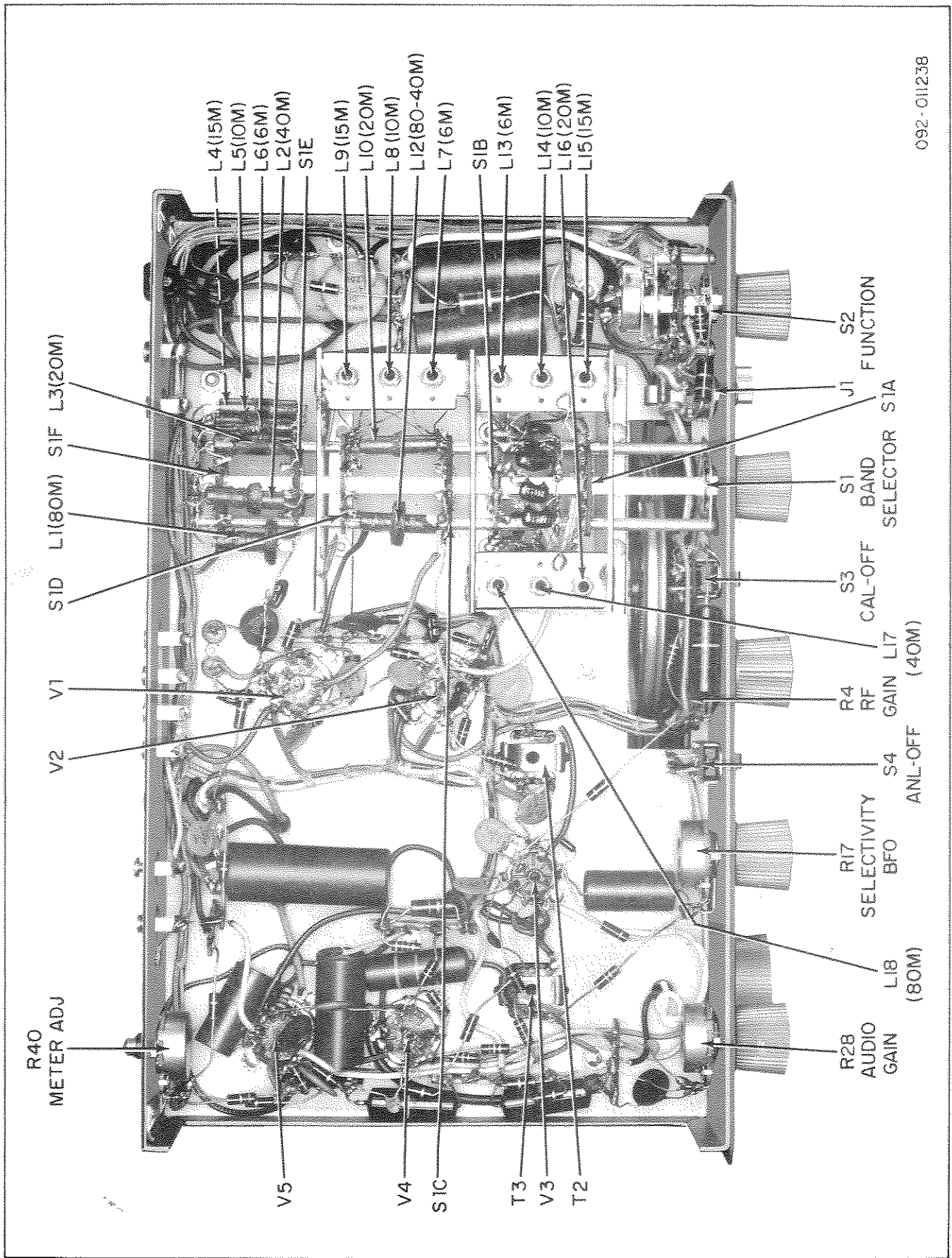
To adjust the carrier level meter, disconnect antenna and short the antenna terminal to the ground terminal. Set the RF GAIN maximum clockwise, and the SELECTIVITY-BFO control maximum counter-clockwise. Set the ANL-OFF switch to the OFF position and turn the receiver on by rotating the FUNCTION control 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 counter-clockwise 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.



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Figure 9. Bottom View Alignments.

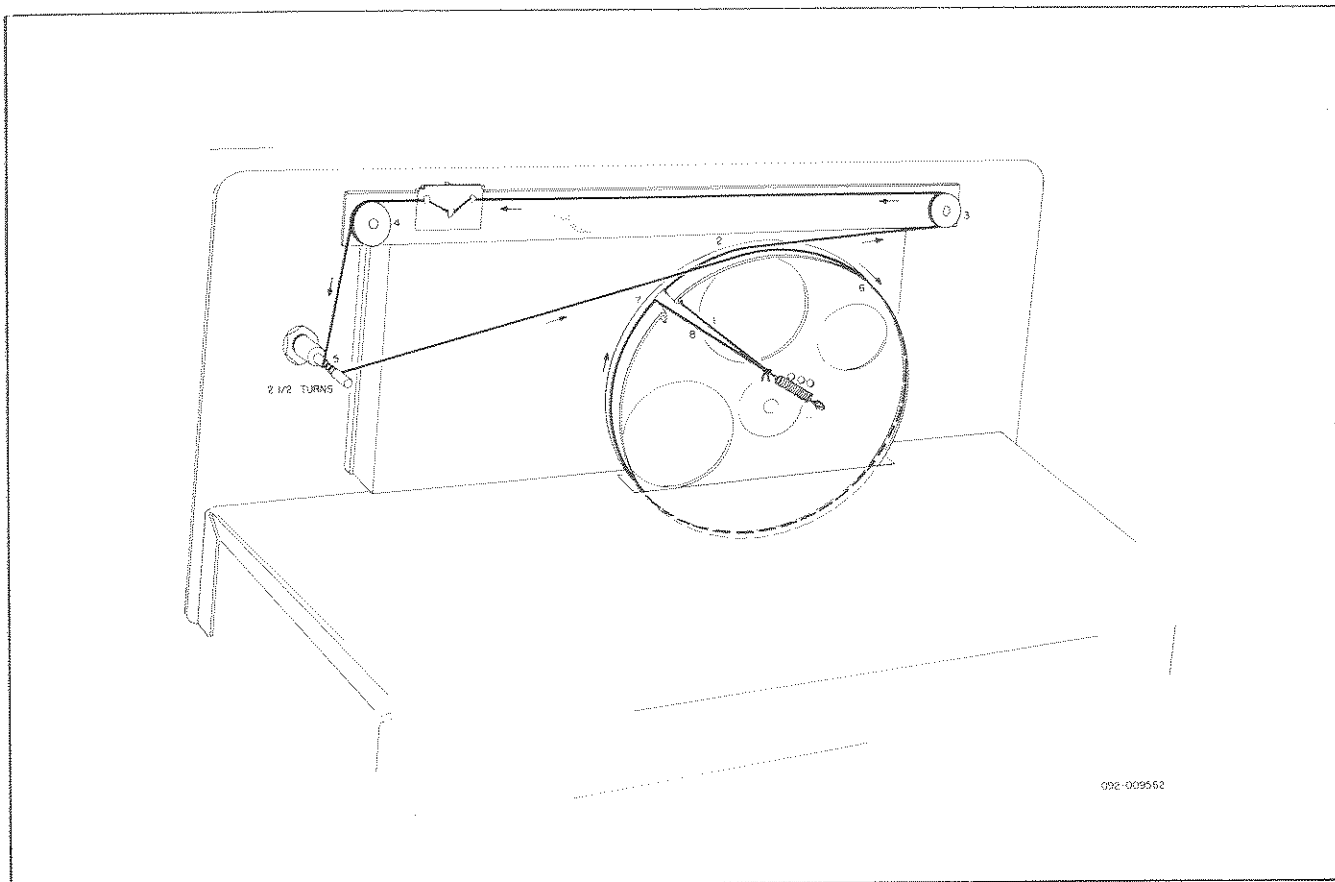


Figure 10. Dial Restringing.

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.
Reception of AM signals but no reception of intelligible CW or SSB signals.	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.
No signals on any one band.	Triode oscillator section of V2 6U8A defective.	Replace 6U8A tube.
	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.

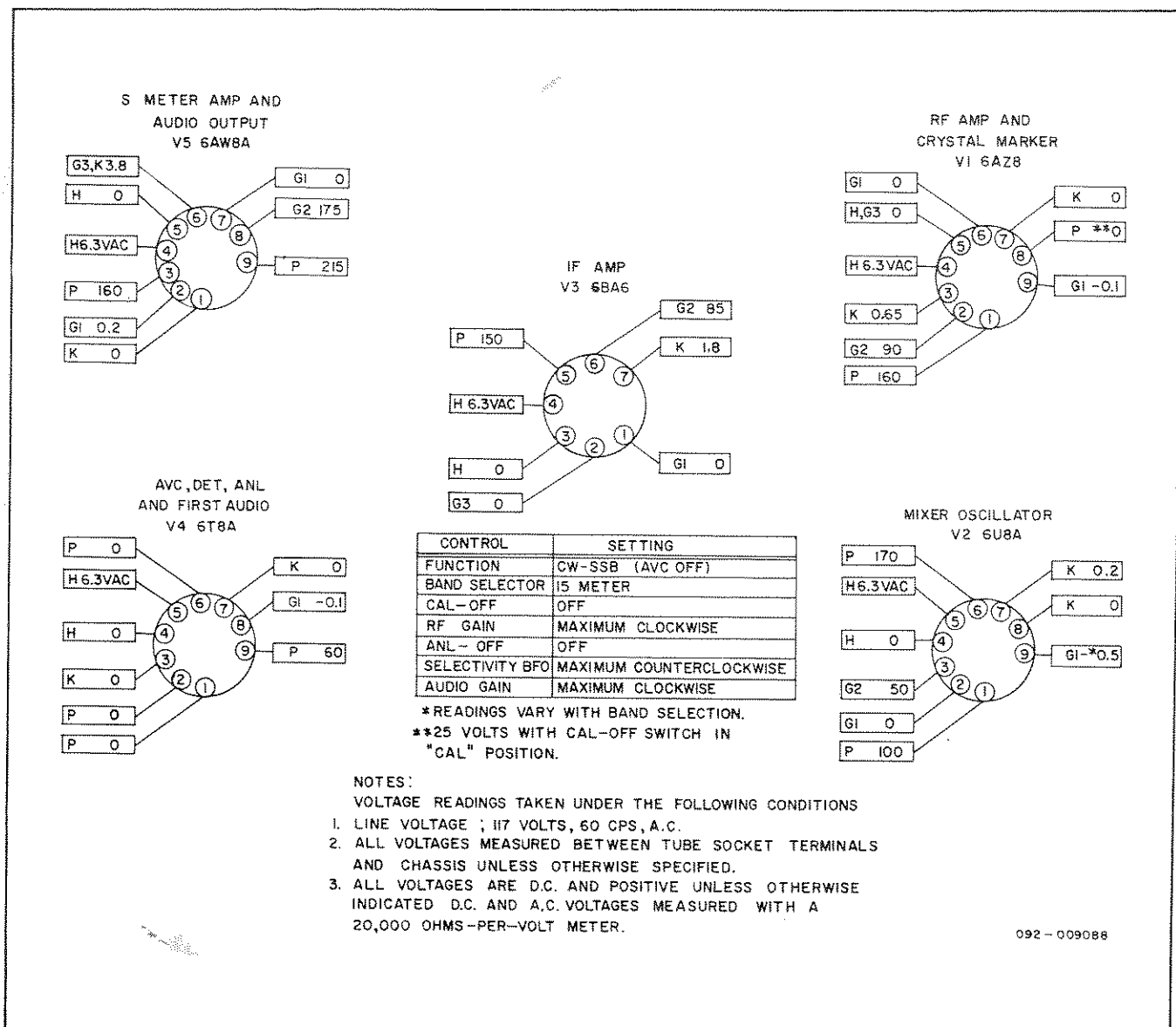


Figure 11. Voltage Chart.

SECTION VII ALIGNMENT

7-1. GENERAL

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).

The Model SX-140K Receiver Kit is supplied with a completely aligned and prewired bandswitch assembly. Under normal conditions, realignment of the assembly will not be necessary. However, should realignment of the oscillator and/or R.F. be required because of component aging or replacement refer to the alignment procedures below.

NOTE

Because of component tolerances and individual wiring methods, it may be necessary to readjust the Cal Reset control when calibrating each band.

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
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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
FUNCT ION	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

- 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.

- 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.

- 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.
- 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.
- Set the CAL-OFF switch to OFF.
- 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

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

PROCEDURE

- Disconnect the antenna and remove the chassis from the cabinet (see para. 6-2).
- 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

- 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).
- Set the signal generator frequency to

1650 KC (1.65 MC).

- 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.
- Adjust IF transformer (T3 and T2) slugs for maximum indication on the output meter in the order listed below, re-adjusting 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)
- Repeat step 6 for final peaking of IF transformers.
- Disconnect the signal generator and the 0.02 mfd capacitor.

7-5. OSCILLATOR ALIGNMENT, METHOD TWO

EQUIPMENT REQUIRED

- 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.

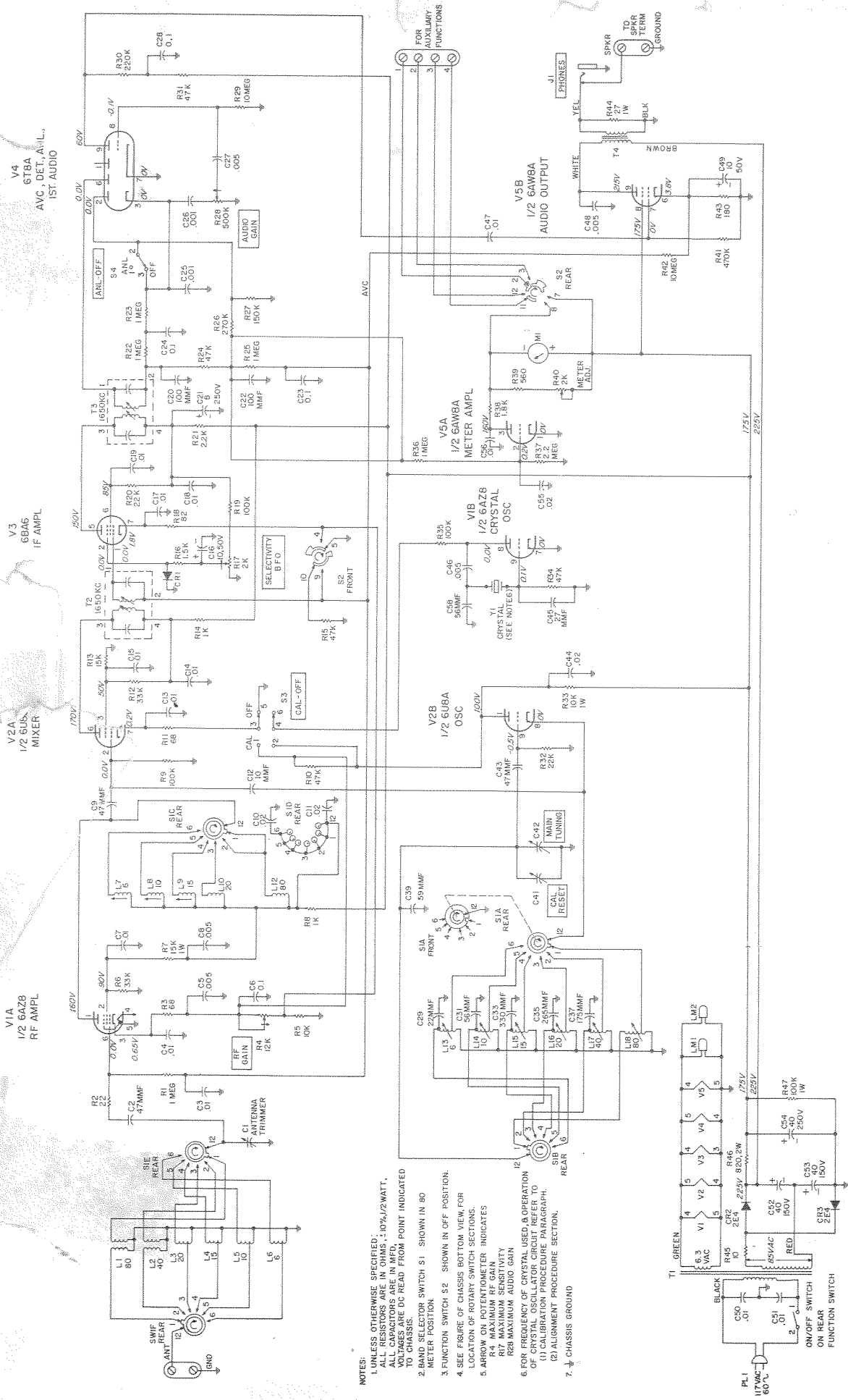
6 meters: Same as above; adjust L7 with main tuning and signal generator at 51.5 MC.

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.

SERVICE PARTS LIST

Schematic Symbol	Description	Hallcrafters Part Number	Schematic Symbol	Description	Hallcrafters Part Number	Schematic Symbol	Description	Hallcrafters Part Number
CAPACITORS			*RESISTORS (cont.)			SWITCHES		
C1	5.2-25.8 mmf., ANT TRIM	048-000492	R10, 15, 24, 31, 34	47K ohm	451-252473	S1	Switch, Rotary, BAND SELECTOR	060-002388
C2, 9, 43	47 mmf., 500V, 2%; Duramica	482-151470	R13	15K ohm	451-252153	S2	Switch, Rotary, FUNCTION	060-002267
C3, 4, 7, 13, 14, 15, 17, 18, 19, 47, 56	.01 mfd., 500V, 20%; Cer. Disc	047-100224	R16	1.5K ohm	451-252152	S3	Switch, DPDT, CAL-OFF	060-002360
C5, 8, 27, 46, 48	.005 mfd., 500V, 20%; Cer. Disc	047-100442	R17	Resistor, Var., SELECTIVITY; 2K ohm	025-001944	S4	Switch, SPDT, ANL-OFF	060-200967
C6, 23, 24	.1 mfd., 200V, 20%; Moulded Paper	499-014104	R18	82 ohm	451-252820	JACKS, PLUGS, AND SOCKETS		
C10, 11, 44, 55	.02 mfd., 500V, +80-20%; Cer. Disc	047-100242	R20, 32	22K ohm	451-252223	J1	Jack, Phone	036-100002
C12	10 mmf., 500V, 2%; Duramica	482-131100	R21	2.2K ohm	451-252222	PL1	Line Cord and Plug	087-100078
C16, 49	10 mfd., 50V; Electrolytic	045-000724	R26	270K ohm	451-252274	XV3	Socket, Tube; 7 pin min.	006-000946
C20, 22	100 mmf., 500V; 10%; Cer. Disc	047-201182	R27	150K ohm	451-252154	XV1, 2, 4, 5	Socket, Tube; 9 pin min.	006-000947
C21	8 mfd., 250V; Electrolytic	045-000721	R28	Resistor, Var., AUDIO GAIN; 500K ohm	025-001942	XY1	Socket, Crystal	006-100346
C25, 26	.001 mfd., 500V, GMV; Cer. Disc	047-200230	R29, 42	10 megohm	451-252106		Socket, Pilot light, left	086-000541
C28	.1 mfd., 400V, 20%; Moulded Paper	499-024104	R30	220K ohm	451-252224		Socket, Pilot light, right	086-000542
C29	22 mmf., 500V, 2%; Duramica	482-151220	R33	10K ohm, 10%; 1W	451-352103	TUBES AND LAMPS		
C31	56 mmf., 500V, 2%; Duramica	482-161560	R37	2.2 megohm	451-252225	V1	6AZ8; RF Amplifier, Crystal Marker	090-901417
C33	330 mmf., 500V, 2%; Duramica	482-161331	R38	1.8K ohm	451-252182	V2	6UBA; Mixer, Oscillator	090-901285
C35	265 mmf., 500V, 2%; Duramica	493-122650-334	R39	560 ohm	451-252561	V3	6BA6; IF Amplifier	090-901112
C37	175 mmf., 500V, 2%; Duramica	493-121750-334	R40	Resistor, Var., (Carrier Level Meter); 2K ohm	025-001943	V4	6TA; AVC, Det, ANL, 1st Audio Amplifier	090-901403
C39	59 mmf., 500V, ±2%; N470; Cer. Tub.	491-104590-83	R41	470K ohm	451-252474	V5	6AW8A; Carrier Level Meter Amplifier, Audio Output	090-901103
C41	Capacitor, Var.; CAL RESET	048-000510	R43	180 ohm	451-252181	LM1, 2	Pilot Lamp #47	039-100019
C42	Capacitor, Var.; MAIN TUNING	048-000494	R44	27 ohm, 10%; 1W	451-352270	MISCELLANEOUS PARTS		
C45	27 mmf., 500V, 2%; Duramica	482-151270	R45	10 ohm	451-252100	CR1	Cabinet Weld Assembly	150-900785
C50, 51	.01 mfd., 1400V, GMV; Cer. Disc	047-200752	R46	820 ohm, 10%; 2W	451-652821	CR2, 3	Chassis, Receiver	070-002025
C52, 53	40 mfd., 150V; Electrolytic	045-000725	R47	100K ohm, 10%; 1W	451-352104		Diode, Silicon	019-102354
C54	49 mfd., 250V; Electrolytic	045-000722	*All RESISTORS are 10%, 1/2 watt, carbon type, unless otherwise specified.				Rectifier, Silicon	027-000283
C58	56 mmf., N750, 5%; Cer. Tub.	491-105560-95	TRANSFORMERS				Dial Cord	038-000049
*RESISTORS			COILS				Dial Plate	063-005042
R1, 22, 23, 25, 36	1 megohm	451-252105	T1	Transformer, Power	052-000853		Dial Window (calibrated)	083-000915
R2	22 ohm	451-252220	T2, 3	Transformer, IF	050-000751		Front Panel Weld Assembly	150-000509
R3, 11	68 ohm	451-252680	T4	Transformer, Audio Output	055-000460		Knob, ANT TRIM, CAL RESET	015-001564
R4	Resistor, Var., R.F. GAIN, 12K ohm	025-002040	TRANSFORMERS				Knob, FUNCTION, BAND SELECTOR	015-201444
R5	10K ohm	451-252103	L1	Coil, Antenna (80 Meter Band)	051-002970		Knob, R.F. GAIN, AUDIO GAIN, SELECTIVITY-BFO	015-201258
R6, 12	33K ohm	451-252333	L2	Coil, Antenna (40 Meter Band)	051-002971		Knob, MAIN TUNING ASSEMBLY	015-301315
R7	15K ohm, 10%, 1W	451-352153	L3	Coil, Antenna (20 Meter Band)	051-002972		Lock, Line Cord	076-200397
R8, 14	1K ohm	451-252102	L4	Coil, Antenna (15 Meter Band)	051-002973		Pointer, Main Tuning	082-000489
R9, 19, 35	100K ohm	451-252104	L5	Coil, Antenna (10 Meter Band)	051-002974		Pointer, Track Assembly	150-000711
			L6	Coil, RF (6 Meter Band)	051-003156		Ring, Retaining	076-100883
			L7	Coil, RF (10 Meter Band)	051-003157		Carrier Level Meter	082-000492
			L8	Coil, RF (15 Meter Band)	051-003158	M1	Shaft, Main Tuning	074-002451
			L9	Coil, RF (20 Meter Band)	051-002966		Shield, Pilot Lamp	086-100037
			L10	Coil, RF (30 Meter Band)	051-002964		Spacer, Track	073-003695
			L11	Coil, Oscillator (6 Meter Band)	051-002963		Spring, Dial Cord	075-000838
			L12	Coil, Oscillator (10 Meter Band)	051-002962		Terminal Board, Antenna	088-202026
			L13	Coil, Oscillator (15 Meter Band)	051-002961		Terminal Board, 4 contact	088-002411
			L14	Coil, Oscillator (20 Meter Band)	051-002960		Terminal Board, Speaker	088-002412
			L15	Coil, Oscillator (40 Meter Band)	051-002959		Washer, Spring	004-002408
			L16	Coil, Oscillator (80 Meter Band)	051-002958	Y1	Crystal, Quartz	019-002720



- NOTES:
1. UNLESS OTHERWISE SPECIFIED: ALL RESISTORS ARE IN OHMS; 1.0% 1/2 WATT. ALL CAPACITORS ARE IN MFD, UNLESS OTHERWISE SPECIFIED. VOLTAGES ARE DC READ FROM POINT INDICATED TO POINT.
 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 R2B MAXIMUM AUDIO GAIN
 6. FOR FREQUENCY OF CRYSTAL USED & OPERATION OF CRYSTAL OSCILLATOR CIRCUIT REFER TO ALIGNMENT PROCEDURE PARAGRAPH. (1) CALIBRATION PROCEDURE PARAGRAPH. (2) ALIGNMENT PROCEDURE SECTION.
 7. CHASSIS GROUND

Figure 12. Schematic Drawing.

WARRANTY

The Hallicrafters Company warrants each part or component supplied with this kit to be free of defective material and workmanship, and agrees to replace any part or component that, under normal installation, use, and service, discloses such defect. Upon return of the intact part or component to the factory, 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 judgement that it is thus defective, it will be replaced.

This warranty does not extend to any parts or components supplied with this kit that have been subjected to misuse, neglect, accident, incorrect wiring, improper installation, or use in violation of instructions furnished by us, nor does this warranty extend to units that have been repaired or altered outside of our factory, or to accessories used therewith not of our own manufacture. No replacement will be made for parts damaged by the purchaser during the assembling or handling of this kit.

Hallicrafters liability under this warranty is limited to the replacement of the part or component part determined to be defective. The Hallicrafters Company assumes no liability for consequential damages including but not limited to personal injury, damage to property and loss of time. 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.

IMPORTANT NOTE

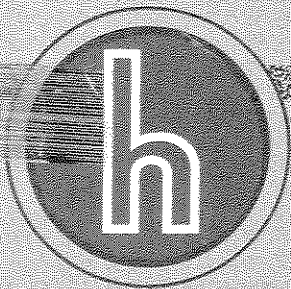
THIS WARRANTY WILL BE COMPLETELY VOID AND THE HALLCRAFTERS COMPANY WILL NOT REPLACE, REPAIR, OR SERVICE EQUIPMENT IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED.

The registration card furnished with each Hallicrafters kit must be completed and returned to The Hallicrafters Company immediately after purchase. The above warranty applies only to equipment that is registered with Hallicrafters.

ASSEMBLING
the

hallicrafters kit

model SX-140K
Receiver



the hallicrafters co.

4401 WEST FIFTH AVENUE • CHICAGO 24, ILLINOIS

WARRANTY

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INTRODUCTION

GENERAL

The Hallicrafters Model SX-140K Receiver Kit is so designed that it may be constructed by individuals with minimum electronic training or experience. The component parts have been carefully selected to insure excellent performance and long life. To eliminate errors in assembly, it is suggested that each step of the assembly procedure be read and performed with care. Take your time -- work carefully -- follow instructions. The result will be a quality receiver whose operation will give you great satisfaction.

MANUALS

Two manuals are packed with the Model SX-140K Receiver Kit: The Assembly Manual, "Assembling The Halli-Kit" (this manual), contains material to instruct the builder in the assembly of this kit. The Operation Manual, "Operating and Service Instructions," contains material designed to instruct the owner in operating procedures, system installation, alignment, trouble shooting, and any service problem which may arise. The builder is advised to read both manuals thoroughly prior to unpacking or constructing the kit. This will familiarize him with the parts and construction procedures.

The Assembly Manual includes fold-in pictorials. These pictorials may be fastened to the wall over the work area or placed where they can easily be referred to during the assembling of the receiver.

The manuals should be retained for future reference.

UNPACKING

After carefully reading the manuals, it is suggested that a clean, well-lighted work area be prepared before unpacking the kit. Remove the parts from the carton, check the quantity and description of each item against the parts check-off list on pages at the back of this manual and group them in assembly order. Place each group in a small container such as a cup-cake tin. Parts illustrations and chart information provided on pages 26 thru 31 help to identify and determine the value of the parts in the kit. If any part is missing, broken, or of the wrong value, notify the dealer from whom the kit was purchased or The Hallicrafters Company for authorization to return the broken or incorrect parts or to obtain the parts which are missing.

In general, the transformers, terminal strips, and tube sockets will be installed first; followed by the wiring harness, jumper wires, and smaller electrical components; the assembly of the front panel, mounting of the tuning capacitors, and installation of the band selector switch and tubes. If the parts are layed out in this general order, construction will be greatly simplified.

TOOLS REQUIRED

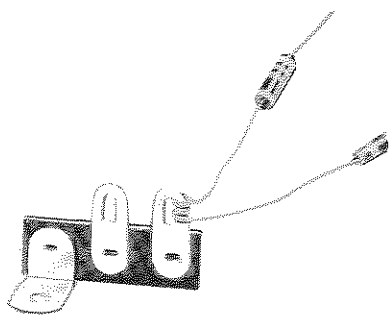
The Model SX-140K Receiver Kit can be constructed with standard tools. The builder should have long-nose pliers, diagonal or side-cutting pliers, a screwdriver with a 3/16-inch blade, a screwdriver with a 1/8-inch blade, and a soldering iron (preferably one with a heating element of not more than 60 watts) available.

SOLDERING TECHNIQUES

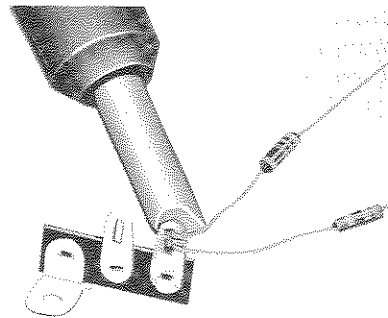
Proper soldering techniques are very important in the assembly of the kit. To obtain the performance engineered into this kit, it is essential that good solder joints be made. A good solder joint ensures an electrical connection and seals the joint from air and moisture to prevent corrosion which could introduce high resistance into the circuit. If the kit builder is unfamiliar with wiring and soldering, the following steps (illustrations A through E) should be carefully studied.

IMPORTANT: Only good quality, rosin core solder is to be used in the construction of this kit. A sufficient amount of rosin core solder is supplied with this kit. **NEVER** use acid core solder or a paste flux. The use of acid core solder or a paste flux will void the warranty on this equipment.

1. The soldering iron element or tip should be cleaned and tinned (covered with a thin coat of solder).

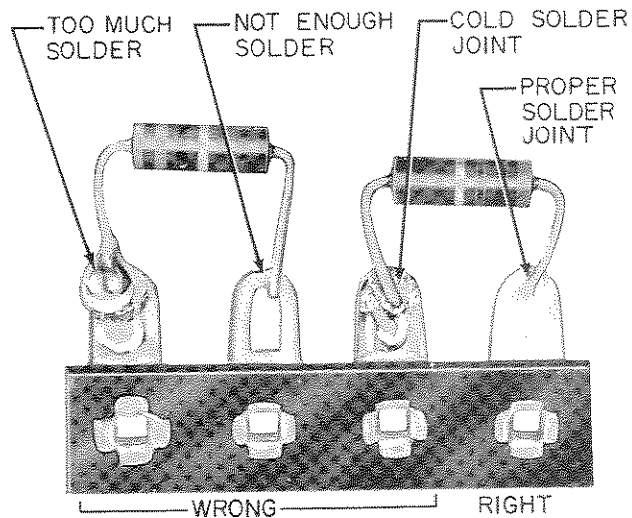


A. WIRED CONNECTION



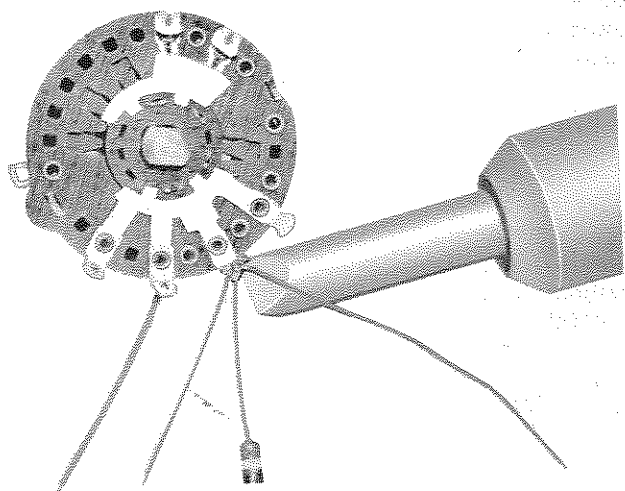
B. PROPER APPLICATION OF HEAT

092-010236



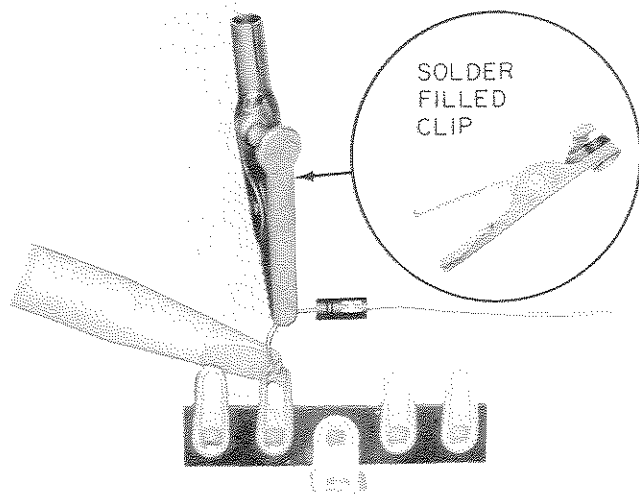
C. SOLDERED CONNECTIONS

092-010235



D. SOLDERING WAFER TERMINAL

092-010238



E. HEAT SINKING A DIODE

092-010551

Soldering Techniques

2. Before soldering, be sure the terminals and the leads are free from dirt and corrosion. Leads and terminals which are dirty or discolored (corroded) can be cleaned by scraping them with a knife.
3. Tin all wires and leads before making connections; this is accomplished by applying a small coating of solder to the lead.
4. Make a mechanical connection before soldering. Leads should be kept as short as possible on small items. Proper lead lengths are given for the individual parts as they are assembled. Leads should be trimmed as specified.
5. Apply heat to the connection with the flat portion of the soldering iron tip. **DO NOT** apply more heat than is necessary to allow the solder to flow evenly over the connection. Make certain that heat is applied to the whole connection (leads and solder terminal). If heat is not applied evenly, a cold solder joint will result and introduce resistance into the circuit.
6. Apply solder simultaneously to the connection and the tip of the soldering iron until the solder melts and flows around and into the connection. Apply only enough solder to cover the leads of the connection; do not apply an excessive amount of solder. Never move the component that is being soldered until after the solder has cooled or solidified.
7. When soldering to a lug on a switch wafer, the switch should be so positioned that the lug to be soldered is on the lower side of the wafer. It may be necessary to turn the chassis if the switch has already been installed. Apply heat and solder to the lower side of the lug; the solder will flow upward into the connection. This method of soldering will prevent the solder from running into the switch and shorting the contacts.
8. Components such as rectifiers (CR1, CR2, and CR3) should be protected from heat when soldering. Alligator clips filled with solder or long-nosed pliers placed on the lead between the component and the connection will conduct the heat away from the soldered component.

ASSEMBLY INSTRUCTIONS

GENERAL

Each step of the following assembly procedures should be read and understood in its entirety before it is performed. When each step is completed, place a check mark in the parentheses preceding the step.

Each assembly step involving the connection of wires or leads will be followed by a symbol, in parentheses, indicating if soldering is required or not. The symbols for soldering requirements are as follows: Do not solder - (DS), Solder 1 lead- (S-1), Solder 2 leads - (S-2), etc.

WARNING

DANGEROUS VOLTAGES EXIST ON BOTH THE TOP AND BOTTOM OF THE CHASSIS. CLOSE EXAMINATION OF THE SCHEMATIC DIAGRAM AND CIRCUIT ARRANGEMENT WILL POINT OUT THESE DANGER SPOTS. HOWEVER, PRECAUTIONS SHOULD BE TAKEN TO KEEP OTHER PEOPLE AWAY FROM THE RECEIVER WHILE IT IS TURNED ON, OR WHEN IT IS BEING WORKED ON.

SX-140K KIT INSTRUCTIONS

The SX-140K Receiver Kit is supplied to you with all of the required parts and hardware. The Antenna, RF interstage, and oscillator coils have been prewired to the band switch and pre-aligned. Under normal circumstances, readjustment of these coils will not be required. However, should readjustment be required due to component replacement, aging, or any other reason, refer to the alignment section in the Operating and Service Instruction Manual before attempting service or realignment.

STEP-BY-STEP ASSEMBLY PROCEDURE

MOUNTING TRANSFORMERS, SOCKETS, TERMINAL STRIPS, AND SPEED NUTS

(Refer To Pictorials 1 and 2 and Figures 1, 2, 3, and 4 when assembling this section)

1. (✓) Mount the power transformer T1 and a four-lug terminal strip, TS1, to the chassis with two No. 6 x 3/8 inch sems screws, two No. 6 flat washers, a No. 6 Kep nut, a No. 6 internal tooth lockwasher, and a No. 6 hex nut as shown in pictorial 1.
2. (✓) Mount a four-lug terminal strip, TS2, at chassis hole 5 with a No. 4 x 5/16 inch sems screw, a No. 4 lockwasher, and a No. 4 hex nut as shown in pictorial 2 and figure 1.
3. (✓) Mount the six-lug terminal strip TS3 at chassis hole 71 as in step 2.
4. (✓) Mount the three-lug terminal strip TS4 at chassis hole 14 as in step 2.
5. (✓) Mount the five-lug terminal strip TS5 at chassis hole 15 as in step 2.
6. (✓) Mount the three-lug terminal strip TS6 at chassis hole 16 as in step 2.
7. (✓) Mount the four-lug terminal strip TS8 at chassis hole 13 as in step 2.
8. (✓) Mount the 9-pin miniature tube sockets XV1, XV2, XV4, and XV5 in chassis holes 8, 9, 11, and 12 with No. 4 x 5/16 inch sems screws, No. 4 internal tooth lockwashers, and No. 4 hex nuts as shown in pictorial 2 and figure 3. Be sure that the open space in the socket's terminal arrangement is as shown in pictorial 2.
9. (✓) Mount the 7-pin miniature tube socket XV3 in chassis hole 10 with No. 4 x 5/16 inch sems screws, No. 4 lockwashers, and No. 4 hex nuts as shown in pictorial 2 and figure 3. Be sure that the open space in the socket terminal arrangement is as shown in pictorial 2.
10. (✓) Mount the single-pole double-throw (SPDT) slide switch S4 in chassis holes 35, 36, and 37 with No. 4 x 1/4 inch flat head screws as shown in pictorial 2. Be sure to bend the three terminal lugs back as shown in the pictorial.
11. (✓) Mount the double-pole double-throw (DPDT) slide switch S3 in chassis holes 32 and 33 with a No. 4 x 1/4 inch flat head screw. Mount a No. 4 solder lug at chassis hole 31, between the switch and the chassis front flange, with a No. 4 x 1/4 inch flat head screw as shown in pictorial 2. Be sure to bend each of the six terminal lugs as shown in the pictorial.
12. (✓) Mount the two-connector board TA1, marked with "A" & "G", at chassis holes 41, 66, 67 and 42 so that the letters (A&G) are located as shown in pictorial 2. Use two No. 4 x 5/16 inch sems screws, a No. 4 solder lug (hole 41), a No. 4 internal tooth lockwasher (hole 42), and two No. 4 hex nuts as shown in pictorial 2.
13. (✓) Mount the four-connector board TA2, marked 1,2,3, and 4 at chassis holes 43, 68, and 44 so that the numerals (1,2,3, and 4) are located as shown in pictorial 2. Use two No. 4 x 5/16 inch sems screws, two No. 4 internal tooth lockwashers, and two No. 4 hex nuts as shown in pictorial 2.
14. (✓) Mount the two-connector board TA3, marked SPKR and GND, at chassis holes 45, 69, 70, and 46 so that the letters (SPKR and GND) are located as shown in pictorial 2. Use two No. 4 x 5/16 inch sems screws, a No. 4 solder lug (hole 46), a No. 4 internal tooth lockwasher (hole 45), and two No. 4 hex nuts as shown in pictorial 2.
15. (✓) Mount R40, the 2K ohm, screwdriver adjustable potentiometer (control with slot in shaft), at chassis hole 47 by inserting the threaded bushing on the control through hole 47 and the locating tab in hole 64. Secure with a 3/8-inch, cadmium-plated pal nut as shown in pictorial 2.
16. (✓) Mount the crystal socket XY1 at chassis hole 25 with a No. 2 x 1/2 inch machine screw, a No. 2 internal tooth lockwasher, and a No. 2 hex nut as shown in pictorial 2.

17. (✓) Mount the audio output transformer T4 at chassis holes 17 and 18. Use a No. 6 x 3/8 inch sems screw and a No. 6 kep nut at hole 18 as shown in pictorial 2. Mount a six-lug terminal strip, TS7, at chassis hole 17. Use a No. 6 x 3/8 inch sems screw, a No. 6 internal tooth lockwasher, and a No. 6 x 1/4 inch hex nut at hole 17. Be sure to place the lockwasher between the chassis and terminal strip TS7.
18. (✓) Insert two Tinnerman speed nuts over the edge of the chassis, as shown in pictorial 2, so that the threaded side of the speed nut is located on the top of the chassis and over cut holes 20 and 21.
19. (✓) Insert four Tinnerman speed nuts over the edge of the chassis so that the threaded side of the speed nuts are located on the inside of the rear flange and are over holes 48, 49, 50, and 51.
20. (✓) Insert the 1/4-inch rubber grommet in chassis hole S.
21. (✓) Mount IF transformer T2 by inserting the four terminal lugs through the oblong chassis holes 57 and 59. Be sure that terminal lug No. 1 (Green Dot) is located as shown in pictorial 2. While holding the transformer firmly in place, insert the transformer mounting clip through chassis holes 56 and 58. Slide this clip up along the outside of the transformer until the clip snaps into the triangular shaped holes on the side of the IF transformer can (See figure 4).
22. (✓) Mount IF transformer T3 in chassis holes 61 and 63. Refer to step 21.

WIRING OF POWER TRANSFORMER T1 AND AUDIO TRANSFORMER T4

(Refer to Pictorial 3 when wiring this section)

- 7 23. (✓) Connect the short black lead from chassis hole X to terminal 3 of terminal strip TS1 (DS).
24. (✓) Connect the short red lead from chassis hole X to terminal 4 of terminal strip TS1 (DS).
25. (✓) Connect one of the green leads from chassis hole Y to terminal 3 of terminal strip TS2 (DS).
26. (✓) Connect the other green lead from chassis hole Y to terminal 4 of terminal strip TS2 (DS).

This completes the wiring of power transformer T1 (leads coming out of holes X and Y), except for the long black and red leads which will be connected later.

27. (✓) Locate the brown and white leads at chassis hole L. Connect the white lead to terminal 9 on tube socket XV5 (DS) and the brown lead to terminal 2 on terminal strip TS7 (DS).
28. (✓) Locate the yellow and black leads at chassis hole K. Connect the black lead to terminal 3 on terminal strip TS7 (DS) and connect the yellow lead to terminal 4 on terminal strip TS7 (DS).

This completes the wiring of the audio output transformer T4 (leads coming out of chassis holes K and L).

PRELIMINARY WIRING

(Refer to pictorial 3 for the wiring of this section.)

NOTE 1: Strip 3/8 inch of insulation off each end of all insulated wires used in the assembly of this kit before making a connection to any terminal. Leads or cut wires may be further trimmed if so desired.

29. (✓) Run a short piece of No. 22 bare tinned wire from the center post on tube socket XV2 (S-1), through socket terminal 4 (S-1), to socket GND lug 2 (DS).
30. (✓) Run a short piece of No. 22 bare tinned wire from the center post on tube socket XV3 (S-1), through socket terminal 3 (S-1), to socket GND lug 2 (DS).

31. (✓) Connect a short piece of No. 22 bare tinned wire to terminal 7 on tube socket XV4 (S-1). Run this wire through the socket center post (S-1), through socket terminal 4 (S-1), to socket GND lug 2 (S-1).
32. (✓) Connect a short piece of No. 22 bare tinned wire to terminal 4 on tube socket XV5 (S-1). Run this wire through the socket center post (S-1), through socket terminal 1 (S-1), to socket GND lug 1 (DS).
33. (✓) Connect a short piece of No. 22 bare tinned wire to terminal 7 on tube socket XV1 (S-1). Run this wire through the socket center post (S-1), through socket terminal 5 (S-1), to socket GND lug 3 (DS).
34. (✓) Connect a short piece of No. 22 bare tinned wire between terminal 2 on connector board TA1 (S-1) and the solder lug at chassis hole 41 (S-1).
35. (✓) Connect a 3-inch length of brown wire from terminal 5 on tube socket XV5 (S-1) to terminal 5 on tube socket XV4 (DS). (See Note 1.)
36. (✓) Connect a 6-inch length of yellow wire from terminal 2 on slide switch S4 (S-1) to terminal 1 on terminal strip TS4 (DS).
37. (✓) Connect a 4-inch length of yellow wire from terminal 1 on terminal strip TS4 (DS), to terminal 3 on tube socket XV4 (DS).
38. (✓) Connect a 3-inch length of red wire from terminal 8 on tube socket XV5 (DS) to terminal 3 on R40, the 2K ohm control (DS).
39. (✓) Connect a 3 1/2-inch length of red wire from terminal 1 on terminal strip TS8 (DS) to terminal 8 on tube socket XV5 (S-2).
40. (✓) Connect a 5-inch length of red wire from terminal 2 on terminal strip TS6 (DS) to terminal 4 on IF transformer T3 (DS).
41. (✓) Connect a 2-inch length of green wire from terminal 9 on tube socket XV1 (S-1) to terminal 2 on crystal socket XY1 (DS).

INSTALLATION AND WIRING OF CABLE HARNESS WH-1

(Refer to pictorial 3 when wiring this section)

NOTE 2: Each cable harness breakout is designated with the cable harness nomenclature (WH-1) and a letter suffix (a), (b), etc. (i.e., WH-1a).

42. (✓) Locate and position the cable harness WH-1 on the chassis as shown in pictorial 3.
43. (✓) Connect the white wire at WH-1a to terminal 3 on terminal strip TS5 (DS).
44. (✓) Locate the two red wires at WH-1a. Connect the shorter wire to terminal 4 (DS) and the longer wire to terminal 1 on terminal strip TS8 (DS).
45. (✓) Locate the three brown wires at WH-1a. Connect the two short wires to terminal 4 on tube socket XV3 (DS), and the longer wire to terminal 5 on tube socket XV4 (S-2).
46. (✓) Connect the red wire at WH-1b to terminal 4 on IF transformer T2 (DS).
47. (✓) Connect the two white wires at WH-1b to terminal 2 on IF transformer T2 (S-2).
48. (✓) Connect the two brown wires at WH-1c to terminal 5 on tube socket XV2 (S-2).
49. (✓) Connect the brown wire at WH-1d to terminal 4 on tube socket XV1 (DS).
50. (✓) Connect the two white wires at WH-1e to terminal 1 on terminal strip TS7 (DS).
51. (✓) Connect the green wire at WH-1e to terminal 4 on terminal strip TS7 (S-2).

52. (✓) Connect the red wire at WH-1e to terminal 6 on terminal strip TS7 (DS).
53. (✓) Connect the yellow wire from WH-1e to terminal 2 on connector board TA3 (S-1).
54. (✓) Connect a short piece of No. 22 bare tinned wire to terminal 1 on connector board TA3 (DS) and to the solder lug at chassis hole 46 (S-1).
55. (✓) Connect the two red wires at WH-1f to terminal 1 on tube socket XV2 (DS).
56. (✓) Connect the two red wires at WH-1g to terminal 1 on terminal strip TS3 (DS).
57. (✓) Connect the yellow wire at WH-1g to terminal 2 on terminal strip TS3 (DS).
58. (✓) Connect the violet wire at WH-1g to terminal 4 on terminal strip TS3 (DS).
59. (✓) Connect the orange wire at WH-1g to terminal 6 on terminal strip TS3 (DS).
60. (✓) Connect the red wire at WH-1h to terminal 2 on slide switch S3 (DS).
61. (✓) Connect the orange wire at WH-1h to terminal 4 on slide switch S3 (S-1).
62. (✓) Connect the yellow wire at WH-1h to terminal 3 on slide switch S3 (S-1).

This completes the installation and wiring of the cable harness WH-1 except for the black and violet wires at WH-1j and the red, black, white, yellow, and green wires at WH-1k which will be connected later.

INSTALLATION AND WIRING OF THE FUNCTION SWITCH S2

(Refer to figure 5 and pictorial 4 when wiring this section)

Locate cable harness WH-2 and function switch S2. The function switch is wired prior to installation. Place the function switch so that the locating key is as shown in figure 5 before wiring.

63. (✓) Connect one end of a 3-1/2-inch length of black wire to terminal 5 on the front of the wafer of switch S2 (DS).
64. (✓) Cut both leads of a 10K ohm, 1/2-watt resistor, R5, to 1/2-inch lengths. Connect one lead to terminal 4 on switch S2 (DS) and the other lead to terminal 5 on switch S2 (S-2).
65. (✓) Connect the yellow wire at WH-2a to terminal 3 on switch S2 (S-1).
66. (✓) Connect the violet wire at WH-2a to terminal 2 on switch S2 (S-1).
67. (✓) Connect the gray wire at WH-2a to terminal 12 on switch S2 (S-1).
68. (✓) Connect the orange wire at WH-2a to terminal 11 on switch S2 (S-1).
69. (✓) Connect the red wire at WH-2a to terminal 7 on switch S2 (DS).
70. (✓) Connect the blue wire at WH-2a to terminal 8 on switch S2 (DS).
71. (✓) Position the cable harness WH-2 in the chassis as shown in pictorial 4.

DO NOT MOUNT THE FUNCTION SWITCH S2 AT THIS TIME.

72. (✓) Connect the black wire at WH-1k to terminal 4 on switch S2 as shown in figure 5 (S-2).
73. (✓) Connect the white wire at WH-1k to terminal 9 on switch S2 (S-1).
74. (✓) Mount the function switch S2 in chassis hole 28 and insert the locating key in hole 65. Secure switch S2 with a black, 3/8-inch palnut and finger tighten only (this nut must be removed when installing the front panel).

75. (✓) Position the cable harness breakouts WH-2 in the chassis as shown in pictorial 4.
76. (✓) Connect the remaining black wire from the power transformer T1 to terminal 1 on the AC snap switch mounted on the rear of switch S2 (S-1).
77. (✓) Connect a 5-inch length of black wire from terminal 1 on terminal strip TS1 (DS) to terminal 2 on the AC snap switch on switch S2 (S-1).

This completes the installation and wiring of the function switch S2 except for resistor R15 which will connect to terminal 10 and red and blue wires which will connect to terminals 7 and 8 respectively.

CABLE HARNESS WH-2 INSTALLATION AND GENERAL WIRING

(Refer to pictorial 4 when wiring this section)

78. (✓) Connect the red wire at WH-2b to terminal 1 on terminal strip TS2 (DS).
79. (✓) Connect the brown wire at WH-2b to terminal 3 on terminal strip TS2 (DS).
80. (✓) Connect the orange wire at WH-2c to terminal 4 on connector board TA2 (S-1).
81. (✓) Connect the gray wire at WH-2c to terminal 3 on connector board TA2 (S-1).
82. (✓) Connect the yellow wire at WH-2c to terminal 2 on connector board TA2 (S-1).
83. (✓) Connect the violet wire at WH-2c to terminal 1 on connector board TA2 (S-1).
84. (✓) Connect the brown wire at WH-2c to terminal 4 on tube socket XY1 (S-2).
85. (✓) Connect the red wire at WH-2d to terminal 2 on terminal strip TS7 (S-2).
86. (✓) Connect the red wire at WH-2e to terminal 3 on terminal strip TS6 (DS).
87. (✓) Connect the blue wire at WH-2e to terminal 3 on control R40 (DS).
88. (✓) Connect the center conductor at one end of the blue shielded wire to terminal 8 on tube socket XV4 (DS).
89. (✓) Connect the shield braid of the same end of the shielded wire to GND lug 3 on tube socket XV4 (S-1).
90. (✓) Connect the center conductor of the other end of the shielded wire to terminal 3 on terminal strip TS4 (DS).
91. (✓) Connect the shield braid of this end of the shielded wire to terminal 2 on terminal strip TS4 (DS).
92. (✓) Connect a 3-inch length of green wire from terminal 6 on tube socket XV4 (S-1) to terminal 1 on IF transformer T3 (S-1).
93. (✓) Connect a 1-1/2-inch length of blue wire from terminal 3 on IF transformer T3 (S-1) to terminal 5 on tube socket XV3 (S-1).
94. (✓) Connect a 2-inch length of green wire from terminal 1 on tube socket XV3 (S-1) to terminal 1 on IF transformer T2 (S-1).
95. (✓) Connect a 3-inch length of blue wire from terminal 3 on IF transformer T2 (S-1) to terminal 6 on tube socket XV2 (S-1).
96. (✓) Connect a 9-1/2-inch length of violet wire from terminal 3 on slide switch S4 (S-1) to terminal 2 on tube socket XV4 (DS).

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97. (✓) Connect a 2-1/2-inch length of white wire from terminal 6 on tube socket XV5 (DS) to terminal 5 on terminal strip TS7 (DS).
98. (✓) Connect a 5-inch length of white wire from terminal 2 on tube socket XV5 (DS) to terminal 2 on terminal strip TS5 (DS).

This completes the installation and general wiring of cable harness WH-2.

PRELIMINARY COMPONENT PART WIRING

(Refer to pictorial 5 when wiring this section)

99. (✓) Cut two 5/8-inch lengths of sleeving, place one length on each lead of a 10 mfd, 50V, electrolytic capacitor, C49, trim both leads so that only 3/8 inch remains beyond the sleeving. Connect the positive (+) lead to terminal 6 on tube socket XV5 (S-2) and the other lead to terminal 3 on terminal strip TS7 (DS).
100. (✓) Cut both leads of a 180 ohm, 1/2-watt resistor, R43, to 1/2-inch lengths. Connect one lead to terminal 5 on terminal strip TS7 (DS) and the other lead to terminal 1 on connector board TA3 (S-2). *Brown gray Brown*
101. (✓) Cut both leads of a .005 mfd, 500V, ceramic disc capacitor, C48, to 1/2-inch lengths. Connect one lead to terminal 9 on tube socket XV5 (S-2) and the other lead to GND lug 4 on tube socket XV5 (S-1).
102. (✓) Cut both leads of a 470K ohm, 1/2-watt resistor, R41 to 3/4-inch lengths. Connect one lead to GND lug 1 on tube socket XV5 (S-2). Connect the other lead to terminal 7 on tube socket XV5 (DS). *yellow violet orange yellow*
103. (✓) Cut both leads of a .01 mfd, 500V, ceramic disc capacitor, C56, to 1/2-inch lengths. Connect one lead to terminal 3 on tube socket XV5 (DS) and the other lead to GND lug 3 on tube socket XV5 (S-1).
104. (✓) Cut both leads of an 1800 ohm, 1/2-watt resistor, R38, to 1/2-inch lengths. Connect one lead to terminal 3 on tube socket XV5 (S-2) and the other lead to terminal 3 on terminal strip TS6 (DS). *Brown gray red*
105. (✓) Cut two 3/4-inch lengths of sleeving, place one length on each lead of a 2200 ohm, 1/2-watt resistor, R21, and trim both leads so that only 3/8 inch remains beyond the sleeving. Connect one lead to terminal 2 on terminal strip TS6 (DS) and the other lead to terminal 3 on control R40 (DS). *red red red*
106. (✓) Cut both leads of a 1000 ohm, 1/2-watt resistor, R14, to 1-1/4-inch lengths. Pass one end through terminal 3 on control R40 (S-4) and connect it to terminal 2 (S-1). Connect the other lead to terminal 6 on terminal strip TS7 (S-2). *Brown Black Red*
107. (✓) Cut two 1-inch lengths of sleeving, place one length on each lead of an 8 mfd, 250V, electrolytic capacitor, C21, and trim both leads so that only 3/8 inch remains beyond the sleeving. Connect the positive (+) lead to terminal 2 on terminal strip TS6 (S-3) and the other lead to terminal 2 on terminal strip TS8 (DS).
108. (✓) Cut both leads of a 2.2 megohm, 1/2-watt resistor, R37, to 1/2-inch lengths. Connect one lead to terminal 2 on tube socket XV5 (DS), and the other lead to terminal 1 on terminal strip TS6 (DS). *Red Red green*
109. (✓) Cut both leads of a .02 mfd, 500V, ceramic disc capacitor, C55, to 1/2-inch lengths. Connect one lead to terminal 2 on tube socket XV5 (S-3) and the other lead to terminal 1 on terminal strip TS6 (DS).
110. (✓) Cut both leads of a 560 ohm, 1/2-watt resistor, R39, to 3/4-inch lengths. Connect one lead to terminal 3 on terminal strip TS6 (S-3) and the other lead to terminal 1 on control R40 (S-1). *green blue Brown*

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111. (✓) Cut both leads of a .01 mfd, 500V, ceramic disc capacitor, C3, to 5/8-inch lengths. Connect one lead to terminal 1 on terminal strip TS7 (DS) and the other lead to terminal 3 on terminal strip TS7 (DS).
112. (✓) Cut both leads of a 10 megohm, 1/2-watt resistor, R42, to 1-1/4-inch lengths. Connect one lead to terminal 5 on terminal strip TS7 (S-3) and the other lead to terminal 1 on terminal strip TS7 (DS). *Brown Black Blue*
113. (✓) Cut both leads of a 10 megohm, 1/2-watt resistor, R29, to 3/4-inch lengths. Feed one lead through GND lug 1 on tube socket XV4 (S-1) and connect it to terminal 1 on socket XV4 (S-1). Connect the other lead to terminal 8 on tube socket XV4 (S-2).
114. (✓) Cut both leads of a .1 mfd, 200V, molded paper capacitor, C24, to 5/8-inch lengths. Connect one lead to terminal 1 on terminal strip TS6 (DS) and the other lead to terminal 5 on terminal strip TS5 (DS).
115. (✓) Cut both leads of a .001 mfd, 500V, ceramic disc capacitor, C25, to 5/8-inch lengths. Connect one lead to terminal 1 on terminal strip TS6 (S-4) and the other lead to terminal 3 on tube socket XV4 (DS).
116. (✓) Cut both leads of a 1 megohm, 1/2-watt resistor, R23, to 1/2-inch lengths. Connect one lead to terminal 3 on tube socket XV4 (S-3) and the other lead to terminal 5 on terminal strip TS5 (DS). *Brown Black green*
117. (✓) Cut both leads of a 150K ohm, 1/2-watt resistor, R27, to 1/2-inch lengths. Connect one lead to terminal 2 on tube socket XV4 (DS) and the other lead to terminal 4 on terminal strip TS5 (S-1). *Brown green yellow*
118. (✓) Cut both leads of a 270K ohm, 1/2-watt resistor, R26, to 1-inch lengths. Connect one lead to terminal 2 on tube socket XV4 (S-3) and the other lead to terminal 1 on terminal strip TS5 (DS). *Red violet yellow*
119. (✓) Cut both leads of a .1 mfd, 200V, molded paper capacitor, C23, to 3/4-inch lengths. Connect one lead to terminal 2 on terminal strip TS4 (DS) and the other lead to terminal 3 on terminal strip TS5 (DS).
120. (✓) Cut both leads of a 1 megohm, 1/2-watt resistor, R22, to 1-1/8-inch lengths. Connect one lead to terminal 5 on terminal strip TS5 (S-3) and the other lead to terminal 2 on IF transformer T3 (DS). *Brown Black green*
121. (✓) Cut both leads of a 47K ohm, 1/2-watt resistor, R24, to 1-inch lengths. Connect one lead to terminal 2 on IF transformer T3 (DS) and the other lead to terminal 1 on terminal strip TS5 (DS). *yellow violet orange*
122. (✓) Cut both leads of a 1 megohm, 1/2-watt resistor, R25, to 1/2-inch lengths. Connect one lead to terminal 1 on terminal strip TS5 (DS) and the other lead to terminal 2 on terminal strip TS5 (S-2). *Brown Black green*
123. (✓) Cut both leads of a 1 megohm, 1/2-watt resistor, R36, to 3/4-inch lengths. Connect one lead to terminal 1 on terminal strip TS5 (DS) and the other lead to terminal 3 on terminal strip TS5 (S-3).
124. (✓) Cut both leads of a 100 mmf, 500V, ceramic disc capacitor, C22, to 1/2-inch lengths. Connect one lead to terminal 1 on terminal strip TS5 (S-5) and the other lead to terminal 2 on terminal strip TS4 (DS).
125. (✓) Cut two 1-inch lengths of sleeving, place one length on each end of a 22K ohm, 1/2-watt resistor, R20, and trim both leads so that only 3/8 inch remains beyond the sleeving. Connect one lead to terminal 4 on IF transformer T3 (DS) and the other lead to terminal 6 on tube socket XV3 (DS). *Red Red orange*

126. (✓) Cut both leads of a .01 mfd, 500V, ceramic disc capacitor, C19, to 1/2-inch lengths. Connect one lead to terminal 6 on tube socket XV3 (S-2) and the other lead to GND lug 4 on tube socket XV3 (DS).
127. (✓) Cut both leads of a .01 mfd, 500V, ceramic disc capacitor, C18, to 5/8-inch lengths. Connect one lead to terminal 2 on terminal strip TS4 (DS) and the other lead to terminal 4 on IF transformer T3 (DS).
128. (✓) Cut both leads of a 100 mmf, 500V, ceramic disc capacitor, C20, to 1-inch lengths. Connect one lead to terminal 2 on IF transformer T3 (S-3) and the other lead to GND lug 4 on tube socket XV3 (S-2).
129. (✓) Cut both leads of a .01 mfd, 500V, ceramic disc capacitor, C14, to 5/8-inch lengths. Connect one lead to terminal 4 on IF transformer T2 (DS) and the other lead to GND lug 1 on tube socket XV3 (DS).
130. (✓) Cut both leads of a .01 mfd, 500V, ceramic disc capacitor, C17, to 1/2-inch lengths. Connect one lead to terminal 7 on tube socket XV3 (DS) and the other lead to GND lug 1 on tube socket XV3 (S-2).
131. (✓) Cut both leads of the small silicon diode, CR1 ("H" on one end), to 3/4-inch lengths. Connect the end with the "H" to terminal 2 on tube socket XV3 (DS) and the other end to GND lug 2 on tube socket XV3 (DS). CAUTION: WHEN INSTALLING THIS DIODE USE HEAT SINK. REFER TO STEP 8 OF SOLDERING TECHNIQUES. DO NOT OVERHEAT.
132. (✓) Cut two 1-inch lengths of sleeving, place one length on each end of a .1 mfd, 400V, molded paper capacitor, C28, and trim both leads so that only 3/8 inch remains beyond the sleeving. Connect one lead to terminal 3 on terminal strip TS8 (DS) and the other lead to terminal 2 on terminal strip TS8 (S-2). *check to have*
133. (✓) Cut both leads of a 220K ohm, 1/2-watt resistor, R30, to 5/8-inch lengths. Connect one lead to terminal 3 on terminal strip TS8 (DS) and the other lead to terminal 9 on tube socket XV4 (DS). *Red Red yellow*
134. (✓) Cut two 1-1/4-inch lengths of sleeving, place one length on each end of a .01 mfd, 500V, ceramic disc capacitor, C47, and trim both leads so that only 3/8 inch remains beyond the sleeving. Connect one lead to terminal 9 on tube socket XV4 (S-2) and the other lead to terminal 7 on tube socket XV5 (S-2).
135. (✓) Cut both leads of a 47K ohm, 1/2-watt resistor, R31, to 1/2-inch lengths. Connect one lead to terminal 1 on terminal strip TS8 (DS) and the other lead to terminal 3 on terminal strip TS8 (S-3). *Yellow black orange*
136. (✓) Cut both leads of a 10K ohm, 1-watt resistor, R33, to 3/4-inch lengths. Connect one lead to terminal 1 on terminal strip TS8 (DS) and the other lead to terminal 4 on terminal strip TS8 (S-2). *Brown black orange*
137. (✓) Cut the positive (+) lead of a 40 mfd, 250V, electrolytic capacitor, C54, to 1-1/4 inches and the negative (-) lead to 5/8 inch. Connect the positive (+) lead to terminal 1 on terminal strip TS8 (S-5) and the negative (-) lead to terminal 3 on terminal strip TS7 (S-4).
138. (✓) Cut both leads of a 100K ohm, 1/2-watt resistor, R9, to 1/2-inch lengths. Connect one lead to terminal 2 on tube socket XV2 (DS) and the other lead to GND lug 2 on tube socket XV2 (DS). *Brown black yellow*
139. (✓) Cut both leads of a .01 mfd, 500V, ceramic disc capacitor, C15, to 1/2-inch lengths. Connect one lead to terminal 3 on tube socket XV2 (DS) and the other lead to GND lug 2 on tube socket XV2 (S-3).
140. (✓) Cut both leads of a 15K ohm, 1/2-watt resistor, R13, to 1-inch lengths. Connect one lead to terminal 3 on tube socket XV2 (DS) and the other lead to GND lug 3 on tube socket XV2 (DS). *Brown green orange*

141. (✓) Cut both leads of a 33K ohm, 1/2-watt resistor, R12, to 1-inch lengths. Connect one lead to terminal 4 on IF transformer T2 (S-3) and the other lead to terminal 3 on tube socket XV2 (S-3). *orange orange orange*
142. (✓) Cut both leads of a 22K ohm, 1/2-watt resistor, R32, to 1/2-inch lengths. Connect one lead to terminal 9 on tube socket XV2 (DS) and the other lead to GND lug 4 on tube socket XV2 (S-1). *red red orange*
143. (✓) Cut both leads of a 68 ohm, 1/2-watt resistor, R11, to 1/2-inch lengths. Connect one lead to terminal 7 on tube socket XV2 (DS) and the other lead to terminal 2 on terminal strip TS3 (S-2). *Blue gray Black*
144. (✓) Cut both leads of a .01 mfd, 500V, ceramic disc capacitor, C13, to 1/2-inch lengths. Connect one lead to terminal 7 on tube socket XV2 (S-2) and the other lead to GND lug 3 on tube socket XV2 (S-2).
145. (✓) Cut both leads of a .02 mfd, 500V, ceramic disc capacitor, C44, to 1/2-inch lengths. Connect one lead to GND lug 1 on tube socket XV2 (S-1) and the other lead to terminal 1 on tube socket XV2 (S-3).
146. (✓) Cut both leads of a 10 mfd, duramica capacitor, C12, to 1/2-inch lengths. Connect one lead to terminal 8 on tube socket XV2 (DS) and the other lead to terminal 2 on tube socket XV2 (DS).
147. (✓) Cut both leads of a 15K ohm, 1-watt resistor, R7, to 3/4-inch lengths. Connect one lead to terminal 2 on tube socket XV1 (DS) and the other lead to terminal 5 on terminal strip TS3 (DS). *Brown green orange*
148. (✓) Cut two 5/8-inch lengths of sleeving, place one length on each lead of a 1K ohm, 1/2-watt resistor, R8, and trim both leads so that only 3/8 inch remains beyond the sleeving. Connect one lead to terminal 1 on terminal strip TS3 (S-3) and the other lead to terminal 5 on terminal strip TS3 (DS). *Brown Black Red*
149. (✓) Cut both leads of a .005 mfd, 500V, ceramic disc capacitor, C5, to 3/8-inch lengths. Connect one lead to terminal 3 on terminal strip TS3 (DS) and the other lead to terminal 4 on terminal strip TS3 (DS).
150. (✓) Cut two 5/8-inch lengths of sleeving, place one length on each lead of a 68 ohm, 1/2-watt resistor, R3, and trim both leads so that only 3/8 inch remains beyond the sleeving. Connect one lead to terminal 4 on terminal strip TS3 (S-3) and the other lead to terminal 3 on tube socket XV1 (DS). *Blue gray Black*
151. (✓) Cut both leads of a .005 mfd, 500V, ceramic disc capacitor, C8, to 5/8-inch lengths. Connect one lead to terminal 3 on terminal strip TS3 (S-2) and the other lead to terminal 5 on terminal strip TS3 (DS).
152. (✓) Cut both leads of a 33K ohm, 1/2-watt resistor, R6, to 1/2-inch lengths. Connect one lead to terminal 2 on tube socket XV1 (DS) and the other lead to GND lug 2 on tube socket XV1 (DS).
153. (✓) Cut both leads of a .01 mfd, 500V, ceramic disc capacitor, C7, to 1/2-inch lengths. Connect one lead to GND lug 1 on tube socket XV1 (S-1) and the other lead to terminal 2 on tube socket XV1 (S-3). *orange orange orange*
154. (✓) Cut both leads of a .01 mfd, 500V, ceramic disc capacitor, C4, to 1/2-inch lengths. Connect one lead to terminal 3 on tube socket XV1 (S-2) and the other lead to GND lug 2 on tube socket XV1 (S-2).
155. (✓) Cut both leads of a 47K ohm, 1/2-watt resistor, R34, to 1/2-inch lengths. Connect one lead to GND lug 3 on tube socket XV1 (DS) and the other lead to terminal 2 on crystal socket XY1 (DS). *yellow violet orange*

156. (✓) Cut both leads of a 27 mmf, 500V, duramica capacitor, C45, to 1/2-inch lengths. Connect one lead to GND lug 3 on tube socket XV1 (DS) and the other lead to terminal 2 on crystal socket XY1 (S-3).
157. (✓) Cut both leads of a .005 mfd, 500V, ceramic disc capacitor, C46, to 5/8-inch lengths. Connect one lead to terminal 8 on tube socket XV1 (DS) and the other lead terminal 1 on crystal socket XY1 (DS).
158. (✓) Cut both leads of a 56 mmf, ceramic capacitor, C58, to 5/8-inch lengths. Connect one lead to GND lug 3 on tube socket XV1 (S-4) and the other lead to terminal 1 on crystal socket XY1 (S-2).
159. (✓) Cut both leads of a 100K ohm, 1/2-watt resistor, R35, to 1/2-inch lengths. Connect one lead to terminal 8 on tube socket XV1 (S-2) and the other lead to terminal 6 on terminal strip TS3 (S-2). *Brown Black yellow*
160. (✓) Cut both leads of a 1 megohm, 1/2-watt resistor, R1, to 1-inch lengths. Connect one lead to terminal 1 on terminal strip TS7 (S-5) and the other lead to terminal 6 on tube socket XV1 (DS).
161. (✓) Cut both leads of a .01 mfd, 1400V, ceramic disc capacitor, C51, to 1/2-inch lengths. Connect one lead to terminal 1 on terminal strip TS1 (DS) and the other lead to terminal 2 on terminal strip TS1 (DS).
162. (✓) Cut both leads of a .01 mfd, 1400V, ceramic disc capacitor, C50, to 1/2-inch lengths. Connect one lead to terminal 2 on terminal strip TS1 (DS) and the other lead to terminal 3 on terminal strip TS1 (DS).
163. (✓) Cut both leads of a 10 ohm, 1/2-watt resistor, R45, to 1-1/8-inch lengths. Connect one lead to terminal 2 on terminal strip TS2 (DS) and the other lead to terminal 4 on terminal strip TS1 (S-2). *Brown Black Black*
164. (✓) Cut both leads of silicon diode (Type 2E4), CR3, to 1-inch lengths. Connect the lead from the round yellow end to terminal 2 on terminal strip TS1 (S-3). CAUTION: USE HEAT SINK, REFER TO STEP 8 OF SOLDERING TECHNIQUES. DO NOT OVERHEAT. Connect the remaining lead to terminal 2 on terminal strip TS2 (DS).
165. (✓) Cut both leads of a silicon diode (Type 2E4), CR2, to 3/4-inch lengths. Connect the lead from the round yellow end to terminal 2 on terminal strip TS2 (S-3). CAUTION: USE HEAT SINK, REFER TO STEP 8 OF SOLDERING TECHNIQUES. DO NOT OVERHEAT. Connect the other lead to terminal 1 on terminal strip TS2 (DS). *ok*

This completes the preliminary component part wiring.

MOUNTING THE TUNING CAPACITORS

(Refer to pictorial 6 when wiring this section)

NOTE

During the following assembly procedures, extreme care must be exercised in the handling of the chassis to prevent bending or damage to the capacitor shafts. The plates of the capacitors should be fully closed (meshed) to prevent damage.

166. (✓) Bend the terminals of C1, C41, and C42, the ANT TRIM capacitor, the CAL RESET capacitor, and MAIN TUNING capacitor respectively, straight out from the body of the capacitor as shown in pictorial 6.
167. (✓) Mount capacitors C41 and C42 to the capacitor mounting bracket with eight No. 4 x 3/16 inch sems screws as shown in pictorial 6. Make certain that the capacitor terminals do not touch the mounting bracket.

168. (✓) Mount the end of the capacitor bracket assembly closest to C42, to the chassis at chassis hole 19 with a No. 6 x 3/8 inch sems screw and a No. 6 kep nut.
169. (✓) Mount the opposite end of the bracket assembly and a 4-lug terminal strip, TS9, to the chassis at chassis hole 6 with a No. 6 x 3/8 inch sems screw, a No. 6 internal tooth lock-washer, and a No. 6 hex nut.
170. (✓) Mount C1, the ANT TRIM capacitor, to the chassis with four No. 4 x 1/2 inch sems screws and four No. 4 x 5/16 inch spacers, at chassis holes 52, 53, 54, and 55.

This completes the mounting of the tuning capacitors.

ASSEMBLY, WIRING, AND MOUNTING OF THE FRONT PANEL

(Refer to pictorial 7 and figure 6 when assembling this section)

171. (✓) Locate the front panel and lay it face down on a soft cloth or other surface that will not scratch or mar the panel.
172. (✓) Locate the background plate and the calibrated dial window. Place the calibrated dial window over the opening in the front panel with the printed side of the window facing up, being careful not to leave fingerprints on the dial.

NOTE: The top of the printed characters should be toward the top of the panel. DO NOT INSTALL THE DIAL WINDOW BACKWARDS.

173. (✓) Place the background plate with the open side over the four weld studs on the back of the panel. Make certain that the plastic dial scale fits properly in the background plate.
174. (✓) Place the right-hand pilot lamp bracket over weld stud No. 1. Place a No. 6 solder lug over this weld stud and secure with a No. 6 hex nut.
175. (✓) Place the left hand pilot lamp bracket over weld stud No. 2 and secure with a No. 6 kep nut.
176. (✓) Place the No. 6 x 3/8 inch brass spacers over weld studs No. 3 and No. 4. Place the pointer track assembly over weld studs No. 3 and No. 4 and secure with two No. 6 internal tooth lockwashers and two No. 6 x 1/4 inch hex nuts.
177. (✓) Assemble the tuning shaft, spring washer, shaft bushing, and retaining "C" washer as follows. Apply a small amount of vaseline to the tuning shaft making sure that no vaseline comes in contact with the grooved portion where the dial cord will ride.

Refer to the cutaway view of pictorial 7.

- a. Place the spring washer on the tuning shaft with the spring edge of the washer away from the shaft shoulder.
- b. Insert the tuning shaft into the shaft bushing.
- c. Compress the spring washer between the shaft and the bushing until the retaining "C" washer can be inserted into the groove on the tuning shaft, behind the shaft bushing.
- d. Place the open ends of the retaining "C" washer into the groove and snap in place with long-nosed pliers.

178. (✓) Mount the completed tuning shaft assembly to the front panel with a 3/8-inch, black palnut.
179. (✓) Connect a 7-inch length of blue wire under the positive (+) terminal screw on meter M1.
180. (✓) Connect a 7-inch length of red wire under the negative (-) terminal screw on meter M1.

181. (✓) Feed the red and blue leads from meter M1 through the meter hole in the front panel, and place the meter mounting clip over the meter. While holding the meter securely against the front panel, push the meter clip tightly against the background plate and the front panel.
182. (✓) Fold the meter insulator cover as shown in figure 6 and install it on the meter by removing the two screws from the top of M1, as shown in the cutaway of pictorial 7. Holding the top of the meter in place, pass the red and blue leads through the front and out the holes in the rear of the insulator cover. Align the holes on top of the cover over the holes on the meter and secure with the removed meter screws.
183. (✓) Connect a 3-inch length of black wire to the No. 6 solder lug at weld stud No. 1 (S-1).
184. (✓) Install the pilot lamps LM1 and LM2 into their sockets, and clip the sockets onto the brackets as shown. Install the shield over pilot lamp LM2.

This completes the front panel assembly.

MOUNTING THE FRONT PANEL TO THE CHASSIS

(Refer to pictorial 8 when assembling this section)

185. (✓) Remove the palnut from the function switch S2. While holding S2 in place, mount the front panel assembly onto the chassis by inserting the function switch shaft through the FUNCTION hole on the panel. Replace and finger tighten the palnut.
186. (✓) Install the 500K ohm Audio Gain control, R28, in chassis hole 39. Insert the locating tab in chassis hole 74 and secure with a 3/8-inch, black palnut.
187. (✓) Install the 12K ohm, RF Gain control, R4, in chassis hole 34. Insert the locating tab in chassis hole 72 and secure with a 3/8-inch, black palnut.
188. (✓) Install the 2K ohm, Selectivity-BFO control, R17, in chassis hole 38. Insert the locating tab in chassis hole 73 and secure with a 3/8-inch, black palnut.
189. (✓) Install the phone jack J1 in chassis hole 29 so that the arm is toward the chassis, as shown in pictorial 8, and secure with a 3/8-inch, nickel-plated flat washer and hex nut.

This completes mounting the front panel to the chassis.

FRONT PANEL AND CHASSIS WIRING

(Refer to pictorial 8 when wiring this section)

190. (✓) Feed the black wire from the No. 6 solder lug at weld stud No. 1 through hole T and connect it to terminal 2 on terminal strip TS4 (DS).
191. (✓) Cut both leads of a .001 mfd, 500V, ceramic disc capacitor, C26, to 3/4-inch lengths. Connect one lead to terminal 1 on resistor R28 (S-1) and the other lead to terminal 1 on terminal strip TS4 (S-3).
192. (✓) Cut both leads of a .005 mfd, 500V, ceramic disc capacitor, C27, to 5/8-inch lengths. Connect one lead to terminal 2 on resistor R28 (S-1) and the other lead to terminal 3 on terminal strip TS4 (S-2).
193. (✓) Connect a short piece of No. 22 bare tinned wire from terminal 3 on resistor R28 (S-1) to terminal 2 on terminal strip TS4 (S-6).
194. (✓) Feed the white lead from pilot lamp, LM2, through chassis hole T and connect to terminal 4 on tube socket XV3 (S-3).
195. (✓) Connect a 3-inch length of black wire from terminal 1 on control R17 (S-1) to GND lug 2 on tube socket XV3 (DS).
196. (✓) Cut both leads of a 10 mfd, 50V, electrolytic capacitor, C16, to 3/4-inch lengths. Connect the positive (+) lead to terminal 2 on control R17 (DS) and the negative (-) lead to GND lug 2 on tube socket XV3 (S-4). CAUTION: USE HEAT SINK, REFER TO STEP 8 OF SOLDERING TECHNIQUES. DO NOT OVERHEAT.

197. (✓) Cut both leads of a 1.5K ohm, 1/2-watt resistor, R16, to 1-1/4-inch lengths. Connect one lead to terminal 2 on control R17 (S-2) and the other lead to terminal 2 on tube socket XV3 (S-2). CAUTION: USE HEAT SINK, REFER TO STEP 8 OF SOLDERING TECHNIQUES. DO NOT OVERHEAT.
198. (✓) Cut both leads of a 100K ohm, 1/2-watt resistor, R19, to 1-3/8-inch lengths. Connect one lead to terminal 3 on control R17 (S-1) and the other lead to terminal 4 on IF transformer T3 (S-4). *Brown Black yellow*
199. (✓) Connect the black wire at cable harness breakout WH-1j to terminal 1 on control R4 (DS).
200. (✓) Connect an 82 ohm, 1/2-watt resistor, R18, from terminal 1 on control R4 (S-2) to terminal 7 on tube socket XV3 (S-2). *gray Red Black*
201. (✓) Connect the violet wire at WH-1j to terminal 2 on control R4 (DS).
202. (✓) Cut two 3/4-inch lengths of sleeving, place one length on each lead of a 47K ohm, 1/2-watt resistor, R10, and trim both leads so that only 3/8 inch remains beyond the sleeving. Connect one lead to terminal 2 on slide switch S3 (S-2) and the other lead to terminal 2 on control R4 (DS). *yellow violet orange*
203. (✓) Feed one end of a 5-1/2-inch length of violet wire through terminal 3 on control R4 (DS) to terminal 2 on control R4 (S-3). Connect the other lead to terminal 1 on slide switch S3 (S-1).
204. (✓) Cut both leads of a .1 mfd, 200V, molded paper capacitor, C6, to 1-1/8-inch lengths. Connect one lead to terminal 3 on control R4 (S-2) and the other lead to solder lug 1 on slide switch S3 (DS).
205. (✓) Run a short piece of No. 22 bare tinned wire from solder lug 1 on slide switch S3 (S-2) to terminal 5 on slide switch S3 (S-1).
206. (✓) Cut both leads of a 27 ohm, 1-watt resistor, R44, to 3/4-inch lengths. Connect one lead to terminal 1 on jack J1 (DS) and the other lead to terminal 3 on jack J1 (DS).
207. (✓) Connect the green wire at WH-1k to terminal 3 on jack J1 (S-2).
208. (✓) Connect the yellow wire at WH-1k to terminal 2 on jack J1 (S-1).
209. (✓) Connect the red wire at WH-1k to terminal 1 on terminal strip TS9 (DS).
210. (✓) Connect the black wire from terminal 5 on function switch S2 to terminal 3 on terminal strip TS9 (DS).
211. (✓) Feed the white wire from pilot lamp socket LM1 through chassis hole N and connect it to terminal 3 on terminal strip TS2 (S-3).
212. (✓) Feed the red and blue wires from the meter M1 through chassis hole N. Connect the red wire to terminal 7 on switch S2 (S-2). Connect the blue wire to terminal 8 on switch S2 (S-2).
213. (✓) Cut both leads of a 47K ohm, 1/2-watt resistor, R15, to 3/4-inch lengths. Connect one lead to terminal 1 on jack J1 (S-2) and the other lead to terminal 10 on switch S2 (S-1).
214. (✓) Connect the red lead from the power transformer T1 to terminal 4 on terminal strip TS9 (DS).
215. (✓) Connect a 1-3/4-inch length of red wire from terminal 4 on terminal strip TS9 (DS) to terminal 2 on terminal strip TS9 (DS).
216. (✓) Cut both leads of a 40 mfd, 150V, electrolytic capacitor, C52, to 5/8-inch lengths. Connect the positive (+) lead to terminal 1 on terminal strip TS2 (DS) and the negative (-) lead to terminal 4 on terminal strip TS9 (S-3).

217. (✓) Cut both leads of a 40 mfd, 150V, electrolytic capacitor, C53, to 5/8-inch lengths. Connect the positive (+) lead to terminal 2 on terminal strip TS9 (S-2) and the negative (-) lead to terminal 4 on terminal strip TS2 (S-2).
218. (✓) Cut both leads of a 820 ohm, 2-watt resistor, R46, to 1-3/8-inch lengths. Connect one lead to terminal 1 on terminal strip TS9 (DS) and the other lead to terminal 1 on terminal strip TS2 (S-4). CAUTION: USE HEAT SINK, REFER TO STEP 8 OF SOLDERING TECHNIQUES. DO NOT OVERHEAT.
219. (✓) Cut both leads of a 100K ohm, 1-watt resistor, R47, to 5/8-inch lengths. Connect one lead to terminal 1 on terminal strip TS9 (S-3) and the other lead to terminal 3 on terminal strip TS9 (S-2).
220. (✓) Install the line cord lock on the line cord PL1 3-1/2 inches behind the tinned ends. Insert the tinned ends of the cord through chassis hole 40 and press the line cord lock into this hole until the shoulder of the lock is against the chassis.
221. (✓) Connect one lead of PL1 to terminal 1 on terminal strip TS1 (S-3). Connect the other lead to terminal 3 on terminal strip TS1 (S-3).

This completes the front panel and chassis wiring. *check*

INSTALLATION OF THE PREWIRED BANDSWITCH ASSEMBLY

(Refer to pictorial 9 when wiring this section)

222. (✓) Carefully place the prewired bandswitch assembly into the chassis by inserting the switch shaft in chassis hole 30. In positioning the switch assembly, feed the blue wire through chassis hole S, and the long green wire through chassis hole M. Make certain that the free leads of the resistors, capacitors, and wires, mounted on the switch assembly are not pinched between the chassis and the switch assembly, when it is being mounted.
223. (✓) Secure the switch assembly to the front panel at chassis hole 30 with a 3/8-inch, black palnut and finger tighten.
224. (✓) Insert two No. 6 x 3/8 inch sems screws through the switch mounting bracket A and into the Tinnerman nuts mounted at chassis holes 20 and 21. Do not tighten these screws at this time.
225. (✓) Place a No. 6 flat washer on a No. 6 x 3/8 inch sems screw, and insert the screw through the foot of the power transformer T1 at chassis hole 4. Thread the screw into pem nut 3 mounted on the switch assembly bracket C. Do not tighten at this time.
226. (✓) Place three No. 6 x 3/8 inch sems screws through chassis holes 22, 23, and 24. Thread these screws into pem nuts 1, 2, and 4 mounted on switch assembly brackets B and C.
227. (✓) Tighten the 3/8-inch palnut, which secures the switch to the front panel, and the six screws that secure the switch assembly to the chassis.
228. (✓) Place a No. 6 flat washer on a No. 6 x 3/8 inch sems screw. Insert the screw through the foot of power transformer T1 at chassis hole 1, through the GND lug X, and secure with a No. 6 kep nut.

This completes the installation of the prewired bandswitch assembly.

WIRING THE BANDSWITCH S1

(Refer to pictorials 9 and 10 when wiring this section)

229. (✓) Connect the blue wire from bandswitch S1, section S1b, through chassis hole S to terminal 2 on capacitor C42 (DS).
230. (✓) Run a piece of No. 22 bare tinned wire from terminal 1 on capacitor C41 (S-1) to terminal 2 on capacitor C42 (S-2).
231. (✓) Connect the green wire from section S1e, through chassis hole M, to terminal 1 on capacitor C1 (S-1).

232. (✓) Connect the yellow wire from section S1a to terminal 8 on tube socket XV2 (S-2).
233. (✓) Connect the blue wire from section S1c to terminal 1 on tube socket XV1 (S-1).
234. (✓) Connect the red wire from section S1d to terminal 5 on terminal strip TS3 (S-4).
235. (✓) Connect the green wire from section S1f to terminal A on connector board TA1 (S-1).
236. (✓) Connect the free lead of the 47 mmf, duramica capacitor, C43, from section S1b to terminal 9 on tube socket XV2 (S-2).
237. (✓) Place a 1-1/4-inch length of sleeving on the free lead of the 47 mmf, duramica capacitor, C9, from section S1c. Trim this lead so that only 3/8 inch remains beyond the sleeving and connect it to terminal 2 on tube socket XV2 (S-3).
238. (✓) Connect the free lead of the 22 ohm, 1/2-watt resistor, R2, from section S1e to terminal 6 on tube socket XV1 (S-2).

This completes the wiring of the bandswitch assembly.

FINAL MECHANICAL INSTALLATIONS

(Refer to pictorial 11 and figure 7)

239. (✓) Insert two No. 8 x 3/16 inch set screws in the tapped holes on the side of the main tuning knob. Mount the metal knob-skirt to the back of the knob with three No. 2 x 3/16 inch machine screws. Mount the knob to the main tuning shaft.
240. (✓) Insert the remaining No. 8 x 3/16 inch set screws in the remaining plastic knobs.
241. (✓) Insert the two No. 8 x 1/8 inch set screws in the two metal knobs.
242. (✓) Mount the two plastic knobs, with the red indicator lines, on the function and band selector switch shafts. Rotate these switches fully counterclockwise and align the indicator lines with the OFF and 80 positions. Secure the knobs by tightening the set screws.
243. (✓) Install the remaining plastic knobs on the audio gain, selectivity-BFO, and RF gain control shafts. Tighten the set screws.
244. (✓) Rotate the ant trim and cal reset shafts fully counterclockwise and mount the metal knobs on these shafts so that the set screws are to the extreme left. Tighten the set screws and rotate these knobs fully clockwise.

This completes the installation of the front panel knobs.

STRINGING THE DIAL DRIVE

(Refer to pictorials 11 and 12)

245. (✓) Tie a loop with a non-slip knot on each end of the dial cord, so that there is 37-3/16 inches ($\pm 1/16$ inch) between the loop ends.
246. (✓) Rotate the main tuning capacitor dial drum fully clockwise as viewed from the rear. Attach one loop of the dial cord to the open end of the dial spring. Connect the closed end of the dial spring to the hook at point A on the dial drum.

Keeping just enough tension on the cord to prevent it from slipping off the drum, string the dial cord following the numbering sequence (1 through 8) as indicated by the direction arrows on the pictorial. Attach the free loop of the cord to the open end of the dial spring.

NOTE: It will be necessary to expand the spring by rotating the main tuning control. After the free end of the dial cord is attached, the spring should remain expanded 1/4 to 3/8 inch.

247. () Rotate the main tuning control counterclockwise until the capacitor is fully meshed. Keeping the capacitor meshed, install and align the dial pointer on the dial track over the alignment mark just to the left of the 50-MC marker on the 6-meter scale. Clinch the pointer clips to hold the pointer in place. Apply a small amount of vaseline to the dial track making sure that no vaseline comes in contact with the dial cord or dial pulleys.

Connect the dial cord to the pointer and clinch the pointer clips to hold the dial in place. Re-check the pointer alignment and apply a drop of household cement to prevent slippage.

INSTALLATION OF TUBES AND CRYSTAL

(Refer to pictorial 10)

248. () Install the tubes and the 3500-KC calibration crystal in their respective sockets.

V1 <i>OK</i>	6AZ8 Tube	Socket XV1
V2 <i>OK</i>	6U8A Tube	Socket XV2
V3 <i>OK</i>	6BA6 Tube	Socket XV3
V4 <i>✓</i>	6T8A Tube	Socket XV4
V5 <i>OK</i>	6AW8 Tube	Socket XV5
Y1	3500 KC Crystal	Socket XY1

249. () This completes the construction of your SX-140K Kit receiver. Refer to the operation manual for alignment and installation information.

PARTS LIST

QUANTITY USED	SCHEMATIC SYMBOL	DESCRIPTION	HALLICRAFTERS PART NUMBER
1	C1	Capacitor, Variable Antenna Trimmer	048-000492
11	C3, 4, 7, 13, 14, 15, 17, 18, 19, 47, 56	Capacitor, .01 mfd, 500V, ±20%; Ceramic Disc	047-100224
5	C5, 8, 27, 46, 48	Capacitor, .005 mfd, 500V, ±20%; Ceramic Disc	047-100442
3	C6, 23, 24	Capacitor, .1 mfd, 200V, ±20%; Molded Paper	499-014104
1	C12	Capacitor, 10 mmf, 500V, ±2%; Duramica	482-131100
2	C16, 49	Capacitor, 10 mfd, 50V; Electrolytic	045-000724
2	C20, 22	Capacitor, 100 mmf, 500V, ±10%; Ceramic Disc	047-201182
1	C21	Capacitor, 8 mfd, 250V; Electrolytic	045-000721
2	C25, 26	Capacitor, .001 mfd, 500V, GMV; Ceramic Disc	047-200230
1	C28	Capacitor, .1 mfd, 400V, ±20%, Molded Paper	499-024104
1	C39	Capacitor, 59 mmf, 500V, ±2%, N470; Ceramic Tubular, Part of Prewired Band Switch Assembly	None
1	C41	Capacitor, Variable; Cal Reset	048-000510
1	C42	Capacitor, Variable; Main Tuning	048-000494
2	C44, 55	Capacitor, .02 mfd, 500V, +80-20%; Ceramic Disc	047-100242
1	C45	Capacitor, 27 mmf, 500V, ±2%; Duramica	482-151270
2	C50, 51	Capacitor, .01 mfd, 1400V, GMV; Ceramic Disc	047-200752
2	C52, 53	Capacitor, 40 mfd, 150V; Electrolytic	045-000725
1	C54	Capacitor, 40 mfd, 250V; Electrolytic	045-000722
1	C58	Capacitor, 56 mmf, 500V, ±5%, N750; Ceramic Tubular	491-105560-95
<p>NOTE: C2, 9, 10, 11, 29, 31, 33, 35, 37, 39, 43 are part of the prewired Band Switch Assembly. C30, 32, 34, 36, 38, 40, 57 are C numbers which are not assigned.</p>			
1	CR1	Diode, Silicon type HO-6225	019-102354
2	CR2, 3	Diode, Silicon type 2E4	027-000283
1	J1	Jack, Phone	036-100002
	L1 to L18	Coil, Part of Prewired Band Switch Assembly	None

<u>QUANTITY USED</u>	<u>SCHEMATIC SYMBOL</u>	<u>DESCRIPTION</u>	<u>HALLICRAFTERS PART NUMBER</u>
2	LM1, 2	Lamp, Pilot, #47	039-100019
1	M1	Meter, Carrier Level	082-000492
1	PL1	Line Cord and Plug	087-100078
5	R1, 22, 23, 25, 36	Resistor, 1 Megohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252105
1	R2	Resistor, Part of Prewired Band Switch Assembly	None
2	R3, 11	Resistor, 68 ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252680
1	R4	Resistor, Variable, 12K ohm, $\pm 10\%$; RF Gain	025-002040
1	R5	Resistor, 10K ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252103
2	R6, 12	Resistor, 33K ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252333
1	R7	Resistor, 15K ohm, $\pm 10\%$, 1 watt; fixed composition	451-352153
2	R8, 14	Resistor, 1000 ohm, $\pm 10\%$, 1/2 watt, fixed composition	451-252102
3	R9, 19, 35	Resistor, 100K ohm, $\pm 10\%$, 1/2 watt, fixed composition	451-252104
5	R10, 15, 24 31, 34	Resistor, 47K ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252473
1	R13	Resistor, 15K ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252153
1	R16	Resistor, 1.5K ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252152
1	R17	Resistor, Variable, 2K ohm, $\pm 10\%$; Selectivity - BFO	025-001944
1	R18	Resistor, 82 ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252820
2	R20, 32	Resistor, 22K ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252223
2	R21, test resistor	Resistor, 2.2K ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252222
1	R26	Resistor, 270K ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252274
1	R27	Resistor, 150K ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252154
1	R28	Resistor, Variable, 500K ohm, Audio Gain	025-001942

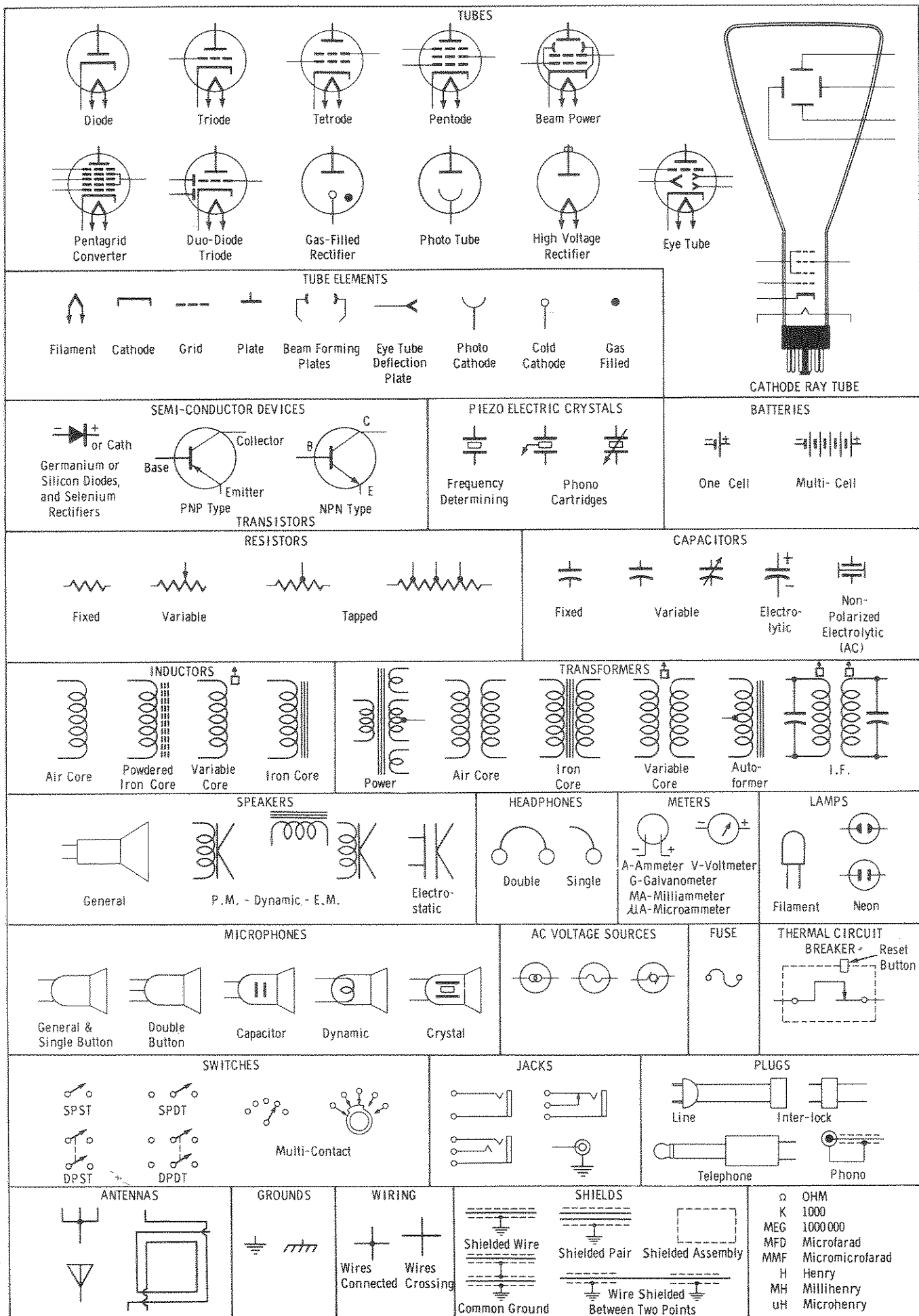
<u>QUANTITY USED</u>	<u>SCHEMATIC SYMBOL</u>	<u>DESCRIPTION</u>	<u>HALLICRAFTERS PART NUMBER</u>
2	R29, 42	Resistor, 10 Megohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252106
1	R30	Resistor, 220K ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252224
1	R33	Resistor, 10K ohm, $\pm 10\%$, 1 watt; fixed composition	451-352103
1	R37	Resistor, 2.2 megohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252225
1	R38	Resistor, 1.8K ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252182
1	R39	Resistor, 560 ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252561
1	R40	Resistor, Variable, 2K ohm, Meter Adjust	025-001943
1	R41	Resistor, 470K ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252474
1	R43	Resistor, 180 ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252181
1	R44	Resistor, 27 ohm, $\pm 10\%$, 1 watt; fixed composition	451-352270
1	R45	Resistor, 10 ohm, $\pm 10\%$, 1/2 watt; fixed composition	451-252100
1	R46	Resistor, 820 ohm, $\pm 10\%$, 2 watt; fixed composition	451-652821
1	R47	Resistor, 100K ohm, $\pm 10\%$, 1 watt; fixed composition	451-352104
1	S1	Switch, Band Assembly Prewired	150-002904
1	S2	Switch, Wafer, Function	060-002267
1	S3	Switch, Slide (DPDT), Cal-Off (six-terminal)	060-002260
1	S4	Switch, Slide (SPDT), ANL-Off (three-terminal)	060-200967
1	T1	Transformer, Power	052-000853
2	T2, 3	Transformer, IF, 1650 KC	050-000751
1	T4	Transformer, Audio Output	055-000460
1	TA1	Board, Terminal 2 Screw Connector (A & G)	088-202026
1	TA2	Board, Terminal 4 Screw Connector	088-002411
1	TA3	Board, Terminal 2 Screw Connector	088-002412
1	TS1	Terminal Strip, 4 lug (Refer to Pictorial #1)	088-200297

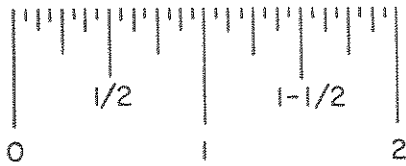
<u>QUANTITY USED</u>	<u>SCHEMATIC SYMBOL</u>	<u>DESCRIPTION</u>	<u>HALLICRAFTERS PART NUMBER</u>
1	TS2	Terminal Strip, 4 lug (Refer to Pictorial 2)	088-200344
1	TS3	Terminal Strip, 6 lug (Refer to Pictorial 2)	088-200230
1	TS4	Terminal Strip, 3 lug (Refer to Pictorial 2)	088-301145
1	TS5	Terminal Strip, 5 lug (Refer to Pictorial 2)	088-200348
1	TS6	Terminal Strip, 3 lug (Refer to Pictorial 2)	088-200304
1	TS7	Terminal Strip, 6 lug (Refer to Pictorial 2)	088-200374
1	TS8	Terminal Strip, 4 lug (Refer to Pictorial 2)	088-200297
1	TS9	Terminal Strip, 4 lug (Refer to Pictorial 6)	088-002235
1	V1	6AZ8, RF Amplifier, Crystal Marker	090-901417
1	V2	6U8A, Mixer, Oscillator	090-901285
1	V3	6BA6, IF Amplifier	090-901112
1	V4	6T8A, AVC, Det, ANL	090-901403
1	V5	6AW8A, Meter Amplifier Audio Output	090-901103
4	XV1,2,4,5	Socket, Tube, 9-Pin Miniature	006-000947
1	XV3	Socket, Tube, 7-Pin Miniature	006-000946
1	XY1	Socket, Crystal	006-100346
1	Y1	Crystal, 3500 KC	019-002720

MISCELLANEOUS

1		Alignment Tool, type GC 8606	033-000988
1		Bracket, Pilot Lamp Mounting (right hand)	067-008984
1		Bracket, Pilot Lamp Mounting (left hand)	067-008985
1		Bracket, Capacitor Mounting	067-008970
1		Bushing, Shaft	077-002558
1		Cabinet	150-900785
1		Chassis, SX-140K	070-002025
1		Clip, Meter (Supplied With Meter)	
2		Clip, IF Transformer Mounting	076-100385
1		Cover, Meter Insulator	008-006690
1		Dial Window (calibrated)	083-000915
45 in.		Dial Cord	038-000049
1		Grommet, 1/4 inch Rubber	016-100976
1		Knob, Main Tuning	015-301315

QUANTITY USED	SCHEMATIC SYMBOL	DESCRIPTION	HALLICRAFTERS PART NUMBER
2		Knob, Plastic with Red Indicator Line	015-201444
3		Knob, Plain Plastic	015-201258
2		Knob, Metal	015-001564
1		Lock, Line Cord (male and female sections)	076-200397
3		Lug, Solder, #4 Internal Tooth	011-200064
1		Lug, Solder, #6 Internal Tooth	011-100054
1		Nut, #2 Hexagon	401-011112
22		Nut, #4 Hexagon	401-023222
6		Nut, #6 x 1/4 inch	401-045222
5		Nut, #6 Kep	002-102188
6		Nut, #6 Tinnerman Speed	002-003311
1		Nut, 3/8 inch Cadmium Plated, Pal	002-101032
1		Nut, 3/8 inch Nickle Plated	002-100806
6		Nut, 3/8 inch Black, Pal	002-102142
1		Panel, Front	150-000509
1		Plate, Dial Background	063-005042
1		Pointer, Dial	082-000489
1		Pointer, Dial Track Assembly	150-000711
3		Screw, #2 x 3/16 inch Machine	406-011312-03
1		Screw, #2 x 1/2 inch Machine	406-011112-08
4		Screw, #4 x 1/2 inch Flat Head	406-023212-04
8		Screw, #4 x 3/16 inch Sems	413-023312-03
22		Screw, #4 x 5/16 inch Sems	413-023312-05
4		Screw, #4 x 1/2 inch Sems	413-023312-08
18		Screw, #6 x 3/8 inch Sems	413-045312-06
2		Screw, #8 x 1/8 inch Set	003-101027
9		Screw, #8 x 3/16 inch Set	003-100973
1		Shaft, Main Tuning	074-002451
1		Shield, Pilot Lamp	086-100037
1		Skirt, Knob	083-000914

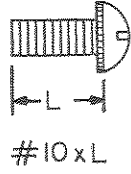
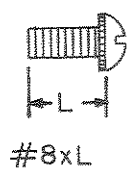
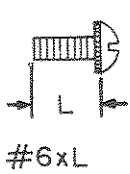
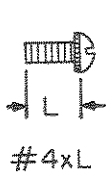




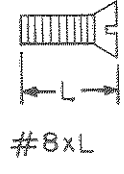
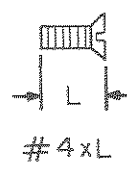
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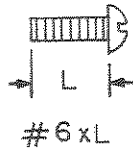
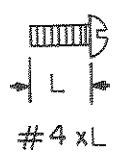
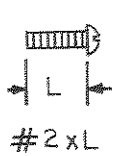
SET SCREWS



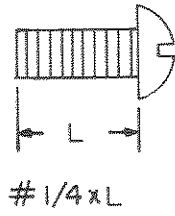
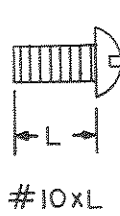
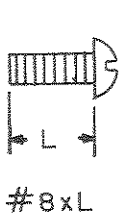
SEMS SCREWS



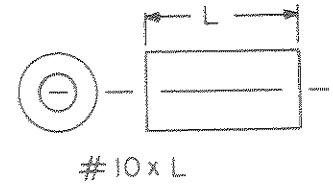
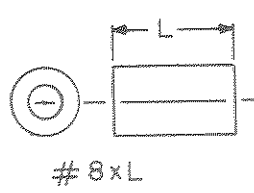
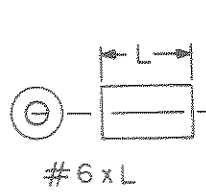
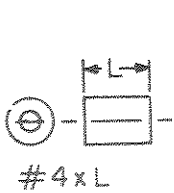
FLAT - HEAD SCREWS



THREAD-FORMING SCREWS

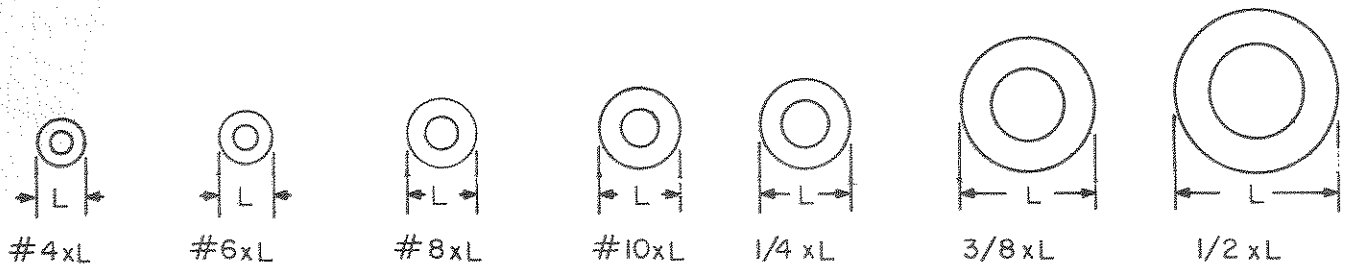


BINDING-HEAD SCREWS

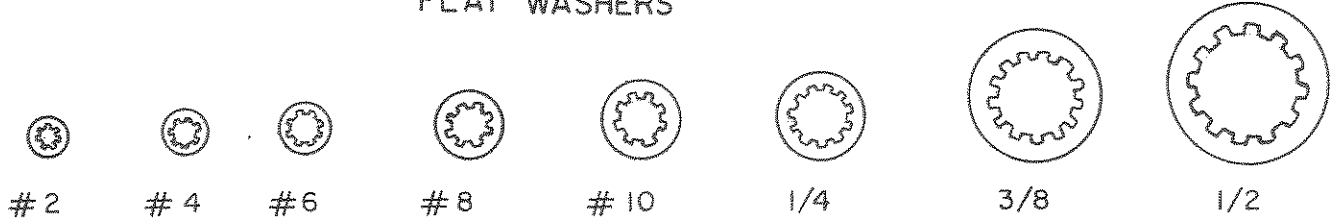


SPACERS (NOT THREADED) OR STAND-OFFS (THREADED)

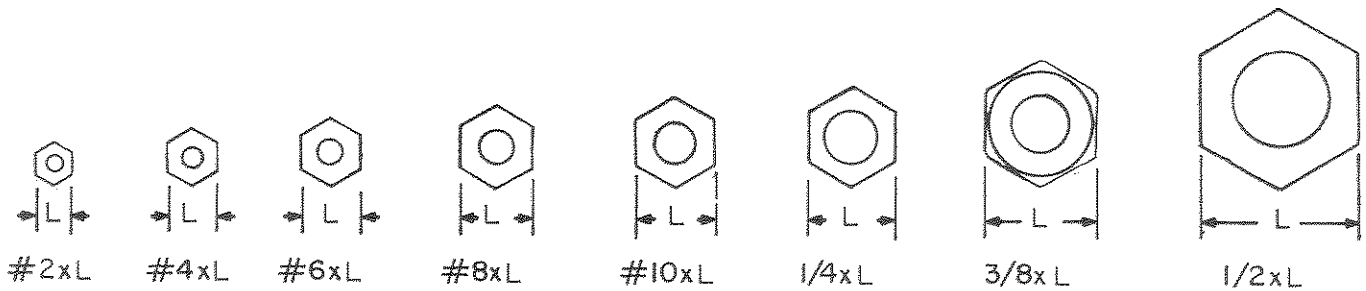
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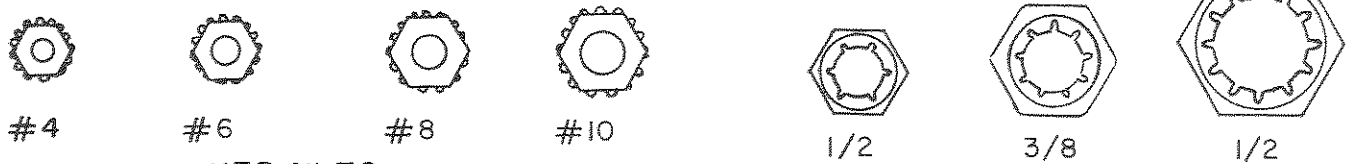
FLAT WASHERS



INTERNAL TOOTH LOCK WASHERS

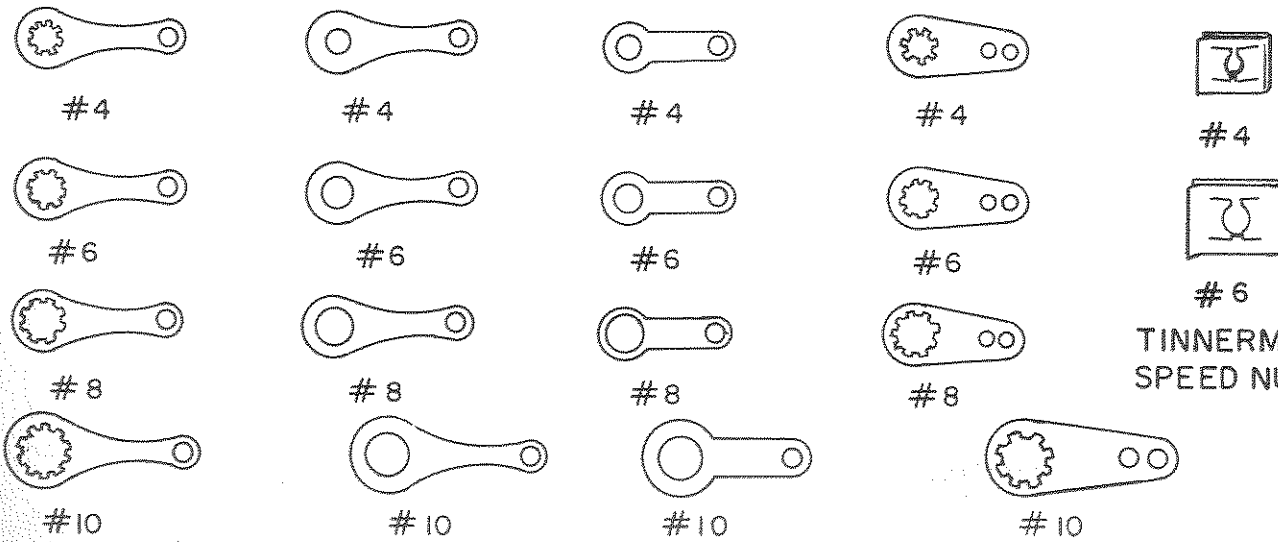


HEX NUTS



KEP NUTS

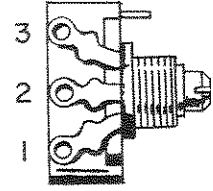
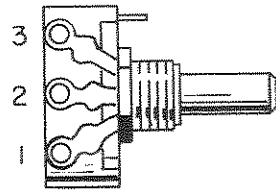
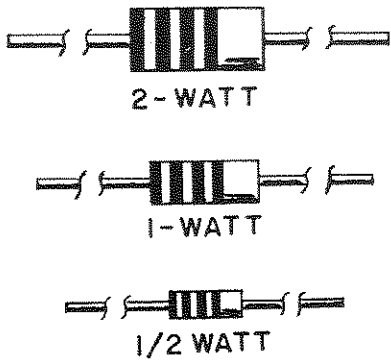
PALNUTS



SOLDER LUGS

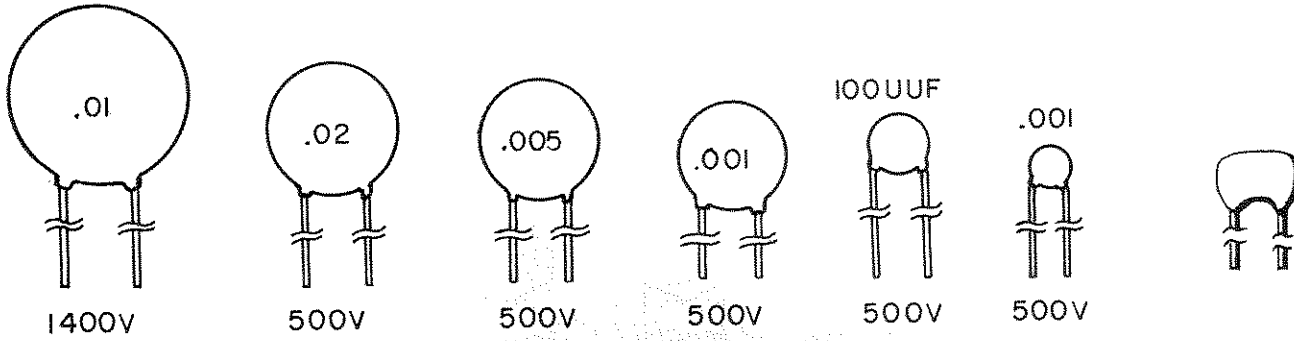
TINNERMAN SPEED NUT

092-011234-2

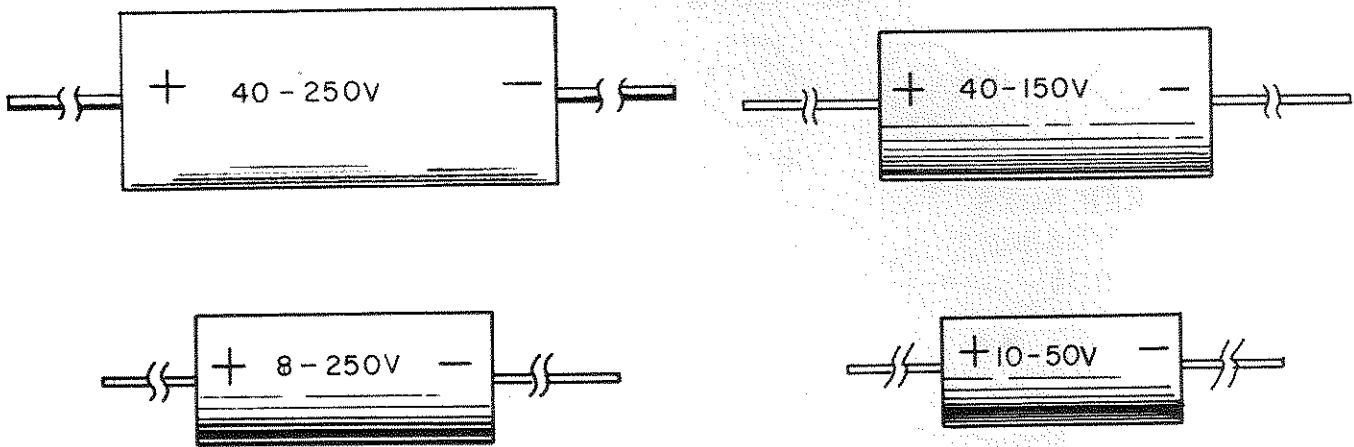


VARIABLE

RESISTORS



CERAMIC DISC

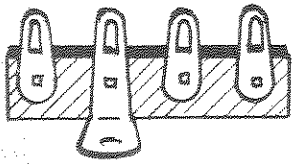


ELECTROLYTICS

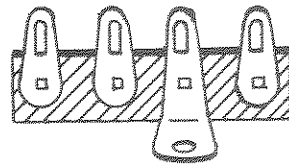


MOLDED PAPER CAPACITORS

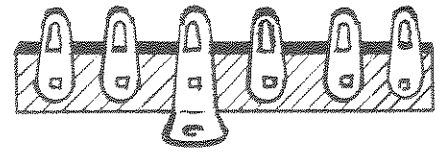
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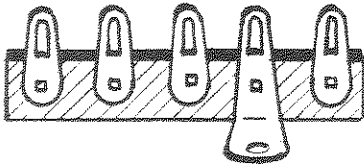
TS1, TS8



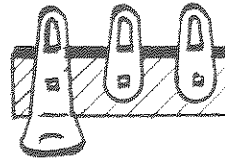
TS9



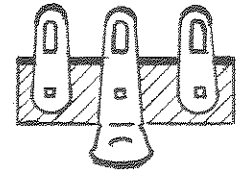
TS7



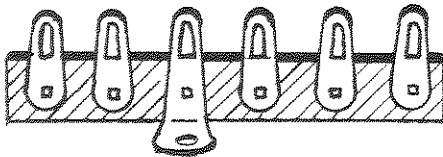
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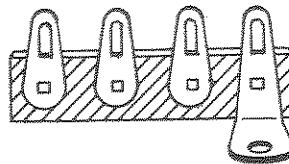
TS6



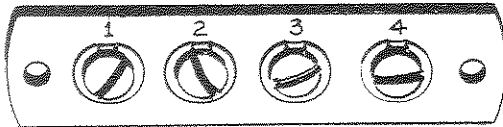
TS4



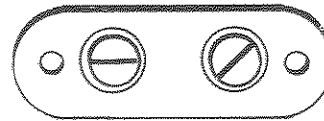
TS3



TS2



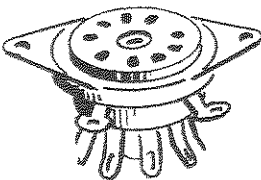
TA2



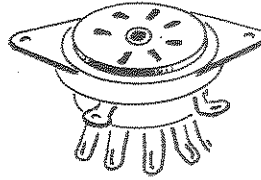
TAI, TA3



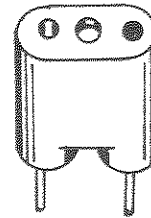
LINE CORD LOCK



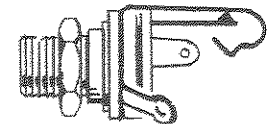
XV1, XV2
XV4, XV5



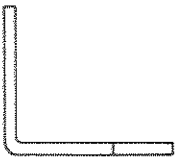
XV3



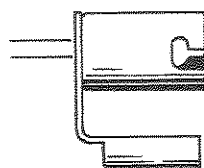
XY1



J1



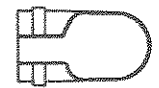
PILOT LAMP
MTG. BRACKET



PILOT LAMP
SOCKET



LMI, LM2



PILOT LAMP
SHIELD

092-011235-2