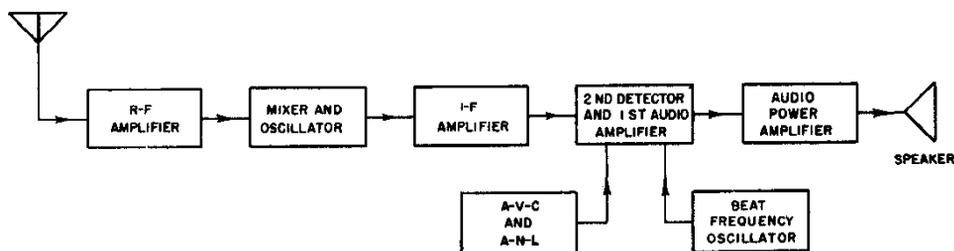


FUNCTIONING OF PARTS

1. GENERAL.

Figure 4-1. shows, in a very simple block form, the plan of the circuit of the Model S-40 radio receiver. Note that the circuit is that of the conventional super-heterodyne receiver. A signal received at the antenna is fed through an r-f amplifier stage to a combined mixer-oscillator stage where a local signal is generated and mixed with the incoming signal. An intermediate frequency signal selected at the output of the mixer stage is fed through two i-f amplifier stages to a combined detector audio amplifier stage where it is demodulated, amplified and fed through an audio power amplifier stage to a loud speaker. Provision is made for headset reception. A combined a-v-c and a-n-l stage is also included to provide improved reception. A beat frequency oscillator is incorporated for the reception of continuous wave (c-w) signals. Provision is also made for bandspread operation. An external tuning meter may be used with the receiver, provision being made at the rear of the receiver for connections.



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Figure 4-1. Radio Receiver Model S-40, block diagram.

2. DETAILED FUNCTIONING BY STAGES. (Refer to Fig. 7-7.)

Since the circuit functions of bands 1, 2, 3 and 4 are essentially identical, this discussion will describe the circuit with BAND SELECTOR switch (S-1A through S-1F) set at band 4 as shown in the schematic diagram.

a. R.F. Amplifier. - The r-f amplifier stage employs a type 6SG7 pentode tube in a conventional class A amplifier circuit. Signals present at the antenna are fed to the primary of transformer T-1 through terminals A-1 and A-2 of the antenna terminal strip TS-1. The secondary of transformer T-1 is tuned by the ganged tuning capacitor section C-6A and trimmer C-1. Ganged tuning capacitor section C-7A acts as a bandspread for the secondary of transformer T-1. R-f signals selected by the parallel resonant circuit are applied to the grid of tube V-1 and appear in greater amplitude across the primary of transformer T-5. Resistor R-1 and capacitor C-5 provide decoupling for the a-v-c voltage applied to the control grid. Parasitic resistors R-4 and R-31 prevents unwanted oscillations in this stage and tends to stabilize the amplifier. Resistor R-2, by-passed by capacitor C-8, provides self-bias for the stage. Resistor R-3 (SENSITIVITY control) regulates the bias to the grid. Resistor R-5 and capacitor C-9 act as a decoupling network for the screen of tube V-1. The signal voltage developed across the primary of transformer T-5 is then coupled to the grid of tube V-2 inductively through transformer T-5 and capacitively through capacitor C-10. Capacitor C-10 provides a small amount of coupling to improve the response at the high frequency end of the band, thus equalizing the r-f signal amplitude over the tunable frequency range.

b. **Mixer-Oscillator.** - The mixer-oscillator stage employs a type 6SA7 converter tube. The tube functions both as oscillator and mixer. The secondary of r-f transformer T-5 is tuned by section C-6B of the ganged tuning capacitor and trimmer C-12. Ganged tuning capacitor section C-7B acts as bandspread tuning for the secondary of transformer T-5. Ganged tuning capacitor section C-6C, trimmed by capacitor C-19, tunes the secondary of transformer T-9 which is part of the oscillator circuit. Ganged tuning capacitor section C-7C acts as bandspread tuning for the secondary of transformer T-9. A signal generated by the local oscillator, 455 kc. higher in frequency than the received signal on bands #1, #2, #3 and 455 kc. lower in frequency than the received signal on band #4, is mixed electronically in the mixer tube since the oscillator tube elements are included as part of the mixer tube V-2 in the same tube envelope. The frequency of oscillation is determined by a resonant circuit consisting of the secondary of transformer T-9 and section C-6C of the main tuning capacitor and trimmer capacitor C-19 connected in parallel. Section C-7C of the variable ganged bandspread capacitor is connected in parallel with section C-6C of the main tuning capacitor for the purpose of effectively spreading or broadening the frequency range. Capacitor C-26 is an additional fixed trimmer across the resonant circuit. Capacitor C-18 provides increased gain for the oscillator on this band. Variable capacitors C-23, C-24, and C-25 are padders for bands #3, #2, and #1 respectively. Resistor R-7 is a grid return for the oscillator grid in tube V-2. Capacitor C-16 is the oscillator grid coupling capacitor while capacitor C-17 provides coupling and d-c blocking for the oscillator plate circuit. Resistor R-30 suppresses parasitic oscillations. Plate voltage for the screen grid of tube V-2, which also acts as oscillator plate, is applied through resistor R-8. The difference frequency of the oscillator and incoming signal frequencies is applied to the first i-f transformer T-13 primary which is tuned by capacitor C-29. Capacitor C-29 is a by-pass for the mixer plate.

c. **First and 2nd I-F Amplifier.** - The first and 2nd i-f amplifier stages employ type 6SK7 pentode tubes. I-f amplifier coupling transformer T-13, T-14, and T-15 for these two stages are tuned to 455 kc by adjusting the trimmer capacitors across each transformer primary and secondary. The gain of the 1st and 2nd i-f amplifier stages is varied by the SENSITIVITY control (R-3), connected in series with the cathodes of both tubes, to provide sensitivity control for the receiver. The a-v-c grid voltage is applied to this section of the receiver through resistor R-12 when A.V.C. switch S-2 is at OFF or in the open position. C-31 is an a-v-c by-pass for the control grid of 1st i-f amplifier tube V-3. Resistor R-9, by-passed by capacitor C-32, provides fixed bias for tube V-3. Resistor R-11 by-passed by capacitor C-35 provides fixed bias for 2nd i-f amplifier tube V-4. Capacitor C-39 is a plate by-pass for tube V-4. The signal voltage developed across the transformer T-15 primary is fed inductively to the 2nd detector.

d. **2nd Detector and 1st Audio.** - Both the second detector and first audio amplifier stages employ a single type 6SQ7 duo diode-triode. The diode section of tube V-5 serves as a detector by rectifying the modulated carrier. The r-f filter for this type of detection consists of resistor R-14 and capacitors C-41 and C-42 connected in a pi-section. Automatic volume control and audio frequency voltage is obtained from a voltage divider consisting of resistors R-19, R-17 and R-15. Capacitor C-43 couples the 2nd detector to the VOLUME control, resistor (R-20). Resistor R-16 is bias for the first audio stage, part of tube V-5. Resistor R-22 is the plate load for the triode part of tube V-5. Capacitor C-44 acts as r-f filter at the plate. The audio frequency voltage is then fed through coupling capacitor C-45 to the grid of the output audio amplifier tube V-6.

e. **Power Audio Amplifier.** - The power audio amplifier stage is a class A amplifier employing a type 6F6-G pentode. Resistor R-23 is a grid return for the control grid of tube V-6. Resistor R-24, by-passed by capacitor C-46, supplies bias to the control grid. Resistor R-25 and capacitors C-47 and C-48 serve as a tone control circuit. Capacitor C-49 serves as by-pass for the screen grid. The audio signal is then fed through socket S0-3 and plug PL-3 to the primary of output transformer T-16 whence it is coupled inductively to the secondary and fed to the speaker LS-1 voice coil. An audio frequency signal is also fed from the grid of tube V-6 to PHONE jack J-1. Voltage is fed to the plate of tube V-6 through the primary of transformer T-16.

f. **A.V.C. and NOISE LIMITER.** - Both the automatic volume control and automatic noise limiter stages employ a single type 6H6 duo-diode. One diode of tube V-7 serves as the automatic volume control rectifier. The remaining diode section of tube V-7 serves as an automatic limiter as follows: Capacitor C-40 becomes charged by the rectified carrier voltage and the time constant of this capacitor and filter network associated with it is such that the audio frequency voltage variations do not alter this charge. During a severe noise pulse, however, the cathode of the diode plate connected to capacitor C-40 becomes more negatively charged than the charge held by capacitor

C-40 until the cathode voltage of the a-n-1 diode again reaches a less negative potential than its plate and capacitor C-40 acquires its normal charge. By shorting the audio voltage to ground during a noise pulse, the a-n-1 circuit prevents the objectionable noise pulses from reaching the audio amplifier stages.

g. **Beat Frequency Oscillator.** - The beat frequency oscillator employs a type 6J5 triode tube in a tuned-grid, untuned plate oscillator circuit. The oscillator frequency is adjusted by a moveable powdered iron core in the field of transformer T-17. This iron core adjustment sets the oscillator frequency at 455 kc. and is adjusted by a screw driver during alignment. The fine adjustment of the oscillator frequency required to provide control of the beat note frequency is controlled by a knob (PITCH CONTROL) from the front panel. The AM-CW switch controls the use of the oscillator by opening or closing the plate voltage lead to the tube. Resistor R-28 provides a load for the plate of tube V-8. Resistor R-29 is the oscillator tube V-8 grid return while capacitor C-55 provides grid coupling from the oscillator tank circuit. Capacitor C-54, across part of transformer T-17, resonates the tank circuit. Capacitor C-53 forms part of a series impedance circuit with part of transformer T-17. The beat frequency signal is coupled to the 2nd detector through capacitor C-38.

h. **Power Supply.** - The receiver has provisions for operation from either an a-c or d-c source.

(1) **A-C Operation.** - The receiver's power supply provides for operation from a 117-volt source. The a-c current is fed to the primary of power transformer T-18 through the line cord. A type 80 (tube V-9) full wave rectifier is employed in a conventional full wave rectifier circuit. The high voltage from this rectifier is fed to a filter network through the "Shorting Plug" on the rear apron of the receiver chassis as is the filament current for the heaters of the tubes. The STANDBY/RECEIVE switch is connected in series with the transformer T-18 center tap lead to ground (chassis), thereby disabling the receiver but at the same time keeping the tube heaters hot and ready for instant use. The filter circuit consists of a pi network made up of the speaker field coil and capacitors C-50 and C-51. Resistors R-26 and R-27 are part of a voltage divider and capacitor C-52 is a by-pass.

(2) **D-C Operation.** - External 6-volt storage battery and 260-volts of "B" batteries or storage battery and vibrator type supply provide for d-c operation. When operating from an external d-c supply the "Shorting Plug" on the rear apron of the receiver chassis is removed and a similar plug is wired to supply filament and plate current to the receiver circuits. The "B" voltage is fed to the input side of the filter sections used for a-c operation thereby insuring adequate filtering for vibrator type power supplies.

i. **Tuning Meter.** - The tuning meter "S METER" is not supplied with the receiver, but can be purchased on request from the company. Provision has been made on the rear apron of the receiver for the external connection of the "S" meter. A five prong plug is wired to the meter as indicated in figure 4-2 and should be plugged into socket 80-2. When metering reception, the meter measures a voltage drop across resistor R-27 e. i. a change in screen current of first and second i-f amplifier tubes V-4 and V-3.

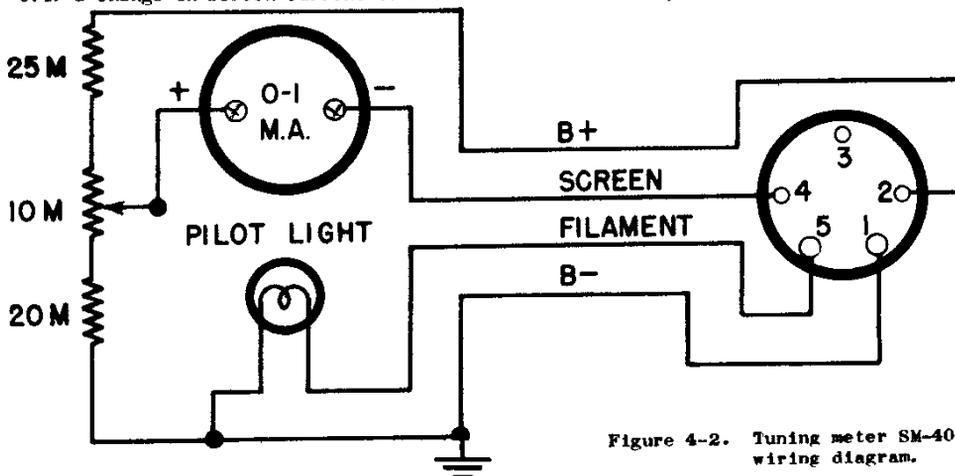


Figure 4-2. Tuning meter SM-40 and schematic wiring diagram.

MAINTENANCE

CAUTION. - Voltages at various points in this equipment are of sufficiently high potential to produce a severe shock. Locate the high - potential points on the VOLTAGE CHART before attempting to service circuits that are "hot". IT IS A GOOD RULE TO DISCONNECT THE POWER SOURCE BEFORE MAKING ADJUSTMENTS WHEN POSSIBLE. BE CAREFUL.

1. PREVENTIVE MAINTENANCE.

All components of the receiver should be given a thorough inspection at regular intervals. The time interval between inspections will be determined by the operating conditions of the individual installation. In general, keep the components clean and dry. Moisture, even in a completely tropicalized set may cause serious deterioration and produce general unsatisfactory operation. Dust and dirt materially effect both electrical and mechanical operation. Keep the various parts clean, especially the tuning capacitors. Dust should be blown out with dry air or brushed out carefully without bending the gang plates in the slightest. Noisy reception may also be caused by dirty condenser wipers, faulty gain controls and switches, frayed cable connections, faulty tubes, etc. in the installation. Check accessible connections, switch contacts, etc. regularly, making sure that all are clean and tight and the tubes and cable connectors are held securely in their sockets.

2. REPLACING TUBES, LAMPS, and FUSES.

a. Replacing Tubes. - All tubes are accessible at the top of the chassis through the hinged cover of the cabinet. When replacing tubes, check the tube type carefully and replace with the correct type. Refer to the top view of the chassis to determine the location of the tubes and to the PARTS LIST for the type number and description of each.

b. Replacing Lamps. - The receiver employs two lamps with bayonet type sockets to illuminate the calibrated tuning dial and the bandspread tuning dial. The lamps are to be replaced with a 6/8-volt, 250 ma. (blue bead) G.E. #44 or equivalent. The color code referred to, is the color of the glass bead above the glass stem inside the envelope of the lamps.

3. PERIODIC ADJUSTMENTS.

a. Receiver Alignment. - The receiver has been carefully aligned at the factory and should not require realignment until the receiver requires new tubes in the r-f and i-f amplifier stages, or shows signs of loss of sensitivity, off frequency calibration or requires service work on one or more of its r-f and i-f amplifier stages. Alignment should not be attempted by inexperienced persons as maximum performance is obtained only by careful and intelligent alignment.

(1) Aligning Tools. -

(a) Signal generator capable of providing a 400 cycle modulated signal at 455 kc, and 550 kc. to 44 mc. range.

(b) A $390 \pm 20\%$ ohm non-inductive carbon dummy antenna resistor.

(c) Non-metallic screw driver. A bakelite screw driver with a short metal blade is very good.

(d) Audio output meter capable of handling 1.5 watts of audio power for speaker load.

(2) I-F Amplifier Alignment. - (See Fig. 5-1)

(a) Connect the "hot" lead of the generator directly to the stator plates of the center section of the main tuning capacitor gang (the solder lug on top of that section). Connect the ground wire of the generator to the receiver chassis. Set main tuning capacitor at minimum capacity (open).

(b) Connect the output meter across the speaker voice coil and set the meter range switch for its highest range to prevent overloading the meter accidentally.

(c) Let the receiver warm up for approximately ten minutes, then set the receiver controls as follows:

SENSITIVITY control at maximum sensitivity (full clockwise).
VOLUME control at maximum volume (full clockwise).
A.V.C. switch at OFF.
NOISE LIMITER switch at OFF.
CW-AM switch at AM.
TONE control at HIGH.
STANDBY/RECEIVE switch at RECEIVE.

(d) Set the signal generator frequency at 455 kc, and turn on the 400-cycle modulation.

(e) Adjust transformers T-13, T-14, and T-15 for maximum output meter reading using just enough signal generator output to provide a good resonant swing on the output meter. The signal level at the generator should be approximately 52 microvolts for a 500 milliwatt audio output level. Repeat the alignment procedure until assured of accurate alignment. Refer to figure 5-1 for the location of 1-f transformer adjustment screws #1 through #3 inclusive on transformers T-13, T-14, and T-15.

(3) Beat Frequency Oscillator Adjustment. -

Connect signal generator as in paragraph (2). Turn 400-cycle modulation off. Remove PITCH CONTROL knob with an Allen wrench and adjust the slotted screw shaft for zero beat. Replace knob so that red mark is on top.

(4) R-F Amplifier Alignment. -

†See note at end of this section.

(a) Connect the "hot" lead of the signal generator to terminal "A1" of the antenna terminal board through a $390 \pm 20\%$ ohm non-inductive carbon resistor. Connect the ground lead of the generator to the receiver chassis. Leave the jumper connected between terminals "A2" and "GND". Turn on the 400-cycle modulation.

(b) Let the receiver warm up for approximately ten minutes, then set the receiver controls as follows:

SENSITIVITY control at maximum sensitivity (full clockwise).
VOLUME control at maximum volume (full clockwise).
A.V.C. switch at OFF.
NOISE LIMITER switch at OFF.
CW-AM switch at AM.
TONE control at HIGH.
STANDBY/RECEIVE switch at RECEIVE.

NOTE - For all alignment adjustments, the signal generator output attenuator must be adjusted to provide a 500 milliwatt audio signal output at the speaker socket of the receiver on the output meter.

NOTE - Refer to figure 5-1 for all r-f alignment points.

(c) Band 4. Alignment. -

(1) Set the signal generator at 36 mc. and tune in its signal on the receiver. If the receiver's calibrated dial reads 36 mc. no adjustment is necessary - if not, adjust oscillator trimmer capacitor C-19 for maximum output with the receiver dial set at 36 mc.

(2) Set the signal generator at 18 mc. and tune in its signal on the receiver. If the receiver's calibrated dial reads 18 mc. no adjustment is necessary - if not, adjust slug #8 on transformer T-9 for maximum output with the receiver dial set at 18 mc.

NOTE - If slug #8 has been adjusted it will be necessary to repeat step (1) again. Several adjustments of capacitor C-19 in step (1) and slug #8 in step (2) may be required in cases where the transformer has been greatly detuned or a new transformer has been installed.

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(3) Set signal generator and receiver at 36 mc. and adjust trimmers C-1 and C-12 for maximum output.

(4) Set signal generator and receiver at 16 mc. and adjust slugs #5 and #6 for maximum output.

NOTE - If slugs #5 and #6 have been adjusted, it will be necessary to repeat step (3) again. Several adjustments of capacitors C-1 and C-12 and slugs #5 and #6 may be required in cases where the transformer has been greatly detuned or a new transformer has been installed.

(d) Band 3. Alignment.

(1) Set the signal generator at 14 mc. and tune in its signal on the receiver. If the receiver's calibrated dial reads 14 mc. no adjustment is necessary - if not, adjust oscillator trimmer capacitor C-20 for maximum output with the receiver dial set at 14 mc.

(2) Set the signal generator at 7 mc. and tune in its signal on the receiver. If the receiver's calibrated dial reads 7 mc. no adjustment is necessary - if not, adjust oscillator padder capacitor C-23 for maximum output with the receiver dial set at 7 mc.

NOTE - If capacitor C-20 has been adjusted, it will be necessary to repeat step (1) again. Several adjustments of capacitor C-20 in step (1) and capacitor C-23 in step (2) may be required in cases where the transformer has been greatly detuned or a new transformer has been installed.

(3) Set the signal generator at 10 mc. and tune in its signal on the receiver. If the receiver's calibrated dial reads 10 mc. no adjustment is necessary - if not, adjust slug #9 on transformer T-10 for maximum output with the receiver dial set at 10 mc.

(4) If slug #9 has been adjusted, repeat steps (1) and (2).

(5) Set the signal generator and receiver at 14 mc. and adjust trimmers C-2 and C-13 for maximum output.

(6) Set signal generator and receiver at 7 mc. and adjust slugs #4 and #7 for maximum output.

NOTE - If slugs #4 and #7 have been adjusted, it will be necessary to repeat step (3) again. Several adjustments of capacitors C-2 and C-13 and slugs #4 and #7 may be required in cases where the transformer has been greatly detuned or a new transformer has been installed.

(e) Band 2. Alignment.

(1) Set the signal generator at 5 mc. and tune in its signal on the receiver. If the receiver's calibrated dial reads 5 mc. no adjustment is necessary - if not, adjust oscillator trimmer capacitor C-21 for maximum output.

(2) Set the signal generator at 1.8 mc. and tune in its signal on the receiver. If the receiver's calibrated dial reads 1.8 mc. no adjustment is necessary - if not, adjust oscillator padder capacitor C-24 for maximum output with the receiver dial set at 1.8 mc.

NOTE - If capacitor C-21 has been adjusted it will be necessary to repeat step (1) again. Several adjustments of capacitor C-21 in step (1) and capacitor C-24 in step (2) may be required in cases where the transformer has been greatly detuned or a new transformer has been installed.

(3) Set the signal generator at 3 mc. and tune in its signal on the receiver. If the receiver's calibrated dial reads 3 mc. no adjustment is necessary - if not, adjust slug #11 on transformer T-11 for maximum output with the receiver dial set at 3 mc.

(4) If slug #11 has been adjusted repeat steps (1) and (2).

(5) Set the signal generator and receiver at 5 mc. and adjust trimmers C-3 and C-14 for maximum output.

(f) **Band 1. Alignment.**

(1) Set the signal generator at 1500 mc. and tune in its signal on the receiver. If the receiver's calibrated dial reads 1500 kc. no adjustment is necessary - if not, adjust oscillator trimmer capacitor C-22 for maximum output with the receiver dial set at 1500 kc.

(2) Set the signal generator at 600 kc. and tune in its signal on the receiver. If the receiver's calibrated dial reads 600 kc. no adjustment is necessary - if not, adjust oscillator padder capacitor C-25 for maximum output with the receiver dial set at 600 kc.

NOTE - If capacitor C-22 has been adjusted it will be necessary to repeat step (1) again. Several adjustments of capacitor C-22 in step (1) and capacitor C-25 in step (2) may be required in cases where the transformer has been greatly detuned or a new transformer has been installed.

(3) Set the signal generator and receiver at 1000 kc. and tune in its signal on the receiver. If the receiver's calibrated dial reads 1000 kc. no adjustment is necessary - if not, adjust slug #10 on transformer T-12 for maximum output with the receiver dial set at 1000 kc.

(4) If slug #10 has been adjusted repeat steps (1) and (2).

(5) Set the signal generator and receiver at 1500 kc. and adjust trimmers C-4 and C-15 for maximum output.

NOTE - After completing the above r-f alignment procedure check the image frequency to determine whether the oscillator frequency is higher than the signal frequency on bands 1, 2 and 3, and lower than the signal frequency on band 4.

(g) When completely aligned the overall receiver sensitivity will usually run from 7.2 microvolts at 600 kc. to 5 microvolts at 36 mc. for 500 milliwatts audip output. If your receiver falls reasonably close to this sensitivity, consider your job finished.

4. LOCATING FAULTS WITH A VOLT-OHM METER.

a. **Voltage Chart.** Refer to schematic for the tube socket terminal voltages. Voltages shown are those between the terminal and ground (chassis) unless otherwise specified. The readings were taken with a Weston Model 772 Analyzer using 20,000 ohm per volt sensitivity. To prepare the receiver for measurement, disconnect the antenna, connect a jumper between the antenna terminals A1, A2, and G, and set the controls as follows:

STANDBY/RECEIVE switch at RECEIVE.
A.V.C., NOISE LIMITER at ON and AM-CW switch at CW.
SENSITIVITY and VOLUME controls full clockwise.
TUNING, and PITCH CONTROL adjustments do not effect the reading.
TONE control at any one of the three tone positions.

b. **Resistance Chart.** - Refer to Fig. 5-3. for the tube socket terminal to ground (chassis) resistance measurements. To identify tube socket connections, refer to Fig. 7-6. The readings were taken with a Weston Model 772 Analyzer. To prepare the receiver for measurement, disconnect the a-c line cord and set the controls as follows:

STANDBY/RECEIVE switch at RECEIVE.
A.V.C., NOISE LIMITER at ON and AM-CW switch at CW.
SENSITIVITY and VOLUME controls full clockwise position.
TONE control at any one of the three tone positions.
TUNING and PITCH control adjustments do not effect the readings.

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c. Checking Transformer and Inductor Windings With an Ohm-meter.

NOTE - One terminal of each winding measured must be disconnected from the circuit to avoid measuring circuit resistance instead of winding resistance alone as indicated in the chart.

Circuit Symbol	Name of Part	Winding	Winding Terminals	D-C Resistance (Ohms)
T-16	TRANSFORMER, audio	Primary	Primary	400
		Secondary	Secondary	* 5
SPKR FIELD	Speaker field	-	-	1500
T-18	TRANSFORMER, power	Primary	1 to 3	6
		H.V. secondary	6 to 10	280
		$\frac{1}{2}$ H.V. secondary	6 to 8	140
		ary	8 to 10	140
		6.3-volt secondary	2 to 4	ZERO
	5.0-volt secondary	7 to 9	ZERO	

* With speaker plug in socket.

† Note Rock main tuning gang capacitor when making r-f adjustments on bands 3 and 4.

TUBE COMPLEMENT.

Symbol	Tube Type	Function
V-1	6SG7	R-F amplifier
V-2	6SA7	Mixer and local oscillator.
V-3	6SK7	1st i-f amplifier
V-4	6SK7	2nd i-f amplifier
V-5	6SQ7	Detector, 1st audio amplifier
V-6	6FG-6	Audio power amplifier
V-7	6H6	A-V-C and noise limiter
V-8	6J5	Beat frequency oscillator
V-9	80	Rectifier

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POWER REQUIREMENTS.

The receiver is designed to operate from a 117-volt, 50/60 cycle single phase, (25/60 cycle if receiver has universal power transformer) a-c source or from a 6-volt storage battery and 260-volts of "B" battery. The "B" batteries may be replaced by a suitable vibrator type power supply if it meets the following current requirements:

A-C Operation	* D-C Operation
Line voltage 117 volts	Filament voltage. 6.3 volts
Line current 0.76 amp.	Filament current. 5 amps.
Power consumption. 75 watts	"B" voltage 260 volts
	"B" current 70 ma.

* The 6-volt battery drain using a vibrator type supply for "B" voltage will run approximately 10 amperes.

Audio Output Connections. - The headset jack marked PHONES, located on the front panel, provides output for headset reception. The circuit is such, that the speaker circuit is opened when the headset cord plug is inserted into the PHONE jack. The output of the first audio stage is then capacitively coupled to the PHONE jack.

Remote Operation Facilities. - The receiver may be disabled remotely by disconnecting the jumper wire between pins #3 and #4 on the shorting plug (PL-2), which is normally plugged into socket S0-1 during a-c operation, and connecting a remote switch or relay across these pins. The stand-by switch is connected in the "B" lead. When using the remote control disabling switch, the STANDBY/RECEIVE switch on the receiver must be set at STANDBY.

PREPARATION FOR USE.

A-C Operation. - The receiver may be operated from a 117-volt, 50/60 cycle, (25/60 cycle if universal power transformer is used) single phase a-c source of power. In the event that the receiver has a universal power transformer, check the line voltage and set the line voltage switch, located on top of the transformer, before connecting the receiver to a source of power. If the receiver power transformer is set for a higher line voltage than the source, it will not be damaged when connected to a line of lower voltage, but a receiver set for a lower line voltage will, in most cases, be damaged when plugged into an outlet having a higher line voltage.

D-C Operation. - The receiver may be operated from a 6-volt d-c source, generally a storage battery, and a 260-volt d-c supply in the form of dry batteries or vibrator type power pack. Consult the chart on power requirements for d-c operation in Section I, and provide battery facilities capable of supplying these demands. The receiver is connected to the d-c supply as follows:

(1) Remove the octal "jumper plug" (PL-2) used for a-c operation from socket S0-1. Use #18 (AWG) wire leads for the 260-volt "B" supply connections to pins #3 and #5, and #12 (AWG) wire leads for the 6-volt "A" battery connections to pins #1, #8 and #2.

CAUTION - Check your wiring carefully before connecting up to the battery supply.

OPERATION.

Listed below are the receiver controls and their settings for the two types of reception provided by this receiver, namely, phone and c-w code reception. Refer to Figure 1-1 or the front panel of the receiver.

a. **PHONE RECEPTION.** - To receive phone signals set the front panel controls as follows:

STANDBY/RECEIVE switch	- Set at RECEIVE. (Set at STANDBY to disable receiver for short standby periods.
BAND SELECTOR switch	- Set at range number corresponding to band covering desired frequency.
AM-CW switch	- Set at AM.
A.V.C. switch	- Set at ON.
NOISE LIMITER switch	- Normally set at OFF.

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- SENSITIVITY control** - Turn the control all the way clockwise to maximum.
- VOLUME control** - Adjust for desired volume at headset or loudspeaker.
- PITCH CONTROL** - Not used.
- TONE control** - Set to please listener. Set at HIGH for normal reception. Generally set at LOW or MED. when noise level is high.
- TUNING control** - Set calibrated dial to frequency of desired signal and adjust for maximum tuning meter deflection (if a tuning meter is used.) Dial frequency calibrations are true only with BANDSPREAD tuning dial set at zero.
- BANDSPREAD Tuning control** - Use this control in conjunction with the TUNING control as described in the paragraph on bandspread tuning in this section. This control is used for finer tuning.

b. C-W Code Reception. - To receive continuous wave (c-w) code signals, set the front panel controls as follows:

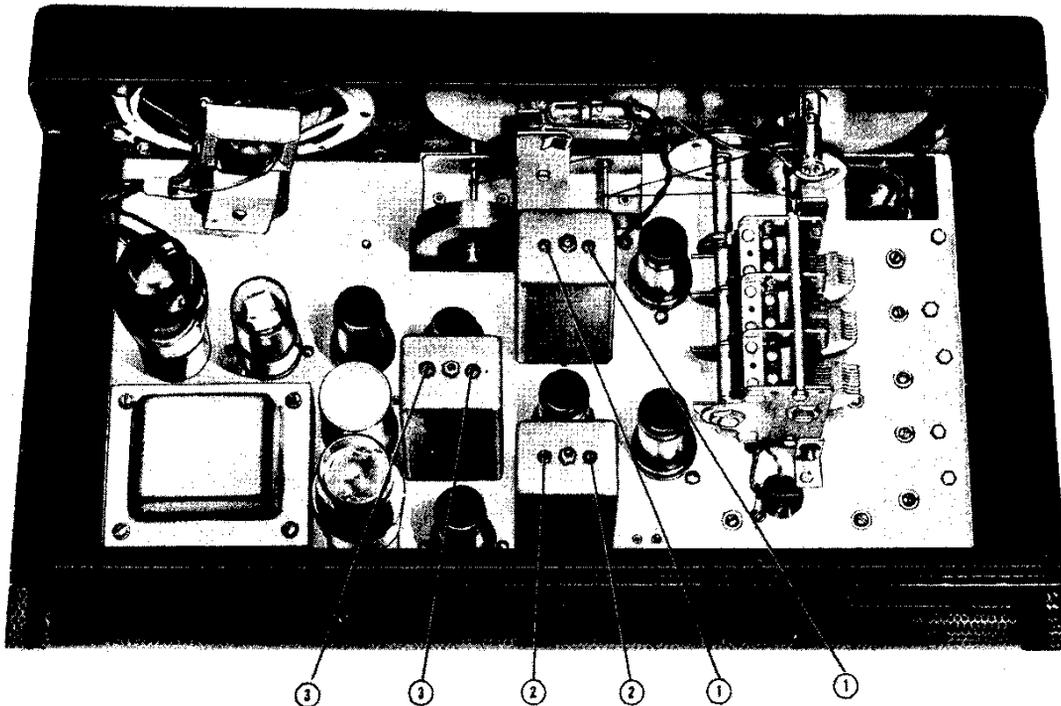
- BAND SELECTOR switch** - Set at range number corresponding to band covering desired frequency.
- A.V.C. switch** - Set at OFF.
- AM-CW switch** - Set at CW.
- NOISE LIMITER switch** - Set at OFF.
- TUNING control** - Set calibrated dial at frequency of desired signal. Tune for maximum signal level at headset or loudspeaker. Dial frequency calibrations are true only with the BANDSPREAD tuning dial set at zero.
- SENSITIVITY control** - Turn up as high as the signal strength of the code signal will permit. Too much gain will result in distortion of the signal.
- TONE control** - Set at LOW or MED.
- VOLUME control** - Turn up to full clockwise.
- BANDSPREAD tuning control** - Use this control in conjunction with the MAIN tuning control as described in the paragraph in bandspread tuning in this section. This control is used for finer tuning.
- PITCH CONTROL** - Set at desired pitch of code signal by turning to the right or left.
- STANDBY-RECEIVE** - Set at RECEIVE (Set at STANDBY to disable receiver for short standby periods.

GENERAL: Model S-40 is a 9 tube commercial superheterodyne table model, radio receiver, incorporating 4 bands of AM/CW reception, as follows: band #1, 540 kc to 1700 kc; band #2, 1.7 mc to 5.35 mc; band #3, 5.35 mc to 15.7 mc; band #4, 15.7 mc to 43 mc. Provision for variable sensitivity control; optional AVC, noise limiting, BFO pitch, tone, headset reception, and use of an external "S" meter; standby operation; and bandspreading are provided.

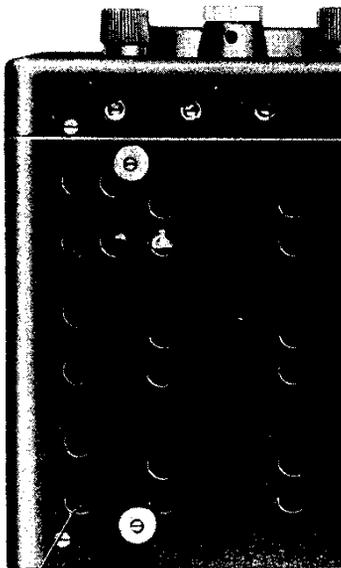
REAR PANEL CONNECTIONS: Consist of AC line cord with plug, antenna and ground connector strip, dc power input socket and external "S" meter connector socket.

POWER SUPPLY DATA: AC operation—117 volt, 50/60 single phase source. (Also, 110/130/150/220/250 volt, 25 cycles single phase source with special power transformer available, Hallicrafter's part #52CO27.) Power drain is 75 watts.

DC operation—filament 6.3 volt @ 3.5 amp; "B" supply 260 volt @ 70 ma. (The 6 volt battery drain for vibrator type supply for "B" voltage will run about 10 amp.)



- ① I-F Adjustments for 1st I-F Transformer T-13
- ② I-F Adjustments for 2nd I-F Transformer T-14
- ③ I-F Adjustments for 3rd I-F Transformer T-15



R-F and oscillator adjustment holes

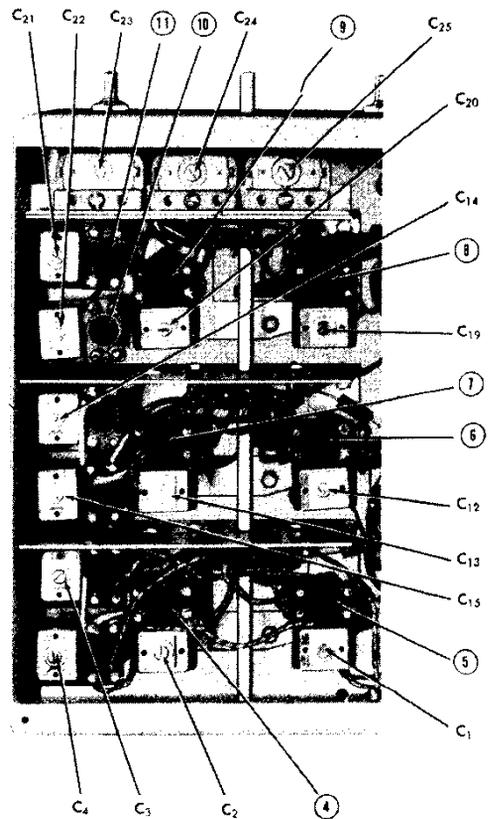


Figure 5-1. Radio Receiver Model S-40, view showing aligning points.

THE HALLICRAFTERS CO.

S-40A

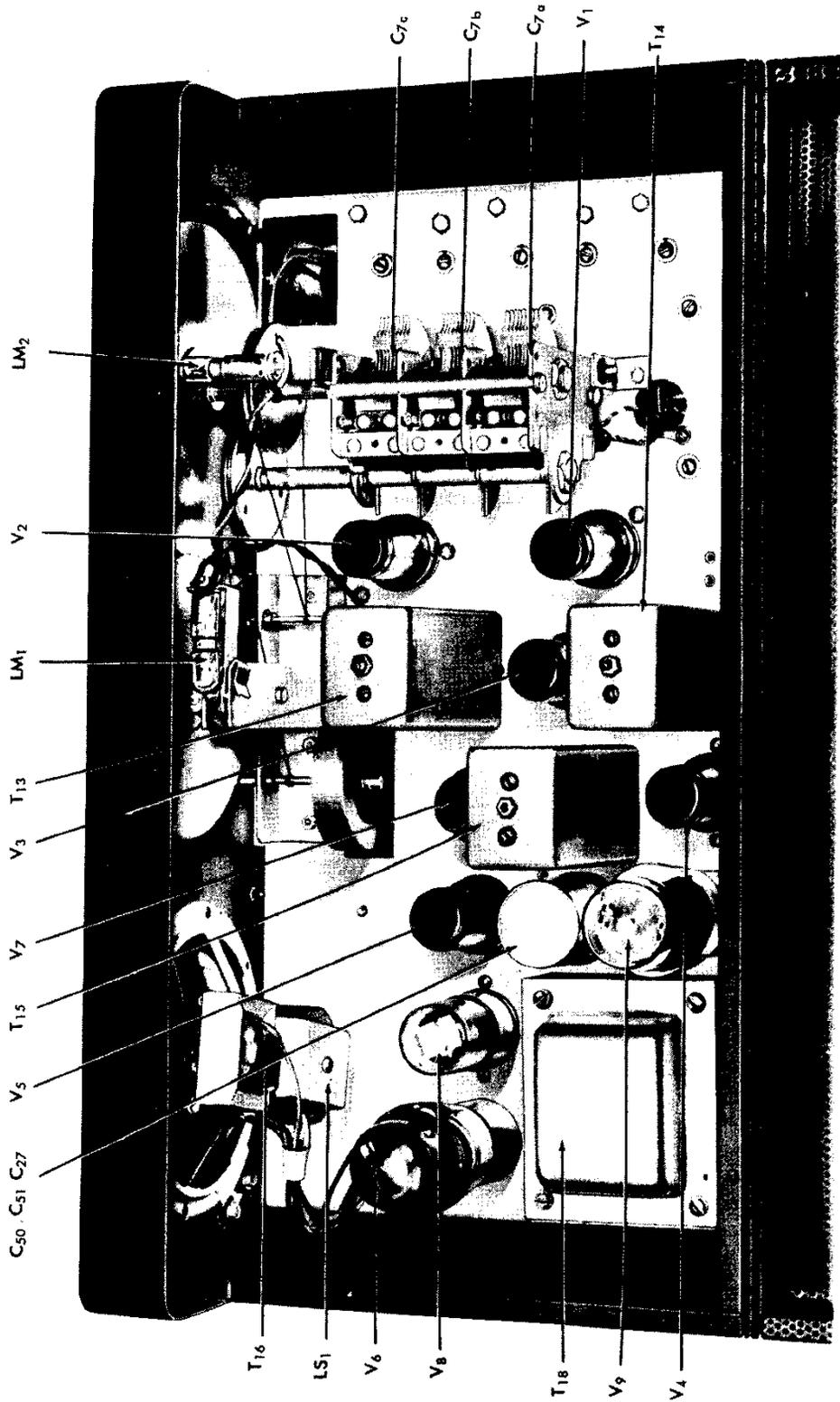
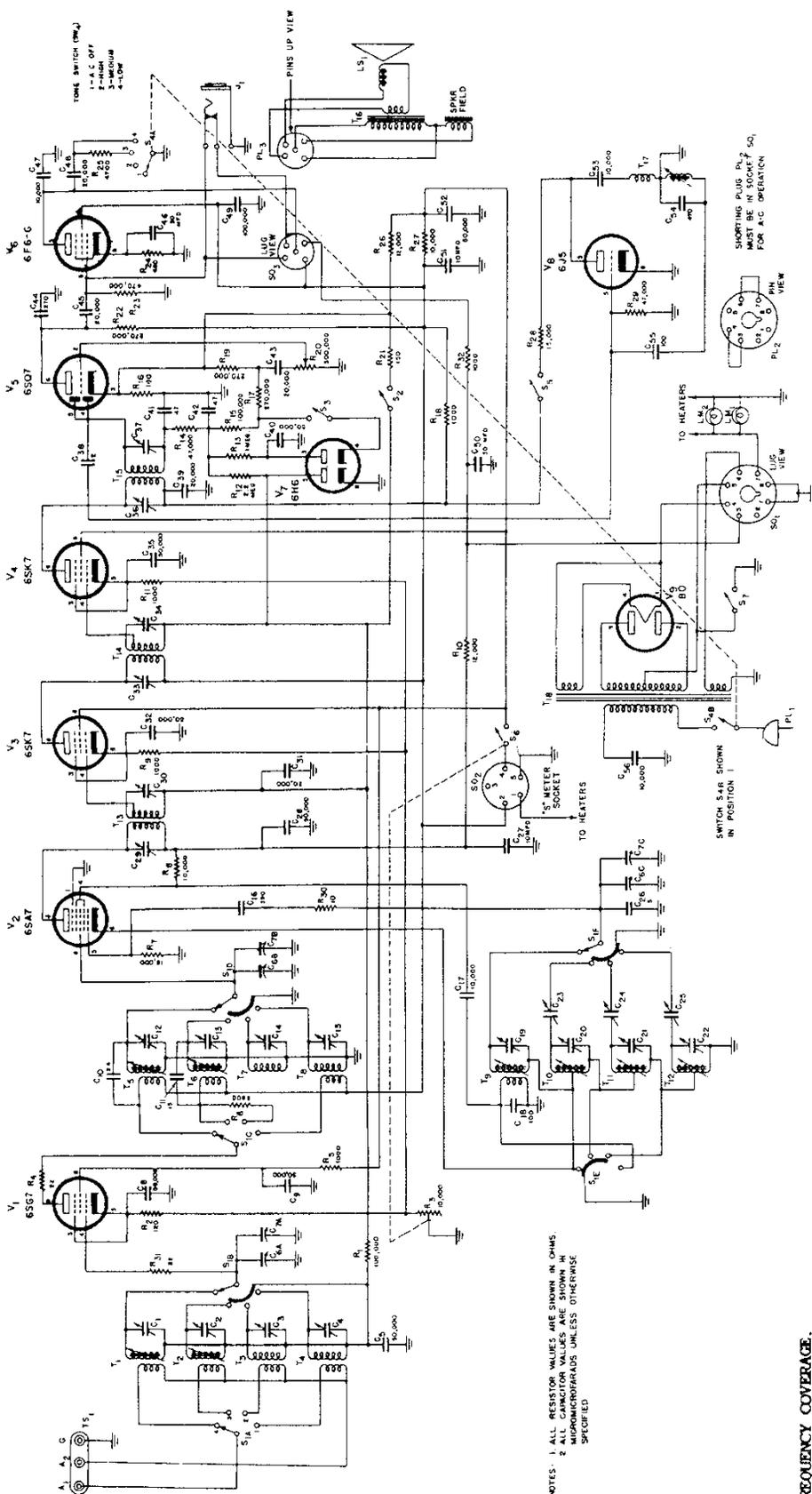


Figure 7-1. Radio Receiver Model S-40, top view.

S-40A

THE HALICRAFTERS CO.



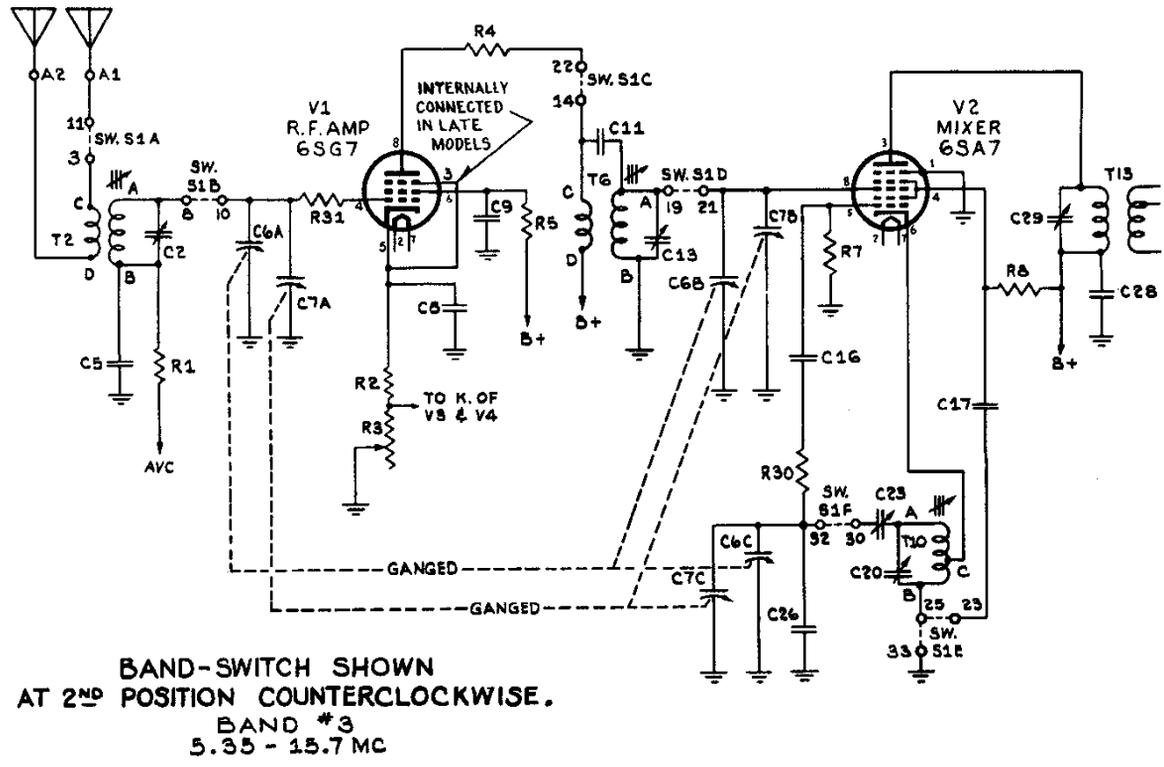
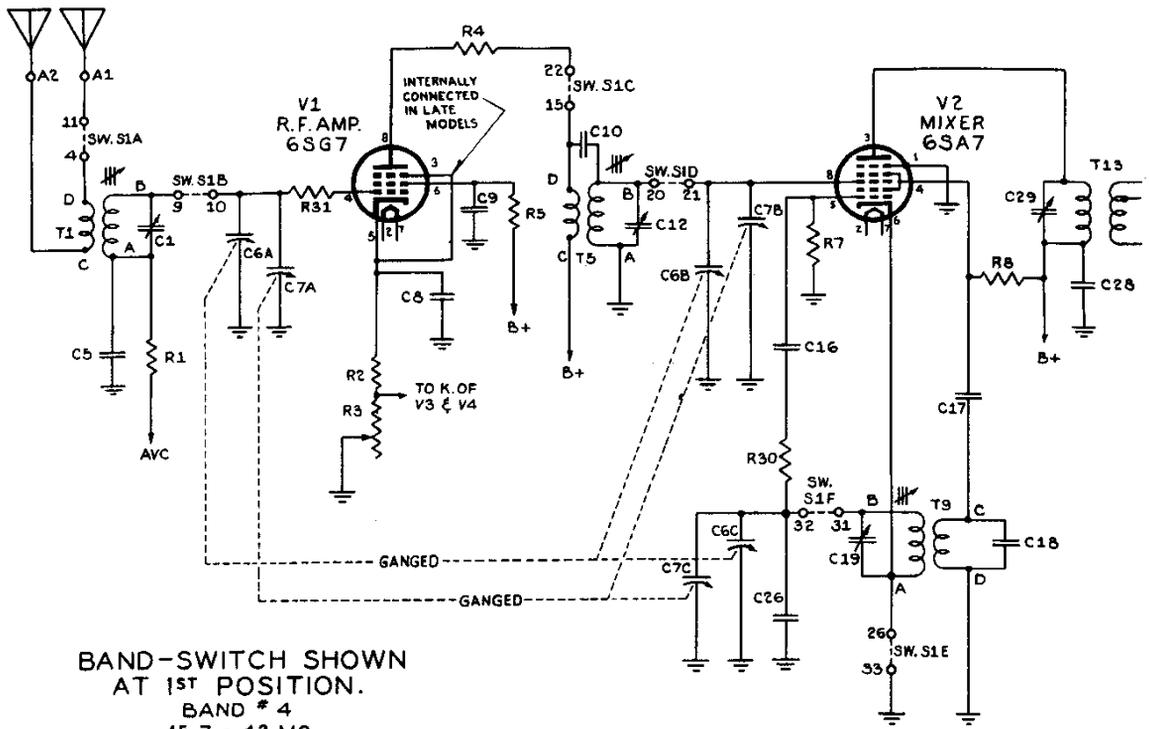
NOTES: 1. ALL RESISTOR VALUES ARE SHOWN IN OHMS.
 2. CAPACITOR VALUES ARE SHOWN IN MICROMICROFARADS UNLESS OTHERWISE SPECIFIED

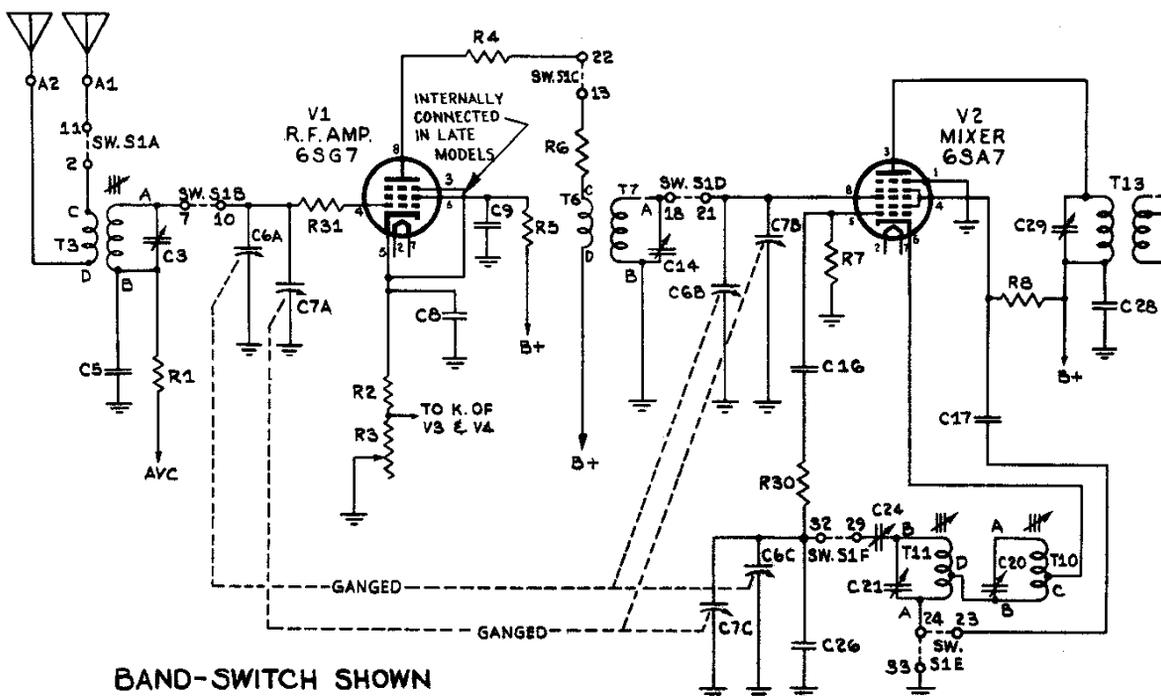
FREQUENCY COVERAGE.

The Model S-40 Radio Receiver provides continuous coverage over the frequency range from 550 kilocycles (kc) to 4.4 megacycles (mc) in four bands. Each band is provided with sufficient overlap to insure continuity of coverage over the entire tuning range. The frequencies covered per band are as follows:

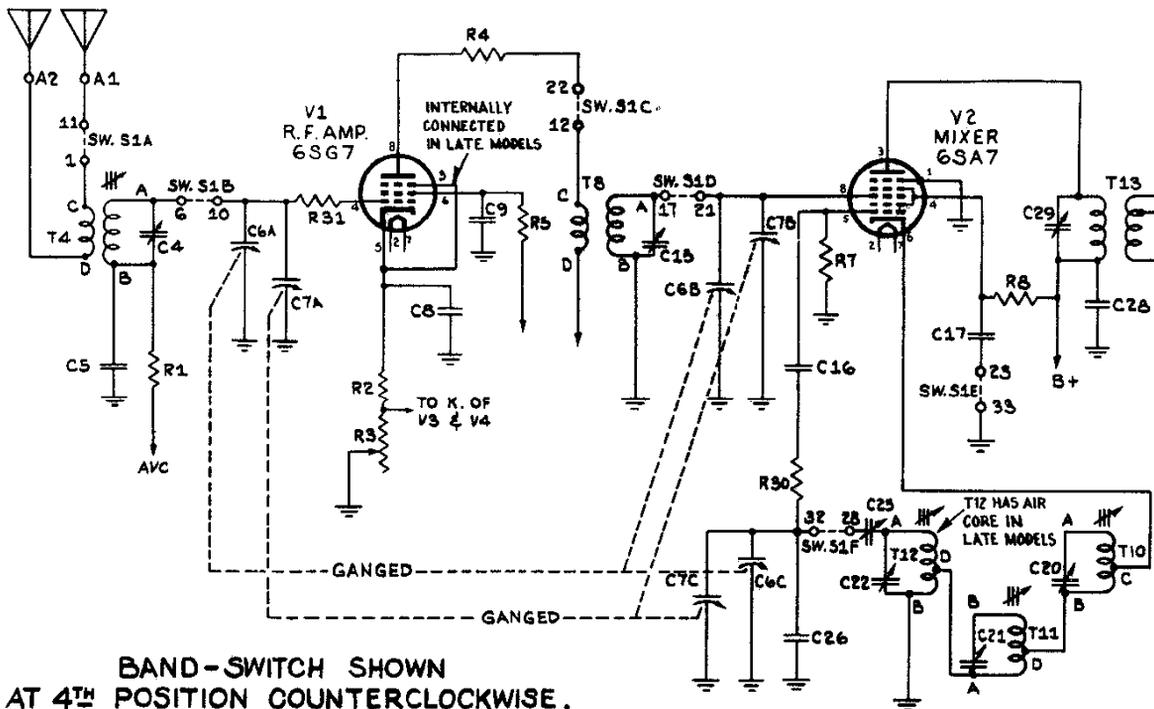
Band	Coverage
1	550 kc. to 1700 kc.
2	1680 kc. to 5.4 mc.
3	5.3 mc. to 15.6 mc.
4	15.3 mc. to 4.4 mc.

Figure 7-7 Radio Receiver Model S-40, schematic wiring diagram.





**BAND-SWITCH SHOWN
AT 3RD POSITION COUNTERCLOCKWISE.
BAND #2
1.7 - 5.35 MC.**



**BAND-SWITCH SHOWN
AT 4TH POSITION COUNTERCLOCKWISE.
BAND #1
540 - 1700 KC.**

THE HALLCRAFTERS CO.

S-40A

IF FREQUENCY	IF SELECTIVITY	IMAGE RATIO	SENSITIVITY	AUDIO OUTPUT
455 kc	6.8 kc wide at 6 db down 40.7 kc wide at 60 db down (for 500 milliwatt output)	6:1 at 30 mc 15:1 at 14 mc 37:1 at 5 mc 1000:1 at 1500 kc	15 microvolt for 500 milliwatt output at 550 kc 8 microvolt for 500 milliwatt output at 40 mc	1 watt with less than 10% distortion

CONTROL SETTINGS FOR PRELIMINARY TEST OPERATION (Broadcast Band)

REF. NO. (in Fig. 1)	NAME	FUNCTION	SETTING	REF. NO. (in Fig. 1)	NAME	FUNCTION	SETTING
1	SENSITIVITY	RF gain control	Maximum clockwise	7	NOISE LIMITER	Noise peak limiting	At "OFF"
2	BAND SELECTOR	Operating band selector	Counter clockwise to "1"	8	BAND SPREAD	Short wave band spreading	To "O" on small dial scale
3	VOLUME	Audio gain control	Half clockwise; adj. as necessary	9	TONE	Receiver on/off switch and tone control	Clockwise to "MED"
4	AVC	Automatic volume control	AT "ON"	10	PITCH CONTROL	CW beat note pitch selector	Any position (not in use)
5	TUNING	Main tuning control	To local station freq. on main dial scale	11	PHONES jack	Headset connection	Not used
6	CW/AM	BFO on/off switch	At "AM"	12	STANDBY RECEIVE	Receiver temporary standby	At "RECEIVE"

REF. NO.	DESCRIPTION	HALLCRAFTERS PART NUMBER	COMPONENT LIST PRICE	REF. NO.	DESCRIPTION	HALLCRAFTERS PART NUMBER	LIST PRICE PER COMPONENT
CAPACITORS				SWITCHES			
C-1, 2, 12, 13 and 19	4 to 80 mmf trimmer for transformers T-1, T-2, T-5, T-6 and T-9.	44A149	\$ 10	S-1	BAND SELECTOR; 3 sections ganged; 4 position; each wiper is individually mounted in chassis, ganged by rotating shaft.		
C-3, 4, 14, 15, 20, 21 and 22	1.5 to 15 mmf trimmer for transformers T-3, T-4, T-7, T-8, T-10, T-11 and T-12.	44A147	.10	T-3	2 bakelite wafers (S-1A through D)	62B039	\$.25
C-5	0.05 mfd; +40-20%; 300 vdcw; paper.	46A091	.20	T-4	1 bakelite wafers (S-1E and F)	62B044	.25
C-6 and 7	Tuning capacitor; 3 sections ganged.	48C138	3.75	S-2, 3, 5 and 7	Shunt and index assembly	60A132	.65
C-8, 32, 35 and 40	0.05 mfd; +40-10%; 500 vdcw; paper.	46A093J	.10	S-4	A.W.C. ON/OFF; SPST; toggle; 3 amp @ 250 volts	60A138	.25
C-9, 26 and 52	0.05 mfd; +40-10%; 500 vdcw; paper.	46A093J	.10	S-6	"S" meter; SPST; refer to P-3; NOT AVAILABLE AS A SEPARATE REPLACEMENT PART.	60A225	.45
C-10	24 mmf; +20%; 500 vdcw; neg. temp. coeff.	CC21UK240M	.15	SO-1	DC power source input socket; octal, female, Amphenol type MIP-8	6A035	.10
C-11	15 mmf; +20%; 500 vdcw; neg. temp. coeff.	44B141	.30	SO-2	Connection for external "5" speaker; 5 contacts, female, Amphenol type MIP-5	6A186	.10
C-16	750 mmf mmf/deg. C; ceramic.	CC21UK150M	.15	SO-3	Speaker plug connector; 5 contacts, female, Cinch type 2649-B	6A246	.10
C-17, 53 and 56	350 mmf; +20%; 500 vdcw; mica	CM20A391K	.10	T-1	Antenna coil for Band 4; variable iron core	51B783	
C-18	0.01 mfd; +40-10%; 500 vdcw; paper	44A024	.35	T-2	Antenna coil for Band 2; air core	51B782	
C-23	0.00075 mmf/mm/deg. C; ceramic.	44A158	.25	T-3	Antenna coil for Band 1; air core	51B780	
C-24	2945 mmf nominal; pad for transformer T-10	44A024	.35	T-4	Mixer coil for Band 4; variable iron core	51B787	
C-25	1300 mmf nominal; pad for transformer T-11	44A024	.35	T-5	Mixer coil for Band 3; variable iron core	51B786	
C-26	490 mmf nominal; pad for transformer T-12	44A142	.25	T-6	Mixer coil for Band 2; air core	51B785	
C-27, C-50 and C-51	3 mmf +0.2 mmf at 25 deg. C; temp. compensating for oscillator stage	44A158	.25	T-7	Mixer coil for Band 1; air core	51B784	
C-29 and 30, 33 and 34	Electrolytic; 3 section unit; coded leg terminals; sect. 1 (C-50) 30 mfd; +40-10%; sect. 2 (C-27) and sect. 3 (C-51) each 10 mfd; +40-10%; all sections 450 vdcw.	45A062	1.60	T-8	Oscillator coil for Band 4; variable iron core	51B791	
C-31 and 43	Dual trimmer unit for IF transformers T-13 and T-14	44A095	.25	T-9	Oscillator coil for Band 3; variable iron core	51B790	
C-35 and 37	0.02 mfd; +40-10%; 500 vdcw; paper	46A093J	.10	T-10	Oscillator coil for Band 2; variable iron core	51B789	
C-36	Dual trimmer unit for IF transformer T-15	44A096	.25	T-11	Oscillator coil for Band 1; variable iron core	51B788	
C-39, 45 and 48	2 mmf gimmick; formed by twisting two insulated wire leads; NOT AVAILABLE AS A REPLACEMENT PART, SHOWN FOR REFERENCE ONLY.	46A203J	\$ 10	T-12	1st IF transformer; 455 kc; shielded	50C186	
C-41 and 42	0.02 mfd; +40-10%; 500 vdcw; mica	46A203J	.10	T-13	2nd IF transformer; 455 kc; shielded	50C186	
C-44	270 mmf; +10%; 500 vdcw; mica	46A203J	.10	T-14	Diode IF transformer; 455 kc; shielded	50C192	
C-46	Electrolytic; 30 mfd; +20-10%; 25 vdcw; axial stranded wire leads	46A203J	.10	T-15	Audio output transformer; part of loudspeaker LS-1 assembly but is available as a separate replacement part.	54B028	
C-47	0.002 mfd; +40-10%; 500 vdcw; paper	46A203J	.10	T-16	BFO coil; 455 kc; shielded		
C-49	0.1 mfd; +40-10%; 400 vdcw; paper	46A203J	.10	T-17	Power transformer; primary—117 volt AC, 50/60 cycle; high voltage secondary 342 volts each side of center tap (no load); filament secondary 6.3 volts @ 3.5 amp; rectifier filament secondary 5 volt @ 2 amp; solder lug terminals at base	52C026	3.30
C-54	560 mmf; +5%; 500 vdcw; mica	46A203J	.10	T-18	Power transformer; same as T-16 above, except primary—110/130/150/220/280 volt AC, 25 cycles	52C027	8.35
C-55	100 mmf; +20%; 500 vdcw; mica	46A203J	.10	T-18*	*This transformer is available on special order only, and is not standard equipment for this model.		
C-57	1000 mmf	46A203J	.10				
J-1	PHONES jack; closed circuit; short body; accepts standard headset plug	36A002	.30				
JACKS				TRANSFORMERS			
LM-1 and 2	6.3 v 1/2 250 ma; blue bead; G.E. type 44	39A003	.10				
LS-1	5" P.M. speaker; 3.2 ohm voice coil						
LOUDSPEAKER				TERMINAL STRIPS			
PL-1	AC line cord and standard 2 prong plug	87A078	.35	TS-1	Antenna and ground connector strip; marked "A1", "A2" and "G" on faces; Cinch type 1738	88A032	.10
PL-2	AC operating shorting plug; Amphenol octal, male, type CP-6; includes jumpers wired between pins 4, 6 and 8	35A003	.10				
PL-3	Speaker connecting plug, Cinch type 2749; part of speaker LS-1 assembly	10A197	.10				
PLUGS				QUANTITY IN EQUIP.			
R-1 and 12	100,000 ohm; ±20%; 1/2 watt; carbon	RC20AE104M	\$ 10				
R-2	120 ohm; ±10%; 1/2 watt; carbon	RC20AE121K	.10				
R-3 and S-6	SENSITIVITY control; 10,000 ohm; includes SPST toggle action switch (S-6) on rear	25A533	.50				
R-4	22 ohm; ±20%; 1/2 watt; carbon	RC20AE220M	.10				
R-5, 18 and 32	1,000 ohm; ±20%; 1/2 watt; carbon	RC20AE103K	.10				
R-6	6,800 ohm; ±10%; 1/2 watt; carbon	RC20AE682K	.10				
R-7	15,000 ohm; ±10%; 1/2 watt; carbon	RC20AE153K	.10				
R-8	10,000 ohm; ±10%; 1/2 watt; carbon	RC20AE102K	.10				
R-9 and 11	1,000 ohm; ±10%; 1/2 watt; carbon	RC20AE103K	.10				
R-10	12,000 ohm; ±10%; 1/2 watt; carbon	RC20AE123K	.10				
R-12	2.2 megohm ±20%; 1/2 watt; carbon	RC20AE225M	.10				
R-13	1 megohm; ±20%; 1/2 watt; carbon	RC20AE105M	.10				
R-14 and 29	470 ohm; ±20%; 1/2 watt; carbon	RC20AE473M	.10				
R-17, 19 and 22	270,000 ohm; ±10%; 1/2 watt; carbon	RC20AE275M	.10				
R-20	AUDIO GAIN control; 500,000 ohm	25A534	.35				
R-21	150 ohm; ±20%; 1/2 watt; carbon	RC20AE151M	.10				
R-23	470,000 ohm; ±20%; 1/2 watt; carbon	RC20AE474M	.10				
R-24	680 ohm; ±10%; 1/2 watt; carbon	RC20AE681K	.10				
R-25	15,000 ohm; ±10%; 1/2 watt; carbon	RC20AE153M	.10				
R-26	12,000 ohm; ±10%; 1/2 watt; carbon	RC20AE123K	.10				
R-27	10,000 ohm; ±10%; 1/2 watt; carbon	RC20AE103K	.10				
R-28	15,000 ohm; ±10%; 1/2 watt; carbon	RC20AE153M	.10				
R-29	10,000 ohm; ±10%; 1/2 watt; carbon	RC20AE103M	.10				
R-30	10 ohm; ±20%; 1/2 watt; carbon	24B1G2E	.30				
R-32	1,500 ohm; ±10%; 10 watt; wire wound	RC20AE156M	.10				
R-33	15 megohm; ±10%; 10 watt; carbon	RC20AE153M	.10				
R-34	10,000 ohm; ±20%; 1/2 watt; carbon						
<p>Note: All prices are subject to change without notice.</p>							

HALLICRAFTERS

S-40B

GENERAL

- Tubes Seven plus rectifier
- Speaker 5-inch PM
- Speaker V.C. Impedance . 3.2 ohms
- Headset Output Low Impedance
- Antenna Provision for external antenna
- Tuning Manual
- Tuning Range Band Selector Position Frequency Range

Band Selector Position	Frequency Range
1.	540 kc - 1680 kc
2.	1680 kc - 5.4 mc
3.	5.3 mc - 15.5 mc
4.	15.5 mc - 44 mc

- Intermediate Frequency . 455 kc.
- Power Supply Standard Model 105-125 V. 60 cycles AC
Universal Model 105-250 V. 25/135 cycles AC
- Power Consumption 75 Watts

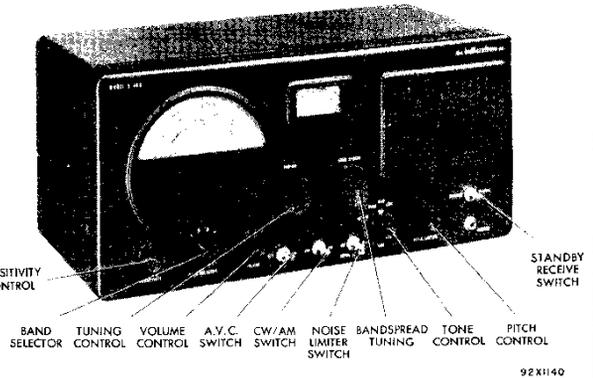
RESTRINGING DIAL CORD

To restringing the general coverage tuning dial cord, cut an 18-inch length of 30 lb. test dial cord and tie one end to the tension spring of the main tuning capacitor drive pulley at position "1" on the diagram. Follow the numbers "1" through "4", and at position "4" stretch the tension spring and tie the cord securely.

To restringing the band spread tuning dial cord cut a 36-inch length of dial cord and follow the procedure as above, starting at position "A" on the diagram. Note that the tuning drive shafts are wrapped with two and a fraction turns of dial cord for proper traction.

REPLACING LAMPS

Refer to Fig. 7 for the location of the two dial lamps used in the receiver. To gain access to defective lamps, reach in through cabinet cover and unclip the dial lamp sockets. The



sockets may then be brought out into the open to change the defective lamp. Replace lamps with 6-8 V. Mazda #44 (Blue bead) lamps or equivalent.

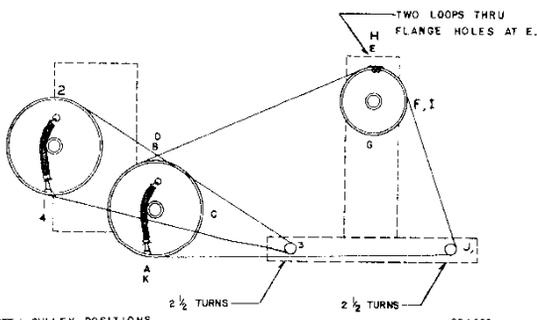
ALIGNMENT PROCEDURE

For I-F amplifier alignment it will be necessary to remove the receiver chassis from the cabinet. The chassis is held in the cabinet by three screws along both the bottom edge of the front panel and the rear of the cabinet, and two screws on either side of the front panel.

NOTE - R-F alignment should be accomplished through the holes provided in the cabinet bottom as the oscillator calibration will be effected slightly by changes in the capacity between the cabinet bottom and the r-f coils and wiring.

Before starting the alignment procedure, check the position of the general coverage dial index marker on the low frequency end of the range and the bandspread dial on zero position. The general coverage condenser should index at max. capacity, and the bandspread condenser at min. capacity.

The standard RMA dummy antenna mentioned in the alignment chart consists of a 200 mmf. condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.



NOTE: PULLEY POSITIONS SHOWN FOR MAX. GANG CAPACITY.

Fig 1. Dial cable stringing procedure

Set the following controls before alignment.

- SENSITIVITY Set at maximum
- VOLUME Set at maximum
- AVC switch Set at OFF
- BAND SPREAD Set at zero
- CW/AM Set at AM (See Step 2)
- NOISE LIMITER Set at OFF
- STANDBY RECEIVE Set at RECEIVE
- TONE SWITCH Set at HIGH

For the settings of the remaining controls, see alignment chart.

S-40B

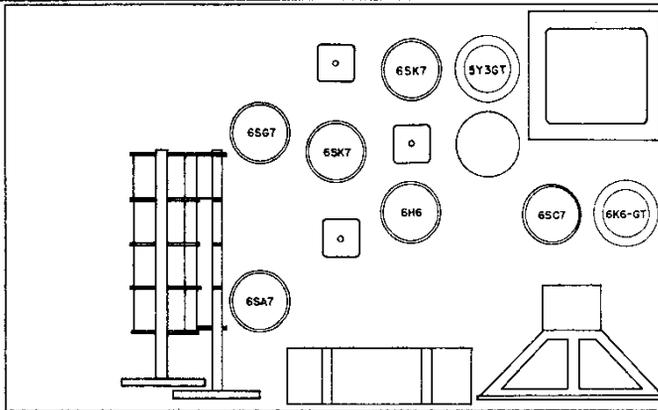


Fig. 7. Top view, location of tubes and dial lamps

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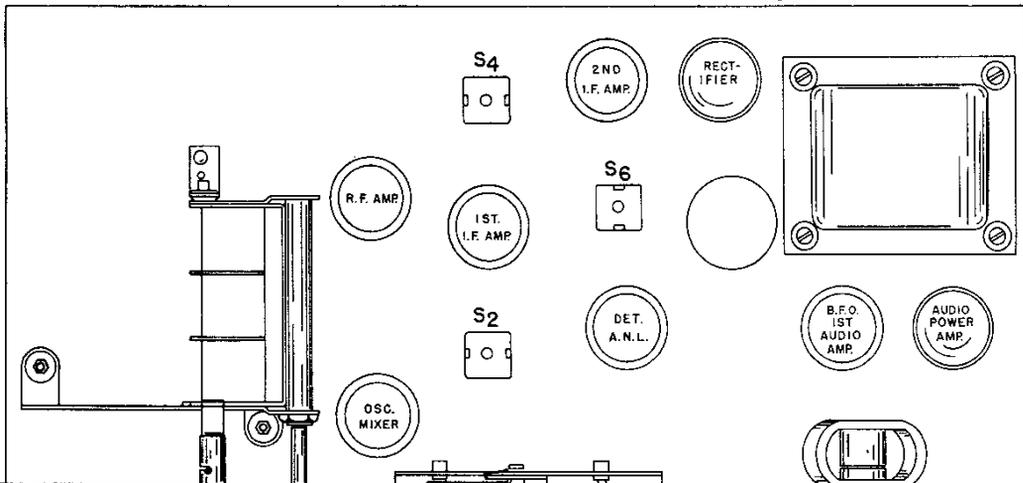


Fig. 2. Top view, alignment points

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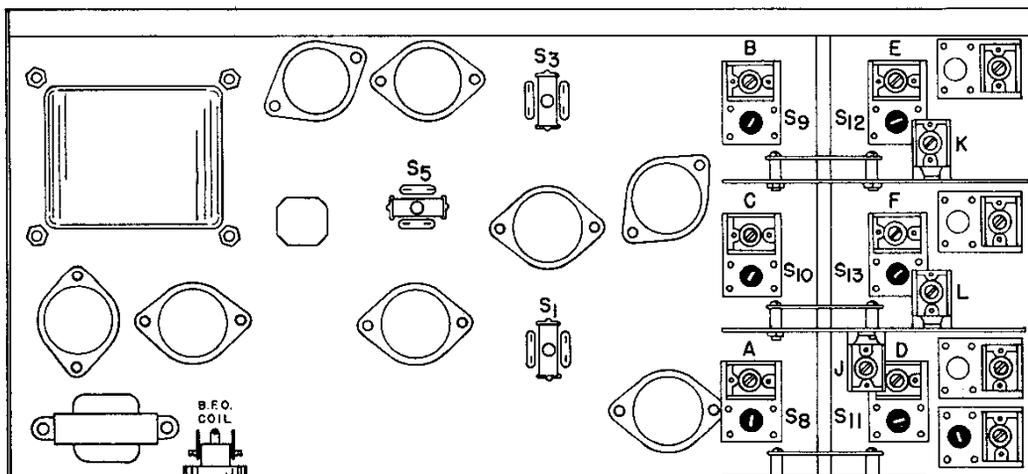
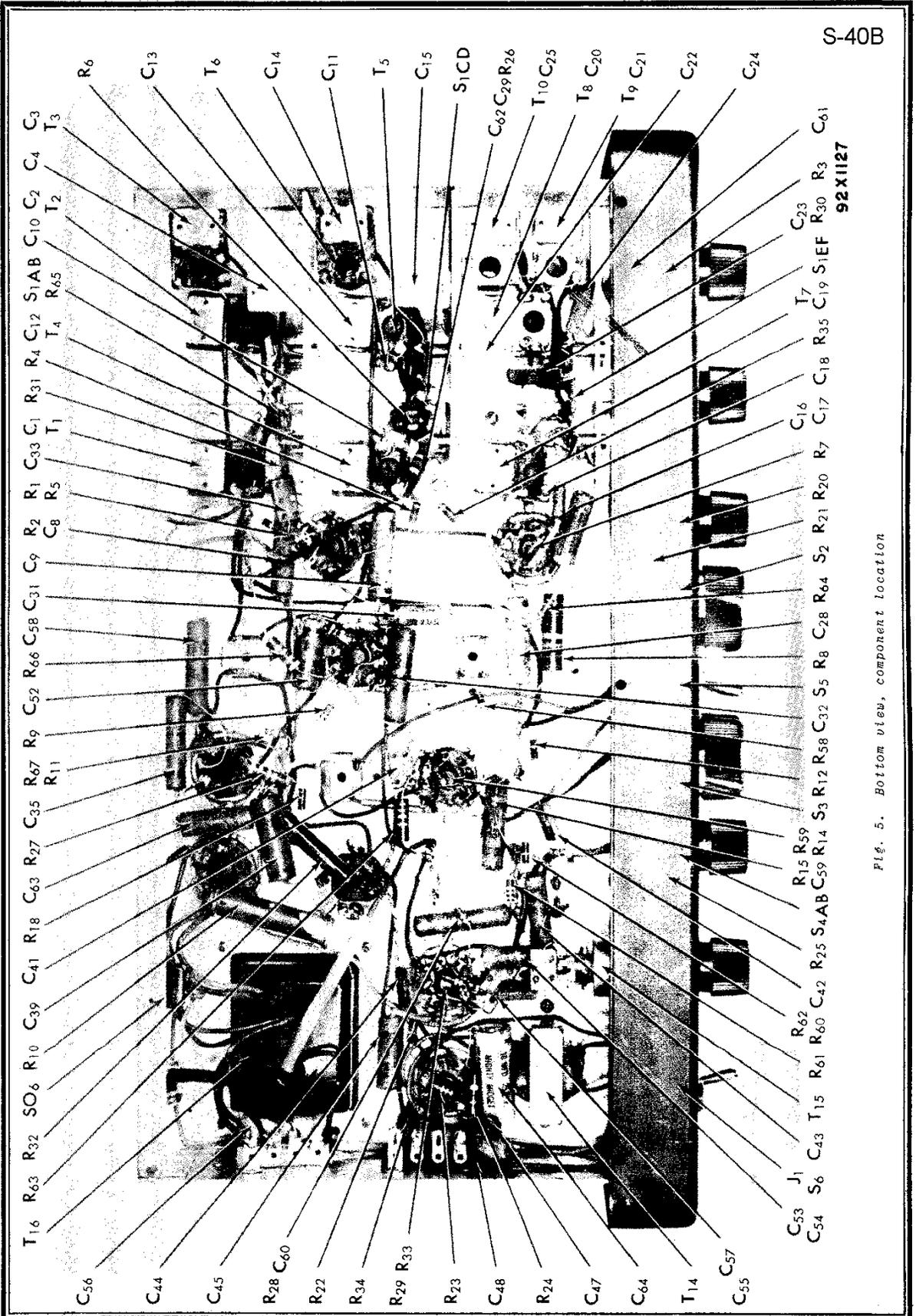


Fig. 3. Bottom view, alignment points

92D1133



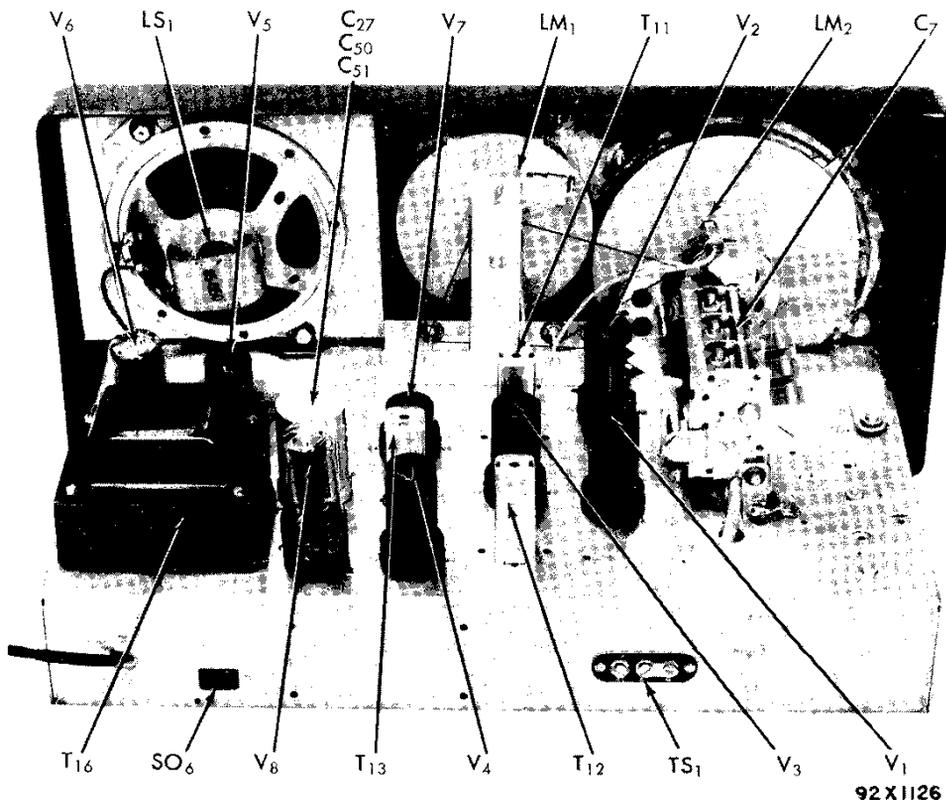
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Fig. 5. Bottom view, component location

ALIGNMENT CHART

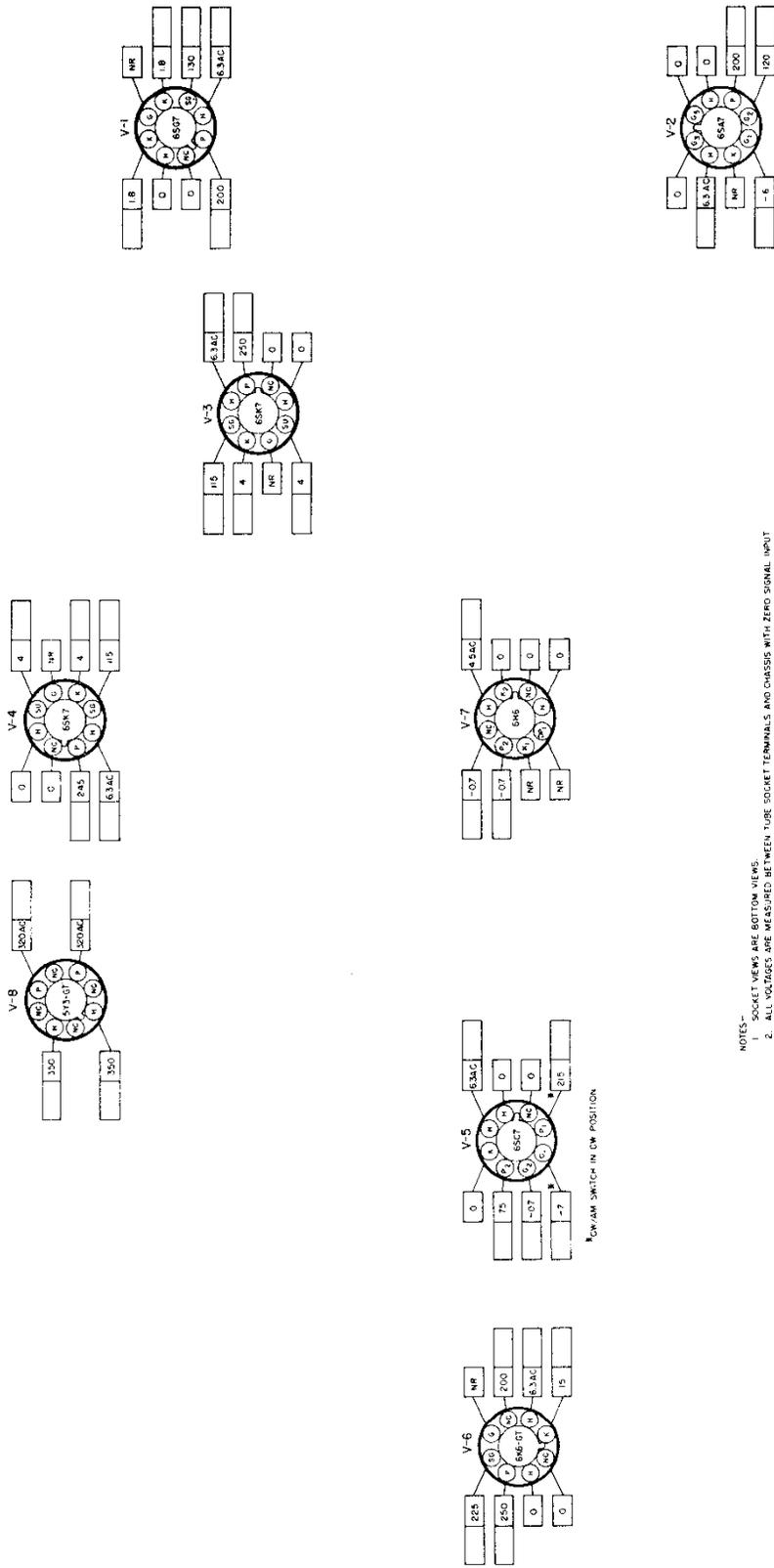
Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Setting	Receiver Dial Setting	Adjust	Remarks
1	None	Stator plates in center section of tuning gang.	455 kc	"1"	1000 kc	S1,S2,S3 S4,S5,S6	Maximum audio output at speaker voice coil. Use just enough signal generator output to obtain a 50 MW signal level.
2	None	See step 1	455 kc (No modulation)	"1"	1000 kc	S7	With the CW/AM switch set at CW, remove the pitch control knob and adjust S1 for zero beat. Replace the knob with the dot in the center position.
3	Std RMA dummy	"A1" on antenna strip. Jumper connected between "A2" and "G".	36 mc	"4"	36 mc	*A, B, C	Maximum output as in step 1
			18 mc		18 mc	*S8,S9,S10	
4	Std RMA dummy	See step 3	14 mc	"3"	14 mc	*D, E, F	Maximum output as in step 1
			10 mc		10 mc	*S11,S12,S13	
5	Std RMA dummy	See step 3	5 mc	"2"	5 mc	*G, H, I	Maximum output as in step 1
			1.8 mc		1.8 mc	*S14	
6	Std RMA dummy	See step 3	1500 kc	"1"	1500 kc	*J, K, L	Maximum output as in step 1
			600 kc		600 kc	*M	

*Note - Calibration adjustments.



92 X 1126

Fig. 4. Top view, component location



- NOTES—
- 1 SOCKET VIEWS ARE BOTTOM VIEWS.
 - 2 ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS AND CHASSIS WITH ZERO SIGNAL INPUT.
 - 3 LINE VOLTAGE 17 V AC.
 - 4 AC VOLTAGES SHOWN IN LESS OTHERWISE SPECIFIED.
 - 5 DC VOLTAGES SHOWN WHEN MEASURED WITH AN ELECTRONIC VOLTMETER.
 - 6 "NC"=NO CONNECTION; VOLTAGE SHOWN FOR THIS TERMINAL ONLY WHEN TERMINAL IS USED AS A TIE LUG.
 - 7 "NR"=NOT READABLE (READING GENERALLY MEANINGLESS).
 - 8 SPACE PROVIDED FOR SERVICE METER READINGS.
 - 9 □

FRONT VIEW OF CHASSIS
BOTTOM VIEW OF CHASSIS

Fig. 6. Tube socket voltage chart

SERVICE PARTS LIST

Ref. No.	Description	Hallcrafters Part Number	Ref. No.	Description	Hallcrafters Part Number
CONDENSERS			TRANSFORMERS AND COILS		
C-1,2,12,13,19	Trimmer, adjustable, part of transformers T-1,2,4,5 and 7	44A149	T-1	Transformer, antenna stage, band 4	51B783
C-3	Trimmer, adjustable, part of transformer T-3	44A389	T-2	Transformer, antenna stage, band 3	51B782
C-4,15,22	Trimmer, adjustable	44A191	T-3	Transformer, antenna stage, band 1 and 2	51B1241
C-7	Tuning capacitor, 3 sections ganged	48C240-B	T-4	Transformer, mixer stage, band 4	51B787
C-8,32,35,58,59,60	.05 mfd. 200 V., tubular	46AU503J	T-5	Transformer, mixer stage, band 3	51B786
C-9,28	.05 mfd. 600 V., tubular	46AY503J	T-6	Transformer, mixer stage, band 1 and 2	51B1240
C-10	22 mmf. 500 V., ceramic	47X21UK220M	T-7	Transformer, oscillator stage, band 4	51B791
C-11	15 mmf. 500 V., ceramic	47X21UK150M	T-8	Transformer, oscillator stage, band 3	51B913
C-14,21	Trimmer, adjustable, part of transformers T-6 and 9	44A147	T-9	Transformer, oscillator stage, band 2	51B789
C-16	390 mmf. 500 V., mica	47X20B391K	T-10	Transformer, oscillator stage, band 1	51B912
C-17,53	.01 mfd. 600 V., tubular	46AY103J	T-11,12	Transformer, 1st and 2nd IF stages	50C243
C-18	68 mmf. 500 V., ceramic	47X25UK680K	T-13	Transformer, detector stage	50C242
C-20	Trimmer, adjustable, part of transformer T-8	44A148	T-14	Transformer, audio output	55B093
C-25	Padder, adjustable, part of transformer T-10	44A188	T-15	Transformer, BFO	54B044
C-23	3000 mmf. 500 V., mica	47X30C302K	T-16	Transformer, power	52A209
C-24	1500 mmf. 500 V., mica	47X30C152J	*T-16	Transformer, power (Universal)	52C210
C-27,50,51	30-10-10 mfd. 450 V., electrolytic	45A062	SWITCHES		
C-29,33	220 mmf. 500 V., mica	47X20B221K	S-1	Bandswitch, wafer, antenna stage	60B389
C-31,43	.02 mfd. 200 V., tubular	46AU203J		Bandswitch, wafer, mixer stage	62B039
C-38	2 mmf., twisted wire gimmick			Bandswitch, wafer, oscillator stage	62B044
C-39	.1 mfd. 600 V., tubular	46AY104J		Bandswitch, shaft	60B392
C-41,42	47 mmf. 500 V., mica	47X20B470M	S-2,3,5,6	Switch, toggle, S.P.S.T., A.V.C., A.N.L., CW-AM, and STANDBY-RECEIVE	60A138
C-44,55	270 mmf. 500 V., mica	47X20B271K	S-4	Switch, PWR-TONE control	60A225
C-45,48,52,63	.02 mfd. 600 V., tubular	46AY203J	PLUGS AND SOCKETS		
C-47	.002 mfd. 1000 V., tubular	46A104	J-1	Jack, headset	36A002
C-54	470 mmf. 500 V., mica	47X20B471J	PL-1	Line cord	87B1573
C-56	.01 mfd. 600 V., molded paper	46AC103J	SO-6	Socket, standby	10A015
C-57	1000 mmf. 500 V., mica	47X25B102M		Socket, octal (tube)	6A035
C-61	.25 mfd. 200 V., tubular	46AT254J		Socket, dial light, general coverage dial	86A070
C-62	2.2 mmf. 500 V., bakelite	47A160-4		Socket, dial light, bandsread dial	86B049
C-64	10 mfd. 25 V., electrolytic	45A121	TUBES, RECTIFIERS AND LAMPS		
RESISTORS			V-1	Type 6SG7, r-f amplifier	90X6SG7
R-1,62	1 megohm 1/2 watt, carbon	23X20X105M	V-2	Type 6SA7, mixer	90X6SA7
R-2	120 ohms 1/2 watt, carbon	23X20X121K	V-3,4	Type 6SK7, 1st and 2nd i-f amplifiers	90X6SK7
R-3	10,000 ohms, SENSITIVITY control	25B590	V-5	Type 6SC7, B.F.O. and audio amplifier	90X6SC7
R-4,31	22 ohms 1/2 watt, carbon	23X20X220M	V-6	Type 6K6GT, audio power amplifier	90X6K6GT
R-5	39,000 ohms 1 watt, carbon	23X30X393K	V-7	Type 6H6, A.N.L. and detector	90X6H6
R-6,26	6800 ohms 1 watt, carbon	23X30X682K	V-8	Type 5Y3GT, rectifier	90X5Y3GT
R-7	18,000 ohms 1/2 watt, carbon	23X20X183K	LM-1,2	Lamp, dial light, Mazda #44	39A003
R-8	10,000 ohms 2 watts, carbon	23X40X103K	MISCELLANEOUS		
R-9	470 ohms 1/2 watt, carbon	23X20X471K	TS-1	Terminal strip, antenna	88A032
R-10	12,000 ohms 4 watts, carbon	23X65CE123K		Lock, line cord	76A397
R-11,18,65	1000 ohms 1/2 watt, carbon	23X20X102K		Spring, retainer (Bandsread, and main tuning drive shaft)	75A062
R-12,59	2.2 megohms 1/2 watt, carbon	23X20X225M		Dial cord	38A001
R-14	47,000 ohms 1/2 watt, carbon	23X20X473M		Spring, dial cord	75A012
R-15,29,58	100,000 ohms 1/2 watt, carbon	23X20X104M		Dial, bandsread	83B372
R-20	1/2 megohm, VOLUME control	25A534		Dial, general coverage	83C240
R-21	150 ohms 1/2 watt, carbon	23X20X151M		Glass, general coverage dial	22B199
R-22	270,000 ohms 1/2 watt, carbon	23X20X274K		Window, bandsread	22A307
R-23,61	470,000 ohms 1/2 watt, carbon	23X20X474M	LS-1	Speaker, P.M. (5-inch)	85B500
R-24	680 ohms 1 watt, carbon	23X30X681K		Knob, PITCH CONTROL	12A058
R-25	15,000 ohms 1 watt, carbon	23X30X153M		Knob, SENSITIVITY, VOLUME and TONE	15A046
R-27,66	47,000 ohms 1 watt, carbon	23X30X473K		Knob, TUNING and BANDSPREAD	15A047
R-28	22,000 ohms 1/2 watt, carbon	23X20X223M		Knob, BAND SELECTOR	15A266
R-30	10 ohms 1/4 watt, carbon	23X10X100M		Foot, rubber	16A007
R-32	1500 ohms 10 watts, WW	24BG152E			
R-33	15 megohms 1/4 watt, carbon	23X10X156M			
R-34	10,000 ohms 1/2 watt, carbon	23X20X103M			
R-35	27 ohms 1/4 watt, carbon	23X10X270K			
R-60,67	330,000 ohms 1/2 watt, carbon	23X20X334K			
R-63	6.8 ohms 1 watt, carbon	23X30X068K			
R-64	330 ohms 1/2 watt, carbon	23X20X331K			

* Used on Universal Model S-40BU only.

CHANGES

Farnsworth Models

The parts shortage has resulted in the substitution of various types of tuning capacitors without change in part numbers stamped on them. In ordering replacement tuning capacitors for ET-060, 061, 063, 064, 065, 066, 069; EK-263, 264, and 265 the following suggestions should be observed:

Gang Capacitor with 21 plate oscillator section requires the removal of trimmer from r-f section of gang if the loop antenna has a r-f trimmer located on it. This capacitor used B.C. oscillator coil #38483 and, if an S.W. oscillator coil is used requires S.W. oscillator coil #38549. Both of these coils have a white dot to indicate finish lug.

A #26239 gang capacitor with 19 plate oscillator section (identified by red dot on rear) may require the removal of r-f trimmer as explained above. This capacitor requires B.C. oscillator coil #38706 and S.W. oscillator coil (if used) #38709. These oscillator coils are marked with a yellow dot at the finish lug.

The following is an alignment hint for the Farnsworth models with respect to the use of the antenna:

The antenna should be held in a vertical position, $\frac{3}{8}$ inch from the back side of the radio chassis in order to maintain the maximum output of the antenna after being installed in the cabinet. Therefore, we suggest some type of a jig to be made out of scrap material found around the service department to hold said antenna in the proper position while the serviceman is realigning the radio out of the cabinet. This suggestion is very helpful in getting the best operation out of the radio and, in addition, saving expense and time.

GALVIN DIAL CORD SLIPPAGE

Dial slippage encountered in 1946 home sets using slide rule type dials can easily be remedied by restringing using two dial cords.

Formerly, a single cord and tension spring was used for both driving the tuning capacitor and moving the pointer. It is recommended that two cords and tension springs be used; one for driving the tuning capacitor and one for moving the pointer.

Before removing the old cord, make a sketch showing the old cord layout. This will assist greatly in restringing.

First install the drive cord between the tuning shaft and tuning capacitor pulley. It is to be routed in exactly the same manner as the old cord was, except run it only between the tuning shaft and tuning capacitor pulley. Be sure to wind 3 turns around the tuning shaft. The old tension

spring is used to provide tension on the cord by hooking in exactly as before. Use the cord originally on the set for this purpose, except cut it down to the required length.

Install the pointer cord supplied by routing it in the same fashion as before except that it does not go to the tuning shaft. Simply run it to the tuning capacitor pulley and apply light tension to it with the attached tension coil spring. There are several holes in the tuning capacitor pulley through which the tension spring may be hooked and/or adjusted.

To calibrate pointer, simply turn the tuning capacitor to the fully meshed position and set pointer to "V" notch or calibration mark provided.

Use a drop of household cement to fix pointer to cord. A drop of cement on all knots will secure them.

Gamble-Skogmo 43-7601, 43-7601A, 43-7601B

These models, shown on pages 16-1 to 16-5 of *Rider's Volume XVI*, use the General Instrument Record Changer model 205, which can be found on pages RCD.CH. 15-5 to 15-8 of *Rider's Volume XV*.

General Electric 250

To reduce the hum in this model, which is found on pages 15-32 to 15-36 of *Rider's Volume XV*, it is suggested that the following change be made.

Resistor R16 (2200 ohms) should be removed from the negative battery terminal lug, lengthen pigtail, insulate with a spaghetti covering, and solder to the ground lug of the terminal board located at socket saddle of the 1LH4 tube.

An appreciable increase in duration of operation from a fully charged battery in this model can be effected in the following manner, realizing, however, that some degree of performance is sacrificed in regard to sensitivity and power output. Replace power-supply filter resistor, R17 (1500 ohms) with one of 4700 ohms, 1 watt, carbon. This change should be made only when the customer demands a longer duration of operation to one battery charge.

Hallcrafters S-38

In the event that an a-c hum develops in this receiver, the schematic of which appears on page 15-59 of *Rider's Volume XV*, it has been found that the 35Z5GT is the cause of the trouble, even though the tube passes a normal test. Also, other tubes in this set have been known to cause hum. Try replacement tubes.

Another cause is a high resistance ground between the chassis and the case.

This usually develops through the rubber mounting grommets or through the switch mounting rivets. Occasionally it may be a defective 25- μ f capacitor (C36), which should be replaced if defective. It is possible that C36 is not of the correct value. Check this point.

If this set loses sensitivity after being in use for approximately a half hour, replace the 12SA7GT/G tube, as an investigation has revealed that this condition is due to a certain percentage of Hytron tubes of this type, of a particular production run marked 1/6, 2/6, 1A6, or 2A6. The replacement should have any other marking than those listed previously.

Hallcrafters S-40

In the event that band 4 (15.7 to 43 mc) fails to operate at all times, but reception on other bands is normal, trouble is indicated in the oscillator circuit of this band, which in most cases can be traced to a weak 6SA7 oscillator tube or low line voltage. In those few cases where trouble persists, even though all voltages are normal and the tube has been replaced, this trouble can be remedied by replacement of the oscillator coil T9 and capacitor C18, as follows:

Replace T9 oscillator coil, part #51B791 containing 7 primary turns, with part #51B791B, having 10 primary turns. Change capacitor C8 (100 μ f) to part #CC25UK680K, 68 μ f. Connect the cathode lead from terminal 6 of the 6SA7 (V2) to T9 direct to the secondary winding where it leaves the coil form rather than to terminal lug "A" on the top of the coil form. (See sketch of coil form on page 15-67, 68 in *Rider's Volume XV*.) Replacement coils are furnished without the iron cores, as they are interchangeable. If new cores are needed, due to loss or breakage, they can be ordered under part #77A068.

If the receiver cannot be placed in "break-in" operation, apply the following remedy: Notice on the schematic of the receiver on page 15-67, 68 in *Rider's Volume XV* that the grid of V6 the output 6F6G tube is connected to the power switch S7, so that when the switch is in the "send" position the grid of this tube is grounded. Many operators wish to leave this switch in the "send" position and connect from terminal 5 on the plug PL2, through the transmitter relay to ground. In order to do this, the lead between S7 and V6 should be removed. On later production runs, this lead has been eliminated. See notes on "Power Requirements" and "Preparation for Use" on page 15-71 of *Rider's Volume XV*.