

hallicrafters

OPERATING AND SERVICE INSTRUCTIONS

COMMUNICATIONS TRANSCEIVER MODEL SR-160

IMPORTANT

BEFORE OPERATING THE SR-160 REFER TO PAGE 16 OF THIS MANUAL, PARAGRAPH 8-3 (BIAS ADJUSTMENT). THE BIAS ADJUSTMENT ON THE POWER SUPPLY MUST BE SET PROPERLY TO PREVENT PERMANENT DAMAGE TO THE FINAL AMPLIFIER TUBES AND FOR OPTIMUM PERFORMANCE OF THIS EQUIPMENT.

WARRANTY

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

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

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

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

the hallicrafters co.

092-014555



156-002823

Figure 1. Hallicrafters Model SR-160 Transceiver.

SECTION I

GENERAL DESCRIPTION

The Hallicrafters Model SR-160 Transceiver is a precision-built, compact, high-performance radio equipment of advanced design. This transceiver utilizes 17 tubes and a single conversion heterodyning system to provide for the transmission and reception of single-sideband (SSB) and continuous wave (CW) signals on the 80, 40, and 20 meter bands.

The versatility of SR-160 equipment permits it to be operated as a fixed station or as a mobile equipment. A 117-volt, 50/60-cycle AC power supply complete with speaker (Model PS-150-120) is available for fixed-station use; a 12-volt DC power supply (Model PS-150-12), and a mobile installation kit (Model MR-160) are available when the transceiver is to be used in a mobile application.

An advanced feature of the SR-160 equipment is the Receiver Incremental Tuning (RIT) control. This control enables the operator to unlock the receiver frequency without disturbing the transmitter frequency, and tune the receiver approximately three KC either side of the transmitter frequency. Rotating the RIT switch to OFF automatically returns the equipment to the transceiver condition.

Another special feature is the amplified Automatic Audio Level Control (AALC) which functions in the transmit mode. The AALC circuitry prevents "splatter" due to severe "flat-topping" of the final amplifier by providing approximately 15 DB of compression after a small amount of "flat-topping" occurs.

Other features of the Model SR-160 Transceiver include:

- A stable, accurately-calibrated VFO.
- A built-in, 100-KC crystal calibrator circuit, (Model SR-160 is supplied less crystal and tube).
- Lower sideband operation, 80-meter and 40-meter bands; upper side band on 20-meter band: Manual SSB operation (push-to-talk) and manual CW operation. Provision for voice controlled SSB operation (VOX) with accessory unit.
- A crystal-lattice filter.
- A product detector.
- An S-meter/RF output level indicator.

IMPORTANT

Do not, under any circumstance, attempt to operate the SR-160 equipment before becoming completely familiar with the instructions contained within this manual.

SECTION II

TECHNICAL DATA

TUBES AND FUNCTIONS

V1	12AW6	Receiver RF Amplifier	V9	12AT7	First and Second Microphone Amplifier
V2	12BE6	Receiver Mixer	V10	6AM8A	AVC/AALC Amplifier-Detector
V3	12BZ6	First IF Amplifier	V11	12BE6	Heterodyne Oscillator and Mixer (40M)
V4	6EA8	Receiver Second IF Amplifier and Meter Amplifier	V12	0A2	Voltage Regulator
V5	12AX7A/ ECC83	Product Detector and First Audio Amplifier	V13	12BE6	Transmitter Mixer
V6	6AQ5A	Receiver Audio Output	V14	12BY7A	Transmitter Driver
V7	12AU6	100-KC Calibrator Oscillator (Not supplied with unit.)	V15	12DQ6B	Transmitter Power Amplifier
V8	12AT7	Carrier Oscillator/BFO and Third Microphone Amplifier	V16	12DQ6B	Transmitter Power Amplifier
			V17	6EA8	VFO and Cathode Follower

FREQUENCY COVERAGE:

Three-band Capability — Full frequency coverage provided for 80, 40, and 20 meter amateur bands. The frequency range of each band is as follows:

80M Band: 3500 KC - 4000 KC
40M Band: 6900 KC - 7400 KC
20M Band: 13900 KC - 14400 KC

OPERATION:

Single Sideband — LSB 80M and 40M bands
USB 20M band
Push-to-talk control (VOX-optional accessory)

CW — Manual

FRONT PANEL CONTROLS:

RIT CONTROL (OFF/ON); RF - AF GAIN; OPERATION (OFF/REC ONLY/CW TUNE/SSB/CAL); DIAL CAL; FREQUENCY; BAND SELECTOR (80M/40M/20M); DRIVER TUNE; CARRIER-MIC GAIN; FINAL TUNE.

GENERAL:

Dial Calibration — 5-KC increments.

Calibration Accuracy — Less than 2 KC between 100-KC points after indexing. (Built-in 100-KC crystal calibrator circuit requires 100-KC crystal and 12AU6 tube to operate.)

VFO — 500-KC tunable range.

Stability — Within 300 CPS after warmup.

Tubes — 16 plus one voltage regulator, six diodes, and one varicap.

Ambient Temperature Range — Minus 20° to plus 50°C.

Construction — Rugged, lightweight aluminum.

Dimensions (HWD) — 6-3/8 by 13 by 11 inches.

Net Weight — 13-1/4 pounds.

Shipping Weight — 18 pounds (nominal).

TRANSMITTER:

Output Tubes — Two 12DQ6B tubes in parallel.

Output Impedance — Fixed, 50-ohm pi-network.

Power Input — SSB . . . . . 150 watts PEP MAX.
CW . . . . . 125 watts MAX.

Carrier and Unwanted Sideband Suppression — 50 DB.

Distortion Products — 30 DB.

Audio Response — 600 CPS to 2800 CPS (3 DB).

Microphone Input — High impedance.

RECEIVER:

Sensitivity — 1 microvolt for a 20-DB signal-to-noise ratio.

Audio Output — 2 watts.

Output Impedance — 3.2 ohms.

Overall Gain — 1 microvolt for 1/2-watt output.

Antenna Input — 50 ohms.

Single Conversion — IF is 5200 KC.

Crystal-lattice filter — 5200 KC.

ACCESSORIES:

Mobile Installation Kit Model MR-160 — Contains mounting brackets and interconnecting cable to power the Model SR-160 Transceiver from the Model PS-150-12 Power Supply. The cable length is 16 feet and may be cut to the length required for the installation.

Net Weight — 3-1/2 pounds.

Shipping Weight — 4-1/2 pounds (nominal).

12-volt DC Power Supply PS-150-12 — Designed for out-of-the-way trunk installation . . . terminal strip provides for quick and easy connection to the interconnecting cable. Contains five silicon diode rectifiers and four transistors. The battery supply leads supplied are twenty feet long and may be cut to the length required for the installation.

Input Power Requirements:

Transmit (CW) . . . . . 20 amperes.

Receive . . . . . 10 amperes.

Dimensions (HWD) — 3-3/4 by 10 by 6-3/4 inches.

Net Weight — 5-1/2 pounds.

Shipping Weight — 9 pounds (nominal).

117-volt AC Power Supply Model PS-150-120 — Styled as a companion unit to the Model SR-160 Transceiver, this supply also contains a 4-inch by 6-inch speaker ... one-cable connection carries power to, and audio from, the transceiver . . . may be plugged into any 117-volt wall outlet . . . contains five silicon diode rectifiers.

Input Power Requirements:

Transmit (CW) . . . . . 300 watts.

Receiver . . . . . 140 watts.

Dimensions (HWD) — 6-1/4 by 7-1/2 by 10 inches.

Net Weight — 22 pounds.

Shipping Weight — 28-1/2 pounds (nominal).

VOX Control Unit Model HA-16 — Designed for quick attachment to rear of Model SR-160 cabinet to provide voice controlled operation. Power is derived from Model SR-160 through a single plug-in connector. Contains three tubes and sensitive VOX relay.

Net Weight — 3/4 pound.

Shipping Weight — 1-1/2 pounds (nominal).

100-KC Calibrator Crystal — The correct type calibrator crystal unit may be obtained under Hallicrafters part number 019-002712 or may be obtained from a crystal supplier to the following specifications:

Frequency — 100.000 KC ±.005%.

Resonance — parallel.

Load Capacity — 20 $\mu\mu$F.

Holder Type — HC-13/U.

SECTION III

INSTALLATION

WARNING

LETHAL HIGH VOLTAGE IS PRESENT WITHIN THIS EQUIPMENT. BE CAREFUL WHEN INSTALLING THE UNIT, WHEN MAKING BIAS ADJUSTMENTS, AND WHEN PERFORMING CHECKS UNDER THE CHASSIS.

3-1. UNPACKING.

Carefully remove this equipment from its carton and packing material and examine it for any possible damage which may have occurred during transit. Should any sign of damage be apparent, immediately file a claim with the carrier stating the extent of the damage. Check all shipping labels and tags for special instructions before removing or destroying them.

3-2. LOCATION.

The Model SR-160 Transceiver may be placed in any location permitting free air circulation through the ventilation openings in the cabinet. However, excessively warm locations such as those adjacent to radiators and heating units should be avoided.

3-3. ANTENNAS.

Antenna connections are provided on the rear of the transceiver, as shown in figure 2. If a common antenna is used, the antenna switch (S4) must be in the COMMON (down) position and the antenna connected to the COMMON connector. If separate antennas are used, the switch must be in the SEPARATE (up) position, and the receiver antenna connected to the top REC. ONLY connector (J6), and the transmitter antenna connected to the COMMON connector (J5).

Refer to the ARRL handbook or similar publications for the selection and installation of antennas. An antenna system which terminates properly into a 50-ohm transmission line will satisfy the load requirements of the Model SR-160 Transceiver.

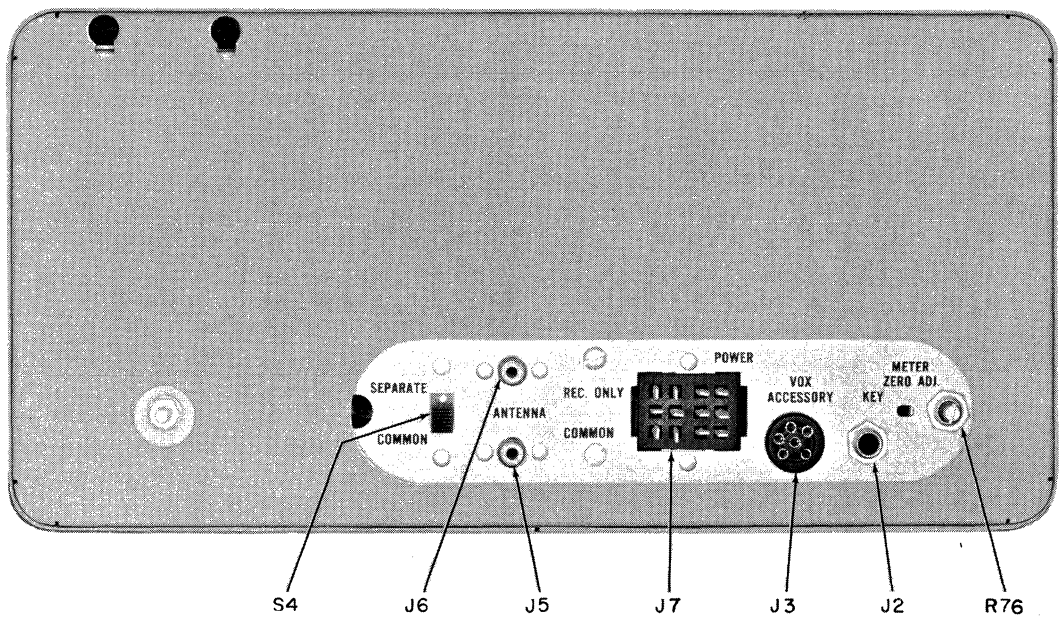
NOTE

Never operate the transceiver without connecting to an antenna load or to a resistive dummy load.

3-4. BASE INSTALLATION.

The Model SR-160 Transceiver as a base station may be operated with or without a linear power amplifier.

To operate the Model SR-160 from 117-volts AC, the Model PS-150-120 Power Supply, or an equivalent supply, is required. Merely connect



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Figure 2. Rear Panel View of Transceiver.

the multiconductor plug, attached to the power supply, to the POWER receptacle on the rear of the transceiver; connect the line cord to the wall outlet; and connect the antenna system to the transceiver ANTENNA receptacles as outlined in paragraph 3-3. A four- by six-inch speaker is contained within the power supply and is interconnected to the transceiver through the cable. The microphone receptacle is located on the front panel, and a push-to-talk style microphone wired as shown in figure 8 is required. The microphone cable connector is an Amphenol 80-MC2M.

Figure 3 shows a typical base installation, in block diagram form, making use of a linear power amplifier and an external antenna change-over relay. In the installation shown, the receiver input is connected directly to the antenna relay through the top ANTENNA connector (J6); the transmitter output of the transceiver is obtained through the bottom ANTENNA connector (J5) and fed to the linear amplifier input. If desired, two separate antennas may be used in the installation shown, eliminating the use of the antenna change-over relay.

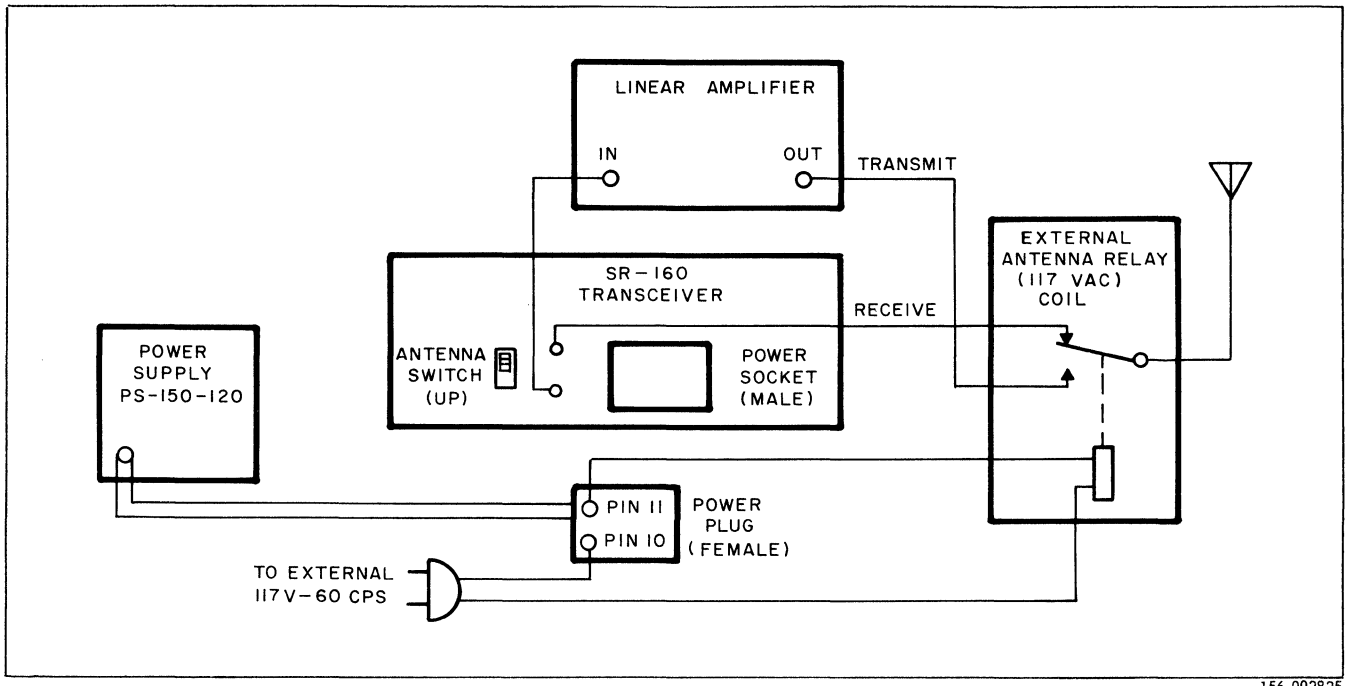


Figure 3. Base Installation, Using a Linear Amplifier

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Pins 10 and 11 of the POWER plug connect to internal relay contacts on the antenna relay (K2) of the transceiver and may be connected into the circuit to control the external antenna relay as shown. Push out the retaining pin in the cable connector and loosen the cable clamp to gain access to the plug wiring.

IMPORTANT

Before operating the Model SR-160 as a transmitter, the bias adjustment control located on the power supply must be set. Refer to paragraphs 8-3 and 9-2 for details.

3-5. MOBILE INSTALLATION.

The Model SR-160 Transceiver may be installed in any vehicle having a 12-volt DC power source. To complete the mobile installation, a Model PS-150-12 Power Supply, a Model MR-160 Mobile Installation Kit (figures 4 and 5) and a mobile antenna system will be required.

The PS-150-12 Power Supply, as shipped, is wired for vehicles having the negative side of the battery grounded. The Model SR-160 Transceiver and VOX accessory unit will operate without modifications in mobile installations of this type.

If the equipment is to be installed in vehicles having the positive battery terminal grounded, make the wiring change noted in figure 19 (Model PS-150-12 Power Supply) and also make one of the two following suggested wiring changes in the Model SR-160 Transceiver.

1. If the transceiver unit is used exclusively as a mobile unit:

   a. Connect a NO. 22 AWG wire jumper across the relay supply rectifier (CR7).

   b. Disconnect the relay supply filter capacitor section (C41C).

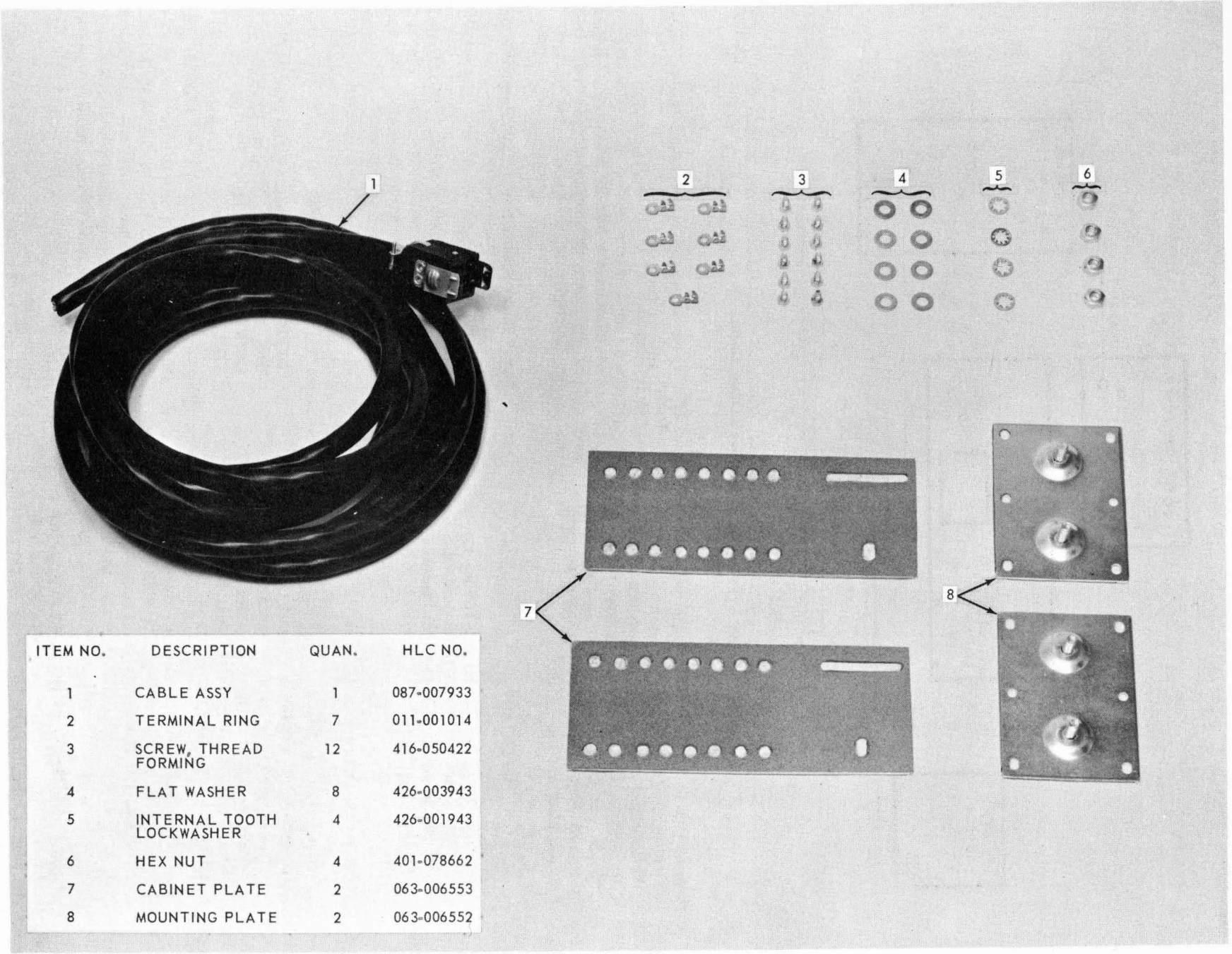
   c. Rewire the surge diode (CR6) located at the antenna relay coil so that the cathode end is connected to the black/white wire.

CAUTION

WITH THIS MODIFICATION DO NOT USE THE MODEL SR-160 TRANSCEIVER WITH THE PS-150-120 POWER SUPPLY.

2. If the transceiver unit is to be used interchangeably with the PS-150-120 Power Supply (AC mains) and the PS-150-12 Power Supply (mobile with positive supply terminal grounded) then modify the SR-160 as follows:

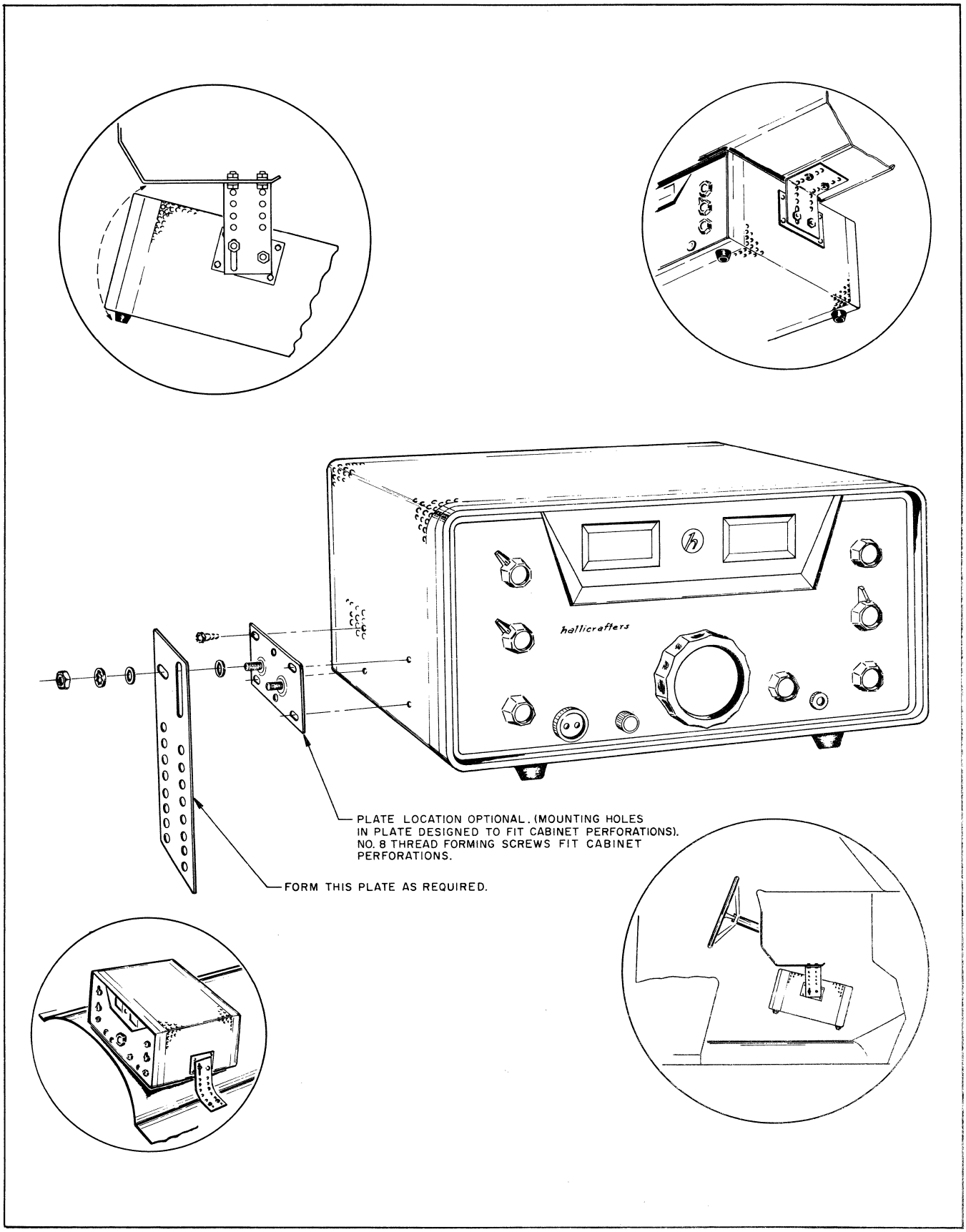
   a. Reverse the polarity of the relay supply rectifier (CR7), that is, connect the cathode to the heater terminal at the tube socket.



ITEM NO.	DESCRIPTION	QUAN.	HLC NO.
1	CABLE ASSY	1	087-007933
2	TERMINAL RING	7	011-001014
3	SCREW, THREAD FORMING	12	416-050422
4	FLAT WASHER	8	426-003943
5	INTERNAL TOOTH LOCKWASHER	4	426-001943
6	HEX NUT	4	401-078662
7	CABINET PLATE	2	063-006553
8	MOUNTING PLATE	2	063-006552

Figure 4. Parts Layout of Model MR-160 Installation Kit.

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Figure 5. Typical Mobile Installations of Transceiver, Using MR-160 Installation Kit.

b. Disconnect the relay supply filter capacitor section (C41C) and substitute a 300 μF 25V electrolytic capacitor unit, connecting the positive terminal to the chassis and the negative terminal to the relay supply.

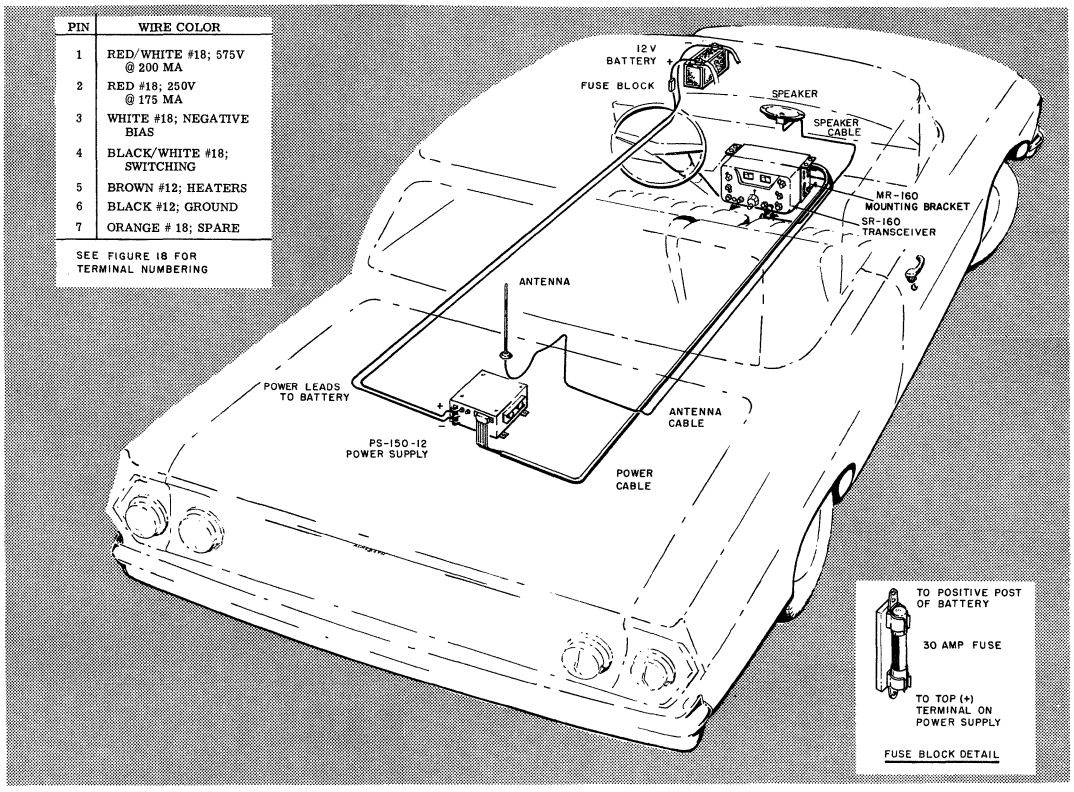
c. Rewire the surge diode (CR6) located at the antenna relay coil so that the cathode end is connected to the black/white wire.

The Model PS-150-12 Power Supply may be installed in any convenient location. In the installation discussed in this book, the power supply will be installed in the trunk. (See figure 6.) Mount the power supply securely, using self-tapping screws. Position the power supply in such a manner that the side with the terminal strips is accessible.

Run the multiconductor power cable supplied in the installation kit MR-160 from the Model SR-160 Transceiver under the floor mat and rear seat and into the trunk. Since this cable is weatherproof, it may be threaded underneath the vehicle if desired. Cut the cable to the desired length, strip the wires, and connect these wires to the terminal strip on the power supply. (See figures 7 and 18 for color coding and terminal numbering.)

IMPORTANT

Before connecting to the vehicle's battery, check the transceiver, if already installed, to ascertain that the OPERATION switch is in the OFF position.



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Figure 6. Wiring Diagram of Mobile Installation.

Connect the two NO. 8 AWG wires supplied between the two-connector terminal strip on the power supply and the battery. The red/white wire should be connected from the top terminal on the power supply to the positive (+) side of the battery and the red/black wire from the bottom terminal to the negative (-) side of the battery. These wires should be cut to a suitable length before being connected to the battery. The positive lead should be connected to the battery through a 30-ampere fuse block (not supplied, see figure 6). If the vehicle has a positive ground electrical system, fuse the negative lead.

CAUTION

USE CARE WHEN MAKING CONNECTIONS TO THE BATTERY IN THE VEHICLE. THE POWER IN A BATTERY CAN CAUSE DANGEROUS BURNS AND EVEN EXPLOSION IF SHORT CIRCUITED.

Connect the speaker to the jack provided on the front panel of the Model SR-160. This jack accepts a standard PL55 type plug. The speaker can also be connected to the rear of the Model

SR-160 through the POWER receptacle (J7), terminals 8 and 9 (see figure 7). Use of the auto radio loud speaker is not recommended unless a switch is installed to remove the speaker from the auto radio when operating the Model SR-160.

Install the antenna system in the manner recommended by the antenna manufacturer. Connect the coaxial cable from the antenna to the COMMON ANTENNA receptacle at the rear apron of the Model SR-160. (Check the selector switch; it should be in the COMMON position-down.) The antenna receptacle on the Model SR-160 mates with a phono-pin-plug type of connector. Use care when soldering the center conductor of the coaxial cable to the plug pin. Solder on the outside surface of the pin can damage the receptacle on the transceiver.

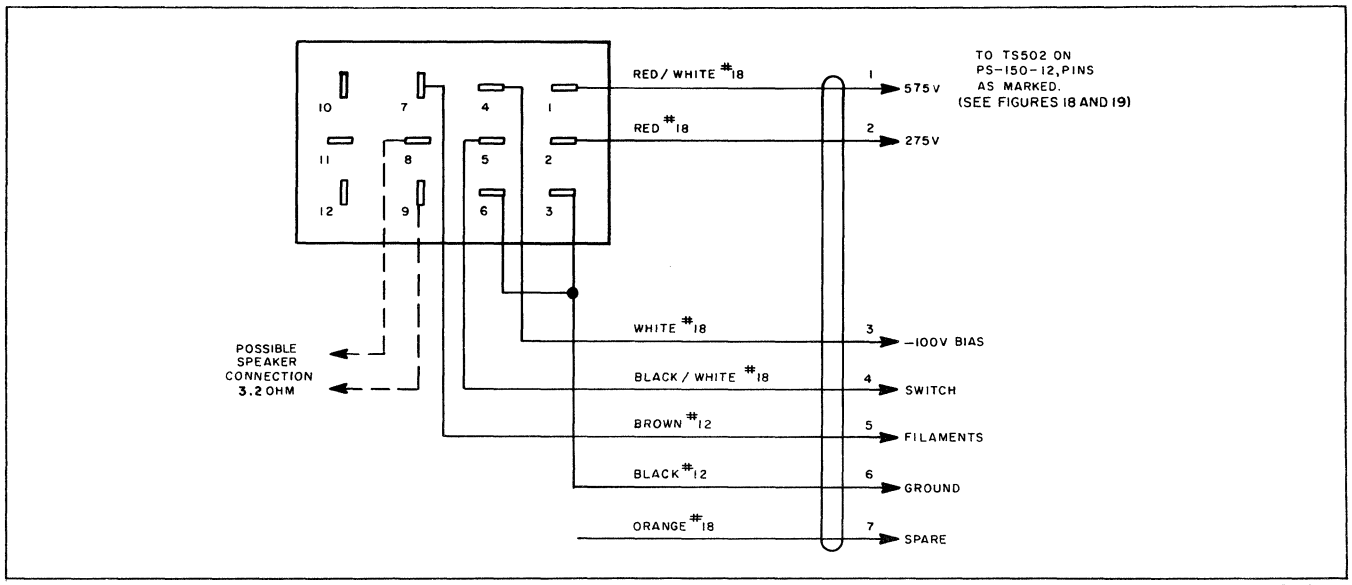
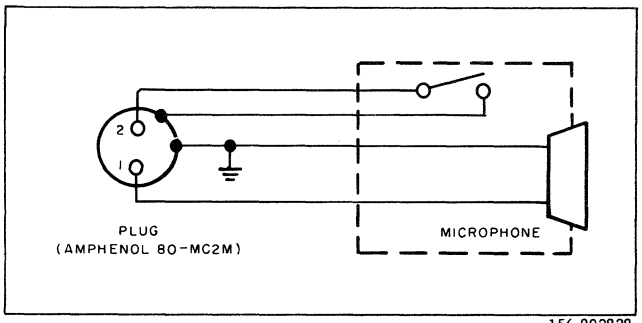


Figure 7. Schematic Diagram of Model MR-160 Interconnecting Cable. 156-002907

Connect a suitable microphone to the receptacle provided on the front panel. The microphone receptacle mates with an Amphenol 80-MC2M cable connector. It is important that the internal wiring of the microphone be as shown in figure 8.



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Figure 8. Required Microphone Wiring.

IMPORTANT

Before operating the Model SR-160 as a transmitter, set the bias adjustment control on the PS-150-12 Power Supply as outlined in paragraph 10-2.

Only after familiarizing yourself with the controls and their functions, as outlined in Sections IV and V, should you perform an operational check. It is recommended that the engine be running while operating the Model SR-160 Transceiver to prevent draining power from the battery.

3-6. MOBILE NOISE SUPPRESSION.

The following suggestions may be helpful in the suppression of noise encountered in mobile operation. Install resistor-type spark plugs and coaxial bypass capacitors in the ignition coil, generator and voltage regulator leads. Install bracket-mounted coaxial capacitors in the generator and battery leads to the voltage regulator and connect a 0.005 μF mica or disc capacitor from the generator lead to ground. Chokes may be used in the generator fields and armature leads instead of the bypass capacitors - approximately 12 turns of NO. 18 wire on a 1/4-inch powdered iron core for the field lead choke and approximately 12 turns of NO. 12 or NO. 14 wire on a 1/4-inch powdered iron core for the armature lead choke.

Hallicrafters has available a Mobile Noise-Suppression Kit, Model HA-3, which will fulfill any suppression requirements of this installation.

Additional information, concerning the proper suppression of mobile noise, is available in the Handbook of Instructions for Hallicrafters' Model HA-3 Mobile Noise Suppression Kit and in other current handbooks on the same subject.

SECTION IV

FUNCTION OF OPERATING CONTROLS

All controls utilized during normal operation of Hallicrafters Model SR-160 Transceiver are located on the front panel (see figure 1).

4-1. RIT CONTROL - ON/OFF.

The Receiver Incremental Tuning (RIT) control consists of two controls with concentric shafts. The ON/OFF function of the lever control either puts the variable-element RIT control in or out of operation. This control, in the ON position, enables the operator to fine-tune the receiver plus or minus three KC by means of the RIT potentiometer (round knob) without disturbing the initial calibration or transmitting frequency. Returning the control to the OFF position again locks the receiver frequency to the transmitter frequency. RIT must be turned OFF to calibrate the dial or to operate the transmitter and receiver on a common frequency.

4-2. RF GAIN - AF GAIN.

The RF GAIN and AF GAIN controls are two controls mounted on concentric shafts. The RF GAIN control (lever control) varies the gain of the receiver RF amplifier stage. Maximum sensitivity is obtained with the control set fully clockwise.

The AF GAIN control (round knob) adjusts the audio output level at the speaker terminals and PHONES jack. Clockwise rotation increases the signal applied to the grid of the audio amplifier, thus increasing the audio level.

4-3. OPERATION.

The OPERATION control is a five position switch. In the OFF position, all power is disconnected from the circuitry. In the REC ONLY position, the receiver portion of the transceiver is placed in operation and all circuits common to both receiver and transmitter are in the receive condition, while circuits used only in the transmit mode are either biased off or switched off by the control relay. In the CW-TUNE position, the control relay switches the circuitry to transmit condition, and if the unit is properly tuned it will deliver a CW signal, the level of which is controlled by the CARRIER control. Inserting an open circuit key into the KEY jack will interrupt the signal and the unit may then be keyed (CW operation). In the SSB operation, the circuitry is switched to receive conditions until the microphone PTT switch is closed. The control relay then switches the circuits to the transmit mode with the carrier balanced out for SSB operation. In the CAL position, the unit operates in the receive mode, but with the 100-KC marker crystal oscillator running to supply calibration signals at the 100-KC points on the dial.

4-4. MIC CONNECTOR.

The MIC connector provides for the connection of a push-to-talk microphone for use in SSB transmission.

4-5. DIAL CALIBRATION ADJUSTMENT (DIAL CAL).

The DIAL CAL control varies the frequency of the variable frequency oscillator (VFO) over a small range so that the dial calibration may be set precisely when compared to a standard.

4-6. FREQUENCY.

The FREQUENCY (tuning) control determines the frequency to which you are listening or transmitting. (Refer to RIT control effect paragraph 4-1.) This control is connected to the tuning dial which presents a visual indication of the frequency in the left-hand window on the panel.

4-7. BAND SELECTOR.

The BAND SELECTOR control is a three-position switch used to select the desired band of operation. The bands of operation are referenced to the wavelength in meters, that is, 80M, 40M and 20M.

4-8. PHONES JACK.

This receptacle provides for the use of headphones. When the headphone plug is inserted, the speaker is disabled. High or low impedance headphones may be used.

4-9. DRIVER TUNE.

The DRIVER TUNE control resonates the associated RF amplifier and mixer stages in both the transmit and receive modes of operation. When operating in the receive mode, the control requires occasional "touch-up" to obtain maximum receiver sensitivity as the unit is tuned across the band. For transceiver operation, the control is always tuned for maximum transmitter output and left at this setting during the receive portion of the contact.

4-10. CARRIER-MIC GAIN.

The CARRIER and MIC GAIN controls are separate potentiometers operating through concentric shafts.

The CARRIER control (lever control) sets the RF output level for CW operation and during the transmitter tuning process for CW or SSB operation. The control is functional only in the CW-TUNE position of the OPERATION switch. Turning the control clockwise increases the RF output level.

The MIC GAIN control (round knob) sets the audio level to the balanced modulator stage from the microphone amplifier stages. The control has sufficient range to handle any high impedance, high or low level microphone designed for voice communications.

4-11. FINAL TUNE.

The FINAL TUNE control drives a variable capacitor that tunes the pi-network used to couple the PA stage to the antenna load. The control is calibrated in band segments to permit presetting the capacitor near resonance during the tuning procedure.

4-12. S-METER.

This meter functions as an indicator of relative signal strength in the receive mode and as a relative power output indicator in the transmit mode. It is switched automatically when the mode of operation is changed.

SECTION V

TUNING PROCEDURE

5-1. GENERAL.

The tuning procedure of the Model SR-160 Transceiver is not complicated; however, care should be exercised when tuning to insure peak performance of the equipment. The following paragraphs describe the procedures for receiver and transmitter tuning.

IMPORTANT

Before operating the SR-160, the bias adjustment control on the power supply must be set. See paragraph 8-3 of alignment procedure.

5-2. RECEIVER OPERATION.

Preset the controls as indicated:

RIT . . . . . OFF.

RF GAIN . . . . . Maximum (clockwise).

AF GAIN . . . . . As required.

DIAL CAL . . . . . Center or leave in calibrated position.

BAND SELECTOR . . Desired band.

FINAL TUNE. . . . . Nonoperating.

CARRIER . . . . . Nonoperating (Full CCW).

MIC GAIN . . . . . Nonoperating (Full CCW).

OPERATION . . . . . REC ONLY position.

FREQUENCY. . . . . Desired frequency.

DRIVER TUNE. . . . Adjust for maximum S-meter reading on signal or maximum background noise.

As the receiver is tuned across the band an occasional readjustment of the DRIVER TUNE control will be found necessary. Maximum AVC effect will be obtained with the RF GAIN control set at maximum sensitivity. The use of the RF GAIN control under special operating conditions is left to the discretion of the operator.

5-3. DIAL CALIBRATION.

The following procedure is applicable if the crystal calibrator has been made operational and calibrated per paragraph 8-6.

Preset the controls as outlined in paragraph 5-2, except set the OPERATION control at CAL.

To calibrate the dial, set the dial to the 100-KC point nearest to the desired frequency. Rotate the DIAL CAL control for zero beat.

It may be necessary to increase the AF GAIN control setting to recover sufficient audio near zero beat. The RIT control must be in the OFF position when calibrating the dial.

After calibrating the dial, return the OPERATION control to either REC ONLY or SSB to receive on the desired frequency. Repeak the DRIVER TUNE control as required.

5-4. BASIC TRANSMITTER TUNE-UP.

Preset the following controls as indicated:

CARRIER . . . . . Initial setting at minimum (Full CCW).

MIC GAIN . . . . . Initial setting at minimum (Full CCW).

BAND SELECTOR . . Desired band.

FINAL TUNE. . . . . Desired band segment.

RIT CONTROL . . . . OFF

FREQUENCY. . . . . Desired frequency.

DRIVER TUNE . . . . Use initial setting obtained for receive mode

OPERATION . . . . . REC ONLY.

Set the OPERATION control at CW-TUNE and close the key circuit if a keyer is plugged into the key jack. Rotate CARRIER control (lever control) clockwise until a small indication is observed on the S-meter. In the transmit mode, the S-meter indicates relative RF output voltage. Adjust the FINAL TUNE control for maximum output, and then adjust the DRIVER TUNE control for maximum output voltage. Adjust the CARRIER control as required to keep the S-meter reading near S-9 while tuning.

Always use the DRIVER TUNE setting obtained during transmitter tuning when receiving on the frequency. The setting obtained while tuning the receiver is generally two broad to satisfy the transmitter requirement.

5-5. CW OPERATION.

Tune the transmitter as outlined in paragraph 5-4. When a keyer is plugged into the key jack, its key circuit must be closed to permit tuning for either CW operation or SSB operation. If the SR-160 is used to drive a linear amplifier, adjust the CARRIER control (lever control) for the drive level required by the linear amplifier. When operating into an antenna load, advance the CARRIER control to just below saturated drive level.

Saturated drive level is determined in the following manner. Start from the full counterclockwise CARRIER control setting and slowly increase the output (clockwise) while observing the S-meter. Set the control at a point where further rotation does not cause an appreciable increase in the S-meter reading. This is saturated output (operate slightly below this level).

The transmitter is now ready to key. To receive, return the OPERATION control to the REC ONLY position.

5-6. PUSH-TO-TALK OPERATION.

Tune the transmitter as outlined in paragraphs 5-4 and 5-5. Note the S-meter reading obtained for maximum drive level to the linear amplifier or the maximum saturated output when operating into an antenna load.

Return the CARRIER control to minimum output and set the OPERATION control at SSB.

Depress the microphone push-to-talk switch, speak into the microphone in a normal voice level, and advance the MIC GAIN control (round knob) until the S-meter swings upward to approximately one-half the reading noted at maximum output during tuning with carrier.

The MIC GAIN control setting will be found to be less critical because of the compression action of the AALC circuitry; however, the knob setting still depends upon the type of microphone, the operator's voice characteristics, and his operating habits.

Sufficient microphone gain has been built into the SR-160 to handle the usual range of levels associated with communication type microphones.

Releasing the microphone switch button will return the transceiver to the receive condition.

NOTE

If a keyer circuit is left plugged into the key jack, it must be closed to permit SSB operation.

5-7. VOICE CONTROLLED SSB OPERATION.

The Model SR-160 Transceiver operates SSB with push-to-talk control; however, the VOX Control Unit Model HA-16 is available for voice controlled single side band operation. When this accessory unit is installed, the following operating procedure will apply.

Initially set the PTT-VOX selector switch of the VOX control unit at PTT, and set the three controls (SENS, DELAY and ANTI-TRIP) at their full counterclockwise positions. Reduce the AF GAIN on the transceiver to a relatively low level.

Use the tuning procedure outlined in paragraphs 5-4, 5-5, and 5-6 to ready the transceiver for SSB operation.

With the OPERATION control on the transceiver set at SSB set the selector switch on the VOX control unit at VOX and set the VOX accessory unit controls as follows:

1. Advance the SENS control (clockwise), while talking into the microphone, until the VOX relay closes on the first syllable of speech. (Use no more VOX gain than necessary for best results.)

2. Adjust the DELAY control for the desired drop-out delay. The delay period increases as the DELAY control is turned clockwise. The delay period should be long enough to prevent change-over between words but not long enough to miss the other operator's quick reply.

3. Set the receiver AF GAIN control for the desired listening level and advance the ANTI-TRIP sensitivity control (clockwise) until the received signals do not actuate the VOX relay. Excessive anti-trip gain or a major increase in the established listening level may lock out the voice control system.

With the VOX accessory unit adjusted, either method of control may be selected by simply setting the selector switch for either PTT or VOX.

NOTE

Some microphones equipped for push-to-talk control have shorting contacts in the switch to disable the microphone element when the pushbutton is released. VOX operation will not be feasible unless this circuitry is disconnected within the microphone.

SECTION VI
THEORY OF OPERATION

6-1. GENERAL.

The Model SR-160 Transceiver consists of a single conversion receiver and single conversion transmitter. The VFO circuitry, the heterodyne crystal oscillator (40M band) circuitry, the carrier/BFO crystal oscillator circuitry, the AVC/AALC amplifier-detector circuitry, the meter circuitry and the crystal filter/IF amplifier circuitry all are common to both the transmitter and receiver systems. Refer to figure 9 for the block diagram of the equipment and to figure 20 for the schematic diagram.

6-2. RECEIVER SECTION.

The signal at the antenna is fed to the receiver's RF amplifier stage (V1) through the antenna relay (K2) located in the transmitter final amplifier section. The signal is amplified and fed to the receiver mixer (V2) where it is heterodyned with the VFO (variable frequency oscillator) on the 80M and 20M bands, or with the product of the VFO and the heterodyne crystal oscillator on the 40M band to produce the 5200 KC intermediate frequency.

The RF amplifier and mixer tuned circuits are selected by the BAND SELECTOR switch and tuned by the DRIVER TUNE control.

The signal, now at intermediate frequency, is fed through the crystal filter and further amplified by two stages of IF amplification (V3 and V4). The output of V4 is fed to the product detector (V5) and to the AVC amplifier/detector (V10). At the product detector the signal is mixed with the 5200 KC BFO signal to produce the audio frequency product desired. The audio frequency signal passes through the AF GAIN control for level control, and is amplified to speaker power level by audio amplifier tubes V5B and V6.

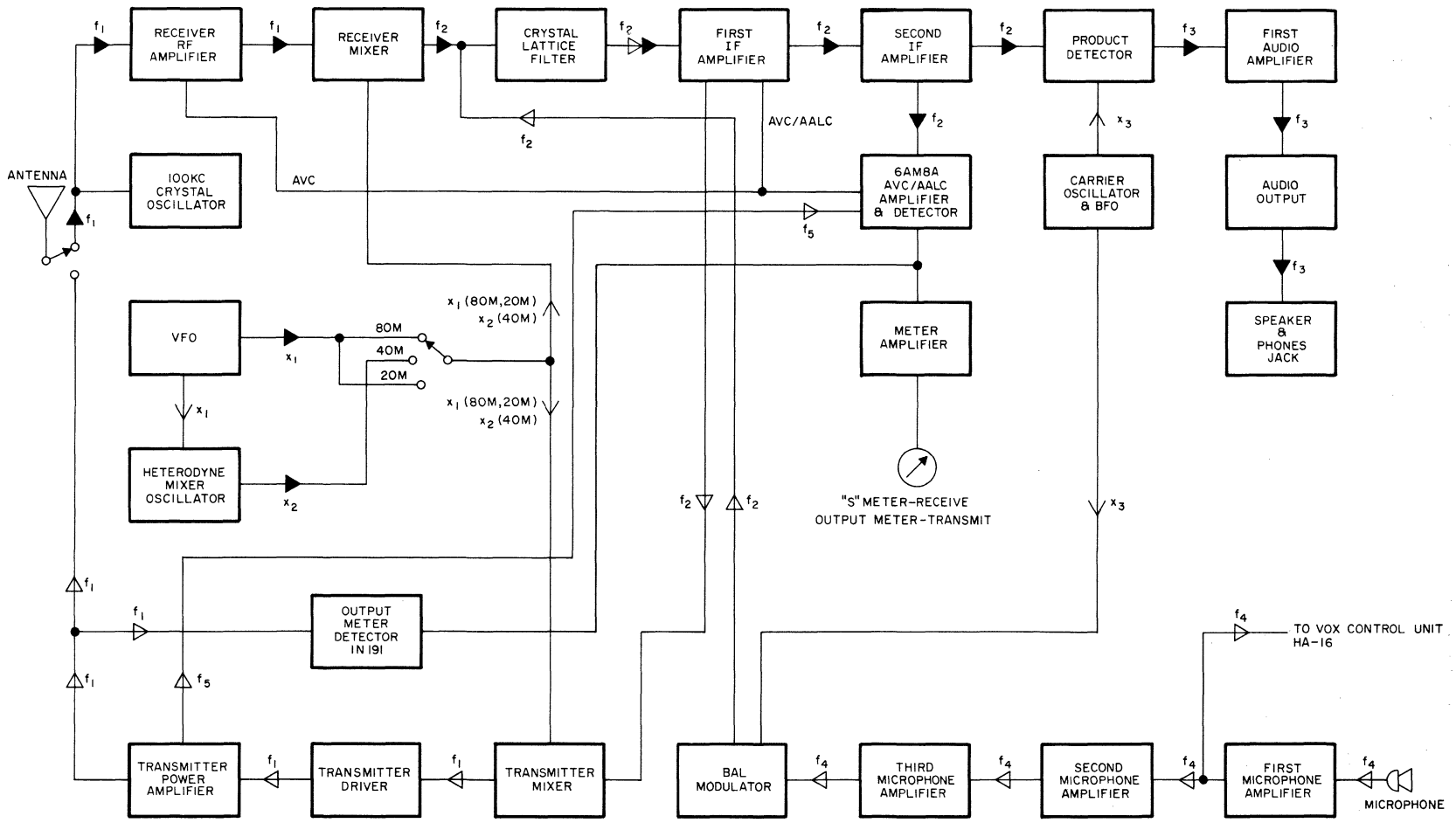
The intermediate frequency signal fed to the AVC amplifier/detector stage (V10) is amplified further and rectified to produce the AVC voltage fed back to the grids of the RF amplifier stage (V1) and the first IF amplifier stage (V3) to control overall system gain for variations in signal level at the antenna.

A sample of the AVC voltage is fed to the grid of the meter amplifier (V4) to display received signal levels on the S-meter.

6-3. TRANSMITTER SECTION.

The audio frequency signal from the microphone is amplified by the two-stage microphone amplifier (V9) with the MIC GAIN control for level control. The amplified audio signal is fed through a cathode follower stage (V8B) to the balanced modulator.

At the balanced modulator the carrier oscillator (V8A) signal is modulated by the audio signal to produce a double sideband suppressed carrier signal centered on 5200 KC. The output of the modulator is fed to the crystal filter where the lower sideband is attenuated and the upper sideband is passed on to the first IF amplifier stage for further amplification.



MIXER FUNCTIONS		
MIXER	BAND	MIXER PRODUCT
RECEIVER MIXER	80M 40M 20M	$f_2(USB)=x_1-f_1(LSB)$ $f_2(USB)=x_2-f_1(LSB)$ $f_2(USB)=f_1(USB)-x_1$
TRANSMITTER MIXER	80M 40M 20M	$f_1(LSB)=x_1-f_2(USB)$ $f_1(LSB)=x_2-f_2(USB)$ $f_1(USB)=x_1+f_2(USB)$
HETERODYNE MIXER/OSC	40M	$x_2=x_1+3400KC$
PRODUCT DETECTOR	ALL BANDS	$f_3(AUDIO)=f_2(USB)-x_3$

SYMBOLS

f_1 = SIGNAL FREQUENCY (AMATEUR BANDS 80M, 40M, 20M)
f_2 = IF = 5200 KC (USB)
f_3 = RECEIVER AUDIO
f_4 = TRANSMITTER AUDIO
f_5 = AACL AUDIO
x_1 = VFO INJECTION (8700KC – 9200KC)
x_2 = HETERODYNE MIXER INJECTION (12.1MC – 12.6MC)
x_3 = CARRIER OSCILLATOR = 5200 KC

SIGNAL PATH LEGEND

- TRANSMITTER SIGNAL
- RECEIVER SIGNAL
- COMMON SIGNAL
- OSCILLATORS

Figure 9. Block Diagram of Transceiver.

From the IF amplifier stage the signal is fed to the transmitter mixer stage (V13) where it is heterodyned with the VFO signal on the 80M and 20M bands or with the product of the VFO and the heterodyne crystal oscillator on the 40M band to produce the desired transmitter frequency.

The signal, at output frequency, from the transmitter mixer is then amplified by the transmitter driver stage (V14) and the power amplifier stage (V15 and V16) and fed to the antenna through the antenna relay.

The RF output voltage is metered by the S-meter for "tune-up" and monitoring purposes by dividing down the RF voltage level, rectifying it and feeding the DC voltage to the grid of the S-meter amplifier tube (V4B).

The tuned circuits of the transmitter mixer and driver stages are selected by the BAND SELECTOR switch and tuned by the DRIVER TUNE control. The power amplifier output tuned circuit is selected by the BAND SELECTOR switch and tuned by the FINAL TUNE control.

The Automatic Audio Level Control (AALC) circuitry operates in the following manner. When a small amount of "flat-topping" occurs in the final amplifier, a ripple voltage at audio frequency develops on the amplifier grid bias line in proportion to the amount of "flat-topping." This audio signal, which is not present without final amplifier "flat-topping," is coupled to the AVC/AALC amplifier tube V10 whose output is a rectified DC voltage. The resulting DC voltage, which is in direct proportion to the degree of "flat-topping" occurring in the final amplifier, is fed to the first IF amplifier grid as gain control bias.

SECTION VII

SERVICE DATA

7-1. CHASSIS REMOVAL.

To remove the chassis from the cabinet, remove the four cabinet screws at the bottom near the cabinet feet, and carefully slide the chassis and panel assembly out from the front of the cabinet.

7-2. TUBE AND DIAL LIGHT REPLACEMENT.

Access to the dial light and all tubes may be obtained by removing the chassis from the cabinet. See paragraph 7-1.

7-3. TROUBLESHOOTING.

In the design of this transceiver, full consideration was given to keep maintenance problems at an absolute minimum. As in all well-designed electronic equipment, maintenance and repair problems are generally confined to the checking and replacement of tubes and semiconductor devices which may become defective. Malfunctions of this nature are usually easily isolated and corrected. However, it is entirely possible that a more obscure malfunction may arise. In this event, only thoroughly trained technical personnel should attempt to service equipment of this complexity.

A recommended aid to troubleshooting the Model SR-160 Transceiver is a general-coverage receiver which can be used to provide a quick check on the various oscillator circuits within the SR-160. A lead connected to the antenna of this receiver, when placed in the proximity of the oscillator tube in the circuit to be checked, can determine the presence or absence of signal from the stage in question.

If a malfunction occurs when operating on one particular band and/or mode of operation, the unit should be checked on all other bands and in all other modes of operation to isolate the difficulty. A careful study of the block diagram (figure 9) will give a quick clue as to which tubes should be checked. The voltage and resistance charts (figures 10 and 11) and schematic diagram (figure 20) will also aid in isolating and correcting a malfunction.

7-4. SERVICE AND OPERATING QUESTIONS.

For further information regarding operation or servicing of the Model SR-160 Transceiver, contact the dealer from whom the unit was purchased. The Hallicrafters Company maintains an extensive system of Authorized Service Centers where any required service will be performed promptly and efficiently at no charge if this equipment is delivered to the service center within 90 days from date of purchase by the original buyer and the defect falls within the terms of the warranty. It is necessary to present the bill of sale in order to establish warranty status. After the expiration of the warranty, repairs will be made for a nominal charge. All Hallicrafters Authorized Service Centers display the sign shown on the following page. For the location of the one nearest you, consult your dealer or your local telephone directory.

Make no service shipments to the factory unless instructed to do so by letter, as The Hallicrafters Company will not accept responsibility for unauthorized shipments.

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



SECTION VIII

ALIGNMENT PROCEDURE

WARNING

LETHAL HIGH VOLTAGE IS PRESENT WITHIN THIS EQUIPMENT. BE CAREFUL WHEN INSTALLING THE UNIT, WHEN MAKING BIAS ADJUSTMENT, AND WHEN PERFORMING CHECKS UNDER THE CHASSIS.

8-1. GENERAL.

The Model SR-160 Transceiver has been accurately aligned and calibrated at the factory and, with normal usage, will not require realignment for extended periods of time. Service or replacement of a major component or circuit may require subsequent realignment, but under no circumstances should realignment be attempted unless the malfunction has been analyzed and definitely traced to mis-alignment. Alignment should only be performed by persons experienced in this work, using the proper test equipment.

NOTE

Do not make any adjustments unless the operation of this transceiver is fully understood and adequate test equipment is available. Refer to figures 12 and 13, the top and bottom views of the transceiver, for the locations of all adjustments.

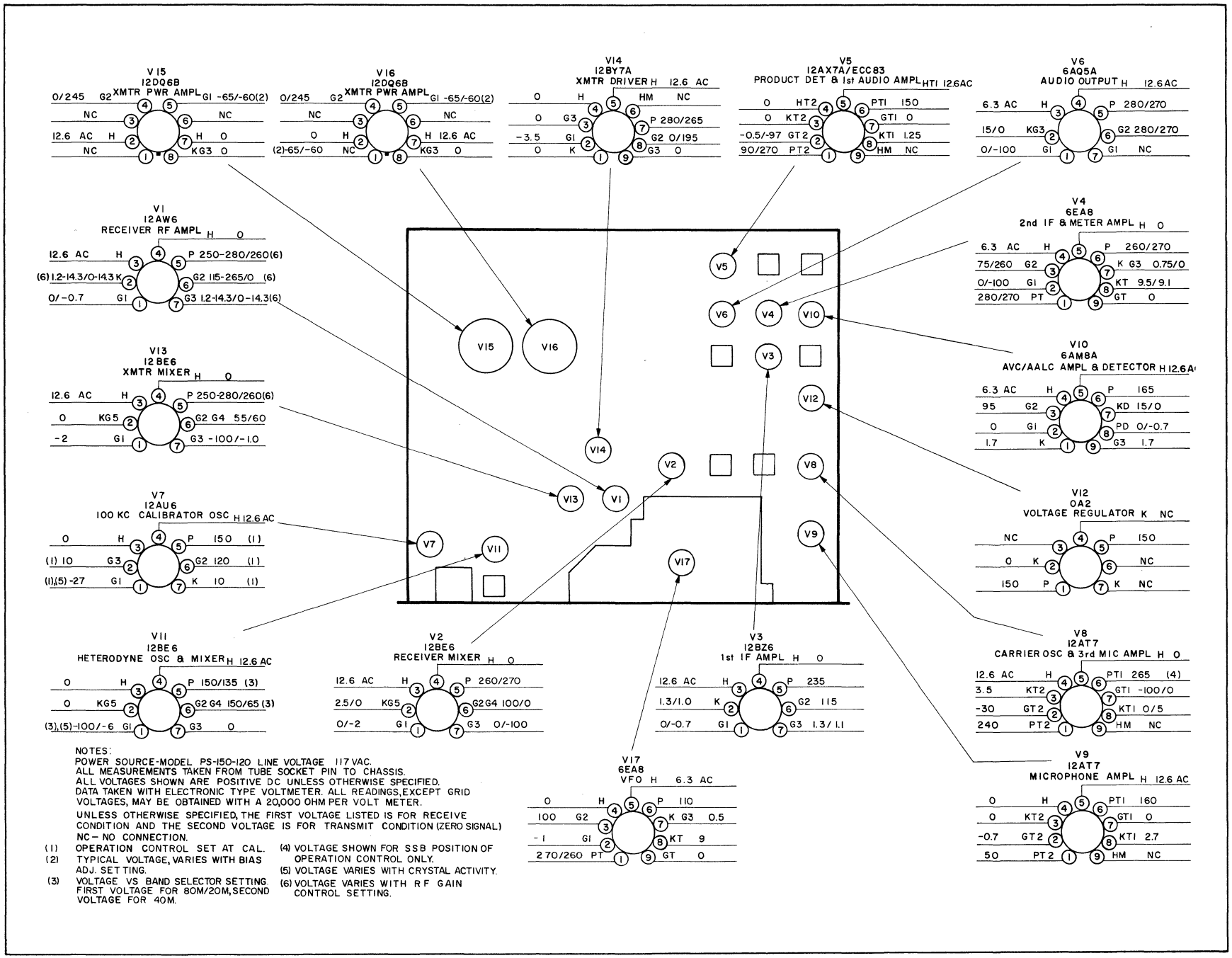
8-2. EQUIPMENT REQUIRED.

1. RF Signal Generator; Hewlett-Packard Model 606A or an equivalent signal generator having up to 1 volt output at an impedance of 70 ohms or less. Throughout the alignment procedure, unless otherwise specified, the signal generator output is unmodulated.
2. A Vacuum Tube Voltmeter (VTVM); Hewlett-Packard Model 410B, or equivalent VTVM having an RF probe good to 30 MC.
3. A dummy Load; 50 ohms non-reactive, rated at 100 watts. Bird Wattmeter or equivalent. The load may be made up of carbon resistors totaling 100 watts dissipation.
4. A DC Voltmeter having a 2.5-volt or 3.0-volt scale for final plate current measurements when using the Model PS-150-120 Power Supply or a 0-300 MA DC milliammeter when using the Model PS-150-12 Power Supply.
5. AF Signal Generator; Hewlett-Packard Model 200 AB, or equivalent.
6. Ballantine voltmeter or equivalent, capable of measuring 1 to 4 millivolt level.
7. A general-coverage receiver covering the frequency range from 3 MC to 30 MC with a 100-KC calibrator.

8-3. BIAS ADJUSTMENT.

The final amplifier bias, must be properly set before any extensive checks are made on the transmitter portion of the Model SR-160.

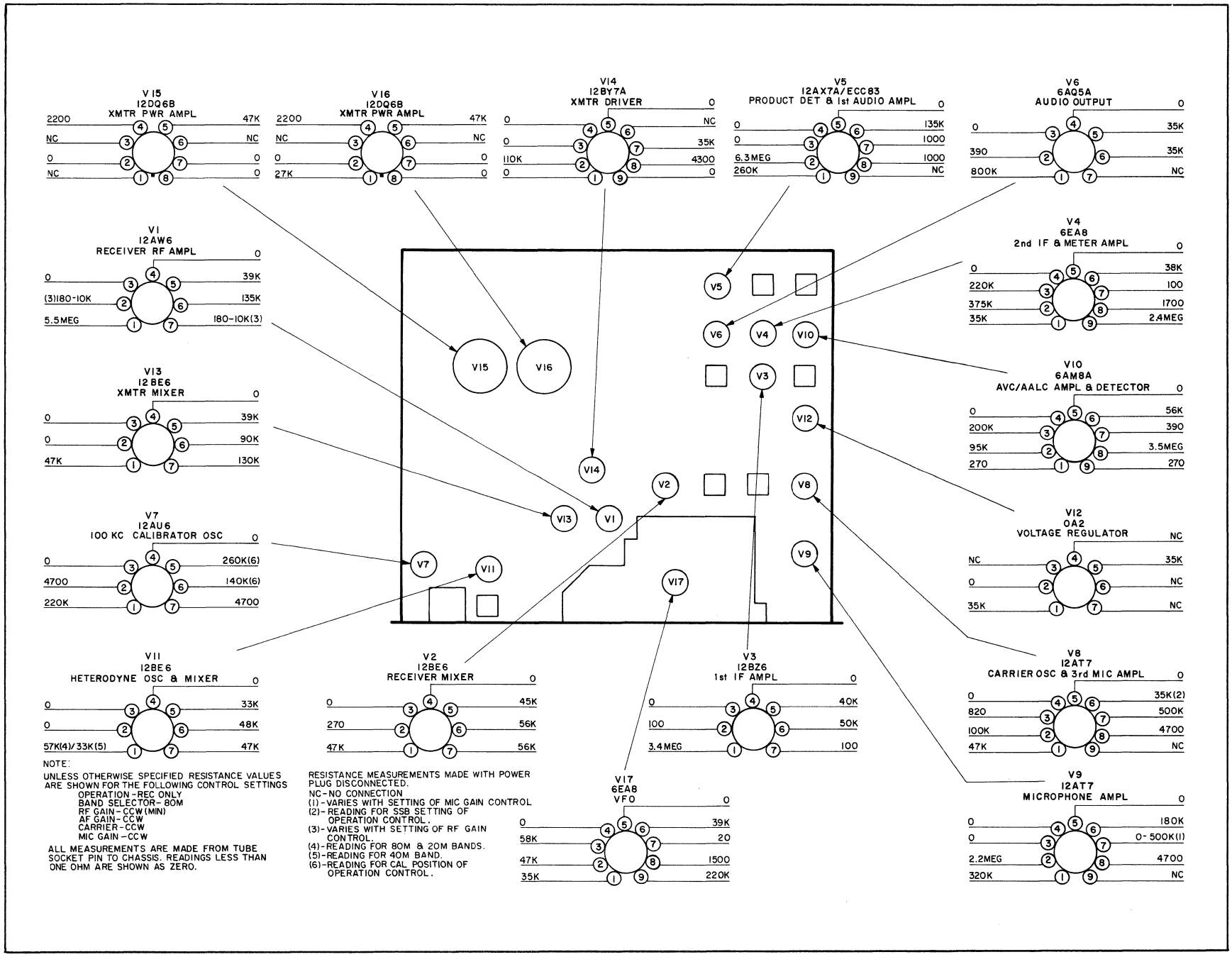
1. When using the AC power supply (PS-150-120), proceed as follows:
   a. Before turning the transceiver on, connect a DC voltmeter to the two jacks on the power supply (see figure 15), positive to red and negative to blue. Set the voltmeter on a low scale (2.5 volts or 3.0 volts). There is a 10-ohm resistor across the tip jacks so that the meter will indicate 1 volt for 100 milliamperes, 2 volts for 200 milliamperes, etc.



NOTES:
POWER SOURCE-MODEL PS-150-120 LINE VOLTAGE 117 VAC.
ALL MEASUREMENTS TAKEN FROM TUBE SOCKET PIN TO CHASSIS.
ALL VOLTAGES SHOWN ARE POSITIVE DC UNLESS OTHERWISE SPECIFIED.
DATA TAKEN WITH ELECTRONIC TYPE VOLTMETER. ALL READINGS, EXCEPT GRID VOLTAGES, MAY BE OBTAINED WITH A 20,000 OHM PER VOLT METER.
UNLESS OTHERWISE SPECIFIED, THE FIRST VOLTAGE LISTED IS FOR RECEIVE CONDITION AND THE SECOND VOLTAGE IS FOR TRANSMIT CONDITION (ZERO SIGNAL)
NC – NO CONNECTION.

(1) OPERATION CONTROL SET AT CAL.
(2) TYPICAL VOLTAGE, VARIES WITH BIAS ADJ. SETTING.
(3) VOLTAGE VS BAND SELECTOR SETTING. FIRST VOLTAGE FOR 80M/20M, SECOND VOLTAGE FOR 40M.
(4) VOLTAGE SHOWN FOR SSB POSITION OF OPERATION CONTROL ONLY.
(5) VOLTAGE VARIES WITH CRYSTAL ACTIVITY.
(6) VOLTAGE VARIES WITH R F GAIN CONTROL SETTING.

Figure 10. Voltage Chart.



NOTE:

UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE SHOWN FOR THE FOLLOWING CONTROL SETTINGS

OPERATION - REC ONLY
BAND SELECTOR - 80M
RF GAIN - CCW (MIN)
AF GAIN - CCW
CARRIER - CCW
MIC GAIN - CCW

ALL MEASUREMENTS ARE MADE FROM TUBE SOCKET PIN TO CHASSIS. READINGS LESS THAN ONE OHM ARE SHOWN AS ZERO.

RESISTANCE MEASUREMENTS MADE WITH POWER PLUG DISCONNECTED.

NC - NO CONNECTION

(1) - VARIES WITH SETTING OF MIC GAIN CONTROL

(2) - READING FOR SSB SETTING OF OPERATION CONTROL.

(3) - VARIES WITH SETTING OF RF GAIN CONTROL.

(4) - READING FOR 80M & 20M BANDS.

(5) - READING FOR 40M BAND.

(6) - READING FOR CAL POSITION OF OPERATION CONTROL.

Figure 11. Resistance Chart.

b. Set the OPERATION switch at REC ONLY and allow approximately ten minutes for the unit to warm up. Then set the OPERATION switch at SSB, the MIC GAIN full CCW, and press the microphone switch to close the relays.

c. Adjust the bias for 60 milliamperes idle plate current with the BIAS ADJ. control (R206) on the power supply (0.6 volt on the voltmeter scale).

2. When using the DC power supply (PS-150-12), proceed as follows:

a. Disconnect the high voltage lead (red/white) from the power supply terminal strip (terminal 1).

b. Connect a DC milliammeter (0-300 MA) between the lead and the high voltage terminal on the power supply.

c. Follow the procedure outlined in the preceding paragraph (step b) and set the BIAS ADJ. control (R308) on the power supply for 60 milliamperes.

8-4. S-METER ZERO ADJUSTMENT.

Periodically the meter should be zero set to maintain accuracy. To accomplish this proceed as follows:

1. Set the OPERATION control at REC ONLY, and the RF GAIN control fully counterclockwise. Allow about 15 minutes for the equipment to stabilize.

2. Turn the METER ZERO ADJ. control (R76) until the meter pointer is directly over the end calibration mark at the left end of the meter scale. The control is located on the rear chassis apron.

8-5. CARRIER BALANCE.

Adjust the carrier balance as follows:

1. The equipment should be allowed to reach operating temperature before making the carrier balance adjustments. Remove the chassis unit from the cabinet as described in paragraph 7-1. With the chassis resting on the table, right side up, and connected to a dummy load or antenna load, tune the unit for SSB operation.

2. Turn the MIC GAIN control fully counterclockwise to remove all audio from the modulator stage. With the OPERATION control set at SSB, close the microphone switch and adjust the CARRIER BAL controls (capacitor C51 and potentiometer R45) for minimum S-meter reading. With an antenna or dummy load connected to the Model SR-160 the meter will drop to zero near the null. Release the microphone switch.

3. Disconnect the antenna load and again close the microphone switch and repeat the balance adjustment. The meter will still drop to zero but will be more sensitive with the load removed. Take care not to feed excessive carrier through the system with the load removed.

8-6. CRYSTAL CALIBRATOR ADJUSTMENTS.

If a 100-KC crystal unit and the 12AU6 tube (V7) have been installed in the Model SR-160, the following adjustments apply:

The crystal calibrator trimmer (C45) is used to set the 100-KC crystal exactly to frequency by comparing its harmonic frequency with the signal transmitted by station WWV.

With a general coverage receiver, tune in station WWV and connect a lead between the Model SR-160 REC ONLY antenna connector and the antenna connector of the external receiver. Set the OPERATION control at CAL and carefully adjust the calibrator trimmer (C45) until the 100-KC oscillator harmonic is at zero beat with station WWV. This adjustment should be made only during periods of NO modulation on station WWV's signal.

8-7. FINAL AMPLIFIER NEUTRALIZATION.

1. Neutralization Check

Connect a voltmeter to the AC supply or a milliammeter to the DC supply to meter the final amplifier plate current as described in paragraph 8-3. With the Model SR-160 in its cabinet (all hardware in place) and connected to a dummy load, tune the unit at 14,150 KC in the CW mode as described in paragraph 5-4. Adjust the CARRIER control for 50 volts RMS output (approximately S-9 on the S-meter if an RF voltmeter is not available). Carefully tune the FINAL TUNE control through resonance and observe the plate current dip and output voltage maximum. If both occur at the same setting, the amplifier is neutralized.

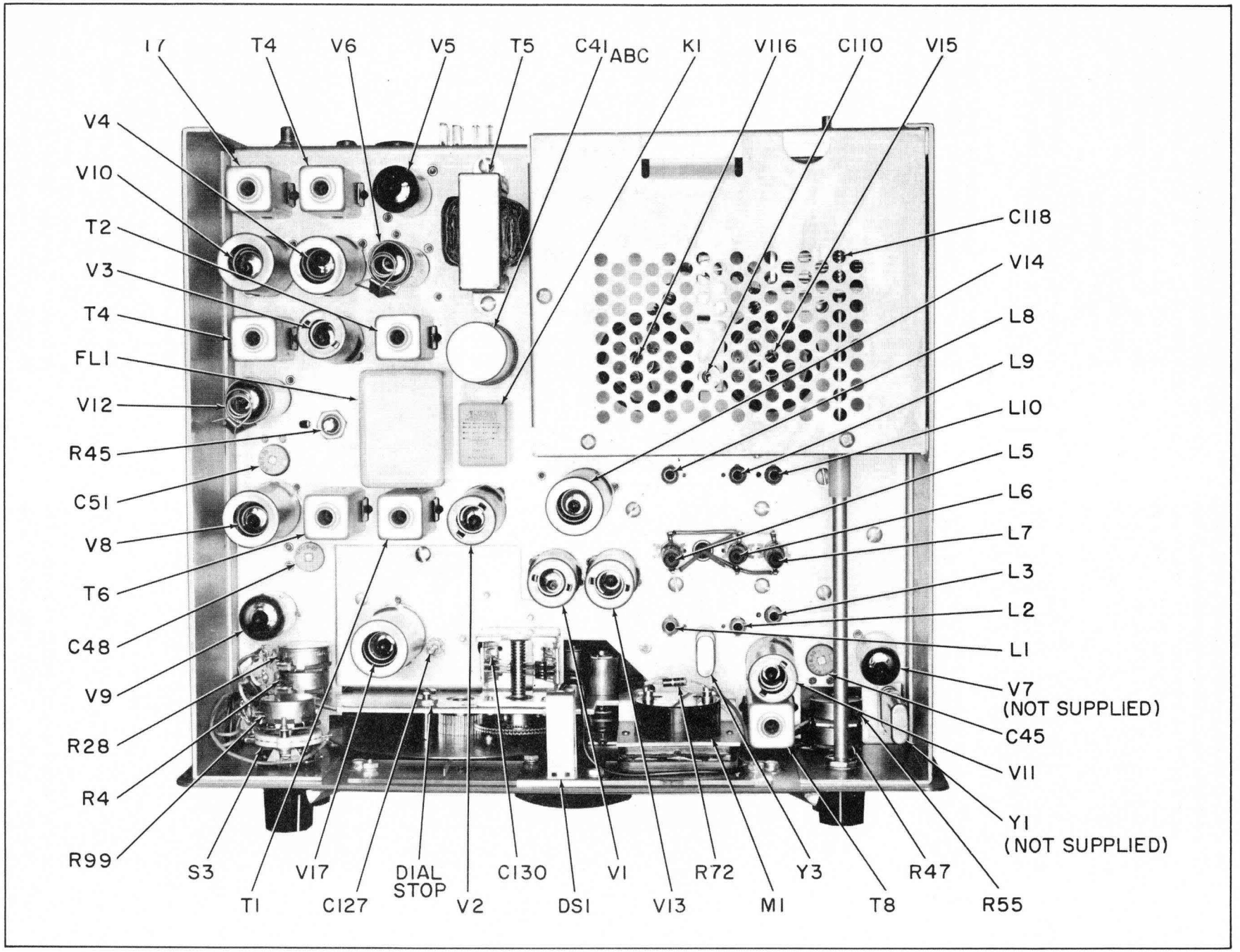


Figure 12. Top Chassis View of Transceiver.

The neutralizing circuits may be checked on 80M and 40M by switching bands and tuning at the same VFO dial setting.

2. Neutralizing the Model SR-160

If the check outlined above indicates a need for neutralization, remove the unit from the cabinet. (Refer to paragraph 7-1.) Use the setup as for the neutralizing check and tune the unit at 14,050 KC. Adjust neutralizing capacitor C110 in 1/2 turn or 1/4 turn steps until neutralization is accomplished. Recheck at 14,150 KC with the unit mounted in the cabinet as described above.

HIGH VOLTAGE APPEARS ON THE ADJUSTMENT SCREW OF THE NEUTRALIZING CAPACITOR AT ALL SETTINGS OF THE OPERATION CONTROL EXCEPT OFF.

8-8. VFO MECHANICAL INDEX.

If the pointer position has been disturbed, check the pointer alignment as follows:

1. Loosen the dial stop lock nut and back-off the dial stop screw. (See figure 12.)

2. Carefully turn the dial beyond 3500 KC until the VFO tuning capacitor rotor stop contacts the stator plates. Exercise care in this operation as the gear train provides enough mechanical advantage to lift the rotor plates out of their mounting.

3. The pointer should line up with the index mark on the dial located to the right of the 3500 KC dial calibration. Shift the pointer position or, if necessary, center the pointer in the window opening and loosen the capacitor drive gear from the capacitor shaft and relocate as required. Retighten the set screws.

4. Turn the dial clockwise beyond the dial stop and reset and relock the dial stop screw. Check for clearance between the dial and the screw end. It should be approximately equal to one-half the dial stop spacer thickness.

8-9. VFO CALIBRATION ALIGNMENT (Trimmer adjustment only).

A trimmer capacity correction is indicated if the dial calibration check across the dial, at the 100-KC check points, consistently falls to one side of the pointer and cannot be corrected by the DIAL CAL control range.

Recalibrate the VFO as follows if the 100-KC marker crystal has been set up as outlined in paragraph 8-6.

1. Set the BAND SELECTOR at 80M, the OPERATION control at CAL and the RIT control at OFF.

2. Center the DIAL CAL control. The dot on the knob should fall at top dead center.

3. Set the dial at exactly 4000 KC and carefully adjust trimmer C127 for zero beat. Care should be exercised to make sure that the correct 100-KC beat is tuned in with the trimmer.

4. Check across the dial at the 100-KC check points. If the frequency error is less than approximately 3000 CPS, the calibration is within acceptable limits. If the error increases and exceeds 3000 CPS at the low frequency end of the dial, the VFO will require a coil adjustment in addition to the trimmer adjustment.

NOTE

If the Model SR-160 calibrator circuitry is not set up for the calibration check, the VFO signal may be picked up with a general coverage receiver tuned to the 8700 KC to 9200 KC VFO tuning range. The receiver used must be equipped with an accurate crystal calibrator.

8-10. VFO CALIBRATION ALIGNMENT (Trimmer and coil adjustment).

If the check carried out in paragraph 8-9 (step 4) indicates a need for both trimmer and coil adjustment, proceed as follows:

1. Check the pointer alignment at the index mark on the VFO dial as described in paragraph 8-8. Be sure to reset the dial stop.

2. Set the BAND SELECTOR at 80M, the OPERATION control at CAL, and the RIT control at OFF.

3. Center the DIAL CAL control. The dot on the knob should fall at top dead center.

4. Set the dial at 4000 KC and adjust trimmer C127 for zero beat.

5. Set the dial at 3500 KC and adjust coil L18 for zero beat.

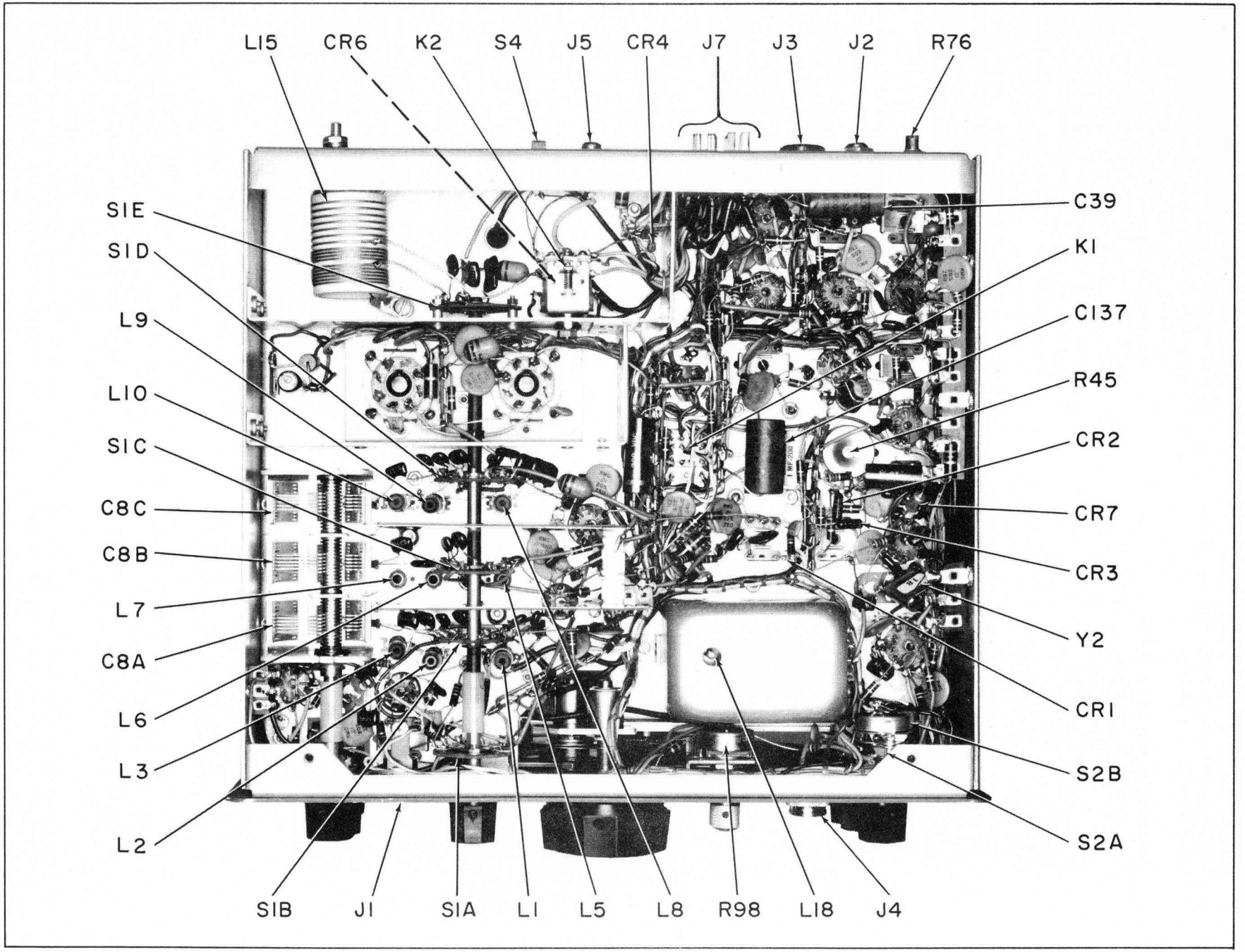


Figure 13. Bottom Chassis View of Transceiver.

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6. Repeat steps 4 and 5 until both the 4000-KC and 3500-KC settings are exactly on frequency.

7. Check the calibration across the dial at the 100-KC points. If the frequency error is less than 3000 CPS, the calibration is within acceptable limits. If the error is in excess of 3000 CPS at any of the mid-points, with the end limits at zero error, the VFO capacitor C130 should be "knifed." This operation should not be attempted by other than qualified personnel, thoroughly familiar with the technique.

NOTE

If the Model SR-160 calibrator circuitry is not set up for the calibration check, the VFO signal may be picked up with a general coverage receiver tuned to the 8700-KC to 9200-KC VFO tuning range. The receiver used must be equipped with an accurate crystal calibrator.

8-11. HETERODYNE MIXER/OSCILLATOR BAND-PASS TRANSFORMER ALIGNMENT.

Before changing the core settings in transformer T8, check the injection voltage between the junction of capacitors C80 and C81 and ground. (Test point A.) The VFO calibration must be within acceptable limits before adjusting this transformer. The following procedure should be used to check and adjust the transformer.

1. Set the OPERATION control at REC ONLY and the BAND SELECTOR at 40M.

2. Connect the VTVM probe to the test point A and ground clip to the chassis.

3. Tune the VFO from 6900 KC to 7400 KC and note the variation in injection voltage. A correctly adjusted transformer will produce equal voltages at 6900 KC and 7400 KC and equal amplitude peaks within the tuning range. The injection level at this test point will run 1.5 volts RMS to 1.8 volts RMS. Switching to 80M will produce approximately 2.0 volts RMS from the VFO directly at the test point.

4. To adjust the transformer for equal injection voltages at 6900 KC and 7400 KC, set the VFO dial to the frequency of lowest injection voltage and turn both cores into or out of their respective coils as required to raise the lower voltage to a new level half way between the two voltages noted. Repeat the process until both dial frequencies produce equal injection voltages.

5. To adjust the transformer for equal peak response voltages within the passband, set the dial to the frequency of lowest peak response voltage and adjust the cores in equal steps to produce a new peak voltage approximately midway between the original voltage levels noted. If one core is turned into its coil, turn the other core an equal distance out of its coil.

6. The adjustments in steps 4 and 5 interact upon each other and require that the steps be repeated. Keep in mind that the passband is shifted in frequency by turning both cores into or out of their coils in approximately equal amounts and that the response peaks are equalized by turning one core into its coil and the other out of its coil in approximately equal amounts.

   Do not misadjust the cores so that they rest in between the two windings.

8-12. BFO/CARRIER OSCILLATOR TRANSFORMER ALIGNMENT.

With the unit operating in the REC ONLY position of the OPERATION control, connect the probe of the VTVM to test point B, ground clip to chassis. If the voltage measured is approximately 1.0 volt RMS no adjustment is required.

If adjustment is required, set the core of transformer T6 for approximately 90 percent of the peak voltage obtained on the high frequency side of the peak setting of the core, that is, turn the core counterclockwise from the peak output voltage setting.

8-13. BFO/CARRIER OSCILLATOR FREQUENCY ADJUSTMENT.

Transformer T6 should be in proper alignment before setting the carrier oscillator to frequency. The oscillator frequency may be adjusted with warping trimmer C48 to exactly 5200 KC. The carrier oscillator signal may be picked up in a general coverage receiver equipped with a 100-KC calibrator known to be correlated with station WWV. Obtain zero beat between the carrier oscillator signal and the 100-KC calibrator in the receiver. Do not use the BFO in the general coverage receiver.

8-14. ALIGNMENT OF TRANSMITTER MIXER AND DRIVER STAGES.

The final amplifier bias adjustment must be properly set as in paragraph 8-3 before extensive operation of the transmitter is attempted. It is assumed that the 5200-KC signal generating stages of the Model SR-160 are functioning properly. Using the internally generated signal of the transmitter, the mixer and driver stages are aligned as follows:

1. Connect a 50-ohm dummy load to the COMMON ANTENNA jack, J5. Set the OPERATION control at CW-TUNE with the CARRIER control set for minimum output.
2. Set the BAND SELECTOR at 80M, the VFO dial at 3500 KC, and the DRIVER TUNE control at approximately 30° clockwise from its CCW stop.
3. Advance the CARRIER control and adjust the FINAL TUNE control for resonance in the 80M panel segment. Maintain an output signal level of 50 volts RMS across the 50-ohm load or approximately S-9 on the output meter as the alignment progresses.
4. Adjust cores of coils L5 and L8 for maximum output meter reading.
5. Set the VFO dial at 4000 KC and adjust the DRIVER TUNE and FINAL TUNE controls for maximum output. Note the position of the DRIVER TUNE control. If its settings at 3500 KC and 4000 KC fall an equal distance from the limits of knob rotation the alignment is complete for this band. If not, change the 3500 KC DRIVER TUNE position slightly, repeak cores L5 and L8 and again recheck the 4000 KC setting. Repeat the procedure until the tuning range centers within the rotational limits of the control.

   The 80M coils are common to the 40M and 20M band circuitry, therefore, they must be in alignment before these last two bands can be aligned. Repeat the above procedure for each band referring to the tuning chart for the appropriate data.

TRANSMITTER TUNING CHART

Band	Final Tune Segment	Adjust Coils At	Adjust Coils For Maximum Output		Check Driver Tune Setting At
80M	80M	3500 KC	L5	L8	4000 KC
40M	40M	6900 KC	L6	L9	7400 KC
20M	20M	13900 KC	L7	L10	14400 KC

A neutralization check (paragraph 8-7) is recommended following alignment of the mixer and driver stages. If a major neutralization adjustment is required, recheck the alignment.

8-15. ALIGNMENT OF RECEIVER ANTENNA STAGE.

The transmitter mixer and driver stages must be in alignment before the receiver antenna stage can be adjusted. The 80M band coil is common to the 40M and 20M band circuitry, therefore the 80M band must be aligned first. The alignment procedure for the antenna stage coils is as follows:

1. Connect the 50-ohm dummy load to the COMMON ANTENNA jack (J5), the RF Signal Generator to the REC ONLY ANTENNA jack (J6), and set the antenna switch at SEPARATE (up). If an AC voltmeter is connected across the speaker circuit, maximum audio output can be monitored visually.
2. Set the OPERATION control at REC ONLY, RF GAIN at maximum, AF GAIN as required.
3. Set the OPERATION control at CW-TUNE and tune the transmitter at 3500 KC (80M band). Adjust the DRIVER TUNE control carefully as outlined in paragraph 5-4.
4. Set the OPERATION switch at REC ONLY and adjust RF signal generator for approximately 1000 CPS audio beat note. Use just enough signal generator output to keep from developing AVC voltage at test point C. (Approximately 1 microvolt for an aligned unit.) Adjust coil L1 for maximum audio output without developing AVC voltage.
5. Repeat the alignment procedure outlined in steps 3 and 4 for the 40M and 20M bands. On 40M, tune the transmitter at 6900 KC and adjust coil L2. On 20M, tune the transmitter on 13900 KC and adjust coil L3.

8-16. ALIGNMENT OF FIRST IF AMPLIFIER STAGE.

To adjust the core of coil T3 in the plate circuit of the first IF amplifier tube, tune the transmitter at approximately 3800 KC into the dummy load, following the procedure outlined in paragraph 5-4. With the CARRIER control adjusted for a carrier output level of 50 volts RMS (S-9 on the output meter) or less, adjust the core of coil T3 for maximum RF output. Back off the CARRIER control setting if the output level exceeds 50 volts RMS during adjustment.

8-17. ALIGNMENT OF SECOND IF AMPLIFIER AND AVC AMPLIFIER STAGES.

Coil T4 in the plate circuit of the second IF amplifier tube and coil T7 in the plate circuit of the AVC/AALC amplifier tube are adjusted in the receive mode as follows:

1. Connect the RF signal generator to the REC ONLY ANTENNA jack (J6). Connect an AC voltmeter across the speaker circuit.

2. Set the OPERATION switch at REC ONLY, RF GAIN control at maximum, AF GAIN control as required and tune the RF signal generator and receiver to 3800 KC for approximately a 1000-CPS audio beat note.

3. Use just enough signal generator output to keep from developing AVC voltage at test point C, and adjust the core of coil T4 for maximum audio output.

4. Increase the RF signal generator output until AVC voltage equal to approximately minus one volt appears at test point C and adjust the core of coil T7 for maximum AVC voltage.

8-18. CRYSTAL FILTER ALIGNMENT.

The filter alignment consists of adjusting the impedance matching transformers, T1 and T2 associated with the hermetically sealed crystal filter unit FL1.

1. The filter response should be checked as follows before any termination adjustments are attempted.

   a. Tune the transmitter for SSB operation on 3800 KC into a dummy antenna load.

   b. Connect the AF signal generator to the MIC connector and monitor the input voltage with the Ballantine voltmeter. Set the AF signal generator at 1000 CPS and adjust the generator level for 50 volts RMS RF output with the MIC GAIN control set near maximum gain.

   c. Maintain constant AF signal generator input voltage and change the frequency of the generator above and below 1000 CPS, recording the frequency at which the transmitter RF output voltage drops to 35 volts RMS (-3 DB). Also note the maximum and minimum RF voltage excursions between these two frequencies. A normal 3-DB frequency response will run 400 to 600 CPS at the low end, 2700 to 3500 CPS at the high end, and less than 2-DB variation (10 volts RMS change) in the pass-band.

2. If the check made in step 1 indicates a need for filter termination adjustment proceed as follows:

   a. Disconnect the crystal filter unit (FL1) input and output wires at the filter terminals. Connect a 270,000-ohm resistor between the wires lifted from the filter terminals.

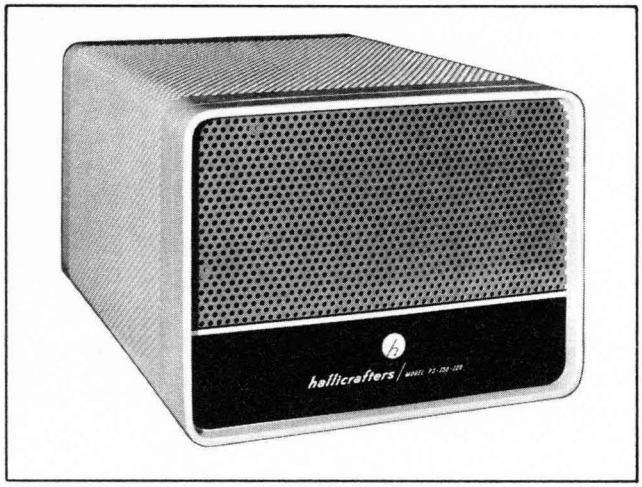
   b. Tune the transmitter for CW operation on 3800 KC into a dummy antenna load.

   c. Set the CARRIER control for approximately 10 volts RMS RF output at the dummy load, and adjust the cores of transformer T1 and coil T2 for maximum RF output.

   d. Remove the resistor and reconnect the filter. Check the filter response as outlined in step 1. If a major change occurred in the core setting of coil T2, recheck the alignment of the first IF amplifier stage coil T3. (See paragraph 8-16.)

SECTION IX

AC POWER SUPPLY MODEL PS-150-120



092-017846

Figure 14. Hallicrafters Model PS-150-120 AC Power Supply.

9-1. DESCRIPTION.

Hallicrafters' Model PS-150-120 Power Supply is a complete, self-contained power unit designed to permit Hallicrafters' Model SR-160 Transceiver to be operated from a nominal 117-volt AC source. This power supply, through a 12-pin power plug and cable at the rear, will furnish all the supply voltages necessary for optimum performance of the SR-160.

Hallicrafters' Model PS-150-120 operates from a 105-volt to 125-volt, 50/60 cycle, AC source. The power supply also contains a 3.2-ohm permanent-magnet type speaker which connects to the SR-160 through the 12-pin power plug and cable.

WARNING

LETHAL HIGH VOLTAGE IS PRESENT WITHIN THIS EQUIPMENT. BE CAREFUL WHEN INSTALLING THE UNIT, WHEN MAKING BIAS ADJUSTMENTS, AND WHEN PERFORMING CHECKS UNDER THE CHASSIS.

9-2. BIAS ADJUSTMENT.

After connecting the power supply to the SR-160 and to the proper power source, the transmitter bias must be adjusted to achieve optimum performance of the transceiver.

1. Connect a voltmeter to the tip jacks at the top rear of the power supply chassis. (Connect the positive lead from the meter to the red jack.)
2. Turn the Model SR-160 on: OPERATION switch to SSB.
3. With no signal applied to the transmitter and the microphone button depressed, adjust the BIAS ADJ potentiometer, R206 on the rear of the power supply chassis, for 0.6 volt on the meter.
4. Disconnect the meter after turning the equipment off.

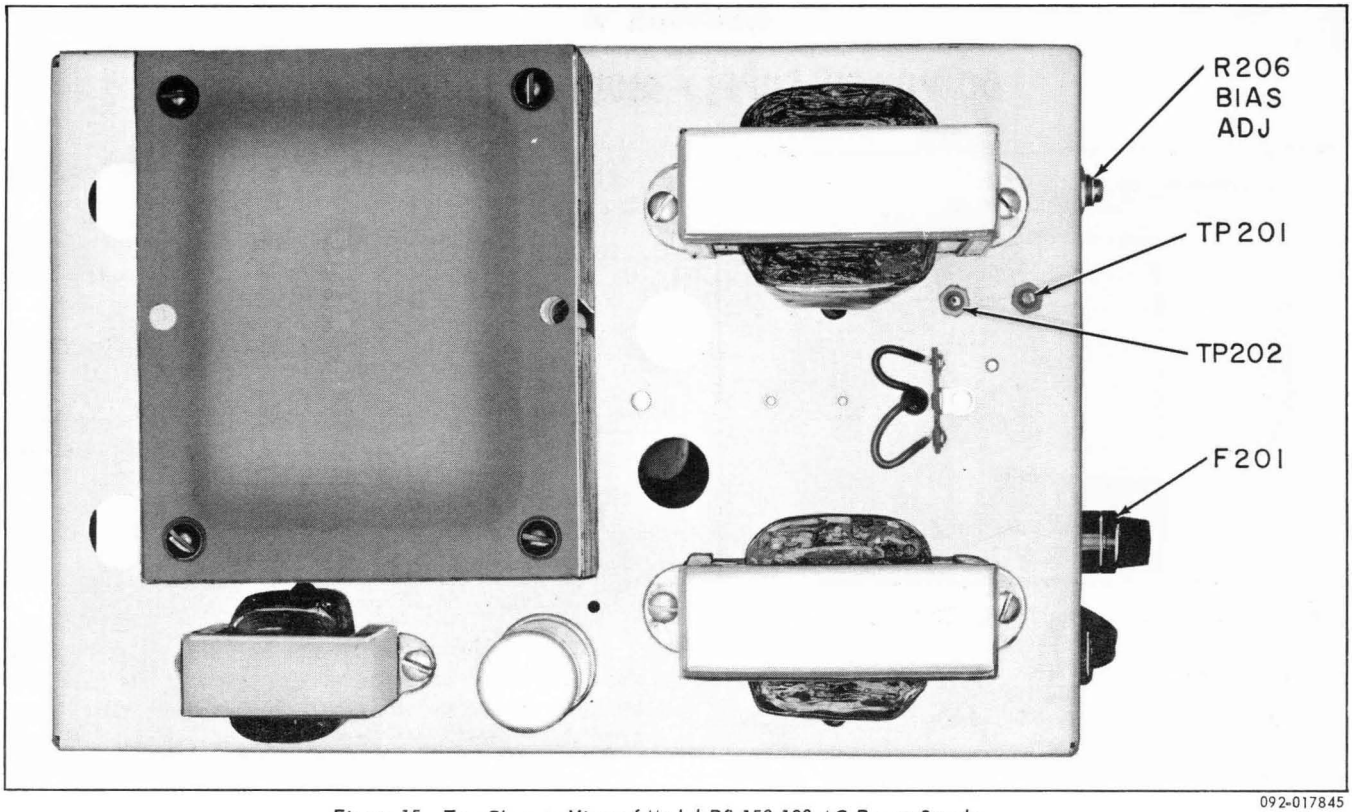
This adjustment is not necessary each time the SR-160 is used; however, it should be checked periodically and whenever the transmitter final amplifier tubes are replaced.

9-3. CHASSIS REMOVAL.

To remove the PS-150-120 chassis from its cabinet, remove the six hex-head screws on the bottom (four are in the feet and two are at the center front and rear) and disconnect the speaker leads on the top rear of the chassis. The chassis will slide out the rear of the cabinet.

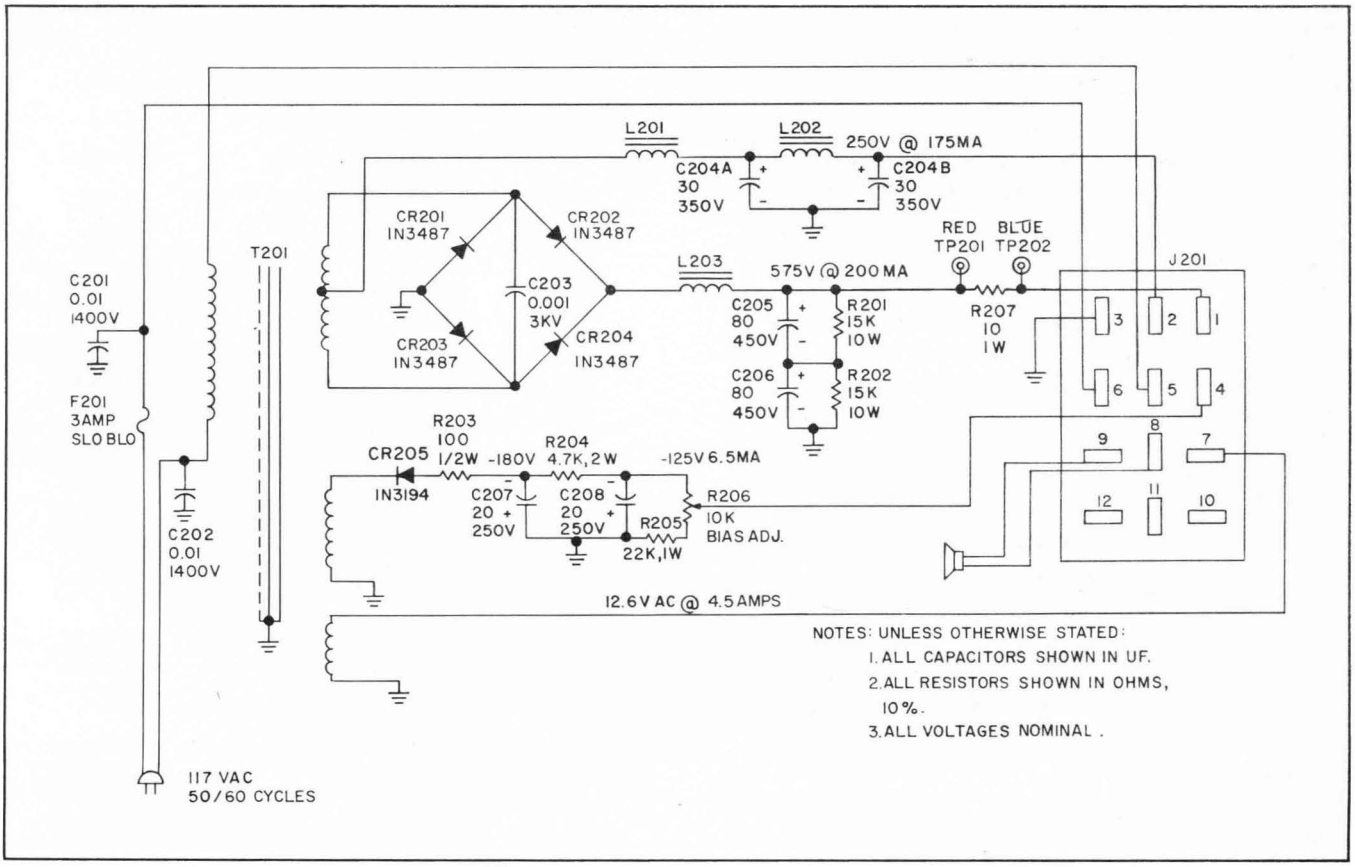
REPAIR PARTS LIST

Schematic Symbol	Description	Hallicrafters Part Number
C201,202	Capacitor, 0.01 μF, 1400V, Ceramic Disc	047-200752
C203	Capacitor, 0.001 μF, 3000V, Ceramic Disc	047-100397
C204A&B	Capacitor, 2 x 30 μF, 350V, Electrolytic	045-000902
C205,206	Capacitor, 80 μF, 450V, Electrolytic	045-000369
C207,208	Capacitor, 20 μF, 250V, Electrolytic	045-000903
CR201,202, 203,204	Diode, Silicon, Type 1N3487	027-000314
CR205	Diode, 1N3194	019-002769
F201	Fuse, 3 Amperes, 125 Volts, 3AG, (Slow Blow)	039-100390
J201	Connector, Power (12-pin)	010-002613
L201	Choke, Filter	056-000595
L202	Choke, Filter	056-000585
L203	Choke, Filter	056-000501
R201,202	Resistor, 15K Ohms, 10%, 10 watts, Wire Wound	445-032153
R203	Resistor, 100 Ohms, 10%, 1/2 watt, Carbon	451-252101
R204	Resistor, 4700 Ohms, 10%, 2 watts, Carbon	451-652472
R205	Resistor, 22K Ohms, 10%, 1 watt, Carbon	451-352223
R206	Resistor, Variable, 10K Ohms, 20%, 3/4 watt, Bias Adj.	025-002330
R207	Resistor, 10 Ohms, 5%, 1 watt, Carbon	451-351100
T201	Transformer, Power	052-001007
TP201	Tip Jack, Red	036-000304
TP202	Tip Jack, Blue	036-000307
	Baffle Board	078-001711
	Baffle, Felt	014-000476
	Cabinet	066-003437
	Cable (9-conductor)	087-007657
	Cable Assembly	087-007648
	Cable Clamp	076-202746
	Foot, Plastic (4)	016-201072
	Front Panel	068-001263
	Fuse Holder	006-200837
	Line Cord	087-104690
	Lock, Line Cord	076-100953
	Rear Panel	068-001404
	Speaker, 4 x 6 inch PM, 3.2 Ohms	085-000218



092-017845

Figure 15. Top Chassis View of Model PS-150-120 AC Power Supply.

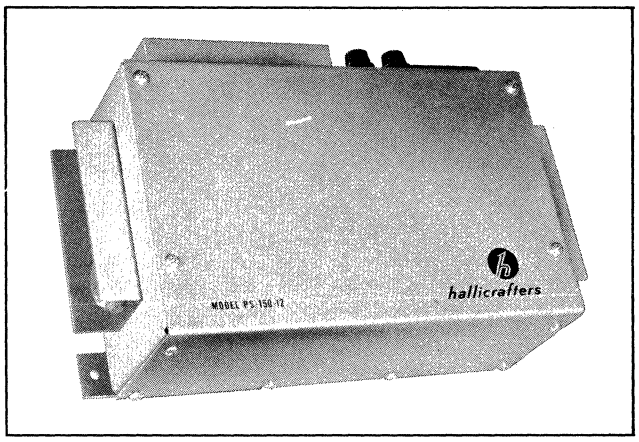


089-003011C

Figure 16. Schematic Diagram of Model PS-150-120 AC Power Supply.

SECTION X

DC POWER SUPPLY MODEL PS-150-12



092-017844

Figure 17. Hallicrafters Model PS-150-12 DC Power Supply.

10-1. DESCRIPTION.

Hallicrafters' Model PS-150-12 Power Supply is a complete, compact, self-contained power unit designed to permit Hallicrafters' Model SR-160 Transceiver to be operated from a nominal 12-volt DC source. This power supply is shipped for operation in conjunction with a negative-grounded power source. However, it is operable with a positive grounded source by changing two internal soldered connections as described in figure 19.

The Model PS-150-12 Power Supply, is designed to operate from a 11.6 volt to 16.0 volt DC source with 13.6 volt as nominal voltage.

All connections are made to the power supply through two terminal strips on one side of the unit (see figures 6 and 18). The two-connector strip (TS301) is used for connection to the 12-volt source through the wires supplied. The seven-connector strip (TS302) is used to supply the operating voltages to the transceiver and connects to the transceiver through the cable supplied with the Mobile Installation Kit Model MR-160 available as an accessory.

WARNING

LETHAL HIGH VOLTAGE IS PRESENT WITHIN THIS EQUIPMENT. BE CAREFUL WHEN INSTALLING THE UNIT, WHEN MAKING BIAS ADJUSTMENTS, AND WHEN PERFORMING CHECKS UNDER THE CHASSIS.

10-2. BIAS ADJUSTMENT.

After interconnecting the power supply to its proper power source and to the transceiver, the transmitter bias must be adjusted to achieve optimum performance of the transceiver.

1. Disconnect the high voltage (red/white) lead from pin 1 of TS302.
2. Connect an ammeter, with a full-scale deflection of 0-300 MA, between the high voltage lead and pin 1 of TS302.
3. Turn the transceiver on: OPERATION switch to SSB.
4. With no signal applied to the transceiver and the microphone button depressed, adjust the BIAS ADJ potentiometer, R308 on the side of the power supply chassis, for a reading of 60 MA on the meter.
5. Disconnect the meter and reconnect lead to pin 1 of TS302.

This adjustment is not necessary each time the SR-160 is used; however, it should be checked periodically and whenever the transmitter final amplifier tubes are replaced.

10-3. COVER REMOVAL.

Remove the nine screws on the top and one side of the unit and lift the cover off. This will provide easy access to all the components in the power supply.

REPAIR PARTS LIST

Schematic Symbol	Description	Hallicrafters Part Number
C301	Capacitor, 25 μF, 50V, Electrolytic	045-000863
C302	Capacitor, 0.001 μF, 3000V, Ceramic Disc	047-100397
C303,304, 306	Capacitor, 40 μF, 450V, Electrolytic	045-000904
C305	Capacitor, 0.22 μF, 10%, 600V, Mylar	046-001376
C307,308	Capacitor, 20 μF, 250V, Electrolytic	045-000903
CR301,302, 303,304	Diode, Silicon, Type 1N3487	027-000314
CR305	Diode, Type 1N3194	019-002769
F301	Fuse, 15 Amperes, 23 Volts, 3AG	039-000707
F302	Fuse, 7.5 Amperes, 32 Volts, 3AG	039-000706
K301,302	Relay	021-000671
L301	Choke, Filter	056-000555
Q301,302, 303,304	Transistor, Type 2N441	112-000194
R301	Resistor, 7.5 Ohms, 10%, 10 watts, Wire Wound	445-032075
R302	Resistor, 220 Ohms, 10%, 2 watts, Carbon	451-652221
R303	Resistor, 100 Ohms, 10%, 7 watts, Wire Wound	445-022101
R304	Resistor, 100 Ohms, 10%, 1/2 watt, Carbon	451-252101
R305	Resistor, 1000 Ohms, 10%, 1/2 watt, Carbon	451-252102
R306,307	Resistor, 47K Ohms, 10%, 2 watts, Carbon	451-652473
R308	Resistor, Variable, 10K Ohms, 20%, 3/4 watt, Bias Adj.	025-002330
R309	Resistor, 100K Ohms, 10%, 1/2 watt, Carbon	451-252104
T301	Transformer, Power	052-000969
	Cabinet Cover	066-003454
	Cable Clamp	076-202744
	Clamp, Resistor (R301)	076-004121
	Cover, Terminal Strip (TS302)	066-003574
	Fuse Holder	006-200837

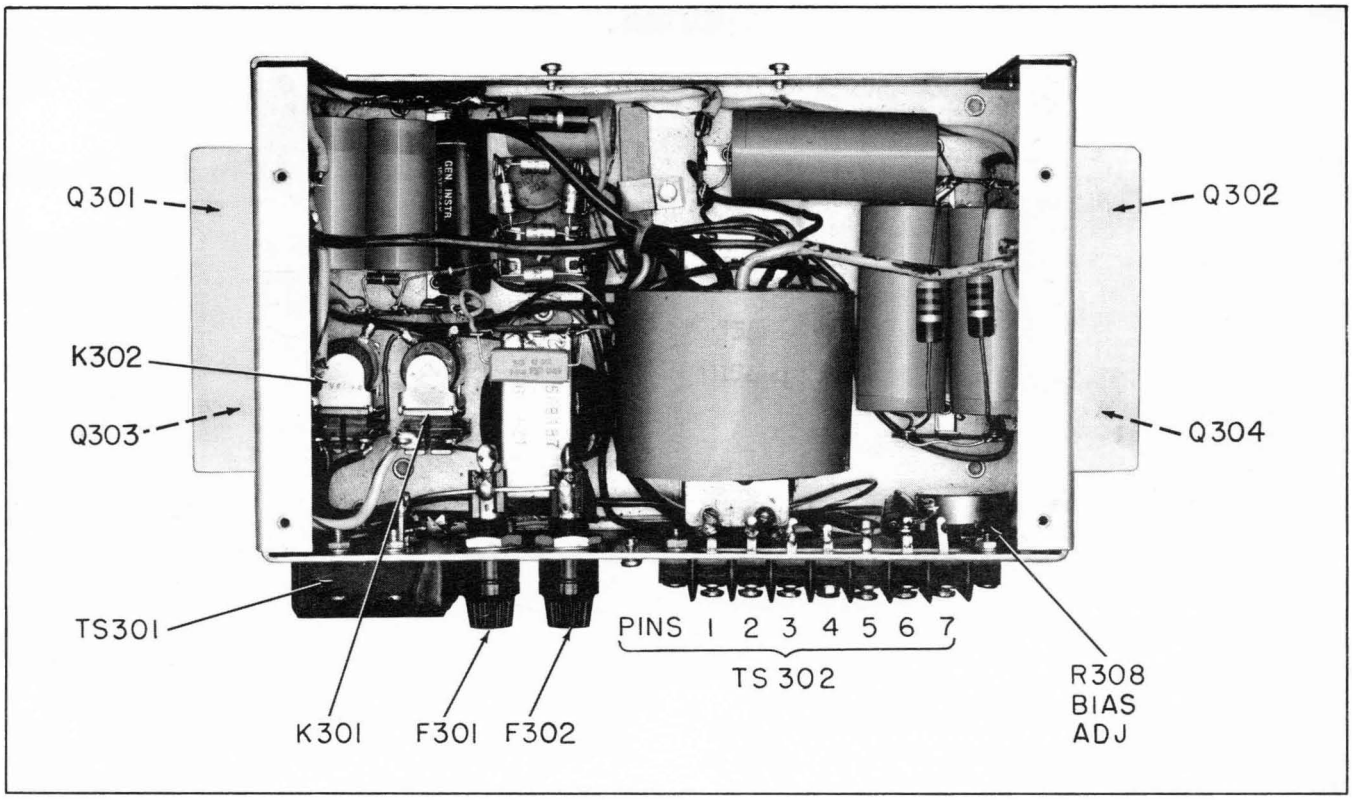
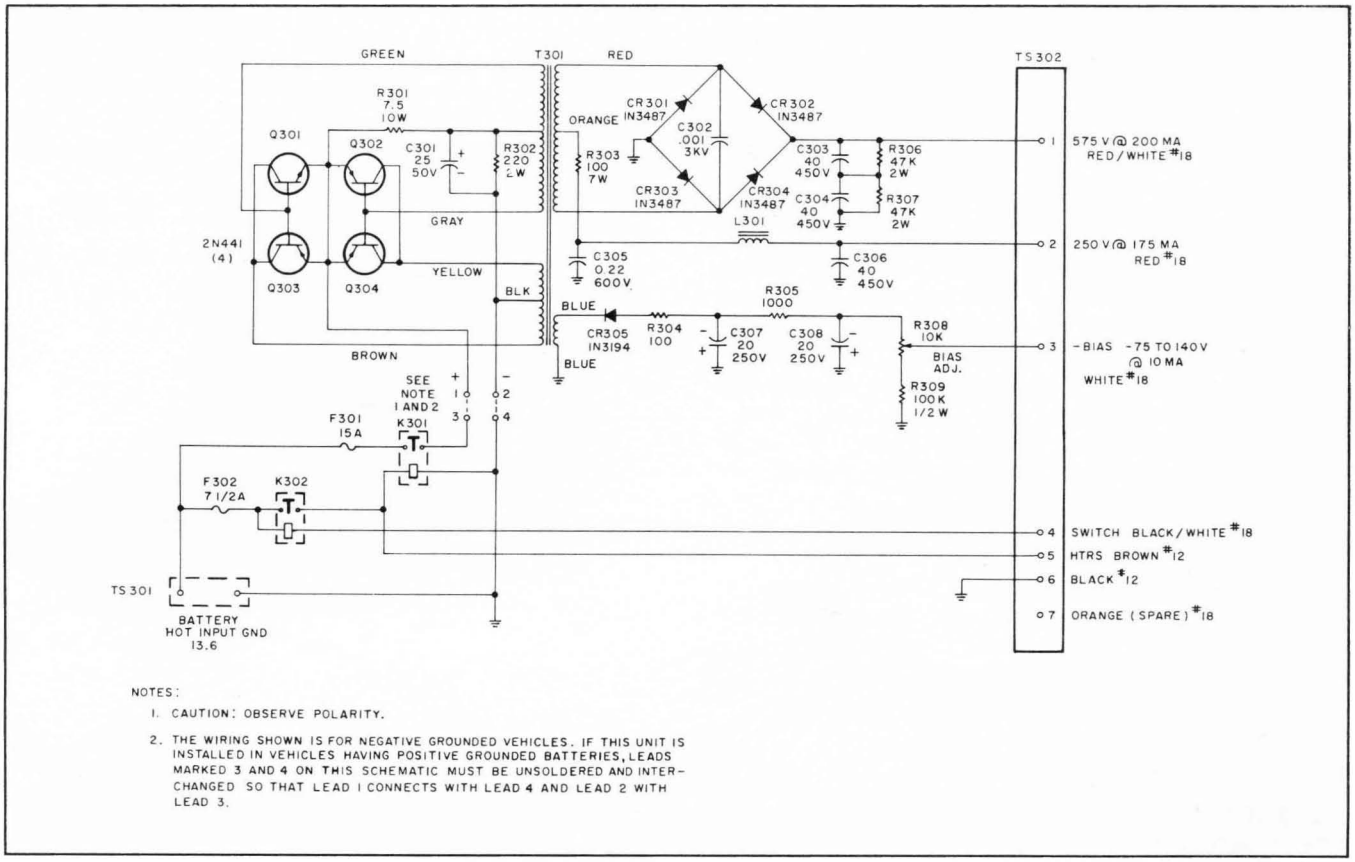


Figure 18. Internal Top View of Model PS-150-12 DC Power Supply.

092-017843



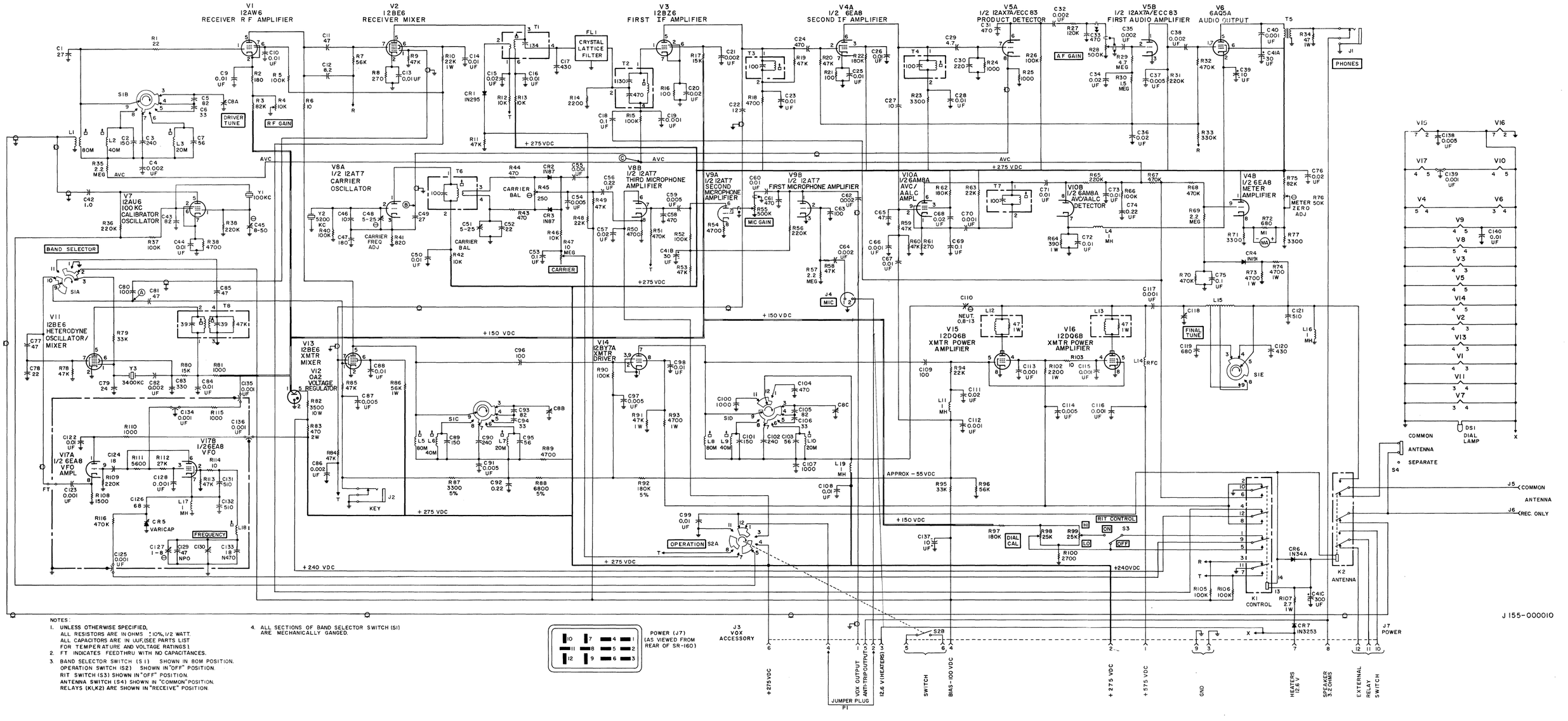
NOTES:

1. CAUTION: OBSERVE POLARITY.
2. THE WIRING SHOWN IS FOR NEGATIVE GROUNDED VEHICLES. IF THIS UNIT IS INSTALLED IN VEHICLES HAVING POSITIVE GROUNDED BATTERIES, LEADS MARKED 3 AND 4 ON THIS SCHEMATIC MUST BE UNSOLDERED AND INTERCHANGED SO THAT LEAD 1 CONNECTS WITH LEAD 4 AND LEAD 2 WITH LEAD 3.

089-002979C

Figure 19. Schematic Diagram of Model PS-150-12 DC Power Supply.

NOTES:



NOTES:

1. UNLESS OTHERWISE SPECIFIED,
   ALL RESISTORS ARE IN OHMS ±10%, 1/2 WATT.
   ALL CAPACITORS ARE IN UUF, (SEE PARTS LIST FOR TEMPERATURE AND VOLTAGE RATINGS.)
2. FT INDICATES FEEDTHRU WITH NO CAPACITANCES.
3. BAND SELECTOR SWITCH (S1) SHOWN IN 80M POSITION.
   OPERATION SWITCH (S2) SHOWN IN "OFF" POSITION.
   RIT SWITCH (S3) SHOWN IN "OFF" POSITION.
   ANTENNA SWITCH (S4) SHOWN IN "COMMON" POSITION.
   RELAYS (K1, K2) ARE SHOWN IN "RECEIVE" POSITION.
4. ALL SECTIONS OF BAND SELECTOR SWITCH (S1) ARE MECHANICALLY GANGED.

POWER (J7) (AS VIEWED FROM REAR OF SR-160)

Figure 20. Schematic Diagram of Model SR-160 Transceiver.

SERVICE REPAIR PARTS LIST MODEL SR-160

Schematic Symbol	Description	Hallicrafters Part Number
	CAPACITORS	
C1,49	27 μμF, 2%, 500V, Plastic Mica	493-110270-331
C2,89,101	150 μμF, 2%, 500V, Plastic Mica	493-110151-334
C3,90,102	240 μμF, 2%, 500V, Plastic Mica	493-110241-334
C4,21,32,35, 38,62,64,82, 86	0.002 μF, 20%, 500V, Ceramic Disc	047-100395
C5,43,93,105	82 μμF, 2%, 500V, Plastic Mica	493-110820-333
C6,94,106	33 μμF, 2%, 500V, Plastic Mica	493-110330-333
C7,95,103	56 μμF, 2%, 500V, Plastic Mica	493-110560-333
C8A,B,C	Variable, DRIVER TUNE	048-000543
C9,10,13,14, 16,23,25,26, 28,44,50,60, 67,71,72,73, 84,88,98,99, 108,122,140	0.01 μF, 20%, 500V, Ceramic Disc	047-100354
C11,65,77, 81,85	47 μμF, 5%, 500V, Plastic Mica	493-210470-233
C12	8.2 μμF, 5%, 500V, Plastic Mica	493-140820-231
C15,20,34, 36,57,68, 76,111	0.02 μF, 20%, 500V, Ceramic Disc	047-100471
C17,120	430 μμF, 2%, 500V, Plastic Mica	493-110431-334
C18,75	0.1 μF, +80%, -20%, 100V, Ceramic Disc	047-001428
C19,40,55, 66,70,112, 113,115,123, 128	0.001 μF, 20%, 500V, Ceramic Disc	047-001671
C22	12 μμF, 2%, 500V, Plastic Mica	493-110120-331
C24,31,33, 58,61	470 μμF, 5%, 500V, Plastic Mica	493-110471-234
C27,46	10 μμF, 5%, 500V, Plastic Mica	493-110100-231
C29	4.7 μμF, 10%, 500V, Plastic Mica	493-140470-131
C30	220 μμF, 5%, 500V, Plastic Mica	493-110221-234
C37,54,59, 87,91,97, 114,138	0.005 μF, 20%, 500V, Ceramic Disc	047-100442
C39	10 μF, 50V, Electrolytic	045-000755
C41A,B,C	2 X 30 μF, 300V; 300 μF, 25V; Electrolytic	045-001115
C42	1 μμF, 10%, Composition	047-200403-002
C45	Variable, 8 to 50 μμF Trimmer	044-200437
C47	180 μμF, 2%, 500V, Plastic Mica	493-110181-334
C48,51	Variable, 5 to 25 μμF Trimmer	044-100473
C52,78	22 μμF, 2%, 500V, Plastic Mica	493-110220-331
C53	0.1 μF, 10%, 200V, Paper	046-001294-04
C56,74,92	0.22 μF, 10%, 200V, Paper	046-001298-004
C63,80,96, 109	100 μμF, 5%, 500V, Plastic Mica	493-110101-234
C69	0.1 μF, 50V, Plastic Mica	047-001146
C79	24 μμF, 2%, 500V, Plastic Mica	493-110240-331
C83	330 μμF, 5%, 500V, Plastic Mica	493-110331-234
C100,107	1000 μμF, 2%, 500V, Plastic Mica	493-310102-334
C104	470 μμF, 2%, 500V, Plastic Mica	493-110471-334
C110	Variable, 0.8 to 13 μμF, Neutralizing Trimmer	044-000520
C116,117	0.001 μF, 3000V, Ceramic Disc	047-100397
C118	Variable, FINAL TUNE	048-000541
C119	680 μμF, 5%, 500V, Plastic Mica	493-310681-234
C121	510 μμF, 2%, 500V, Plastic Mica	493-110511-334
C124	18 μμF, 5%, 300V, Plastic Mica	493-110180-221
C125,135, 136,139	0.001 μF, GMV, Feed-Through	047-001308
C126	68 μμF, 2%, 300V, Plastic Mica	493-110680-323
C127	Variable, 1 to 8 μμF, Trimmer	044-000593
C129	47 μμF, 2%, 500V, NPO, Ceramic Tubular	491-024470-022
C130	Variable, FREQUENCY	048-000542
C131,132	510 μμF, 2%, 300V, Plastic Mica	493-110511-324
C133	18 μμF, 2%, 500V, N470, Ceramic Tubular	491-004180-083
C134	0.001 μF, GMV, Stand-off	047-001634
C137	10 μF, 150V, Electrolytic	045-100307
	***RESISTORS**	
R1	22 ohm	451-252220
R2	180 ohm	451-252181
R3,75	82K ohm	451-252823
R4 and R28	Variable, 10K ohm, 20%, 1/2 watt, RF GAIN; 500K ohm, 30%, 1/8 watt, AF GAIN	025-002311
R5,15,26,37, 40,52,66,90, 105,106	100K ohm	451-252104
R6,103,114	10 ohm	451-252100
R7,96	56K ohm	451-252563
R8,61	270 ohm	451-252271
R9,11,19,20, 49,53,58,59, 60,78,84,85, 113	47K ohm	451-252473
R10	22K ohm, 1 watt	451-352223
R12,13, 42,46	10K ohm	451-252103
R14	2200 ohm	451-252222
R16,21	100 ohm	451-252101
R17,80	15K ohm	451-252153
R18,38,50, 54,89	4700 ohm	451-252472
R22,62,97	180K ohm	451-252184
R23,71,77	3300 ohm	451-252332
R24,25,81, 110,115	1000 ohm	451-252102
R27	120K ohm	451-252124
R29	4.7 Megohm	451-252475
R30	1.5 Megohm	451-252155
R31,36,39, 56,65,109	220K ohm	451-252224
R32,51,67, 68,70,116	470K ohm	451-252474
R33	330K ohm	451-252334
R34	47 ohm, 1 watt	451-352470
R35,57,69	2.2 Megohm	451-252225
R41	820 ohm	451-252821
R43,44	470 ohm	451-252471
R45	Variable, 250 ohm, 20%, 1/4 watt, Carrier Bal.	025-002227
R47 and R55	Variable, 10 Megohm, -20%, +40%, 1/8 watt, CARRIER 500K ohm, 30%, 1/8 watt, MIC GAIN	025-002229
R48,63,94	22K ohm	451-252223
R64	390 ohm, 1 watt	451-352391
R72	680 ohm	451-252681
R73,74,93	4700 ohm, 1 watt	451-352472
R76	Variable, 50K ohm, 20%, 1/4 watt, Meter Zero Adj.	025-002228
R79,95	33K ohm	451-252333
R82	3500 ohm, 5%, 10 watts, Wire Wound	024-001484
R83	470 ohm, 2 watts	451-652471
R86	56K ohm, 1 watt	451-352563
R87	3300 ohm, 5%	451-251332
R88	6800 ohm, 5%	451-251682
R91	47K ohm, 1 watt	451-352473
R92	180K ohm, 5%	451-251184
R98	Variable, 25K ohm, 30%, 1/6 watt, DIAL CAL	025-002306
R99	Variable, 25K ohm, 30%, 1/6 watt, RIT CONTROL (Inc. S3)	025-002226
R100	2700 ohm	451-252272
R102	2200 ohm, 1 watt	451-352222
R107	2.7 ohm, 1 watt	451-352027
R108	1500 ohm	451-252152
R111	5600 ohm	451-252562
R112	27K ohm	451-252273

*All Resistors are Carbon Type, 10%, 1/2 watt unless otherwise stated.

COILS AND TRANSFORMERS

L1	Coil, 80-Meter Antenna	050-000976
L2,9	Coil, 40-Meter Antenna and Driver	050-001013
L3,10	Coil, 20-Meter Antenna and Driver	050-000974
L4,11,16, 17,19	RF Choke, 1 MH	053-000580
L5	Coil, 80-Meter Mixer	050-001075
L6	Coil, 40-Meter Mixer	050-001074
L7	Coil, 20-Meter Mixer	050-001073
L8	Coil, 80-Meter Driver	050-000975
L12,13	Parasitic Choke Assembly	053-000676
L14	RF Choke	053-200426
L15	Coil, PI Output	050-001067
L18	Coil, VFO	050-001011
T1	Transformer, Mixer Plate	050-001024
T2	Transformer, Filter Termination	050-001023
T3,4,7	Transformer, 5200 KC IF	050-001021
T5	Transformer, Audio Output	055-000508
T6	Transformer, Carrier Oscillator Plate	050-001025
T8	Transformer, Heterodyne Mixer Plate	050-001022

ELECTRON TUBES, DIODES, AND CRYSTALS

V1	Tube, Type 12AW6	090-901319
V2,11,13	Tube, Type 12BE6	090-900040
V3	Tube, Type 12BZ6	090-001538
V4,17	Tube, Type 6EA8	090-901350
V5	Tube, Type 12AX7A/ECC83	090-901230
V6	Tube, Type 6AQ5A	090-901331
V7	Tube, Type 12AU6 (Not Supplied)	090-001544
V8,9	Tube, Type 12AT7	090-900034
V10	Tube, Type 6AM8A	090-001539
V12	Tube, Type OA2	090-900001
V14	Tube, Type 12BY7A	090-901192
V15,16	Tube, Type 12DQ6B	090-001475
CR1	Diode, Type 1N295	019-301980
CR2,3	Diode, Type 1N87	019-002941
CR4	Diode, Type 1N191	019-102018
CR5	Diode, Type V-100 Varicap	048-000464
CR6	Diode, Type 1N34A	019-101918
CR7	Diode, Type 1N3253	019-002939-01
Y1	Crystal, 100 KC (Not Supplied)	019-002712
Y2	Crystal, 5200 KC	019-003247
Y3	Crystal, 3400 KC	019-003219-001

SWITCHES

S1	Rotary, BAND SELECTOR (Inc. A1A Only)	060-002636
S1B&C	Wafer, Receiver RF Amplifier and Mixer	062-000210
S1D	Wafer, Transmitter Driver	062-000209
S1E	Wafer, Transmitter PI Output	062-000208
S2	Rotary, OPERATION-POWER ON/OFF	060-002615
S3	Rotary, RIT ON-OFF	P/O R99
S4	Slide, SPST, Antenna Common-Separate	060-100440

CONNECTORS

J1,2	Connector, PHONES and Key Jack	036-000350
J3	Connector, Accessory, 6-Pin	006-001096
J4	Connector, MIC, W/hardware	010-101569
J5,6	Connector, Phono Pin-Plug, Antenna (2)	036-100041
J7	Connector, Power, 12-Pin Jones Type	010-002586
	MISCELLANEOUS	
	Bracket, Capacitor Mounting (C110)	067-010104
	Bracket, Capacitor Mounting (C118)	067-010032
	Bracket, Dial Drive	067-011801
	Bracket, High Voltage Shield Mounting	067-010909
	Bracket, Meter Mounting	067-010135
	Bracket, Pilot Light	067-010893
	Bracket, Potentiometer Mounting	067-011800
	Bracket, Terminal Board Mounting	067-010891
	Bracket, Tube Mounting (V15-16)	067-009814
	Cabinet	150-006629
	Cable, Two-Conductor Shielded	087-007927
	Coupling, Insulated (C8 and C118)	029-200564
	Coupling, Insulated (S1)	029-001061
	Cover, High Voltage Shield	066-003715
	Dial Pointer	082-000567
	Dial Window	022-000696
	Disc Drive Assembly (Inc. Dial Scale)	150-006930
	Disc, Pinch	028-000496
	Disc, Pinch Drive	028-000497
	Disc, Support	028-000498
	Escutcheon	007-000877
	Escutcheon Plate	007-000872
FL1	Filter, Crystal	049-000280
	Foot, Mounting	016-201072
	Front Panel	068-001451
	Gear, Pinion	026-001087
	Gear, Spur	026-001097
	Gear, Spur (Fixed)	026-001096
	Grommet, Rubber (K2)	016-100034
	High Voltage Shield Assembly	150-005800
	Insulator, Feed-Through (K1)	008-103697
	Insulator, Feed-Through (VFO)	008-103722
	Insulator, Stand-Off (L15)	008-106147
	Knob, AF GAIN, MIC GAIN, RIT LO-HI	015-001773
	Knob, BAND SELECTOR, DRIVER TUNE, FINAL TUNE, OPERATION	015-001775
	Knob, Bar Type, CARRIER RF GAIN, RIT OFF/ON	015-001740-001
	Knob, DIAL CAL	015-001755-02
	Knob, FREQUENCY	015-001815-003
	Medallion, Hallicrafters "h"	007-000850
M1	Meter	082-000566
DS1	Pilot Lamp, 1815	039-000689
	Plate, Chassis, Left-Hand	063-006421
	Plate, Chassis, Right-Hand	063-006420
	Plug, Six-Contact (Mates with J3)	035-000088
K1	Relay, Control	021-000729
K2	Relay, Antenna	021-000731
	Ring, Retaining, Driver Tune Shaft	076-000972
	Ring, Retaining, Pinch Drive	076-102136
	Shaft, Band Selector	074-002891
	Shaft, Dial Disc	074-002759
	Shaft, Driver Tune	074-002873
	Shaft, Final Tune	074-002882
	Shaft, Pinch Drive	074-002758
	Shaft, Tuning	074-002757
	Shield, Final Tank	069-001785
	Shield, High Voltage	069-001786
	Shield, RF Driver	069-001874
	Shield, RF Mixer	069-001873
	Shield, RF Power Amplifier	069-001784
	Shield, VFO Can	069-001586
	Spring, Anti-Backlash	075-000841
	Spring, Ground	075-000959
	Spring, Pinch Drive	075-000902
	Terminal Board	008-008068

FINAL (12DQ6B) TUBE MATCHING.

If either or both 12DQ6B tubes are replaced, tube matching will be required. This may require access to a number of tubes in order to select those with the desired characteristics. Matched pairs of tubes are available through Hallicrafters' Service Department for customer convenience.

The procedure for tube matching is as follows:

CAUTION

It will be necessary to come into contact with circuits which normally have high voltage applied to them. Use extreme care while performing the following operations.

1. Set the OPERATION switch to OFF.
2. Remove the chassis unit from the cabinet as described in paragraph 7-1.
3. Remove the top cover from the final amplifier cage.
4. Remove one 12DQ6B tube. If both tubes are defective, both tubes should be removed and one new tube installed. The unused plate cap must not touch nearby components.
5. Connect a voltmeter or milliammeter to the power supply tip jacks as described in BIAS ADJUSTMENT, paragraph 8-3.
6. Set the OPERATION switch at REC. ONLY and allow approximately two minutes warmup.
7. Set the CARRIER control fully CCW.
8. Set the OPERATION switch at CW-TUNE.
9. Adjust the BIAS ADJ control for a 0.3-volt (30 MA) reading on the voltmeter.
10. Return the OPERATION switch to OFF.
11. Short the 12DQ6B plate cap to the chassis and remove the tube from its socket.
12. Insert a new 12DQ6B tube into the same socket and connect the plate cap.
13. Place the OPERATION switch in REC. ONLY and allow approximately two minutes for warmup.
14. Place the OPERATION switch at CW-TUNE and observe the voltmeter reading. (Do not change the bias setting.)
15. If this tube causes the voltmeter to read between 0.2 volt (20 MA) and 0.4 volt (40 MA), it can be considered as being matched to the original tube. If the difference in reading exceeds 0.1 volt (10 MA), other tubes must be checked until the difference reading of the pair to be matched is less than 0.1 volt (10 MA).
16. Install the matched pair of tubes and set the bias as described in BIAS ADJUSTMENT, paragraph 8-3.
17. The final amplifier may require neutralization after the new tubes are installed. Refer to paragraph 8-7 for the neutralization check and adjustment procedure.

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