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	12AN6	Receiver RF Amplifier
V2	12BE6	Receiver Mixer
V3	12BZ6	First IF Amplifier
V4	6EA8	Receiver Second IF Amplifier and Meter Amplifier
V5	12AX7A/ ECC83	Product Detector and First Audio Amplifier
V6	6AQ5A	Receiver Audio Output
V7	12AU6	100-KC Calibrator Oscillator (Not supplied with unit.)
V8	12AT7	Carrier Oscillator/BFO and Third Microphone Amplifier
V9	12AT7	First and Second Microphone Amplifier
V10	6AH8A	AVC/AALC Amplifier-Detector
V11	12BE6	Heterodyne Oscillator and Mixer (40M)
V12	6AZ	Voltage Regulator
V13	12BE6	Transmitter Mixer
V14	12BY7A	Transmitter Driver
V15	12DQ6B	Transmitter Power 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 μμF.

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-160-120 Power Supply, or an equivalent supply, is required. Merely connect

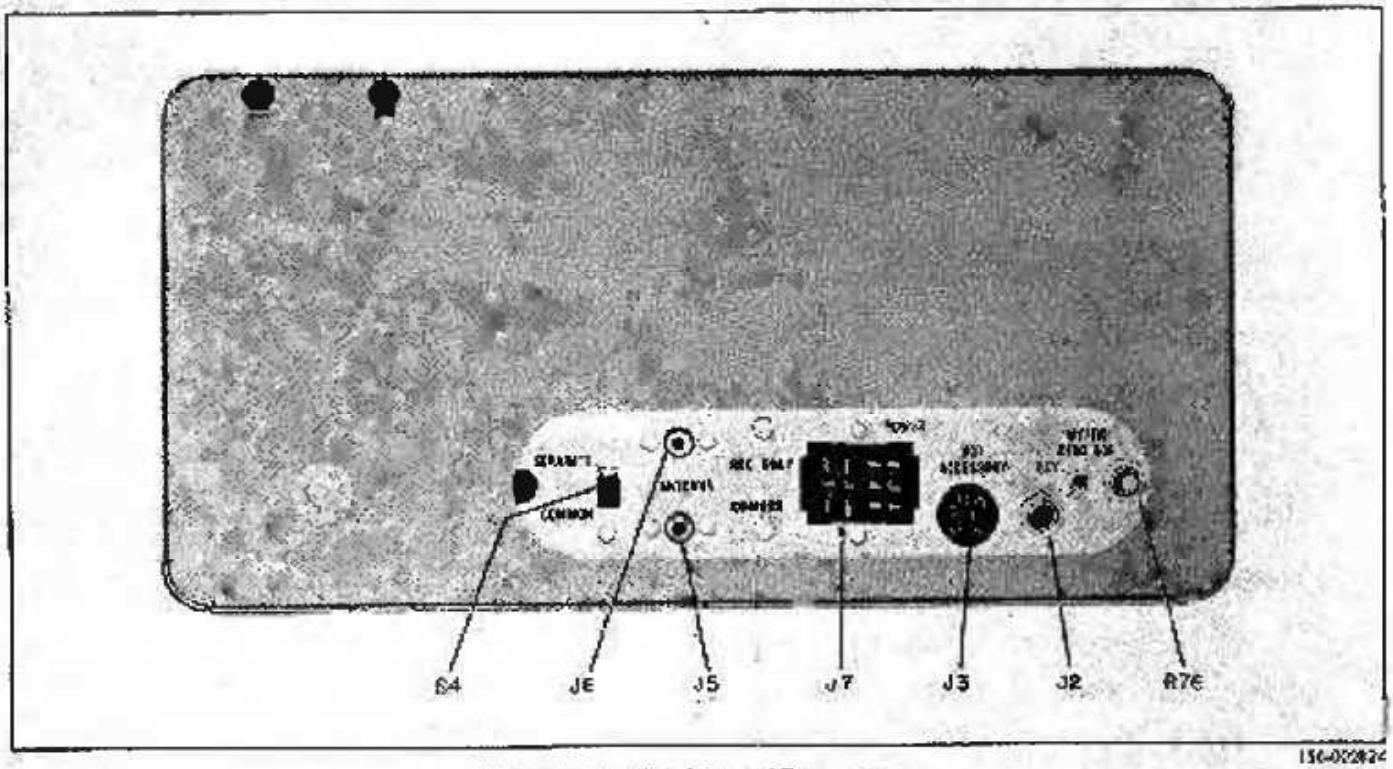


Figure 2. Rear Panel View of Transceiver.

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.

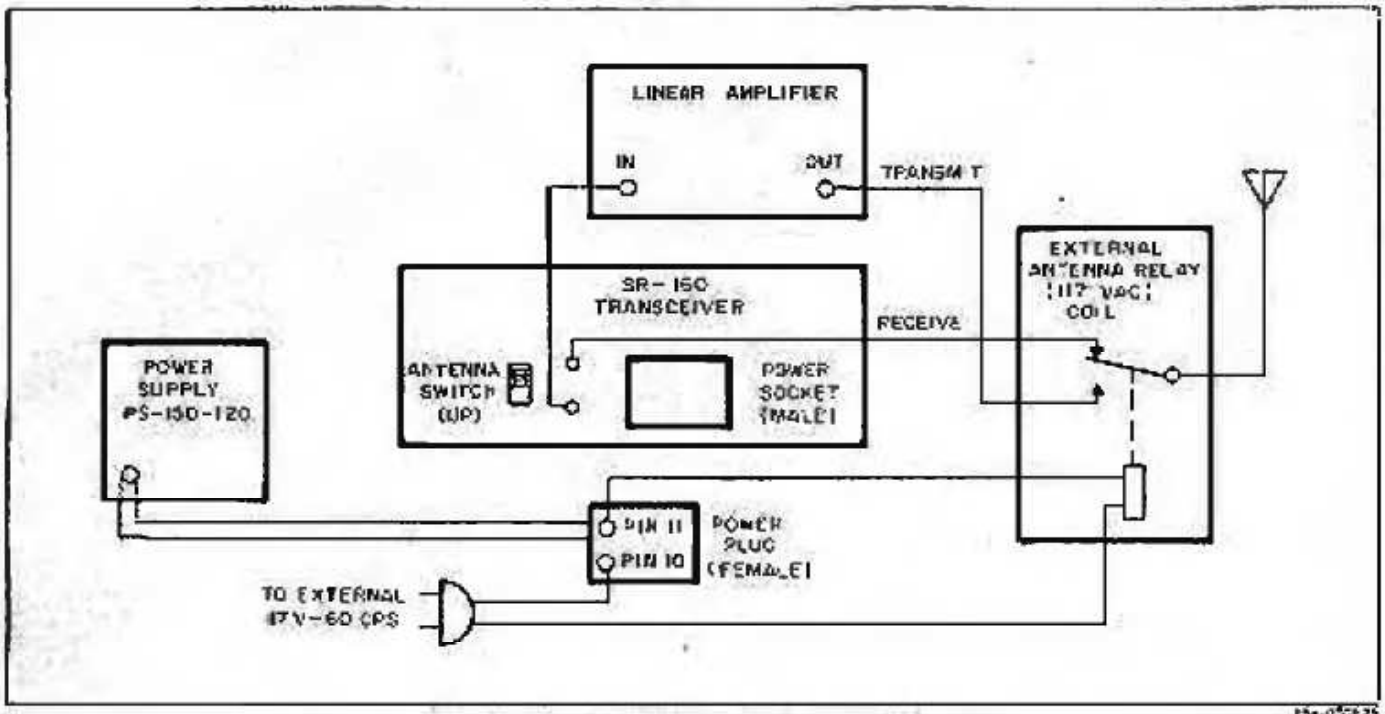


Figure 3. Base installation, Using a Linear Amplifier

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 (C4f C).

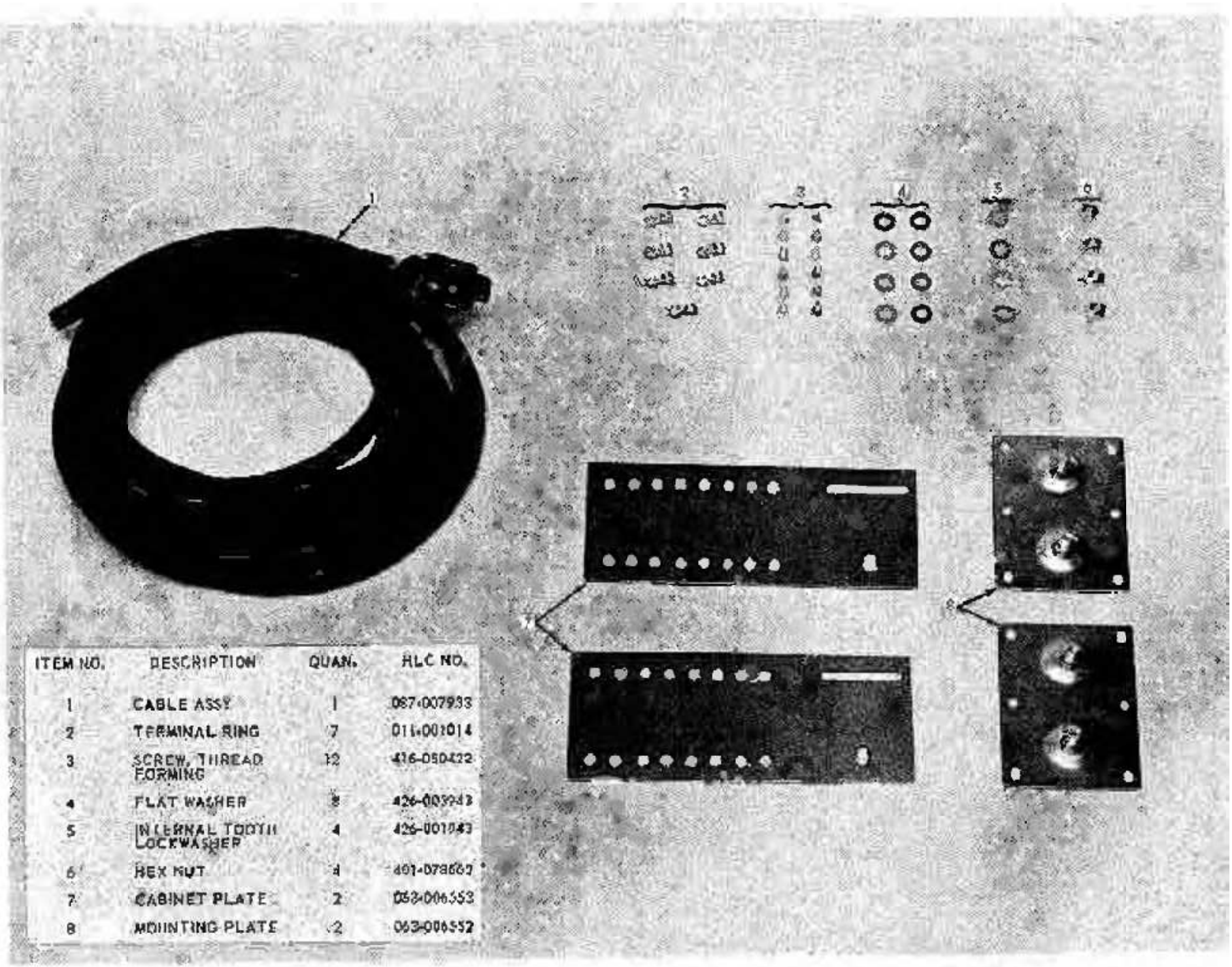
   c. Rewire the surge diode (CR6) located at the antenna relay coil so that the cathode end is connected to the black/white wire.

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	426-001043
6	HEX NUT	4	401-078667
7	CABINET PLATE	2	063-006553
8	MOUNTING PLATE	2	063-006552

Figure 4. Parts Layout of Model MR-360 Installation Kit.

134-002934

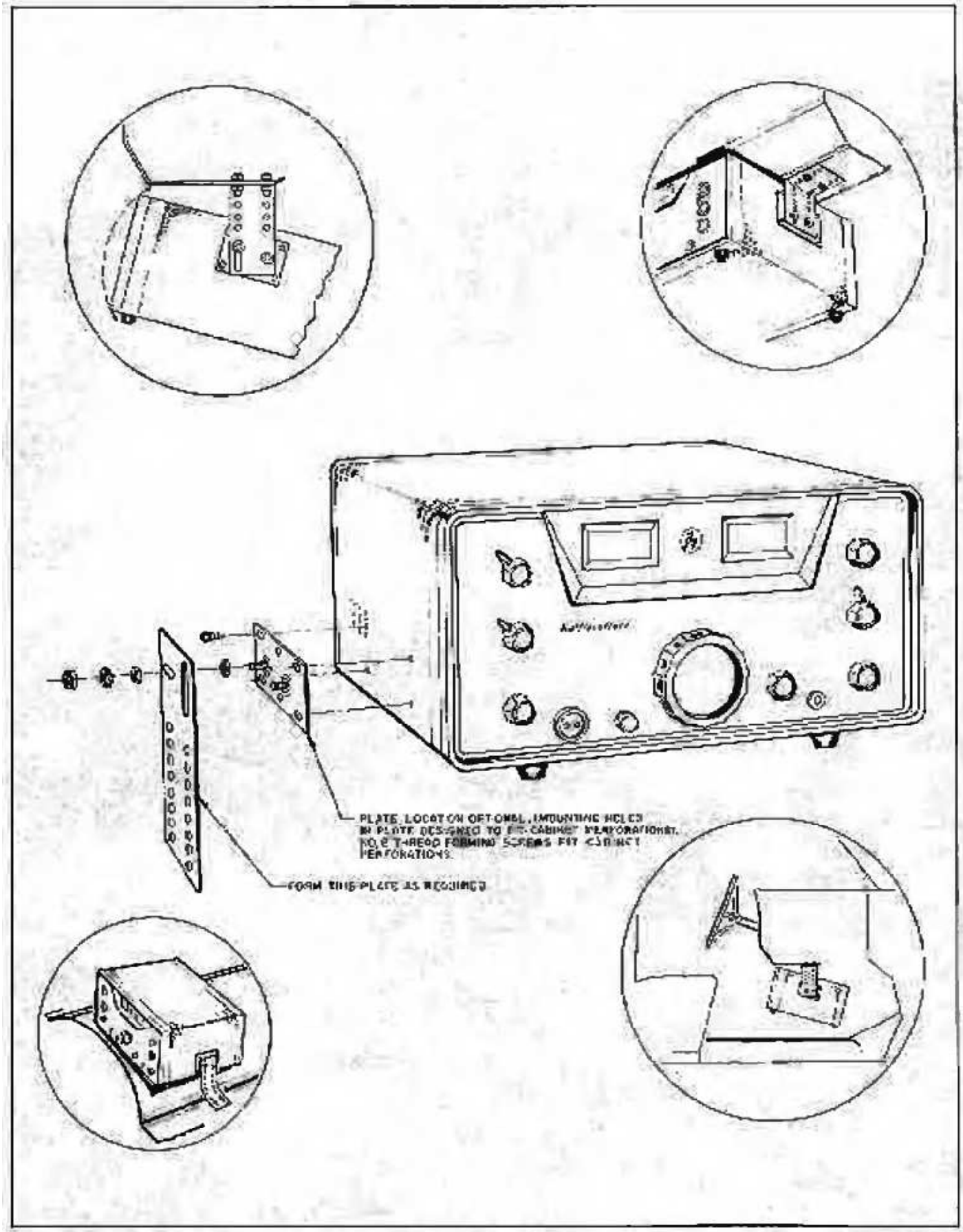


Figure 5. Typical Mobile Installations of Transceiver, Using HF-160 Installation Kit.

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.

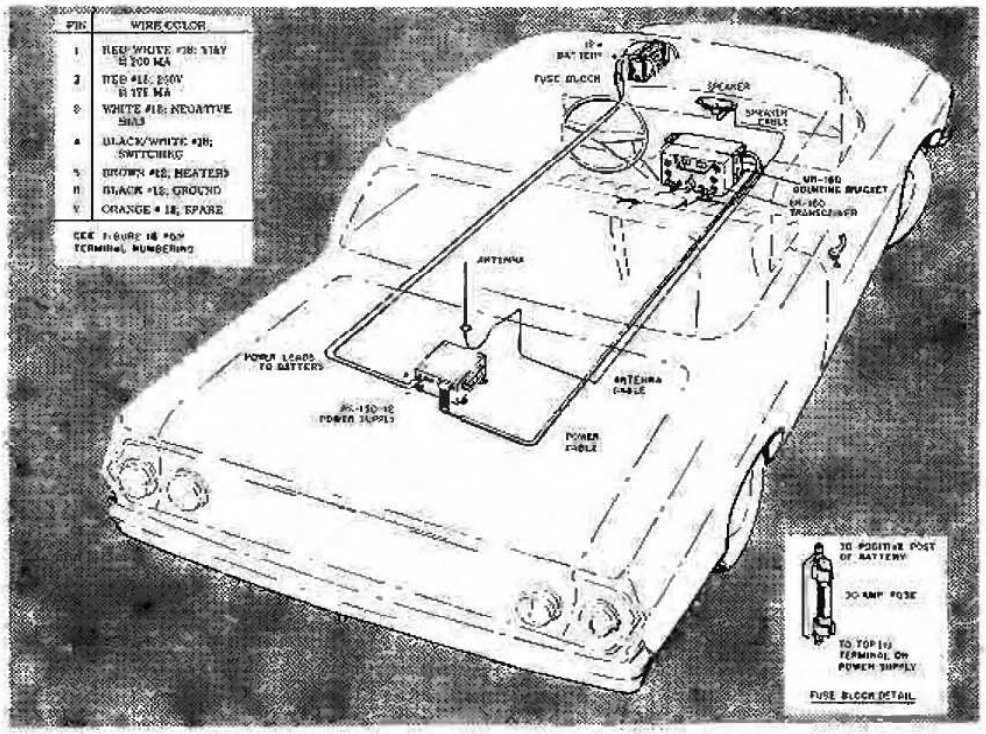
c. Rewire the surge diode (CR6) located at the antenna relay coil so that the cathode end is connected to the black/white wire.

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.



156-002827

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.

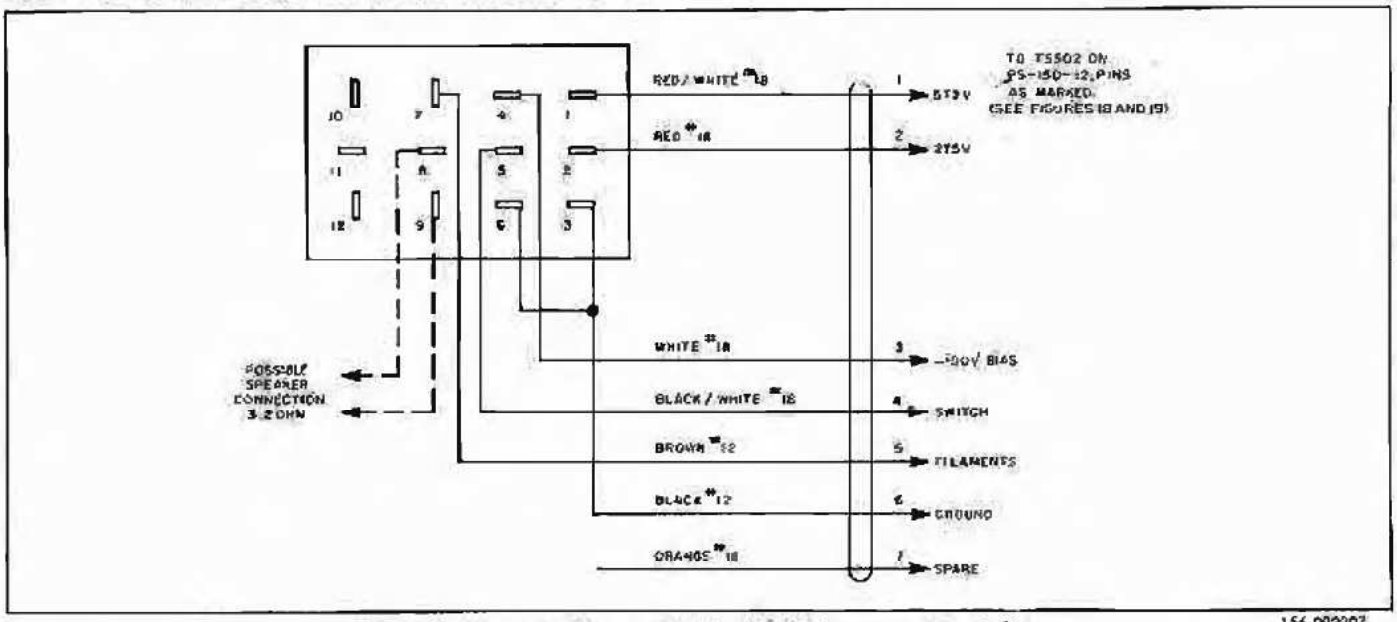


Figure 7. Schematic Diagram of Model MR-160 Interconnecting Cable. 156-002907

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.

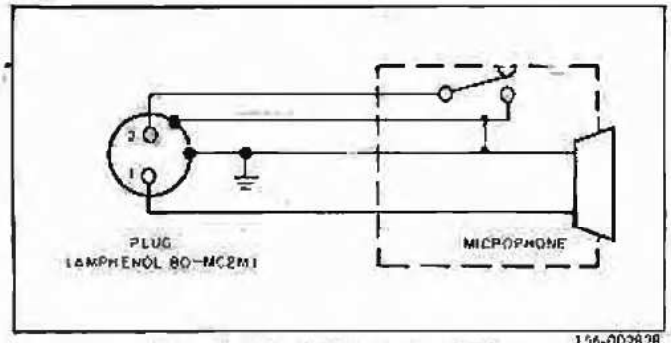


Figure 8. Required Microphone Wiring. 156-002828

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 6-3 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 6-6.

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 too 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.

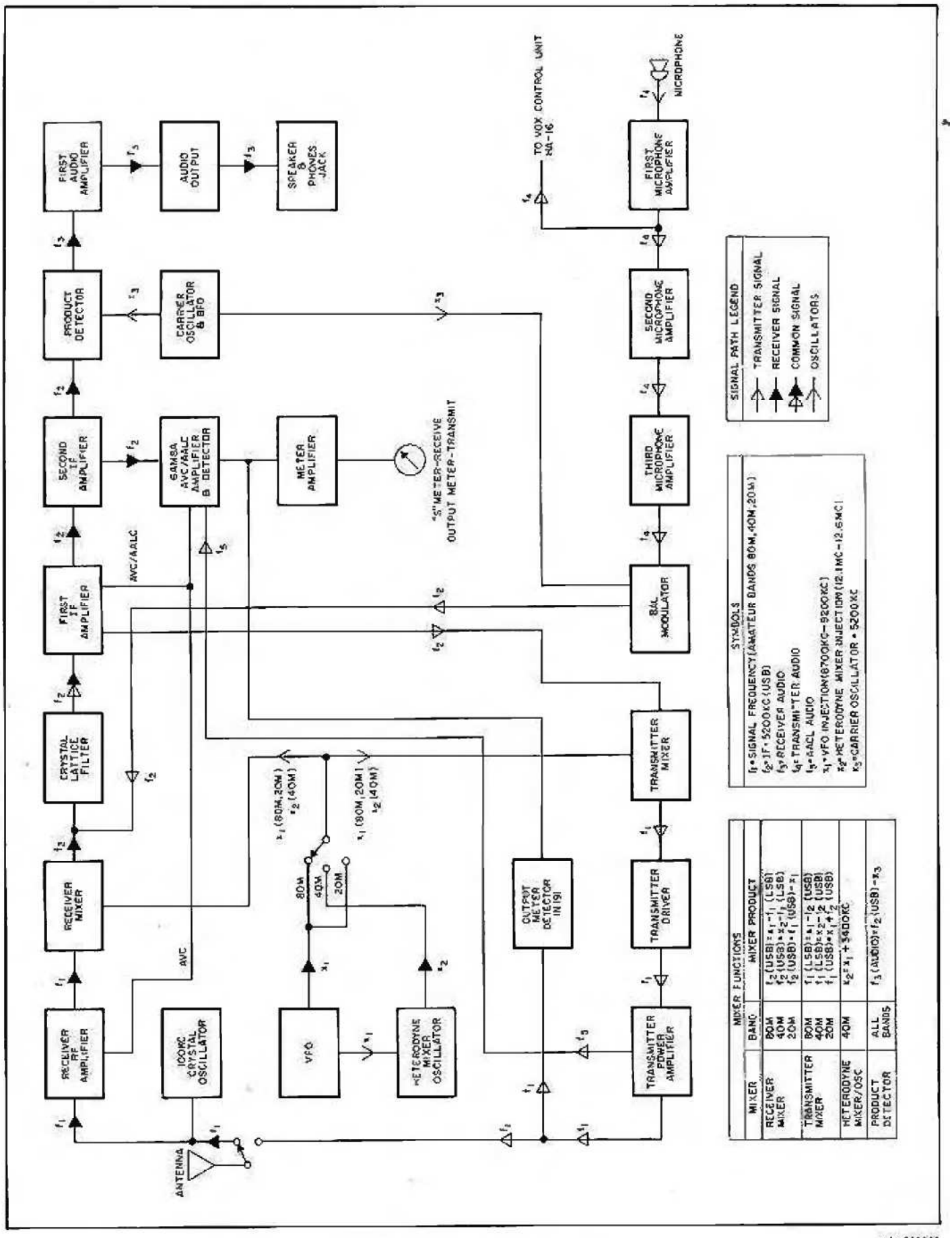


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Figure 9. Block Diagram of Transceiver.

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.