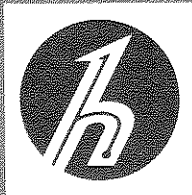


**OPERATING AND
SERVICE INSTRUCTIONS
FOR...**

**COMMUNICATIONS
RECEIVER
MODEL SX-133**

the hallicrafters co.



A Subsidiary of Northrop Corporation

WARRANTY

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

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

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

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

the hallicrafters co.
A Subsidiary of Northrop Corporation



092-014597B



156-016113

Figure 1-1. Hallicrafters Model SX-133 Receiver.

SECTION I GENERAL DESCRIPTION

Hallicrafters Model SX-133 Communications Receiver is a four band, superheterodyne receiver, tuning from 535 to 1610 kilohertz (KHz) and 1.725 to 31.5 megahertz (MHz). Calibrated electrical bandspread is provided on the 80-, 40-, 20-, 15-, and 10-meter amateur bands, the citizens band, and the 49-, 31-, 25-, and 19-meter shortwave broadcast bands. The frequency range covers foreign and domestic shortwave broadcasts, amateur, aircraft, marine, and standard AM broadcasts. The receiver provides for the reception of code (CW), voice (AM), and single-sideband (SSB) signals over the entire tuning range; the upper sideband (USB) or lower sideband (LSB) is readily selectable by means of a front panel control. This feature greatly simplifies tuning of single-sideband signals.

Other features of the Model SX-133 include:

- Product detector for CW and SSB.

- Slide rule bandspread dial.

- Separate bandspread tuning capacitor.

- Crystal filter.

- Antenna trimmer for maximum signal transfer.

- SIGNAL LEVEL meter to indicate the accuracy of tuning and the relative strength of received signals.

- Front panel controlled automatic noise limiter to reduce interference from electrical equipment, ignition noise, etc.

- Calibrated beat frequency oscillator (BFO) for USB, LSB, and CW.

- Crystal phasing control for precise bandwidth adjustment.

- Manual RF gain control to prevent overloading by strong signals.

- Precision tuning mechanism to insure close calibration and accurate resettability.

- Balanced or unbalanced antenna inputs.

- New, handsomely styled cabinet.

SECTION II

TECHNICAL SPECIFICATIONS

Frequency Coverage

Range 1	535 to 1610 KHz
Range 2	1.725 to 4.7 MHz
Range 3	4.5 to 13.0 MHz
Range 4	11.9 to 31.5 MHz

Intermediate Frequency 1650 KHz

Reception Modes AM, CW, and SSB

Selectivity Variable in three steps: NORMAL, XTAL BROAD, and XTAL SHARP

Power Source 105 to 125 volts, 50-60 Hz

Power Consumption 48 watts

Audio Power Output 2 watts

Audio Output Impedance 3.2 ohms; rear mounted screw terminals

Headphone Impedance 50 to 2000 ohms; panel jack accepts standard 1/4-inch phone plug

Antenna Input Impedance 50 to 600 ohms; balanced or unbalanced

Number of Tubes Seven, plus one diode

Receive/Standby Rear mounted screw terminals; short to receive, open for standby

Dimensions 8 inches high, 18-7/8 inches wide, 9-3/4 inches deep

Net Weight 22 pounds

Shipping Weight 25 pounds

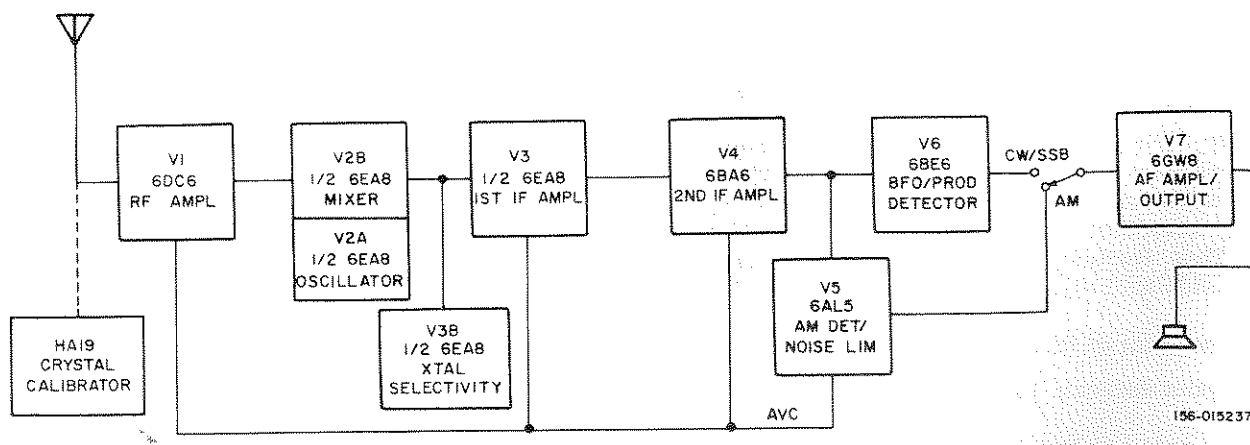


Figure 2-1. Model SX-133 Receiver, Block Diagram.

SECTION III INSTALLATION

3-1. **UNPACKING.** Carefully remove this equipment from its carton and packing material and examine it for any possible damage which may have occurred in transit. Should any sign of damage be apparent, file a claim immediately with the carrier stating the extent of damage. Carefully check all shipping labels and tags before removing or replacing them.

3-2. **LOCATION.** The receiver may be placed in any location that will permit free air circulation around the cabinet. Avoid excessively warm locations such as those near radiators and heating vents. Also, avoid direct blasts of air from circulating fans, etc.

3-3. **ANTENNAS.** The Model SX-133 uses an input circuit designed for a 50- to 600-ohm input. Any of the popular dipole, beam antennas, or single wire antennas will give good results. It should be remembered, however, that these antennas will give optimum results over a limited frequency range. Generally speaking, the same rules that apply to transmitting antennas will hold true for receiving antennas. If an unbalanced or a single

wire antenna is used, connect one end to the terminal marked A1. The jumper link should be connected between A2 and G (see figure 3-1). For further information on antennas, refer to the "Radio Amateur's Handbook" or the "ARRL Antenna Book", both published by the American Radio Relay League.

3-4. **GROUNDING.** All station equipment should be bonded together with heavy copper wire or braid and connected to a cold water pipe or earth ground. An external chassis ground terminal is provided on the SX-133 rear chassis apron for this purpose.

3-5. **POWER SOURCE.** The SX-133 is designed to operate from a 105/125-volt, 50/60-hertz AC power source. Power consumption is 48 watts.

NOTE

If in doubt about your power source contact your local power company prior to inserting the power cord into any power outlet. Plugging the power cord into the wrong source can cause extensive damage to the unit.

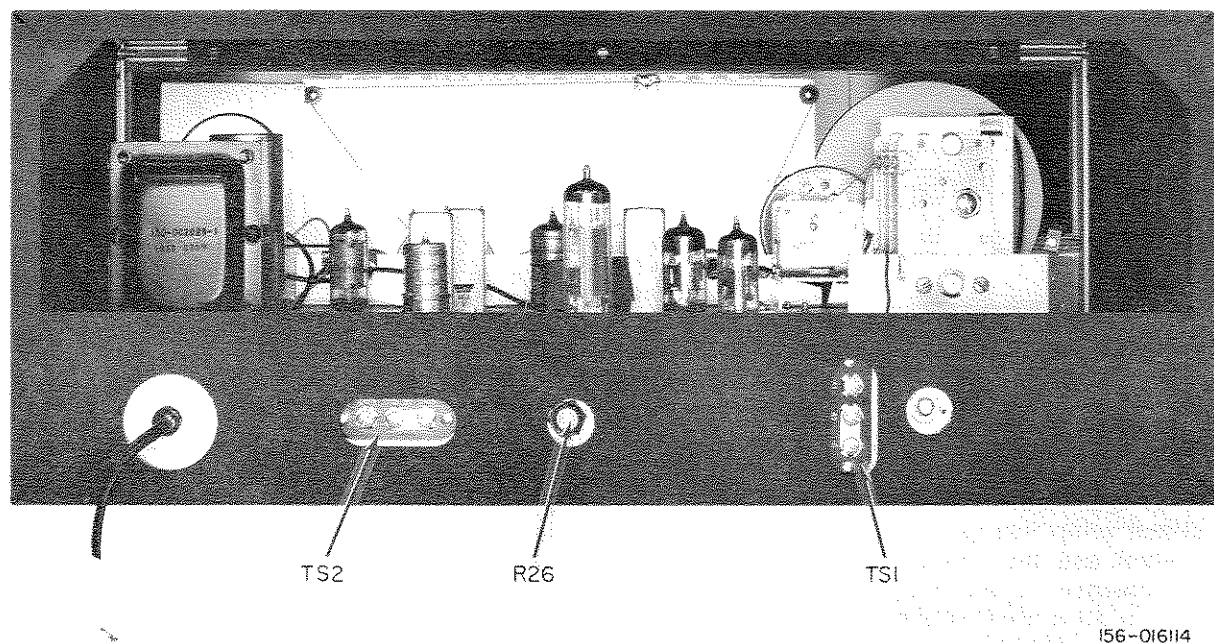


Figure 3-1. Model SX-133 Receiver, Rear View.

3-6. **SPEAKER.** Terminals marked SPKR and GND are provided on the rear chassis apron for connecting an external speaker. Any permanent magnet type speaker with a 3.2-ohm voice coil can be used by connecting two leads from the voice coil to the terminals.

Hallicrafters Model R-50 Speaker or Model R-51 Speaker-Clock give excellent results in all reception modes.

3-7. **HEADPHONES.** The headphone jack marked PHONES is located on the front panel and is wired

so that the speaker output is automatically disabled when the headphone plug is inserted. The impedance is not critical, and any headphones in the 50- to 2000-ohm range will give satisfactory performance.

3-8. **STANDBY SWITCHING.** The receiver may be disabled from a remote location by removing the jumper between STDBY and GND and connecting an SPST switch or relay contacts between these terminals. The contacts should be wired so that these terminals are connected together in the receive mode and open in the standby mode.

SECTION IV OPERATING CONTROLS



156-016113

Figure 4-1. Model SX-133 Receiver, Front Panel Controls.

Each control on your receiver performs a definite function which contributes to its reception capabilities. Full appreciation of the receiver can only be realized after you have become familiar with each control and the effect each control has on the performance of the receiver. The controls discussed in this section are identified in figure 4-1.

4-1. **RF GAIN CONTROL.** The RF GAIN control varies the gain of the RF amplifier and the second IF amplifier stages. Maximum sensitivity is ob-

tained with the control rotated fully clockwise. In this position, the tubes being controlled are operating at maximum gain with minimum cathode bias. As the control is rotated counterclockwise, the cathode bias is increased with a resultant decrease in gain.

The setting of the RF GAIN control will vary with conditions. When searching for weak signals, the control should be fully advanced. When copying strong signals under crowded or noisy conditions, it may be found desirable to reduce gain.

4-2. RANGE SELECTOR SWITCH. The RANGE SELECTOR switch is a four position rotary switch, which is used to place the proper set of coils into the circuit to cover the desired frequency range. The range of frequencies covered for each setting of the switch is shown in the following chart.

SWITCH POSITION	FREQUENCY
1	535 to 1610 KHz
2	1.725 to 4.7 MHz
3	4.5 to 13.0 MHz
4	11.9 to 31.5 MHz

4-3. ANT TRIM CONTROL. The ANT TRIM control is a variable capacitor connected across the secondary of the antenna coil in use. The capacitor adjustment compensates for the loading effects of various types of antennas. This control should always be peaked for maximum signal increase after the desired signal has been tuned in.

4-4. XTAL PHASE CONTROL. This control is to be used with the SELECTIVITY switch for maximum rejection of unwanted signals. Adjust for best reception, when using BROAD or SHARP XTAL selectivity positions.

4-5. SELECTIVITY SWITCH. The SELECTIVITY switch has three positions for selecting the intermediate frequency bandwidth required for different reception modes.

Recommended settings are:

NORMAL Full fidelity AM
 BROAD XTAL SSB, or AM under adverse conditions
 SHARP XTAL CW

4-6. ANL SWITCH. The ANL switch is normally kept in the OFF position and used when necessary to eliminate impulse noise in AM reception. The switch does not function when receiving CW or SSB.

4-7. AM-CW/SSB SWITCH. In the AM position the switch connects the AM detector to the AF amplifier and disables the BFO. In the CW/SSB position the switch connects the product detector to the AF amplifier and energizes the BFO.

4-8. CAL SWITCH. The CAL switch is used only when the optional Model HA-19 Crystal Calibrator is inserted in socket J2. When placed in the ON position, the calibrator generates marker signals for alignment of the MAIN TUNING and bandspread dials (see paragraph 5-5).

NOTE

The CAL switch should be placed in the OFF position after calibration has been performed to prevent spurious signal generation.

4-9. USB-CW-LSB CONTROL. This control establishes the frequency necessary for proper recovery of upper sideband, CW (code), or lower sideband signals. After the desired signal has been tuned in, this control may be used for fine tuning to establish the desired voice or code pitch. The control is not used for AM reception.

For single-sideband reception, this control will usually be set as follows:

80 and 40 meters LSB
 20, 15, and 10 meters USB

4-10. AF GAIN-OFF CONTROL. The AF GAIN-OFF control turns power on and off, also, adjusts the audio output level in the speaker or headphones. Clockwise rotation increases the signal voltage applied to the grid of the AF amplifier, thus increasing the audio output.

4-11. TUNING AND BAND SPREAD CONTROLS. These controls interact with each other to tune the desired signal frequency. Wide tuning is performed with the TUNING control, and fine tuning may be done with the BAND SPREAD control.

a. MAIN TUNING DIAL. The MAIN TUNING, or left-hand dial, is operated by the TUNING control. The dial has four calibrated scales covering the following ranges:

1 535 to 1610 KHz
 2 1.725 to 4.7 MHz
 3 4.5 to 13.0 MHz
 4 11.9 to 31.5 MHz

Also, a 0 to 100 scale is provided for accurate logging and relocation of stations of special interest.

IMPORTANT

The main dial calibration will be correct only when the bandspread pointer is set at the extreme right (100 on the bandspread logging scale).

b. BANDSPREAD DIAL. The bandspread, or right-hand dial, is operated by the BAND SPREAD control. This dial contains nine scales calibrated for the 80-, 40-, 20-, 15-, and 10-meter amateur bands, the citizens band, and the 49-, 31-, 25-, and 19-meter shortwave broadcast bands.

When the MAIN TUNING dial is set to the dot appearing just above the high-frequency end of a particular band, the frequency may then be read directly on the bandspread dial. The dot used for 10 meters should also be used to establish bandspread calibration for the 11-meter citizens band.

The bandspread dial may also be utilized as a fine tuning adjustment over any portion of the receiver tuning range. Two methods of fine tuning are described below.

1. The first method of fine tuning is used to tune a single signal. First the BAND

SPREAD control is set a few degrees from its full clockwise position. Then the signal is located with the MAIN TUNING control, and finally the signal is accurately tuned by "rocking" the BAND SPREAD control for best reception.

2. The second method of fine tuning is used to tune through a group of signals. With the BAND SPREAD control set fully clockwise, adjust the TUNING control to the highest frequency signal in the group. The other signals may then be received by slowly turning the BAND SPREAD control in the counterclockwise direction.

SECTION V OPERATION

5-1. AM RECEPTION. Set the front panel controls as outlined below:

RF GAIN Maximum clockwise
RANGE SELECTOR Desired range
AF GAIN-OFF As required
ANT TRIM Peak on signal
ANL OFF
AM-CW/SSB AM
SELECTIVITY... NORMAL or XTAL BROAD
TUNING and BAND SPREAD As desired

Turn the receiver on by rotating the AF GAIN-OFF control clockwise until a click is heard. The tuning dials will light up, indicating the receiver is operative. Rotate the AF GAIN-OFF control for the desired volume level.

5-2. SINGLE-SIDEBAND RECEPTION. Set the front panel controls as outlined below:

RF GAIN Maximum clockwise
RANGE SELECTOR Desired range
AF GAIN-OFF As required
ANT TRIM Peak on signal
AM-CW/SSB CW/SSB
SELECTIVITY... NORMAL or XTAL BROAD
XTAL PHASE For best results
USB-CW-LSB Usually LSB for 40 and 80
meters; USB for 20, 15,
and 10 meters.
TUNING and BAND SPREAD As desired

Turn the receiver on by rotating the AF GAIN-OFF control clockwise until a click is heard. The tuning dials will light up, indicating the receiver is operative. Rotate the AF GAIN-OFF control for the desired volume level.

It should be remembered that an SSB signal will convey intelligence only when the correct sideband position has been selected by the USB CW-LSB control. If the signal does not tune properly, move the USB-CW-LSB control to the opposite sideband position and retune the receiver.

Under certain conditions, it may be found advantageous to reduce the RF GAIN control setting for improved reception. It should be remembered that this will reduce AVC and also affect the SIGNAL LEVEL meter reading.

5-3. CW RECEPTION. Set all controls as shown in single-sideband reception, except for the USB-CW-LSB control which should be set to the CW position.

Under crowded-band conditions, it may be found desirable to set the SELECTIVITY switch to XTAL SHARP position for improved selectivity.

5-4. USE OF THE SIGNAL LEVEL METER. The SIGNAL LEVEL meter provides a visual means of determining whether or not the receiver is properly tuned, as well as an indication of the relative signal strength. The meter circuit consists of a DC milliammeter connected in series with the cathode lead of the first IF amplifier tube, the grid of which is controlled by AVC voltage. Since the cathode current of this tube varies with the strength of the incoming signal, the meter will indicate relative signal strength. The SIGNAL

LEVEL meter is calibrated in "S" units from 1 to 9 and in decibels above S-9.

5-5. USE OF THE CRYSTAL CALIBRATOR. The optional Model HA-19 Crystal Calibrator permits accurate calibration of the MAIN TUNING and bandsread dials over the complete tuning range. The calibration is accomplished by comparing dial markings to marker signals appearing every 100 KHz.

NOTE

Since the tuning dials are calibrated in megahertz the multiples of the 100 KHz calibrator should be converted to megahertz (100 KHz is equal to 0.1 MHz). For example, the calibrator output in the 80-meter band is 3.5, 3.6, 3.7, 3.8, 3.9, and 4.0 MHz.

a. Calibration of Bandsread Dial.

1. Set the bandsread tuning dial to a convenient multiple of 100 KHz. The following list gives examples of dial settings for each frequency band.

AMATEUR BANDS

80 Meters		4.0 MHz
40 Meters		7.3 MHz
20 Meters		14.3 MHz
15 Meters		21.4 MHz
10 Meters		29.7 MHz

SHORTWAVE BROADCAST BANDS

49 Meters		6.2 MHz
31 Meters		9.8 MHz
19 Meters		15.5 MHz

2. Set the TUNING control to indicate the index dot of the desired band on the MAIN TUNING dial.

3. Set the AM-CW/SSB switch to SSB/CW, the USB-CW-LSB control to CW, and the CAL switch to ON.

4. Carefully adjust the TUNING control for the exact frequency as indicated by a zero beat with the calibrator signal. The bandsread tuning dial is now calibrated, and a zero beat should be obtained at every multiple of 100 KHz on the band being used. For example, on the 80-meter band a zero beat should be obtained at 3.5, 3.6, 3.7, 3.8, 3.9, and 4.0 MHz.

5. The procedure outlined in steps 1 through 4 provides average calibration accuracy over the entire frequency band being used. However, a precise accuracy may be obtained for a particular section of the band by setting the bandsread tuning dial to a multiple of 100 KHz close to the desired frequency rather than the high end of the dial as in step 1.

b. Calibration of the MAIN TUNING Dial.

1. Rotate the BAND SPREAD control until the dial pointer is aligned with the index marks at the high-frequency end of the dial, 100 on the logging scale.

2. Set the MAIN TUNING dial to a convenient multiple of 100 KHz near the desired frequency or range of frequencies.

3. Set the AM-CW/SSB switch to SSB/CW. Set the CAL switch to ON. If a zero beat is not obtained, rotate the BAND SPREAD control either direction as necessary. Once the BAND SPREAD control has been adjusted for a zero beat, the MAIN TUNING dial is calibrated.

SECTION VI SERVICE DATA

6-1. CHASSIS REMOVAL. To remove the chassis and panel assembly from the cabinet, first remove three screws from inside the cabinet, at the top of the front panel. These screws can be reached through the rear cabinet opening. Then remove five screws from the bottom of the cabinet. After these screws have been removed, slide the chassis forward and out of the cabinet.

6-2. TUBE AND DIAL LAMP REPLACEMENT. Tubes may be replaced from the rear of the cab-

inet without removing the chassis. When replacing dial lamps, it is recommended that the chassis be removed from the cabinet. (Refer to paragraph 6-1.)

6-3. DIAL RESTRINGING. To restring the TUNING or bandsread dials, first remove the chassis from the cabinet. (Refer to paragraph 6-1). For stringing details, see figure 6-1.

6-4. SERVICE AND OPERATING QUESTIONS. For further information regarding operation or

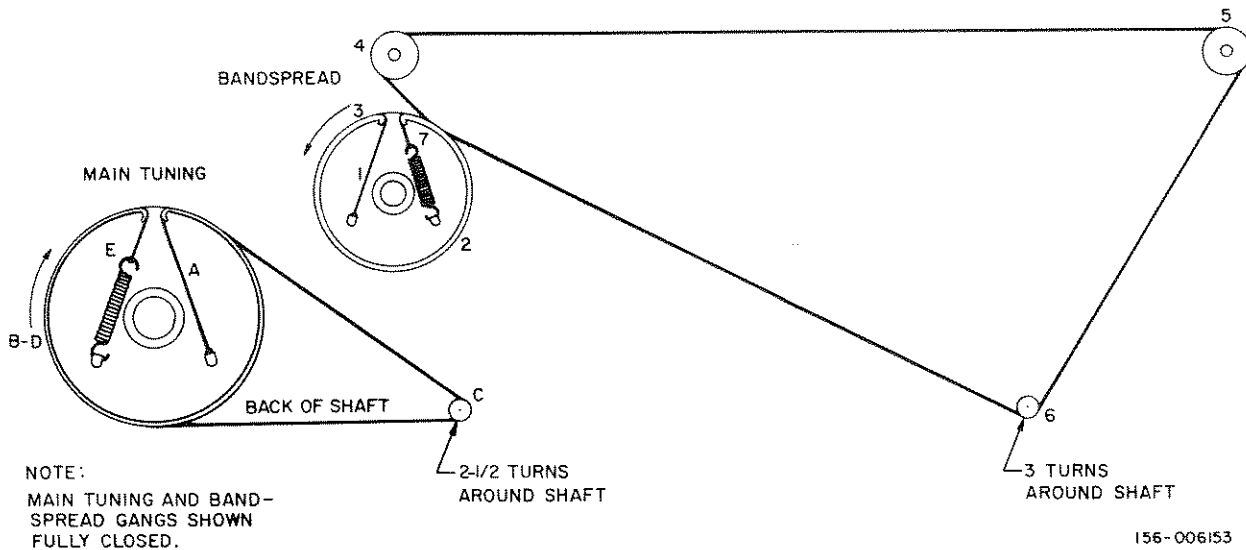


Figure 6-1. Dial Cord Restraining Diagram.

servicing of this equipment, contact the dealer from whom the unit was purchased. The Hallicrafters Co. maintains an extensive system of Authorized Service Centers where any required service will be performed promptly and efficiently at no charge if the 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 at right. 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 Co. will not accept responsibility for unauthorized shipments.

The Hallicrafters Co. reserves the privilege of making revisions in current production of equip-

ment and assumes no obligation to incorporate such revisions in earlier models.



SECTION VII ALIGNMENT

This receiver has been carefully aligned at the factory by specially trained personnel using precision equipment. Alignment of the receiver should not be attempted until all other possible causes of faulty operation have been investigated. Alignment should not be required unless the receiver has been tampered with or component parts have been replaced in the RF or IF stages. Alignment should be performed only by persons familiar with communications receivers and experienced in their alignment.

7-1. EQUIPMENT REQUIRED.

- a. Signal generator covering 455 KHz to 30 MHz.
- b. Vacuum tube voltmeter (VTVM).
- c. Audio output power meter, set to 3-4 ohms.

7-2. INITIAL CONTROL SETTINGS.

RANGE SELECTOR . . . As indicated in chart
RF and AF GAIN-OFF Maximum

XTAL PHASE Center of range
ANL OFF
AM-CW/SSB AM
BAND SPREAD Fully clockwise

Other controls to be set as indicated by the alignment chart.

7-3. ALIGNMENT PROCEDURE. The adjustments mentioned in the alignment chart may be located by referring to figures 7-1 and 7-2. Before proceeding with alignment perform the following:

- a. Remove chassis from cabinet. (Refer to paragraph 6-1.)
- b. Connect power meter to SPKR terminal and GND terminal. Adjust the generator output to maintain a 500-milliwatt reading on the power meter.

IF ALIGNMENT

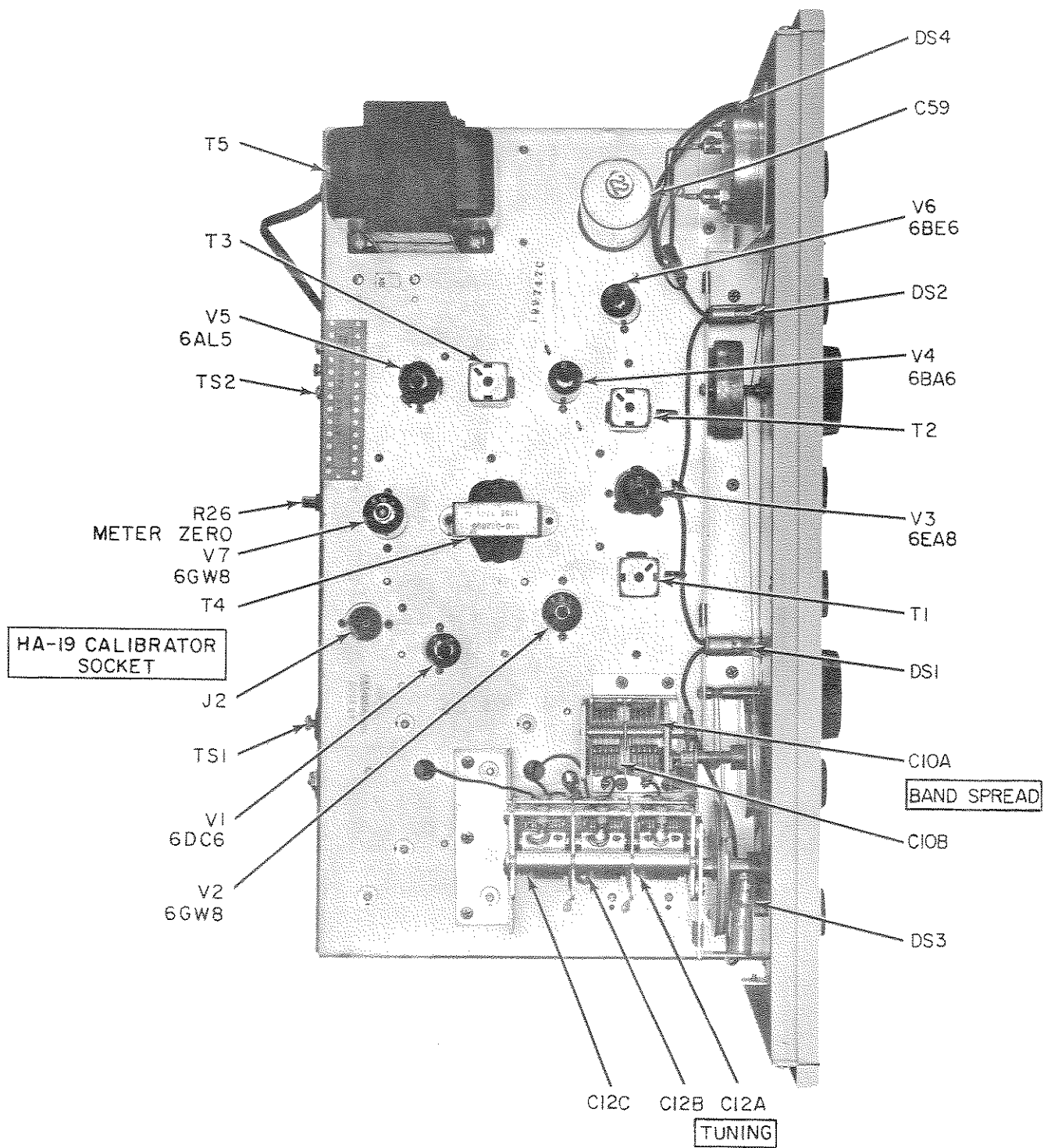
Connect the high side of the signal generator output to pin 2 of V2 and the low side to the chassis.

STEP	SIGNAL GENERATOR FREQUENCY	RECEIVER CONTROL SETTINGS	ADJUST	REMARKS
1	1650 KHz (APPROX) unmodulated	RANGE SELECTOR: 1 SELECTIVITY: XTAL BROAD	Signal generator	Adjust the signal generator amplitude to give a slight indication on the SIGNAL LEVEL meter. Adjust the signal frequency for maximum deflection of the SIGNAL LEVEL meter. The frequency obtained is the crystal filter frequency and is used to align the IF section.
2	Crystal filter frequency. Modulate the signal generator 30% at 400 Hz	RANGE SELECTOR: 1 SELECTIVITY: NORMAL	T1, T2, T3	Adjust top and bottom cores for maximum audio output.
3	Crystal filter frequency. WITHOUT modulation	RANGE SELECTOR: 1 SELECTIVITY: NORMAL AM-CW/SSB: CW/SSB	L14	Remove knob from USB-CW-LSB control and adjust L14 shaft for zero beat. Replace knob with white indicator dot in center of CW line on panel.

RF, MIXER, AND OSCILLATOR ALIGNMENT

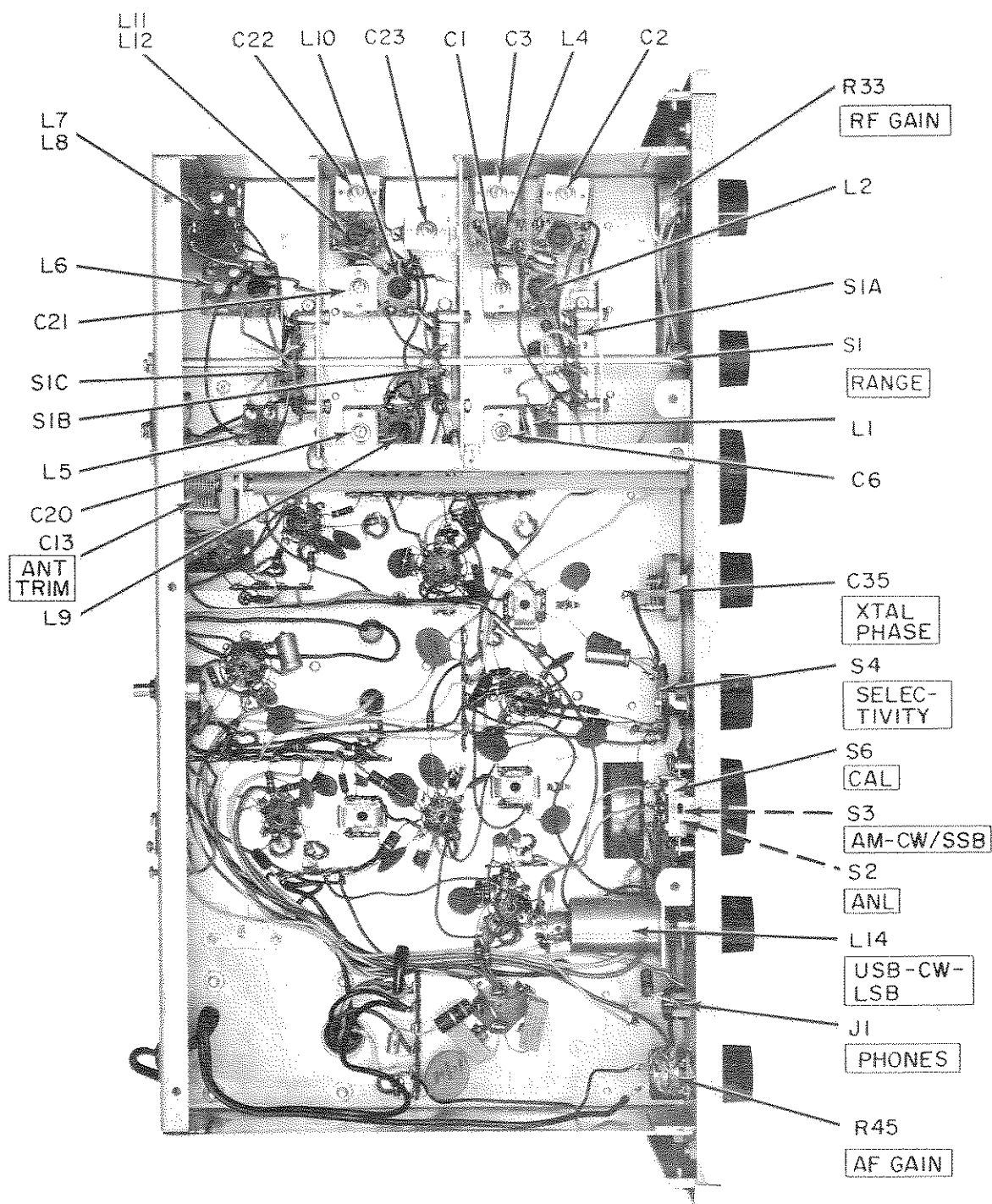
All controls set as in initial control settings. Generator modulated 30% with 400 Hz.
(The local oscillator frequency is 1650 KHz above the frequency of the incoming RF signal.)

STEP	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RECEIVER CONTROL SETTINGS	ADJUST	REMARKS
1	Connect high side to A1, low side to GND. (A2 & GND tied together.)	1400 KHz	RANGE SELECTOR: 1, TUNING: 1400 KHz	C3 (OSC trimmer) C23 (Mixer trimmer) C13 (ANT TRIM)	Adjust for maximum output.
2	Same as step 1.	600 KHz	RANGE SELECTOR: 1, TUNING: 600 KHz	L4 (OSC coil) L12 (Mixer coil) C13 (ANT TRIM)	Adjust for maximum output.
3	Same as step 1.	4.0 MHz	RANGE SELECTOR: 2, TUNING: 4.0 MHz	C2 (OSC trimmer) C22 (Mixer trimmer) C13 (ANT TRIM)	Adjust for maximum output.
4	Same as step 1.	1.8 MHz	RANGE SELECTOR: 2, TUNING: 1.8 MHz	L3 (OSC coil) C13 (ANT TRIM)	Adjust for maximum output.
5	Same as step 1.	11 MHz	RANGE SELECTOR: 3, TUNING: 11 MHz	C1 (OSC trimmer) C21 (Mixer trimmer) C13 (ANT TRIM)	Adjust for maximum output.
6	Same as step 1.	5.0 MHz	RANGE SELECTOR: 3, TUNING: 5.0 MHz	L2 (OSC coil) L10 (Mixer coil) C13 (ANT TRIM)	Adjust for maximum output.
7	Same as step 1.	28 MHz	RANGE SELECTOR: 4, TUNING: 28 MHz	C6 (OSC trimmer) C20 (Mixer trimmer) C13 (ANT TRIM)	Adjust for maximum output.
8	Same as step 1.	14 MHz	RANGE SELECTOR: 4, TUNING: 14 MHz	L1 (OSC coil) L9 (Mixer coil) C13 (ANT TRIM)	Adjust for maximum output.



156-016115

Figure 7-1. Model SX-133 Receiver, Top View.



156-016116

Figure 7-2. Model SX-133 Receiver, Bottom View.

SECTION VIII

CRYSTAL CALIBRATOR MODEL HA-19 (ACCESSORY ITEM)

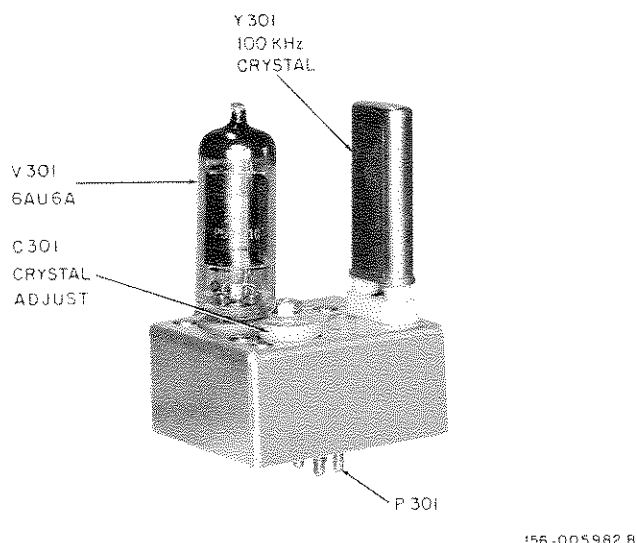


Figure 8-1. Model HA-19 Crystal Calibrator.

8-1. GENERAL. The Model HA-19 Crystal Calibrator (figure 8-1) is an accessory which provides marker signals every 100 KHz on the dial of the SX-133 enabling the operator to check calibration accuracy. The HA-19 is placed into operation by plugging it into socket J2 on the receiver chassis

(figure 7-1) and placing the front panel CAL switch in the ON position. Refer to table 8-1 for the parts list and figure 8-2 for the schematic diagram.

8-2. CRYSTAL CALIBRATOR CHECK. The crystal adjust capacitor, C301, permits adjustment of the calibrating crystal to exactly 100 KHz by comparison with the frequency standard transmitted by station WWV. This capacitor has been set at the factory and should not require readjustment unless extreme accuracy is desired. If adjustment is required, proceed as follows:

Set the AM-CW/SSB switch to AM, the CAL switch to OFF, and all other front panel controls for normal AM reception. Tune in station WWV on any of the transmitting frequencies (2.5, 5, 10, 15, 20, and 25 MHz), and wait for a period during which the signal is unmodulated. Set the CAL switch to ON, and adjust the crystal adjust capacitor for a zero beat.

NOTE

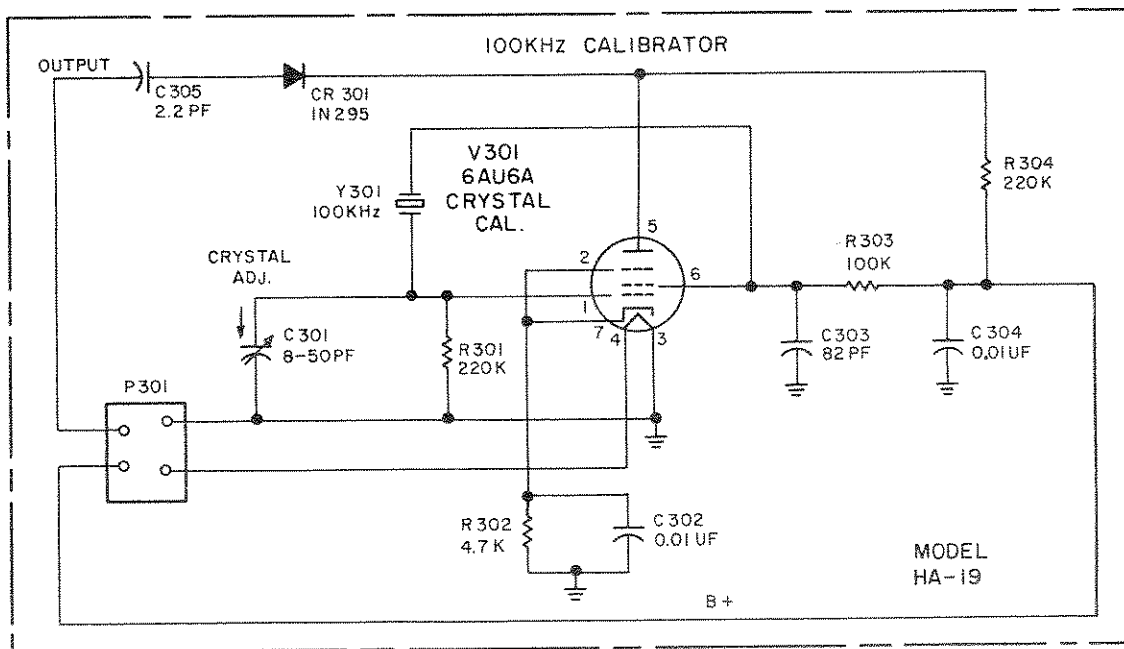
Do not attempt adjustment when WWV is transmitting a modulated signal as an erroneous zero beat may be obtained.

Table 8-1. HA-19 Parts List.

Reference Designation	Description	Hallicrafters Part Number
	100 KHz Crystal Calibrator Assembly (Model HA-19)	001-004979
C301	Capacitor, Variable 8 to 50 PF	044-200404
C302, C304	Capacitor, 0.01 μ F, 20%, 500 V, Ceramic Disc	047-100354
C303	Capacitor, 82 PF, 2%, 500 V, Plastic Mica	493-110820-333
C305	Capacitor, 2.2 PF, 1/4%, 500 V, Plastic Mica	493-140220-631
CR301	Diode, Type 1N295	019-301980
P301	Plug, 4-pin	010-003253
R301, R304	Resistor, 220K Ohms, 10%, 1/2 watt, Carbon	451-252224
R302	Resistor, 4.7K Ohms, 10%, 1/2 watt, Carbon	451-252472
R303	Resistor, 100K Ohms, 10%, 1/2 watt, Carbon	451-252104
V301	Electron Tube, Type 6AU6A	090-001495

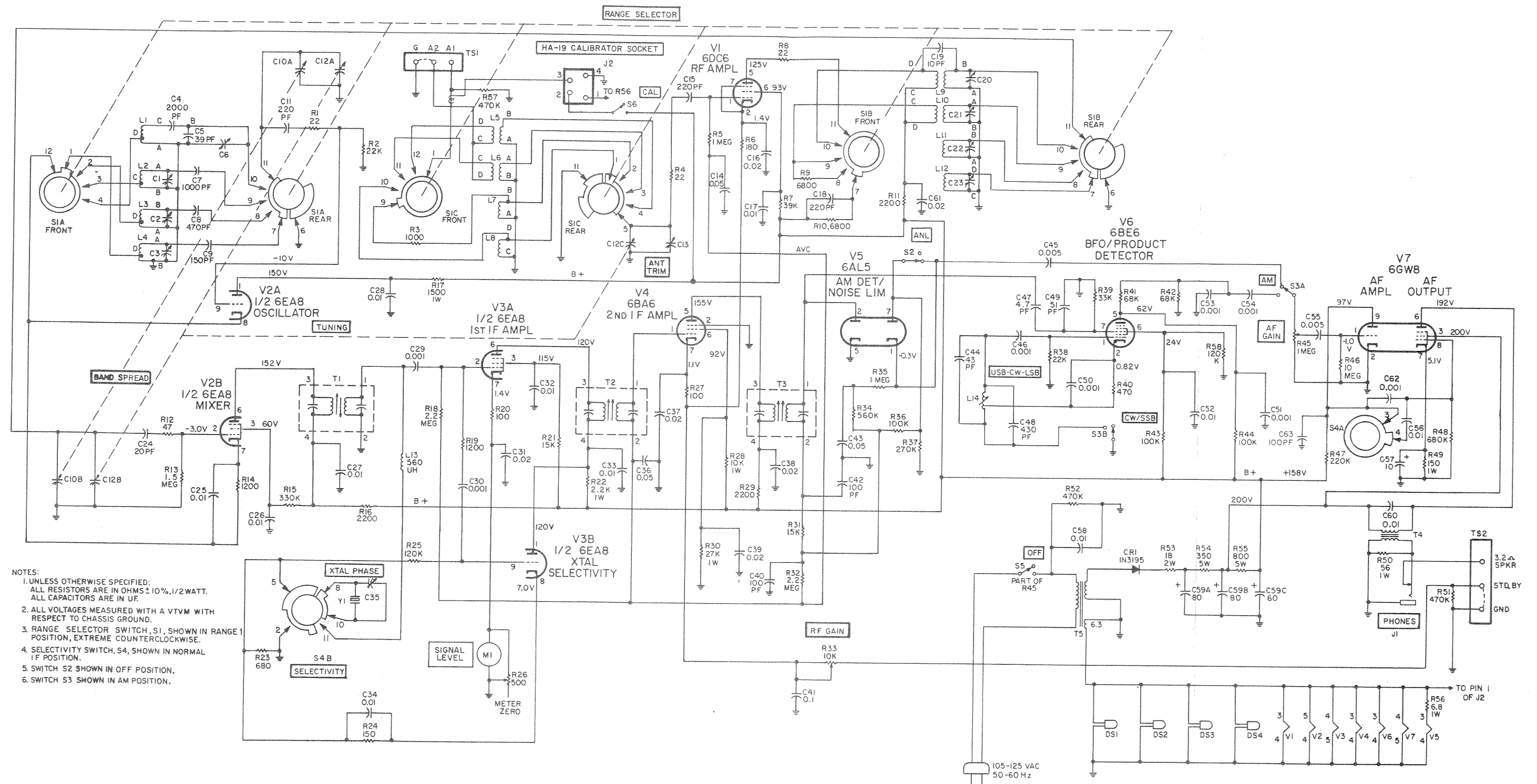
Table 8-1. HA-19 Parts List (CONT).

Reference Designation	Description	Hallicrafters Part Number
Y301	Crystal, Quartz, 100 KHz	019-002712
	Socket, Crystal (Y301)	006-100320
	Socket, Tube (V301)	006-001094



155-000425

Figure 8-2. Model HA-19 Crystal Calibrator, Schematic Diagram.



SERVICE REPAIR PARTS LIST

Schematic Symbol	Description	Hallicrafters Part Number	Schematic Symbol	Description	Hallicrafters Part Number	Schematic Symbol	Description	Hallicrafters Part Number
CAPACITORS			RESISTORS (CONT)			COILS AND TRANSFORMERS (CONT)		
C1,2,3,20	Variable, Trimmer 4 PF to 80 PF	044-000395	R3	1000 ohms	451-252102	T1,2,3	Transformer, IF, 1650 KHz	050-000751
C4	2000 PF, 2.5%, 500 V, Plastic	505-201202	R5,35	1 megohm	451-252105	T4	Transformer, Output	050-002099
C5	39 PF, 2%, 500 V, Dura-Mica	493-110390-333	R6	180 ohms	451-252181	T5	Transformer, Power	050-002025-001
C6	Variable, Trimmer, 1.5 PF to 15 PF	047-000147	R7	39 K ohms	451-252393	ELECTRON TUBES AND DIODES		
C7	1000 PF, 2.5%, 500 V, Plastic	505-001102	R9,10	6800 ohms	451-252682	V1	Tube, Type 6DC6	090-001338
C8	470 PF, 2.5%, 500 V, Plastic	505-001471	R11,16,29	2200 ohms	451-252222	V2,3	Tube, Type 6EA8	090-001350
C9	150 PF, 2.5%, 500 V, Plastic	505-001151	R12	47 ohms	451-252470	V4	Tube, Type 6BA6	090-001112
C10A & B	Variable, BAND SPREAD	048-000608	R13	1.5 megohms	451-252155	V5	Tube, Type 6AL5	090-001163
C11,15,18	220 PF, 10%, 500 V, Plastic	505-003221	R14,19	1200 ohms	451-252122	V6	Tube, Type 6BE6	090-001124
C12A, B & C	Variable, TUNING	048-000702	R15	330 K ohms	451-252334	V7	Tube, Type 6GW8	090-001502
C13	Variable, 4.6 PF to 52.5 PF, ANT TRIM	048-000546	R17	1500 ohms, 1 watt	451-352152	CR1	Diode, Silicon, Type 1N3195	019-002770
C14,36,43	0.05 μ F, +80%, -20%, 50 V, Ceramic Disc	047-001144	R18,32	2.2 megohms	451-252225	SWITCHES		
C16,31,37, 38,39,61	0.02 μ F, +80%, -20%, 500 V, Ceramic Disc	047-000242	R20,27	100 ohms	451-252101	S1	Rotary, RANGE SELECTOR	060-200389
C17,25,26, 27,28,32 33,34,52 56	0.01 μ F, +80%, -20%, 500 V, Ceramic Disc	047-000224	R21,31	15 K ohms	451-252153	S2,6	Push, SPDT, ANL, CAL	060-003093
C19	10 PF, 10%, 500 V, Fixed Composition	047-200403-011	R22	2.2 K ohms, 1 watt	451-352222	S3	Push, DPDT, AM-CW/ SSB	060-003092
C21	Variable, Trimmer, 3 PF to 30 PF	044-000396	R23	680 ohms	451-252681	S4	Rotary, SELECTIVITY	060-003089
C22	Variable, Trimmer, 2 PF to 30 PF	044-000148	R24	150 ohms	451-252151	S5	Part of R45	
C23	Variable, Trimmer, 2 PF to 20 PF	044-000191	R25,58	120 K ohms	451-252124	MISCELLANEOUS		
C24	20 PF, 10%, 500 V, Plastic	505-003200	R26	Variable, 500 ohms, 2 watts, Meter Zero	025-002121	Y1	Cabinet	066-005451
C29,30,46, 50,51,53, 54,62	0.001 μ F, 20%, 500 V, Ceramic Disc	047-001671	R28	10 K ohms, 1 watt	451-352103		Core, Adjustable (L14)	077-003176
C35	Variable, 3.1 PF to 20.6 PF, XTAL PHASE	048-000703	R30	27 K ohms, 1 watt	451-352273		Core, Coil Tuning (L1, 2,3,4,9 & 10)	077-100068
C40,42,63	100 PF, 20%, 1000 V, Ceramic Disc	047-001799	R33	Variable, 10 K ohms, 20%, 1 watt, RF GAIN	025-002891		Crystal, Quartz, 1650 KHz	019-003651
C41	0.1 μ F, +80%, -20%, 100 V, Ceramic Disc	047-001428	R34	560 K ohms	451-252564		Dial, Cord (Tuning & Bandspread)	038-100049
C44	43 PF, 5%, N750, Ceramic Tubular	047-002503-011	R36,43,44	100 K ohms	451-252104		Dial Scale, Tuning Flywheel	083-001094 071-000212-002
C45,55	0.005 μ F, GMV, 1000 V, Ceramic Disc	047-000485	R37	270 K ohms	451-252274	J1	Foot, Rubber (4)	016-001469
C47	4.7 PF, 10%, 500 V, Fixed Composition	047-000403-006	R39	33 K ohms	451-252333	J2	Jack, PHONES	036-000350
C48	430 PF, 2%, 500 V, Dura-Mica	493-110431-334	R40	470 ohms	451-252471		Socket, Calibrator HA-19	010-003254
C49	51 PF, 10%, NPO, Ceramic Tubular	047-002503-016	R41,42	68 K ohms	451-252683		Knob, ANT TRIM	015-001775
C57	10 μ F, 25 V, Electrolytic	045-000934	R45	Variable, 1 megohm, 30%, AF GAIN-OFF	025-002892		Knob, RANGE SELECTOR	015-001976
C58	0.01 μ F, 1400 V, Ceramic Disc	047-000752	R46	10 megohms	451-252106		Knob, RF GAIN, XTAL PHASE, SELECTIVITY, USB-CW-LSB, AF GAIN	015-001760
C59A, B & C	60 μ F, 300 V; 2 x 80 μ F, 300 V, Electrolytic	045-001330	R47	220 K ohms	451-252224		Knob, TUNING & BAND SPREAD	015-001593
C60	0.01 μ F, 20%, 600 V, Ceramic Disc	047-000354	R48	680 K ohms	451-252684		Line Cord	087-000078
*RESISTORS			R49	150 ohms, 1 watt	451-352151	M1	Lock, Line Cord	076-004546-004
R1,4,8	22 ohms	451-252220	R50	56 ohms, 1 watt	451-352560	DS1,2	Meter, SIGNAL LEVEL	082-000747
R2,38	22 K ohms	451-252223	R51,52,57	470 K ohms	451-252474	DS3,4	Pilot Lamp, Type No.44	039-000003
			R53	18 ohms, 2 watts	451-652180		Pilot Lamp, Type No. 47	039-000004
			R54	350 ohms, 5 watts, wire wound	445-012351		Pointer, Bandspread	082-000669
			R55	800 ohms, 5 watts, wire wound	445-012801		Shield, Coil (L14)	069-000142
			R56	6.8 ohms, 1 watt	451-352068		Shield, Tube (V3)	069-000667
			*All resistors are carbon type 10%, 1/2 watt, unless otherwise specified.				Shield, Tube (V5)	069-000232
			COILS AND TRANSFORMERS				Socket, Pilot Lamp	086-000710
			L1	Coil, RF, Oscillator, Range 4	050-002478		Socket, Tube, 7-pin (V1,4,5 & 6)	006-000946
			L2	Coil, RF, Oscillator, Range 3	050-002136		Socket, Tube, 9-pin (V2,3 & 7)	006-000947
			L3	Coil, RF, Oscillator, Range 2	050-002135		Spring, Dial Cord (2)	075-000893
			L4	Coil, RF, Oscillator, Range 1	050-002134	TS1	Terminal Strip (Antenna)	088-000032
			L5	Coil, Antenna, Range 4	050-002141	TS2	Terminal Strip (Output)	088-002554
			L6	Coil, Antenna, Range 3	050-002140			
			L7,8	Coil, Antenna Ranges 1 and 2	050-002139			
			L9	Coil, RF, Mixer, Range 4	051-001905			
			L10	Coil, RF, Mixer, Range 3	051-001906			
			L11,12	Coil, RF, Mixer, Ranges 1 and 2	050-002138			
			L13	Choke, RF, 560 μ H	050-002155			
			L14	Coil, BFO, 1650 KHz, USB-CW-LSB	050-002087			