TM11-4028

WAR DEPARTMENT TECHNICAL MANUAL

RADIO RECEIVERS

BC-973-A and B

REPAIR INSTRUCTIONS

WAR DEPARTMENT • SEPTEMBER 1945

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Refer to FM 21-6 for explanation of distribution formula.

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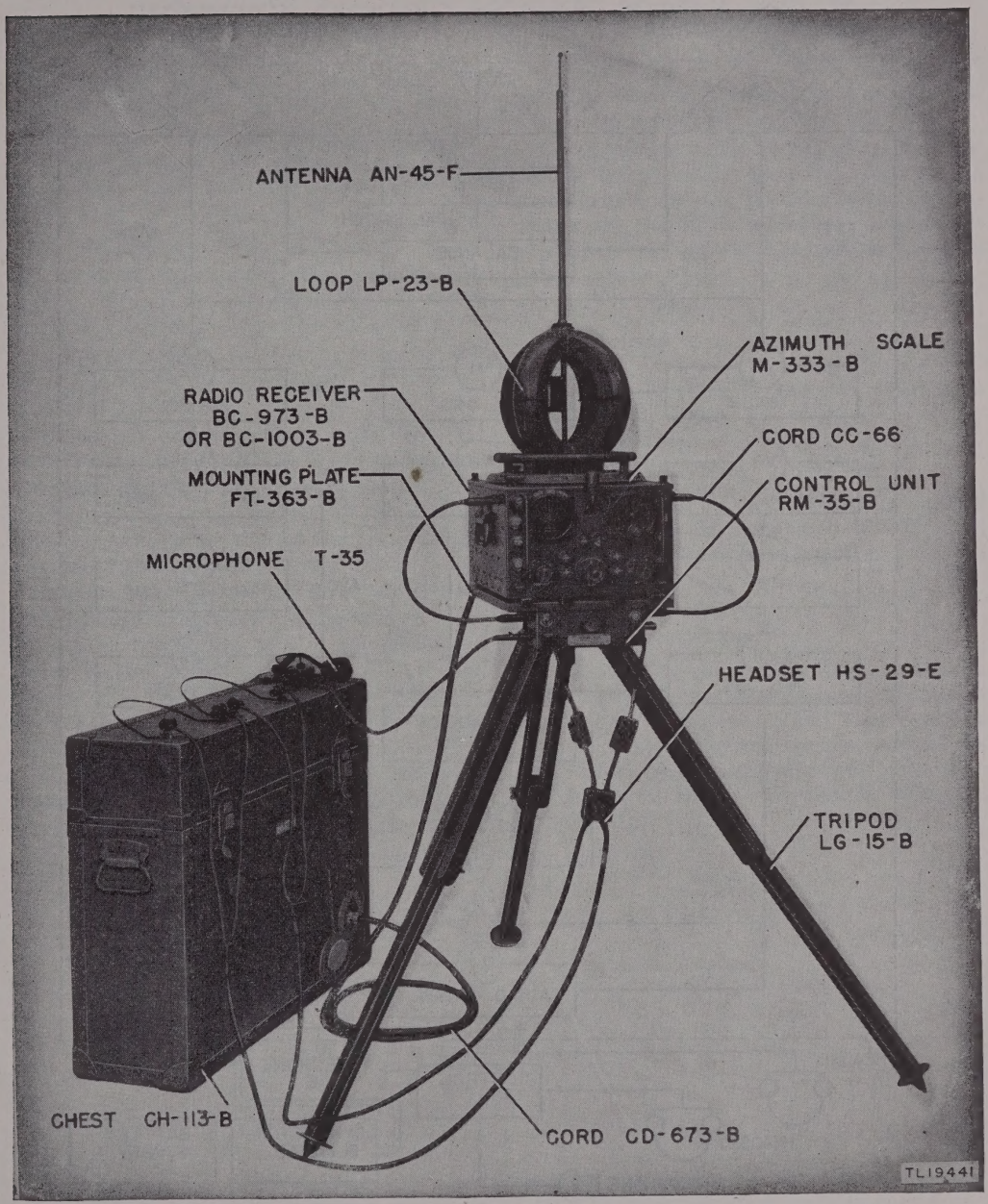


Figure 1. Radio Receiver BC-973-B ready for use.

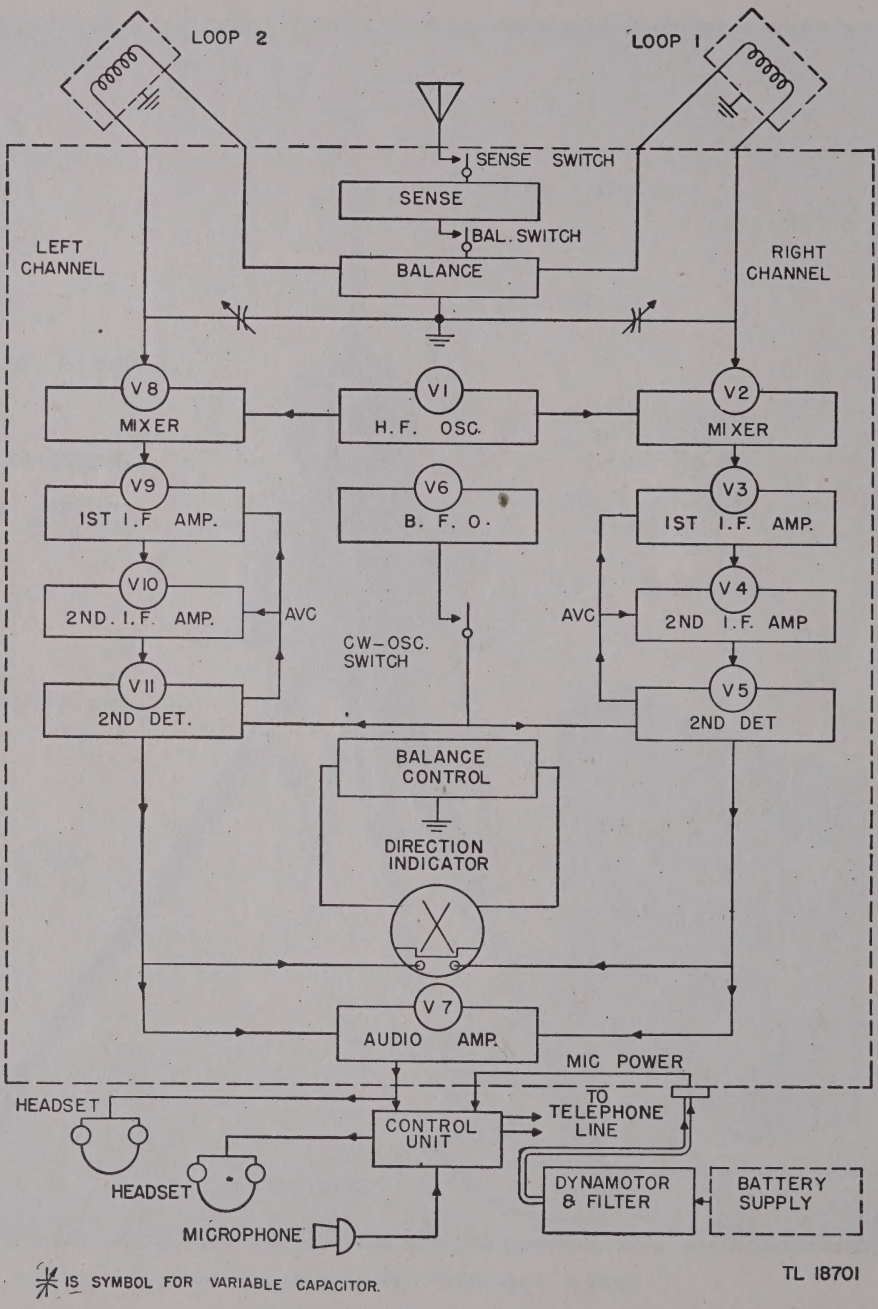


Figure 2. Radio Receiver BC-973-(*)—block diagram.

Section I

DESCRIPTION OF RADIO RECEIVERS BC-973-A AND -B*

1. Characteristics

a. FREQUENCY RANGE. Radio Receiver BC–973–(*) (two-band set) covers 1 to 3 megacycles (mc) in the following bands:

(1) *Band A.* 1 to 2 mc.

(2) *Band B.* 2 to 3 mc.

b. TYPE OF MODULATION. The receivers are capable of receiving both amplitude-modulated (a-m) and continuous-wave (c-w) signals.

c. POWER OUTPUT. (1) Output of Radio Receiver BC–973–(*) without Control Unit RM–35–A is 750 milliwatts.

(2) Output of Radio Receiver BC–973–(*) with Control Unit RM–35–A is 375 milliwatts.

d. TACTICAL USE. The set is designed to determine the direction or azimuth of radio transmitters operating within the frequency bands covered by the above receivers.

e. DESCRIPTION OF EQUIPMENT. (1) Official nomenclature followed by (*) is used to indicate all models of the item of equipment included in this Technical Manual. Thus Radio Receiver BC–973–(*) represents Radio Receivers BC–973–A and –B, which are treated together in this manual.

(2) Radio Receiver BC–973–(*) consists of a portable direction finding radio designed for amplitude-modulated or continuous-wave signals. The receiver is powered by a storage battery and a dynamotor power supply.

(3) A control unit provides means for connecting the output of the radio receiver to a telephone line and also provides means for connecting the operator's microphone and headset to a telephone line for communication with a remote station.

f. POWER INPUT.

Filament	12 volts at 1.6 amperes
Plate (supplied by dynamotor)	230 volts at 85 milliamperes
Total battery requirements	12.6 volts at 5.3 amperes

The plate voltage for each receiver is supplied by a dynamotor Power Supply PE–133–(*). The microphone power is supplied from the storage battery.

2. Over-all System Function

a. GENERAL. Each direction finding radio receiver consists of two loop antennas mounted at an angle of 90° to each other. They feed two identical superheterodyne circuits, a sense circuit, and a direction indicator, which compares the outputs of the two circuits, as illustrated in figure 2.

* See TM 11-246A for installation, operation, and other maintenance data on this equipment.

b. CIRCUIT OPERATION. (1) *Voltage generated in one loop.* The signal is picked up by both loop antennas. For one loop antenna (fig. 3) the

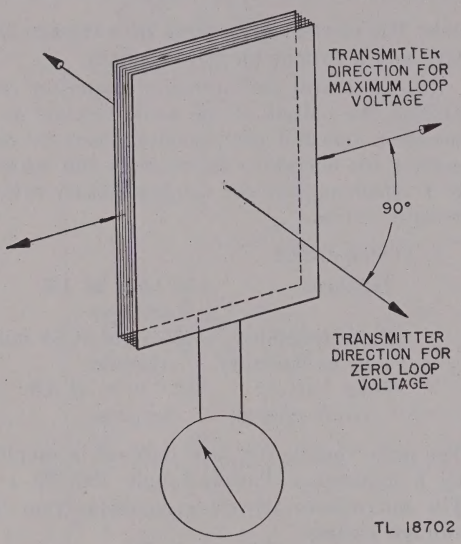


Figure 3. Voltages generated in one loop.

voltage generated in the loop will be a maximum when the transmitting antenna lies in the plane of the loop. When the transmitting antenna is exactly at right angles to the plane of the loop, the voltage induced in the loop will be zero. When the transmitting antenna lies at some angle between zero and 90° to the loop, the voltage induced in the loop will have a value between the maximum value and zero.

(2) *Voltage generated in two loops.* Referring to figure 4, it will be seen that the two loops in the receiver are always at an angle of 90° to each other. When the transmitting antenna makes an angle of 45° with one loop it will make an angle of 45° with the other loop. Since the angle the transmitter makes with both loops is the same, the voltage induced in both loops is the same. Therefore, if the loops are rotated until the voltage induced in them is the same, the transmitting antenna is known to be at an angle of 45° to the planes of the loops.

(3) *Balance circuit.* (*a*) The balance circuit provides means for equalizing the effective amplification of both channels of the receiver. At the same time, the operator distinguishes between the true direction of the transmitter A, and the two imaginary directions *B* and *B'*, figure 4.

(*b*) When the loops are connected for balancing, they are disconnected from ground and put in series. The voltages on the two mixer grids are now equal and the amplifications of the two channels can be equalized. The total voltage is applied to both grids. With the loops in the balancing connection, the voltage applied to the mixer grids is zero when the loops are rotated 90° away from the true direction of the signal. This occurs because the voltage in one loop changes phase when the loops are rotated 90°, causing the two loop voltages to buck each other.

(4) *Sense circuit.* When the sense circuit is turned on the sense antenna is connected in series with the loops so that the operator can tell whether the signal is coming from the direction *A* or *A'*, figure 4. Once the sensitivity of the loops has been equalized with the balance control, and correct "sense" (*A* or *A'*) has been determined, the receiver is operated with both the balance and sense controls turned off. Each loop feeds the signal grid of a mixer tube.

(5) *High-frequency oscillator.* One h-f Oscillator (V1, fig. 2) feeds the oscillator grids of both mixer tubes.

(6) *Intermediate-frequency amplifiers.* Each channel of the receiver has an intermediate-

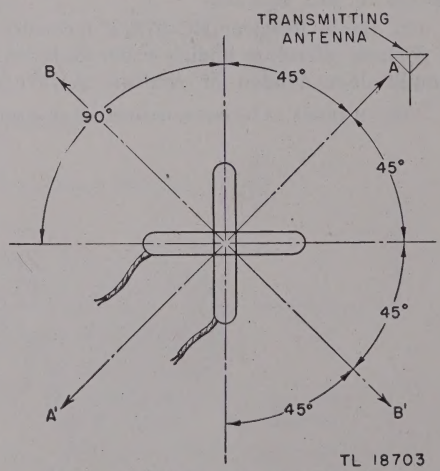


Figure 4. Voltage balance in two loops.

frequency amplifier which follows the mixer stage.

(7) *Second detectors.* Following the i-f amplifiers are the second detectors. These tubes supply the automatic-volume-control (a-v-c) voltages, the audio voltage, and the voltages which actuate the two needles of the bearing meter.

(8) *Direction indicator* (*bearing meter*). When the output from both second detectors is the same, both needles of the bearing meter deflect an equal amount and the needles cross each other in the center of the scale. The transmitter is then known to lie exactly between the two loops.

(9) *Audio amplifier.* The audio outputs of the second detectors of both channels are connected in parallel and feed the audio amplifier.

(10) *Beat frequency oscillator.* A beat-frequency oscillator (bfo) is connected to the second detector to facilitate the reception of continuous-wave signals.

Section II

DIFFERENCE BETWEEN MODELS

3. Design Differences

a. GENERAL. The only differences between Radio Receivers BC–973–A and –B are design differences. These differences do not affect the operation of the receivers, but they do make the assembly and alignment techniques different.

b. TUBE PLACEMENT AND CHASSIS LAY-OUT. The differences in physical lay-out are readily seen by observing the top views of the chassis of the two models. (See figs. 49 and 55.) They are as follows:

(1) The output transformer in Radio Receiver BC–973–A is located at the left of VT-134. The output transformer in Radio Receiver BC–973–B is located at the right of the b-f-o coil.

(2) The h-f oscillator tube of the BC–973–A is mounted horizontally on the oscillator subassembly. In the BC–973–B the tube is mounted on the chassis.

c. GENERAL CIRCUIT DIFFERENCES. The general circuit arrangement of the two models is the same. However, differences in design must be noticed. In many instances, design differences make it impossible to substitute parts from one model for another. When the Signal Corps stock number is the same, parts are identical and can be substituted from one model or another.

d. SPECIFIC CIRCUIT DIFFERENCES.

BC-973-A	*BC-973-B*
12A6 a-f amplifier tube.	6V6 a-f amplifier tube.
Adjustable series trimmer (padder) in the h-f oscillator.	Fixed series trimmer (padder) in the h-f oscillator.
One output jack.	Three output jacks.

(1) The circuits for the h-f oscillators differ in the coil winding and in the capacitor arrangement.

(2) The circuits for the beat-frequency oscillators differ in the coil winding and in the capacitor arrangement.

(3) The two i-f transformers of the two models differ in circuit design.

(4) The balance controls differ in the arrangement of the resistors.

(5) The values of resistors and capacitor in many of the circuits are different.

e. REFERENCE NUMBERS. The reference numbers for the parts of the two models are different.

f. LOOP ANTENNAS. The loops of the BC–973–A are secured to the top of the loop mount with slide fasteners. The loops of BC–973–B are fastened with machine screws.

Section III

INITIAL REPAIR PROCEDURES

Note. Before making any repairs or adjustments, all authorized modification work orders should be applied. See FM 21-6 for list of applicable MWO's.

4. General

Maintenance personnel should follow the procedure outlined in this manual when repairing and overhauling Radio Receivers BC–973–A and –B. The repair information in this and the following sections is presented in the order in which the repairman should actually perform the various operations on the equipment in the repair shop. This procedure permits repair of the equipment in the shortest time possible, resulting in sensitivity and selectivity comparable to that of new equipment.

5. Tools, Test, and Cleaning Equipment

The following tools and equipment are necessary for servicing the radio receivers:

Item	*Description*
Screw driver	¼-inch blade; 8 inches long; insulated handle.
Screw driver	⅛-inch blade; 3 inches long; insulated handle.
Pliers	Long-nose; 2-inch jaws.
Cutters	Diagonal side; ¾-inch jaws.
Soldering iron	150-watt.
Solder	Rosin core radio solder.
Storage battery	12-volt; 40 amp-hours, or more.
Resistor	4,000-ohm, 2-watt.
Air blower	Source of dry, low-pressure compressed air suitable for blowing dust out of radio set.
Power supply	D-c power supply, filtered, to supply 230 volts at 85 milliamperes.
Ohmmeter	Range from zero to 15 megohms, or more.
D-c voltmeter	D-c vacuum tube voltmeter suitable for measuring up to 250 volts dc. A 20,000-ohm per-volt voltmeter may be substituted.
A-c voltmeter	A-c vacuum tube voltmeter suitable for audio and radio frequencies.
Signal generator, radio frequency	Radio frequency signal generator with output calibrated in microvolts, covering 100 to 3,000 kc. The output must reach 100,000 microvolts, preferably 200,000 microvolts, and an output of 1 volt must also be available. The output must be internally modulated at 400 cycles or 1,000 cycles, 30 percent.
Audio oscillator	2-watt output; 20 volts at 400 cycles or 1,000 cycles.
Loop antenna	Transmitting loop antenna consisting of four turns of No. 18 enameled, copper wire, space-wound on a 3-inch diameter coil form. The spacing is to be equal to the wire diameter. This must be mounted 14 inches above the test bench, with the plane of the coil vertical. The coil terminals must be connected to the signal generator by a shielded cable.
Field strength meter	Field strength meter covering 100 to 3,000 kc; for field strengths from 15 to 80 microvolts per meter.
Plug	Plug PL-55 or PL-51.
Plug	Plug PL-89.
Tube checker	Standard tube checker.
Flashlight	Standard.
Petrolatum	Standard, for lubricating gears.
Oil	Oil, Lubricating, Preservative, Special.
Cleaning fluid	Solvent, Dry-cleaning.
Mallet	Small mallet, wooden, padded.
Sandpaper*	Fine sandpaper.
Paint brushes	Assorted.
Headset	4,000 ohms.
Burnishing tool	Relay burnishing tool.
Voltmeter, d.c.	0-250 volts; 1,000 ohms per volt.
Frequency Meter or Crystal calibrator	Range from 100 kc to 3 mc. Range from 100 kc to 3 mc.
Polish (for phone plugs)	Polish: metal, paste.

* Never use sandpaper to polish phone plugs.

6. Removal of Tubes

a. PILOT LAMPS. (1) Remove the pilot-lamp cover spring which holds the reflecting cap. Use a small screw driver to pry the ends of the spring out of the groove.

(2) Remove the pilot-lamp reflecting cap by pulling it until it snaps out of its groove.

(3) Remove the defective light-bulb by unscrewing it. Replace it with a spare bulb taken from the phone compartment in the cover of the receiver chest.

(4) Snap on the reflecting cap.

(5) Replace the pilot light cover spring.

b. TUBES. The tubes are carefully selected and switching tubes indiscriminately will make it impossible to balance the receiver. Therefore, mark the tubes for position before removing them, using masking tape for the markers. When it is necessary to replace a tube, remove the top cover by loosening the four screws in the corner of the cover and lifting it off. (See par. 7*a*(3).) Remove the tube puller from the receiver chest. Place it over the tube to be removed so the two prongs come between the tube case and socket. (See fig. 5.) Grasp the tube puller firmly and pull up.

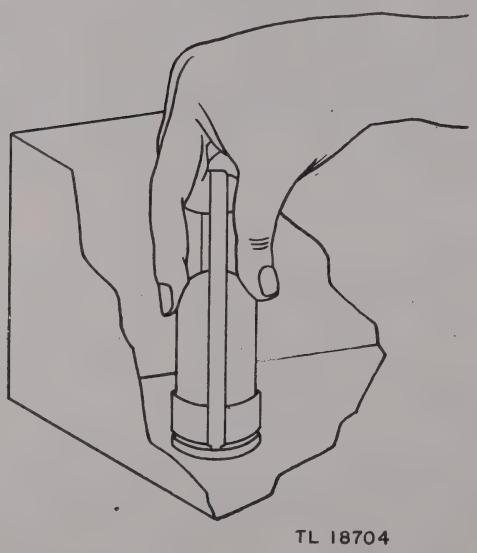


Figure 5. Method of using tube puller.

7. Disassembly of Loop Commutator and Chassis Parts

a. REMOVAL OF LOOP COMMUTATOR MECHANISM. (1) Remove the loop of Radio Receiver BC–973–A by releasing the four slide fasteners at the base of the loop and lifting it. On Radio Receiver BC–973–B, the four machine screws at the base of the loop must be removed to remove the loop.

(2) Remove the azimuth scale.

(3) Remove the top cover of Radio Receiver BC–973–A by unfastening the four cams. The cams are in an open position when the engraved arrows on the knurled knobs face directly to the rear of the set. In order to release the knobs, turn them in a counterclockwise direction. In replacing this cover, it is necessary that the four arrows face directly to the rear of the set, otherwise it will be difficult to seat the cover of the housing.

Note. The top cover of Radio Receiver BC-973-B is held in place by four thumb-screws. The top cover, loop, and azimuth scale are removed as a unit. (See fig. 6.)

(4) On Radio Receiver BC–973–A turn the commutator assembly until the four flat head screws can be seen through the holes in the flat portion of the commutator assembly. Remove the four screws. Lift the commutator assembly carefully and slowly. In replacing the commutator mechanism, rotate the annular disk, which has the four holes, until these holes line up with the holes in the top plate of the commutator assembly. Then insert the commutator slowly and carefully, moving it downward until these four holes line up with the corresponding four holes in the top of the pedestal, in order that the flat head screws may be replaced.

b. TO REACH TOP SIDE OF CHASSIS. To reach the tubes and other units on the top side of the chassis, follow the first three steps outlined in *a* above. The use of the tube puller is illustrated in figure 5.

c. TO REACH BOTTOM OF CHASSIS. (1) Remove the receiver from mounting Plate FT–363–(*) by releasing the two outer slide fasteners, pulling them forward.

(2) Remove the bottom plate by unscrewing the four corner screws.

d. REMOVAL OF LOOP COMMUTATOR BRUSHES. (1) Remove the receiver from the mounting plate, as directed in *c* above.

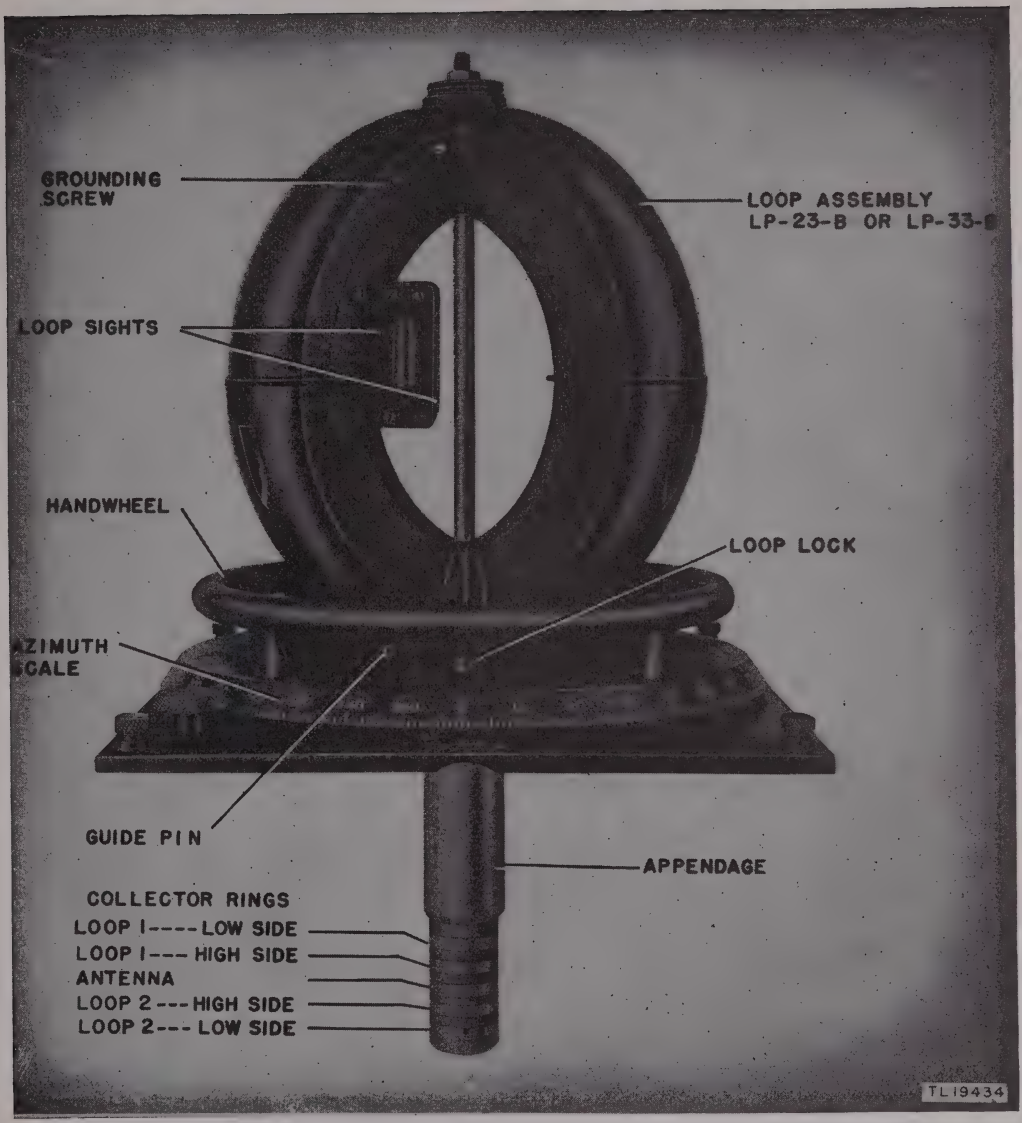


Figure 6. Radio Receiver BC-973-B, loop assembly and appendage.

(2) Remove the bottom plate as directed in *c* above. To inspect, clean, or replace the six silver commutator brushes of Radio Receiver BC–973–A, unsolder the wires connected to the brushes, then unscrew the threaded brush holders from the square aluminum can (Radio Receiver BC–973–A) mounted on the center of the chassis.

(3) On Radio Receiver BC–973–B the brush holders are mounted on a round aluminum casting.

8. Cleaning, Inspecting, and Lubricating

a. Relay Contacts. (1) Relay contacts become noisy after they have been subjected to considerable use. This causes a very loud click in the headphones whenever the PRESS TO BALANCE or SENSE controls are pushed. This clicking may be reduced by cleaning the contacts with a small cloth that has been saturated with Solvent, Dry-cleaning. Use a relay burnishing tool, if it is available, after cleaning. The relay contacts in this set are gold-plated; do not use harsh abrasives in cleaning them.

(2) Dirty relay contacts may easily show up as an uncertainty of direction indication when the set is subjected to a light mechanical vibration such as rapping it on the side with the palm of the hand. These symptoms clearly indicate a need for relay cleaning.

b. Loop Commutator. (1) The loop commutator may become dirty and cause the pointers of the DIRECTION INDICATOR to show an intermittent indication as the loops are rotated. Usually it is possible to locate the defective section of the commutator, since the pointers will behave in an erratic manner whenever a certain portion of the azimuth scale is facing the index line.

(2) Clean and lubricate the commutator as follows: remove the loop commutator according to the instructions above and clean the commutator rings with a lintless cloth saturated with dry-cleaning solvent (SD). After cleaning, apply a *very light film* of special preservative lubricating oil (ps) or equal, to the commutator rings.

c. Dust and Dirt. Dust can be most quickly removed by blowing compressed air against the chassis where the dust is lodged. Use a low-pressure blower. A high-pressure blower can bend or break the wires and parts in the set. Do not direct a strong stream of air against the relay contact arms, since these are easily bent out of adjustment. Remove any dirt that cannot be cleared away by the air-blower, by using a *dry* cloth. Use a *dry* cloth to remove all grease, oil, or electrolyte that has leaked out of the capacitors.

d. Inspecting. (1) See that there are no broken wires, or soldered joints that have become loose or broken. These two items should be taken care of as soon as they are located. Inspect the electrolytic capacitors to see that the electrolyte has not leaked out. See that the oil has not leaked out of the oil-filled paper capacitors. There are the "bathtub" type in metal cans, mounted on the side of the chassis. The capacitors will have to be replaced if they have been damaged. Do not replace them until the cause for damage, if any, has been determined and corrected.

(2) Examine the relay contacts to see that they are not bent or broken, and that the relay armatures move freely without sticking.

e. Lubricating. Lubricate the gears of the dial with petrolatum, if necessary. Lubricate the detent mechanism of the band switch and the gears of the band switch with petrolatum, if necessary. Lubricate the spring and clutch of the PUSH TO BALANCE control with petrolatum.

9. Cleaning, Inspecting, and Testing of Tubes

a. Cleaning Tubes. Remove the tubes one at a time. Blow dust and dirt out of the tube sockets with compressed air. Remove rust from the tube prongs with crocus cloth or very fine sandpaper.

b. Testing Tubes. (1) Test the tubes, one at a time, in a standard tube checker. Mark the tubes that are weak with a piece of scotch masking tape or a label. Replace defective tubes with spares from the spare tube kit. These are labelled for position. If matched spares are not available, the corresponding tubes in both channels will have to be selected by matching the amplification of the stages in both channels. This must be done according to the alignment procedure given ir paragraph 12*e*.

(2) In making tube replacements, check to see that the channels can be equalized at all settings of the SENSITIVITY control by ad-

justing the balance control. It will be most difficult to obtain a balance when the SENSITIVITY CONTROL is near minimum.

(3) If replacement tubes are not available, it is frequently possible to equalize the amplification of the two channels by switching tubes, one pair at a time, from one channel to the other.

Section IV

PRELIMINARY TROUBLE-SHOOTING PROCEDURES

10. Trouble Location Within Receiver

a. Input Resistance at Power Input Socket. Turn the receiver on its side so that the power socket at the rear is toward you. Use an ohmmeter to measure the resistance between ground and each prong of the socket. The ON-OFF switch must be in the OFF position.

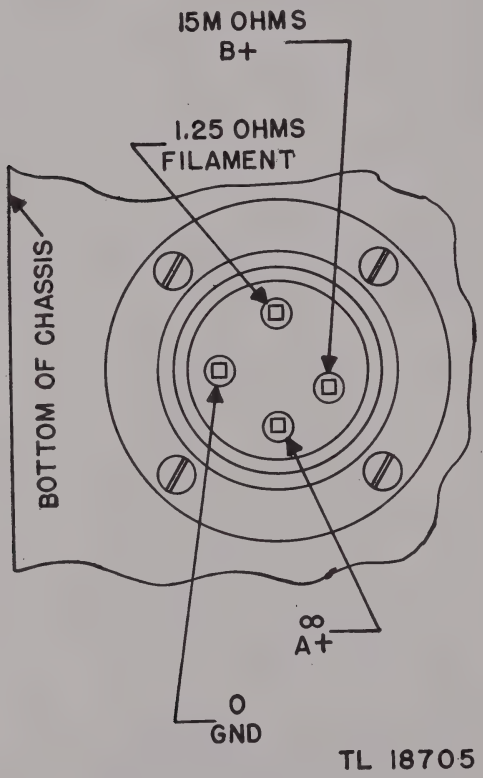


Figure 7. Power socket voltage resistance chart.

If the resistance is lower than 1.25 ohms, there is a short circuit which must be located and repaired before the power is turned on. If the resistance is higher than 1.25 ohms there is an open filament circuit. This should be repaired before turning the power on.

b. Test of Cable and Plug Continuity. (1) Remove the dynamotor-receiver cable. The plugs at both ends are identical. Hold both plugs so that the contacts face up. Switch the ohmmeter to the lowest ohms scale and check for continuity between corresponding contacts in both plugs.

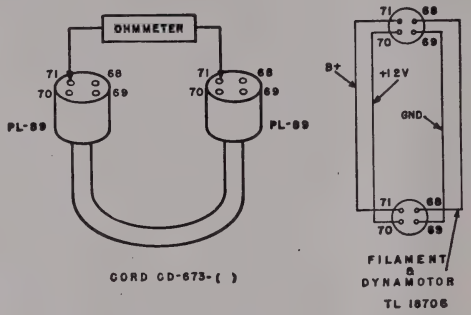


Figure 8. Power cable and plug continuity test.

(2) There should be zero resistance between the pair of contacts 71 and 71. The resistance should also be zero for pairs of contacts 68 and 68, 69 and 69, and 70 and 70.

(3) There should be more than 20 megohms between any two contacts on the same plug. Test the resistance between contacts 68 to 69, 68 to 70, 68 to 71, 69 to 70, 69 to 71, and 70 to 71. All these resistances should be over 20 megohms.

11. Preparing Set for Operation

Caution: This radio direction finder contains two carefully adjusted receiving channels. The loop trimmers are accessible on the front panel. Any disturbance of the trimmers will affect the operation. Do not tamper with the trimmers unless alignment is called for.

a. Replacement of Plug-In Parts. Set the ON-OFF switch in the OFF position. Replace the tubes and the loop antenna. Screw the collapsible sense antenna on the top of the loops and extend it. This is normally shipped in the large battery chest. Plug a headset into one of the output jacks.

b. CONNECTION OF EXTERNAL POWER UNIT. (1) If Dynamotor Power Supply Unit PE–133–(*) is available connect it to the battery. Connect the dynamotor to the receiver with Cord CD–673–(*).

(2) If this power supply is not available, connect Plug PL–89 to a 230-volt d-c supply and a 12-volt storage battery as shown in figure 9. Use No. 14 rubber-covered, stranded wire for leads to the batteries.

c. TURNING ON THE SET. (1) Set the front panel controls to the following positions:

METER DAMP	switch to OFF
CW OSC.	switch to OFF
LIGHTS	switch to OFF
MVC-AVC	switch to MVC
ON-OFF	switch to ON
SENSITIVITY	control to 7
VOLUME	control rotated to maximum clockwise position.

(2) Watch for any odor, arcing, crackling, or burning. If any of these occur, locate and correct the cause. Turn the set on one side to look at the underside of the chassis. Do not allow the sense antenna to strike any object. Unscrew the sense antenna if it becomes necessary to move the set around on the bench. Do not lean the set on the loops.

(3) If a resistor overheats and smokes, it is overloaded. This may be due to a short circuit in a capacitor, vacuum tube, transformer, or any component in the circuit.

(4) If an electrolytic capacitor overheats or leaks, remove it from the circuit and test the circuit voltage. If the circuit voltage is correct, replace the capacitor with a new one.

(5) Turn the set right side up. Tune in a signal. The pointers of the DIRECTION INDICATOR must not be allowed to deflect beyond the top of the 0° line in the center of the scale. This is controlled by the SENSITIVITY control. Turn the loops through 360°. The pointers of the DIRECTION INDICATOR should intersect on the orange line for four positions of the loop antennas. Push the PRESS TO BALANCE control and turn the loops through 360°. There should be two loop positions for which the pointers of the DIRECTION INDICATOR collapse to zero, and two positions of maximum deflection. Replace the sense antenna and extend it. Press the PUSH TO BALANCE control and locate the two loop positions that give maximum deflection on the DIRECTION INDICATOR. At each of these loop positions release the PRESS TO BALANCE control and press the SENSE button. In one position the crossover point of the pointers should move to the right, in the other position it should move to the left.

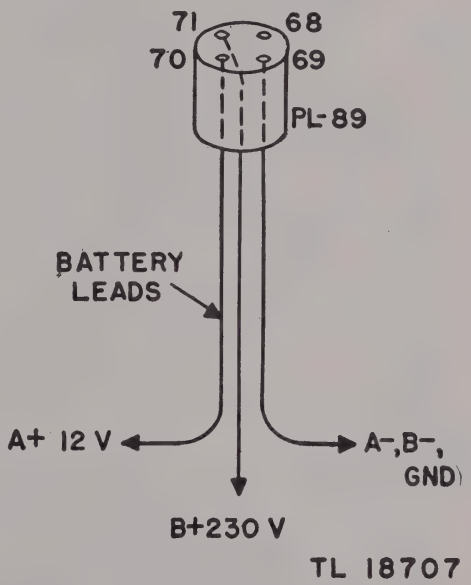


Figure 9. Power cable connections for separate A and B supplies.

Section V

ALIGNMENT PROCEDURE

12. Preliminary

a. Remove the sense antenna, loop, and top cover.

b. Remove the mounting plate and bottom plate.

c. Connect the commutator prong terminals marked *HI* together.

d. Connect the commutator prong terminals marked *LO* together.

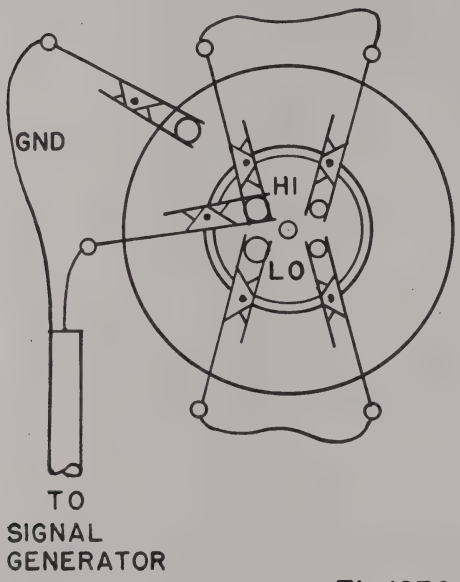


Figure 10. Commutator prong connections for alignment.

e. Set the signal generator to 458 kc and check with a frequency meter or the crystal calibrator.

f. Connect the *HI* side of the signal generator to the *HI* terminals of the commutator. Connect the *LO* side of the signal generator to the metal frame of the commutator (ground).

g. Set the sensitivity control to maximum.

h. Set the switches on the front panel to the following positions:

METER DAMP	switch to OFF
CW OSC.	switch to OFF
ON-OFF	switch to ON
MVC-AVC	switch to MVC
LIGHTS	switch to ON or OFF

i. Set the receiver frequency dial to 2,000 kc on band B.

j. Turn the frequency band switch to B.

k. Turn up the output of the signal generator until the tips of the pointers of the DIRECTION INDICATOR meet. They should meet on the 0° center line. If they do not meet at 0°, press the PRESS TO BALANCE control and turn it until the pointers intersect on the 0° center line. Readjust the signal generator output until the tips of the pointers meet at the 0° center line. This is "rated deflection" for the direction indicator. The receiver should give rated deflection of the DIRECTION INDICATOR for an input of 5 microvolts.

l. If improper indication is obtained from either channel, proceed to line up the receiver stage by stage.

13. Alignment of Second i-f Amplifier (Third i-f Transformer)

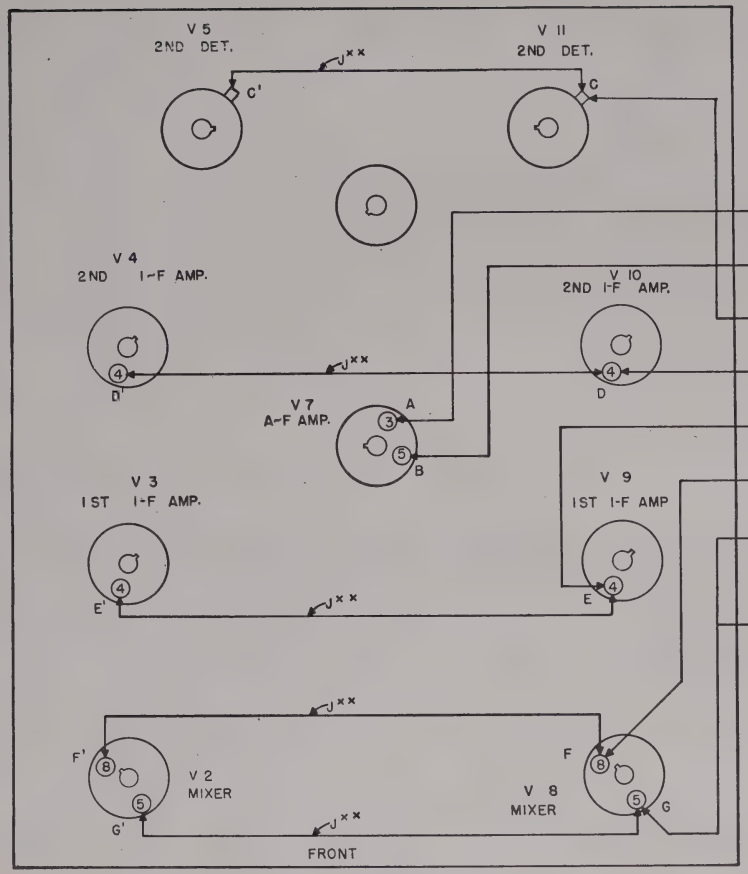
a. Connect the *HI* terminal of the signal generator to grids of the second i-f tubes (points *D* and *D'* on the alignment chart, fig. 11 or 12) in both channels by means of two short leads.

b. Connect the ground terminal of the signal generator to the chassis near one of the second i-f tubes.

c. Set the signal generator output to 458 kc. and 80,000 microvolts.

d. Trim the third i-f transformer in each channel for maximum pointer deflection. Adjust the signal generator microvolts output for rated deflection of the direction indicator. The i-f trimmer location is shown in figure 13 for Radio Receiver BC–973–A, and figure 16 for Radio Receiver BC–973–B.

e. Push the PRESS TO BALANCE control and turn it to the furthest clockwise position. Then turn it to the furthest counterclockwise



CONNECT SIGNAL GENERATOR TO POINTS B, C, D, E, F OR G FOR POINT UNDER TEST.

TEST POINTS	SIGNAL GENERATOR	OUTPUT INDICATION
A[X]		
B	1,000 CYCLES ±	A-F V.T.V.M 89 V.
C	1,000 CYCLES ±	DITTO
D	458 KC. 80,000 MICROVOLTS	
E	458 KC 240 MICROVOLTS	DIRECTION INDICATOR
F	458 KC. 3 MICROVOLTS	POINTERS MUST DEFLECT
G	3,000 KC 5 MICROVOLTS (RECEIVER AT 3,000 KC.)	TILL THEIR TIPS MEET
G	2,000 KC. 5 MICROVOLTS (RECEIVER AT 2,000 KC. BAND-A)	ON 0° LINE.

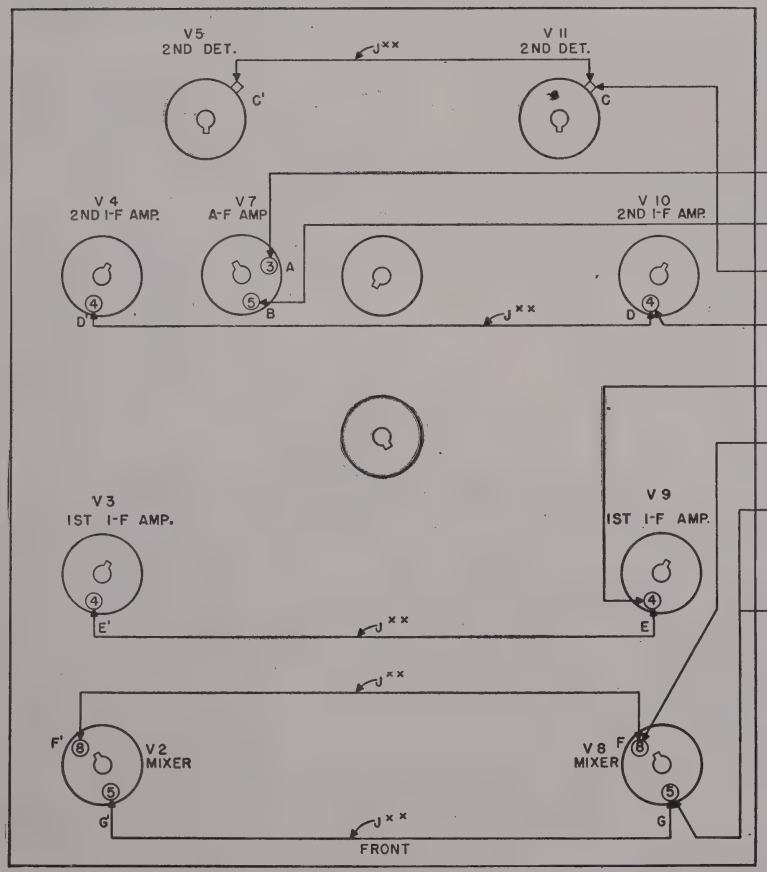
X CONNECT A-F VACUUM TUBE VOLTMETER AT POINT "A" & A 4,000Ω, 1 WATT RESISTOR TO THE RECEIVER OUTPUT JACK.

± APPLY ENOUGH SIGNAL TO GIVE REQUIRED OUTPUT.

J[XX] THIS JUMPER IS CONNECTED AT POINT UNDER TEST ONLY.

TL 18709

Figure 11. Radio Receiver BC-973-A—signal tracing chart.



CONNECT SIGNAL GENERATOR TO POINTS B, C, D, E, F, OR G FOR POINT UNDER TEST.

TEST POINT	SIGNAL GENERATOR	OUTPUT INDICATION
A[x]		
B	1,000 CYCLE ‡	A-F V. T. V. M. = 89 V
C	1,000 CYCLES ‡	DITTO
D	458 KC. 80,000 MICROVOLTS	DIRECTION INDICATOR POINTERS MUST DEFLECT TILL THEIR TIPS MEET ON 0° LINE.
E	458 KC. 240 MICROVOLTS.	
F	458 KC. 3 MICROVOLTS	
G	3,000 KC. 5 MICROVOLTS (RECEIVER AT 3,000 KC)	
G	2,000 KC. 5 MICROVOLTS (RECEIVER AT 2000 KC BAND-A)	

× CONNECT A-F VACUUM TUBE VOLTMETER AT POINT "A" & A 4,000 Ω, 1 WATT RESISTOR TO THE RECEIVER OUTPUT JACK.

‡ APPLY ENOUGH SIGNAL TO GIVE REQUIRED OUTPUT.

×× THIS JUMPER IS CONNECTED AT POINT TEST ONLY.

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Figure 12. Radio Receiver BC-973-B—signal tracing chart.

position. The pointer intersection should swing about the same distance to the right as to the left. If it does not, interchange the second i-f tubes, or try substituting other tubes in one of the channels, until matched tubes are found. If it is still impossible to meet this condition, interchange the second detector tubes, or replace one of them with a tube that will match.

f. Rebalance with the PRESS TO BALANCE control.

g. Check the perfection of alignment by turning the signal generator frequency dial slowly, both above and below resonance. Observe the path followed by the intersection of the pointers. It should follow the 0° line exactly. If it does not, repeat the alignment operations.

h. When maximum perfection of alignment by peaking has been achieved, the final correction can be made by turning the frequency dial of the signal generator to the off resonance point at which the sidewise movement (wobble) of the pointer intersection was noted. Turn the plate trimmers of the i-f transformers in the channel controlling the lower pointer until the intersection is on the 0° line.

i. To achieve perfect alignment, repeat the alignment and touch up processes explained above. The sensitivity for rated deflection of the DIRECTION INDICATOR should be 80,000 microvolts. (See alignment chart, fig. 11 or 12.)

14. Alignment of First i-f Amplifier (Second i-f Transformer)

a. Move the *HI* leads of the signal generator to the first i-f amplifier tubes (points *E* and *E'* on the alignment chart).

b. Repeat steps described in paragraph 13*b* through *i* above, peaking the second i-f transformers. *Do not disturb the trimmers of the third i-f transformers.* The signal generator output should be about 240 microvolts.

15. Alignment of Mixer Stage (First i-f Transformer)

a. Move the *HI* leads of the signal generator to the No. 8 pins of the mixer tubes (points *F* and *F'* on the alignment chart). *Do not allow the signal generator leads to come close to the third i-f transformers.* Connect the *LO* lead of the signal generator to a ground point near the mixer tubes, such as the grounded tap on the PRESS TO BALANCE control.

b. Repeat steps described in paragraph 13*b* through *i*, peaking the first i-f transformers. *Do not disturb the trimmers of the second and third i-f transformers.* The signal generator output should be about 3 microvolts.

16. Adjustment of Beat-Frequency Oscillator

a. Apply an unmodulated i-f signal to the No. 8 pins of both mixer tubes and tune the signal generator to the frequency which gives maximum meter indication. Throw the CW OSC.-OFF switch to CW OSC., and the AVC-MVC switch to MVC.

b. Adjust the beat - frequency oscillator (marked B.F.O.) trimmer until the beat note in the headset is approximately 1,000 cycles per second (cps).

17. Oscillator Tracking For Band B (Radio Receiver BC-973-A Only)

a. In all oscillator tracking adjustments, unless otherwise noted, the switches on the front panel shall be in the following positions:

METER DAMP-OFF	-OFF
CW OSC.-OFF	-OFF
ON-OFF	-ON
MVC-AVC	-MVC
LIGHTS-OFF	-as required

b. Connect the signal generator to a loop of wire consisting of four or five spaced turns approximately 3 inches in diameter. Set the output control to zero.

c. With the direction finder completely assembled and the top cover, handwheel, and loop in position, set the direction finder up approximately 2 feet away from the transmitting loop. If the transmitting loop is too close to the direction finder, inaccurate tracking will result due to mutual inductance between transmitting and receiving loops. If the transmitting loop is too far away, the signal strength may fall below the required amount. The leads to the transmitting loop should always run in a direction away from the direction finder and should preferably be in a coaxial cable, properly grounded.

d. Set the radio receiver frequency band switch to B.

e. Rotate the tuning dial of the receiver to exactly 3,000 kc. This is the high end of band B.

f. Set the signal generator accurately at 3,000 kc. (Check with frequency calibrator or frequency meter.)

g. Turn Radio Receiver BC–973–A ON, and set the SENSITIVITY control to 7 on the dial.

h. Increase the signal generator output until a deflection is noted on the DIRECTION INDICATOR.

i. Adjust oscillator parallel trimmer marked OSC. B-P until maximum deflection of the pointers is obtained. (It may be necessary to reduce the output of the signal generator progressively as this adjustment is made.)

j. Adjust the loop trimmers on front panel (fig. 14) marked LOOP B1 and LOOP B2 very carefully until an absolute maximum indication of the pointers is obtained. Rotate the loop with respect to the transmitting antenna until the pointers intersect on the zero bearing line. If, when PRESS TO BALANCE control is pressed, the needles drop completely, rotate the loops until the pointers intersect on the 0° line.

k. To check the perfection of the loop trimmer adjustments (assuming the intermediate frequency was previously found to be perfect), rock the signal generator frequency a small amount, both below and above 3,000 kc, and observe the path followed by the intersection of the pointers. If this intersection follows the zero bearing line of the meter exactly, the loop trimmer adjustment is perfect. If any sidewise motion of the intersection is observed, repeat the loop trimmer peaking operation outlined above.

l. Rotate the frequency dial of the receiver to exactly 2,000 kc (with the frequency band switch still on B).

m. Rotate the signal generator dial to approximately 2,000 kc and rock it about this point until maximum deflection is obtained on the pointers of the DIRECTION INDICATOR.

n. If necessary, increase the signal generator output until a deflection is observed on the DIRECTION INDICATOR.

o. Rock in the low end of this band by adjusting the B band oscillator series trimmer marked OSC. B-S to a peak, then readjusting the signal generator frequency slightly. If the pointers rise further giving a higher peak, leave the signal generator at this frequency and readjust OSC. B-S seeking a still higher peak. Repeat the processes back and forth, readjusting first the generator and then the receiver OSC. B-S series trimmer until an absolute peak is reached by this rocking process.

p. Repeak the high end of the band at 3,000 kc exactly as before. Refer to steps described in *d* through *k* above.

q. If any readjustment was made at the high end, again repeak the low end. Refer to steps described in (*l*) through (*o*) above. Continue this process of peaking and repeaking high and low ends of the band until no appreciable readjustments are required at either end of the band.

18. Oscillator Tracking For Band A (Radio Receiver BC-973-A Only)

a. The tracking of band A follows the identical processes followed above with the exception that the high end of the band is 2,000 kc and the low end of the band is 1,000 kc. Set the receiver band switch to band A.

b. Line up the high end of band A, 2,000 kc, following the procedure described in paragraph 17*d* through *r* above.

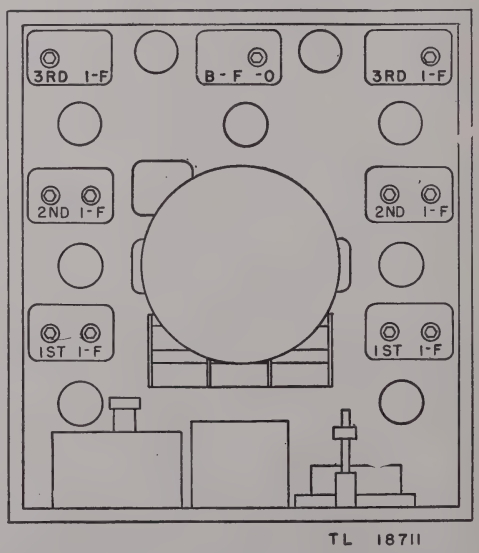


Figure 13. Radio Receiver BC-973-A—i-f trimmer location.

c. Line up the low end of band A, 1,000 kc, following the procedure described in paragraph 17*l* through *o* above.

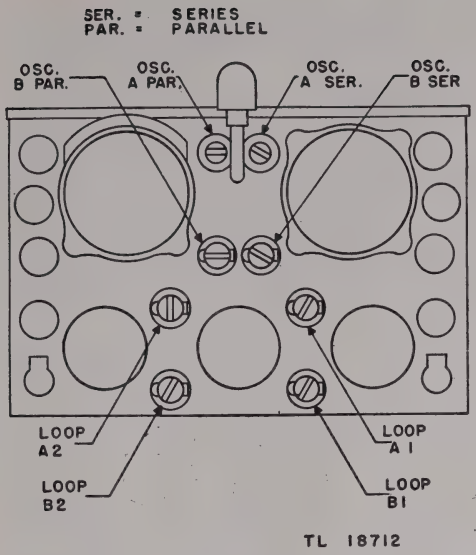


Figure 14. Radio Receiver BC-973-A—r-f trimmer location.

19. Oscillator Tracking For Band B (Radio Receiver BC-973-B Only)

a. Set the frequency band switch on the front panel of the receiver to band B. Set front panel switches as follows:

METER DAMP	to OFF
CW OSC.	to OFF
AVC-MVC	to MVC
ON-OFF	to ON
SENSITIVITY	to maximum

b. Rotate the tuning dial of the receiver to exactly 3,000 kc.

c. Remove the top cover of the receiver by loosening the four knurled screws in the corners of the cover and lifting it up very carefully.

d. Connect the *HI* leads of the signal generator to the top stator lugs of both loop tuning capacitors with clip leads, and the *LO* lead of the signal generator to the frame of the capacitors. (See fig. 15.)

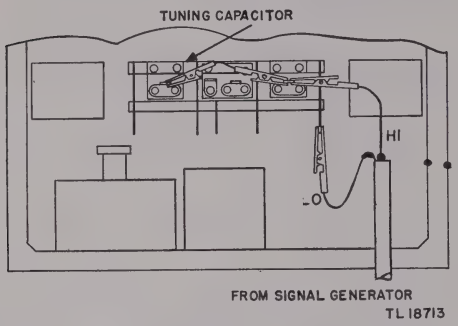


Figure 15. Connections for signal generator to tuning capacitor.

e. Set the signal generator output to exactly 3,000 kc and 5 microvolts.

f. Adjust the trimmer B-parallel on the front panel (fig. 17), for the maximum pointer deflection of the DIRECTION INDICATOR. (It may be necessary to reduce the output of the signal generator as the oscillator trimmer is brought into adjustment.)

20. Oscillator Tracking For Band A (Radio Receiver BC-973-B Only)

a. Set the frequency band switch on the front panel to band A.

b. Rotate the tuning dial to exactly 2,000 kc.

c. Set the signal generator output to exactly 2,000 kc, 5 microvolts.

d. Connect the output of the signal generator to the receiver as described in paragraph 19*d*.

e. Adjust the trimmer A-parallel (fig. 17), for maximum pointer deflection of the DIRECTION INDICATOR.

21. Peaking Loop Trimmers of Band A (Radio Receiver BC-973-B Only)

a. Replace the top cover azimuth scale, and loop antennas.

b. Set the SENSITIVITY CONTROL to 7.

c. Connect the signal generator to a loop of four spaced turns, about 3 inches in diameter. Place this transmitting loop 2 feet from the receiver. The leads from the transmitting loop should run away from the receiver and should preferably be in a coaxial cable, properly grounded.

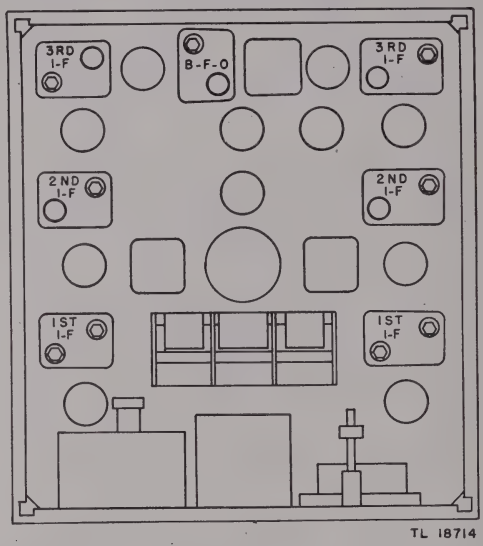


Figure 16. Radio Receiver BC-973-B—i-f trimmer location.

d. Set the signal generator at exactly 1,900 kc.

e. Set the receiver to band A, 1,900 kc.

f. Increase the output of the signal generator and tune the signal to maximum on the receiver.

g. Rotate the receiving loop until the pointers on the DIRECTION INDICATOR intersect on the 0° line.

h. Adjust the loop trimmers marked LOOP–A 1 and LOOP–A 2 for maximum pointer deflection. Watch the right pointer when peaking the

right trimmer and watch the left pointer when peaking the left trimmer.

i. Rebalance the set with the balance control, retune the main receiver dial, and repeak the trimmers as described in *h* above.

j. To check the perfection of the loop trimmer adjustments, rock the signal generator frequency a small amount above and below 1,900 kc. Observe the path followed by the intersection of the pointers. If this intersection follows the 0° line of the meter exactly, the loop trimmer adjustment is perfect. If any sidewise motion is observed, repeat the loop trimmer peaking operation outlined above.

22. Peaking Loop Trimmers of Band B (Radio Receiver BC-973-B Only)

a. Set the receiver to 3,000 kc on band B.

b. Set the signal generator to 3,000 kc.

c. Repeat steps indicated in paragraph 21*f* through *j*.

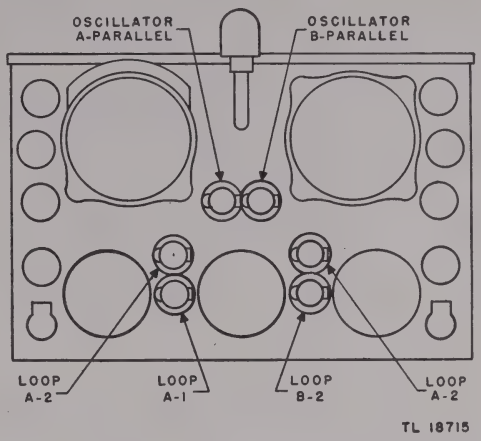


Figure 17. Radio Receiver BC-973-B—r-f trimmer location.

Section VI

DETAILED TROUBLE-SHOOTING PROCEDURES

23. General Signal Tracing

Operate the receiver and tune in a station. If the receiver does not operate properly, the following clues will help to locate the trouble.

a. If the DIRECTION INDICATOR shows a reading when a signal is tuned in, but no audio is heard in the headset, the trouble may be one or more of the following: the audio output stage, the second detector tube grid or plate circuit, the output transformer and volume control circuit, or the headset.

b. If the right pointer operates and the left does not move, the trouble must be either in the left loop circuit, or the left i-f channel.

c. Similarly, if the left pointer operates and the right does not, the trouble is in the right loop or right i-f amplifier.

d. It is possible to have a slight reading on the DIRECTION INDICATOR as a result of tube noise, and still not be able to tune in any signal. If, in addition to the above, there is also a rushing noise in the earphones when the SENSITIVITY and VOLUME controls are on full, the trouble is either in the oscillator circuit or the loop circuit. After having localized the trouble from the above clues, proceed with detailed electrical test.

24. Audio Section

If the clues point to trouble in the audio section, proceed as follows:

a. Short the grid (B) of the output tube intermittently to ground. (See fig. 11 or 12.) If the output tube and circuit are working, a clicking noise will be heard in the earphones. An audio oscillator can be used to excite the output audio grid instead of shorting to ground. The oscillator tone will be heard in the earphones. The 1-volt, 1,000-cycle signal on the grid is satisfactory.

b. If no signal is heard, check the headphones. Remove the phone plug and connect a 20-volt audio signal to the phone plug. This should be audible in the phones. If the phones are good, test the output circuit and output transformer for open circuits or shorts with an ohmmeter.

c. If the output circuit is not at fault, use a voltmeter to check the tube voltages. (See fig. 18*a* or 19*a*.) If the plate voltage is very low, the plate capacitor may be shorted. Very high cathode voltage indicates an open cathode resistor. If the grid voltage is positive, the coupling capacitor is shorted.

d. Now pass to the pentode section of the second detector. Check the plate voltage of the pentode section. If there is no plate voltage, look for an open plate resistor. The plate bypass capacitors may be shorted. If the plate circuit of the second detector is not at fault, there may be no screen voltage. Look for a shorted bypass capacitor, or an open screen resistor.

e. The only remaining cause of trouble pertaining to clue No. 1 is the grid circuit of the second detector. Check the resistance from grid (point *C* or *C'* of the signal tracing chart) to ground (figs. 11 and 12), and check the resistance of the grid winding of both detector transformers. Grid-to-ground resistance is given in the tube socket resistances chart. (See fig. 18 or 19.) If the fault is only in one grid circuit, a signal will be heard when the loops are turned in the direction of a station. However, there will be no audio signal when the loops are turned 90° away from the same station.

25. I-f Amplifier and Loop Circuits

If the clues in paragraph 23*b* or *c* point to trouble in either the left channel or the right channel, determine which stage of the defective channel is not operating. This is done by putting a signal generator between grid and ground of the i-f amplifier tubes and watching the DIRECTION INDICATOR to see whether the channel is operating.

a. Set the signal generator for the i-f frequency (458 kc). Start with the last i-f amplifier grids (points *D* and *D'*, fig. 11 or 12). 80,000 microvolts should make the direction indicator needle deflect to the top of the 0° line in the middle of the meter, with the AVC-MVC switch

at MVC. Vary the signal generator frequency a few kilocycles each way, to make sure that it is tuned to the same frequency as the i-f amplifiers of the receiver. The voltages required at each of the i-f grids to give full deflection of the DIRECTION INDICATOR are given in the signal tracing charts. (See figs. 11 and 12.)

b. If the DIRECTION INDICATOR shows no deflection, check the meter by putting an ohmmeter across the meter under test.

Caution: Use a high resistance scale, 1 meg or higher.

Using the low resistance scale will overload the bearing meter, and damage it. The bearing meter should deflect when the ohmmeter is connected to it. If it does not, the meter coil is open or shorted. If the meter does not deflect but the circuit shows continuity, remove the meter connecting wires or meter plug. Now check the indicator again. If the bearing meter *does* deflect, there is a short in the diode circuits, balance control, or the meter connector. Check the resistance of the balance control and the resistors of the diode circuit of pin No. 5 of the second detector. See figure 18 or 19 for resistance values.

c. If the meter circuit is functioning properly, check the d-c voltages of the second i-f amplifier. Zero plate or screen voltage indicates an open resistor or shorted capacitor. High cathode voltage indicates an open cathode resistor, or an open MVC control. Use an ohmmeter to locate the defective part. Check the resistances of the grid and plate coils of the i-f transformer.

d. If the second i-f stage is functioning properly, proceed trouble shooting of the first i-f amplifier. Apply 240 microvolts between grid (*E* or *E'*) and ground. If the bearing meter does not deflect, check the d-c voltages and parts of this stage. When this stage is working properly, proceed trouble shooting of the first i-f for an excitation of 240 microvolts. Full scale deflection means that the tips of the meter pointers reach the top of the 0° line in the center of the meter scale. If the first i-f stage is working properly, the fault must lie in the mixer tube circuit, or in the h-f oscillator circuit. Set the signal generator to the i-f frequency and apply the signal to the No. 8 pins (*F* or *F'*) of mixer tubes. These are the oscillator grids. Now move the signal generator output leads to (*G* or *G'*), both mixer grids (No. 5 pins), and remove the shorting wires on the loop commutator prongs.

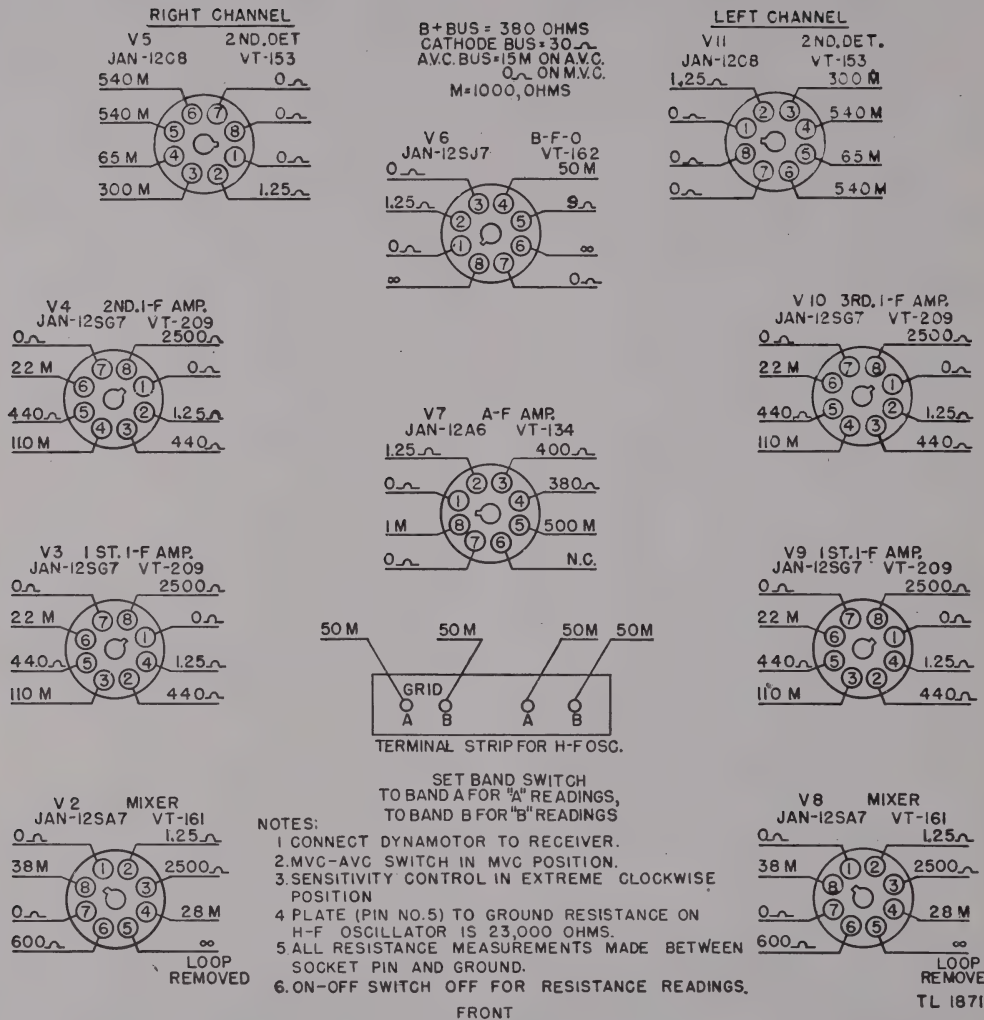
Caution: BOTH mixer grids (No. 5 pins) should be connected to the high side of the signal generator to provide a d-c ground for these grids when shorting wires on the loop commutators are removed.

The sensitivity at this point should be about 5 microvolts. If the sensitivities for both mixer grids are low, check the d-c voltage in the mixer circuits. Check the resistors and capacitors with an ohmmeter.

e. If the signal gets through from pin No. 5 of the mixer but not from the prongs of the loop commutator, the trouble is in the band switch, relays, or in the series coils for the loops. The circuit must then be checked very carefully to see that there is good contact. Clean the loop commutator and all other contacts if necessary.

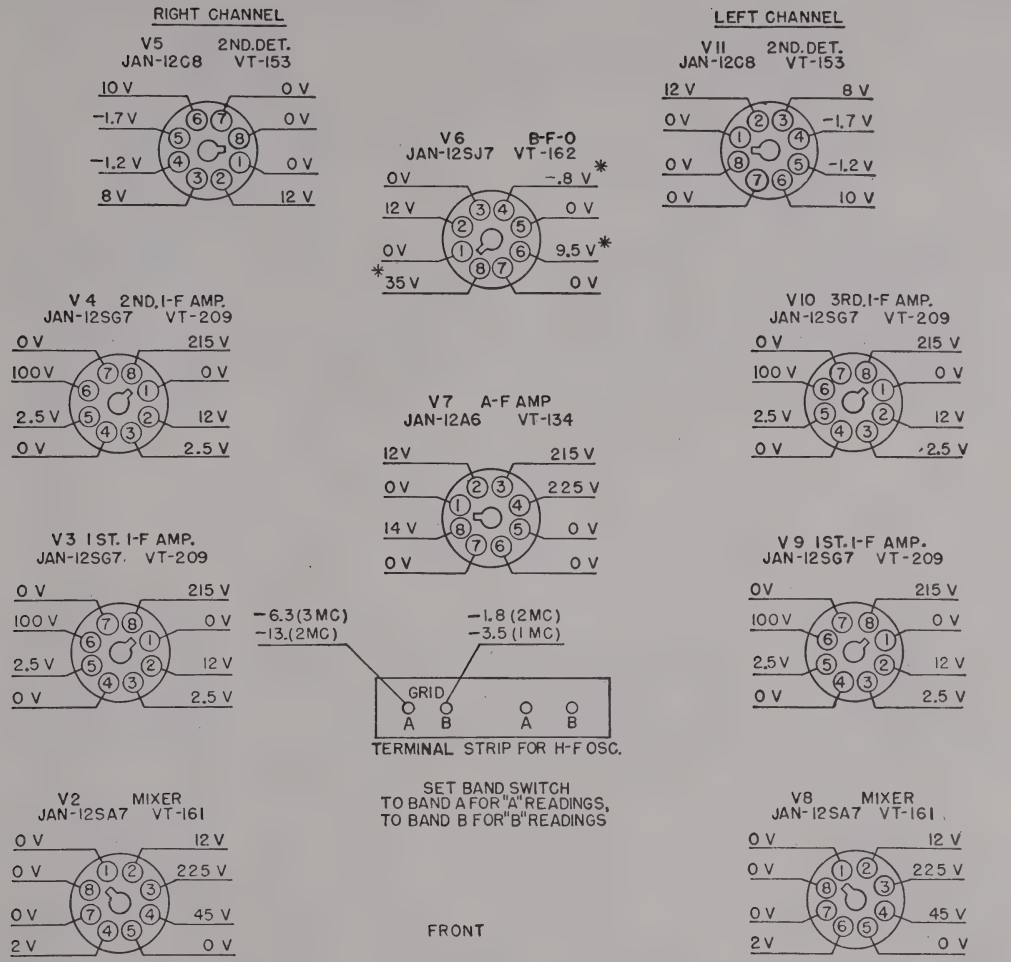
26. Oscillator and Loop Circuits

If the clues point to trouble in the oscillator circuit or in the loop circuits, check to see whether the oscillator is working. A d-c vacuum tube voltmeter or a 20,000-ohm-per-volt voltmeter should indicate a *negative* voltage on the grid of the h-f oscillator tube. If the oscillator is not working, check the tube and its d-c voltages. If it is working and the mixer tube operates from both mixer grids (Nos. 5 and 8 pins), the oscillator coupling capacitor to the defective channel may be open. Shunt this with a 50-mmf capacitor, and apply a radio-frequency signal of the proper frequency to the loop commutator prongs. Use the signal generator as a signal source.



① *Tube socket resistances.*

Figure 18. Radio Receiver BC-973-A.



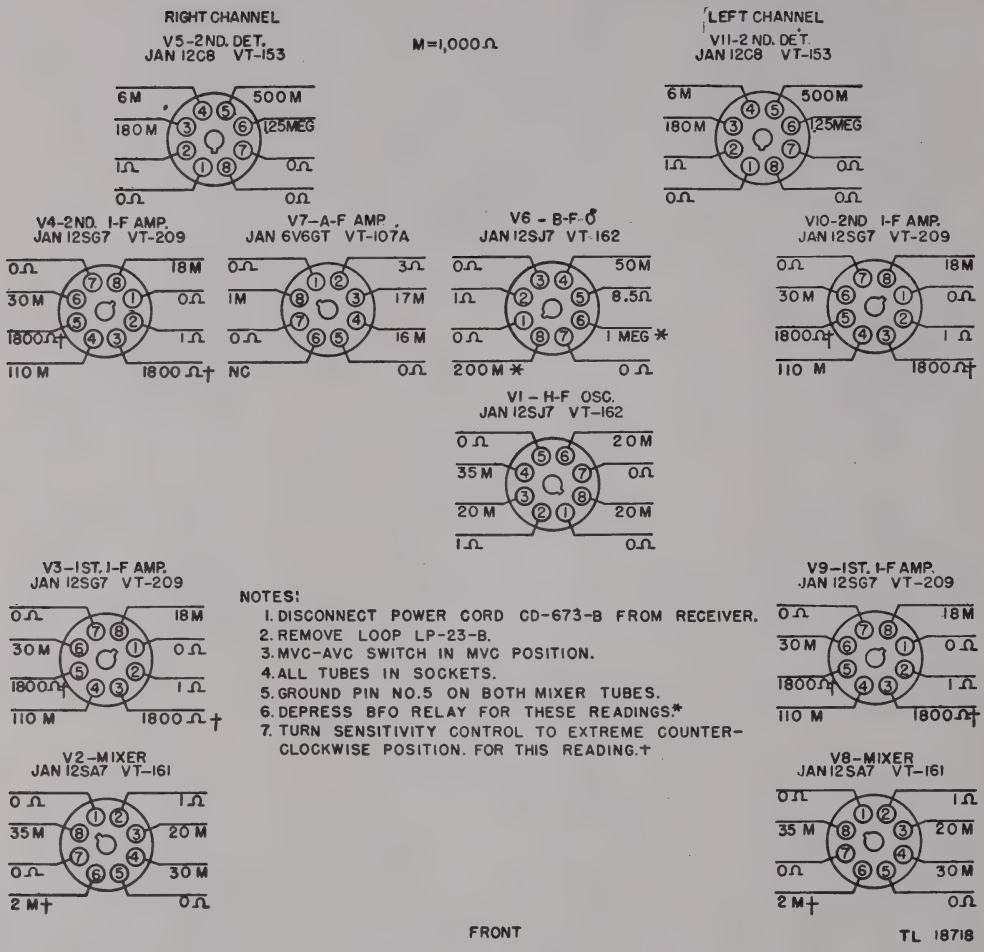
NOTES.

1 SENSITIVITY CONTROL AT MAXIMUM.
2 ZERO SIGNAL VOLTAGE.
3 MVC-AVC SWITCH IN MVC POSITION.
4 CW OSC SWITCH IN OFF POSITION.
5 CW OSC SWITCH MUST BE ON FOR THIS READING.*
6 METER SENSITIVITY OF 1000 OHMS PER VOLT.
7 A+ VOLTAGE 12 VOLTS.
8 B+ VOLTAGE 230 VOLTS.
9 PLATE (PIN NO 3) ON H-F OSCILLATOR 115 VOLTS

TL 19408

② *Tube socket voltages.*

Figure 18. Radio Receiver BC-973-A.

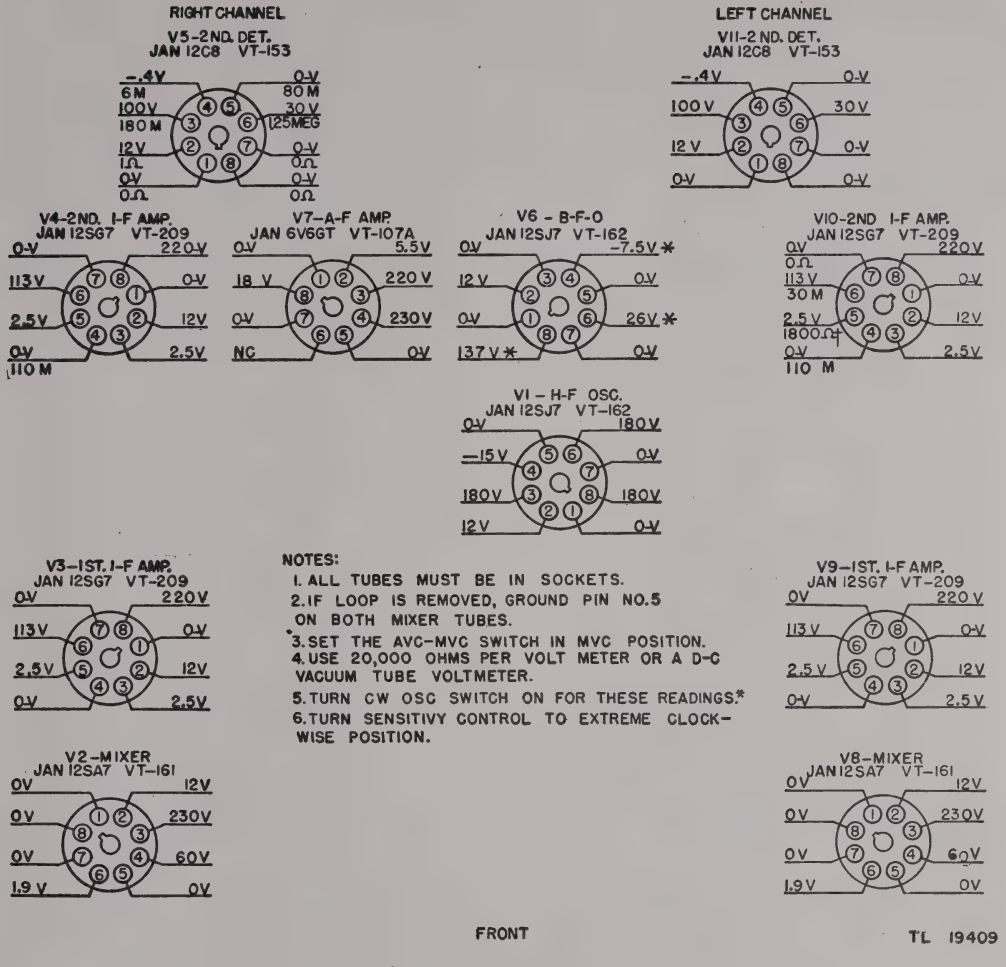


NOTES:

1. DISCONNECT POWER CORD CD-673-B FROM RECEIVER.
2. REMOVE LOOP LP-23-B.
3. MVC-AVC SWITCH IN MVC POSITION.
4. ALL TUBES IN SOCKETS.
5. GROUND PIN NO.5 ON BOTH MIXER TUBES.
6. DEPRESS BFO RELAY FOR THESE READINGS.*
7. TURN SENSITIVITY CONTROL TO EXTREME COUNTER-CLOCKWISE POSITION. FOR THIS READING.†

① *Tube socket resistances.*

Figure 19. Radio Receiver BC-973-B.



② *Tube socket voltages.*

Figure 19. Radio Receiver BC-973-B.

27. Charts of Socket Voltages and Resistances

The d-c voltages are made with the sensitivity control in the maximum position, the AVC-MVC switch in the MVC position, and the ON-OFF switch ON. The CW OSC. is OFF except for measurements on the c-w oscillator. There is no signal applied to the receiver. The loops should be in place for the voltage readings. If it is necessary to take voltage readings with the loops disconnected, short circuit *HI* and *LO* prongs for each loop on the commutator. (See fig. 20.)

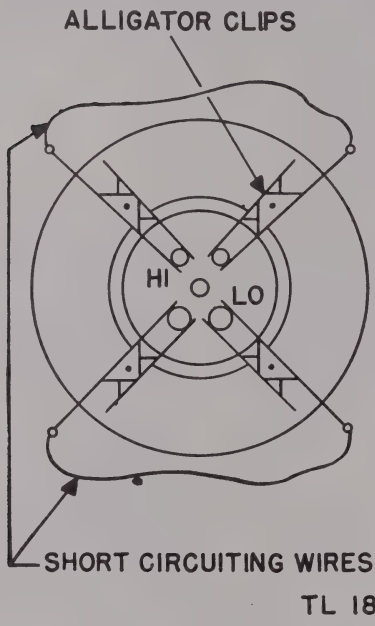


Figure 20. Short circuited loop commutator prongs.

28. Checking Automatic-volume-control (A–V–C) Operation

Assemble the loop antennas with the receiver for normal operation. Put the MVC-AVC switch in the MVC position and tune in a station. Rotate the loops until the pointers of the DIRECTION INDICATOR cross on the 0° line. Switch to AVC. The pointers should drop to approximately one-half of their previous deflection. If it is necessary to check the a-v-c operation without the loops in place, feed a signal from the signal generator into the grids of both mixer tubes, and proceed as above. This may be an r-f or an i-f signal of the proper frequency and voltage to give full deflection of the DIRECTION INDICATOR.

29. Checking Continuous-wave Oscillator

Tune in an unmodulated, c-w signal, and turn the CW OSC. switch ON. A 1,000-cycle, audible tone should be heard in the headset.

30. Moistureproofing, Fungiproofing, and Refinishing

After the receiver has been repaired and is functioning correctly, see TB 11–246–1 and moistureproof and fungiproof the equipment as instructed. If the receiver case has been scarred or chipped, remove any rough spots with fine sandpaper and repaint with a small brush. If the case is sufficiently scarred and scratched to warrant complete refinishing, remove receiver chassis from case, and remove all dirt and rust, with dry-cleaning solvent (SD) when necessary. Spray entire case with the proper paint in accordance with existing regulations.

Section VII

FINAL TESTING

31. Alignment Check

a. After repairs have been completed, and the unit has been moistureproofed and fungiproofed, make a final test to make certain that the unit is in proper condition for tactical use. Although the unit was correctly aligned during the repair procedure, a recheck of the alignment and performance are necessary after moisturproofing and fungiproofing have been completed.

b. Alignment must be checked on both bands A and B. This is done by connecting a four-turn loop to the signal generator as in the alignment procedure. The check frequencies for band A are 1,000 kc and 2,000 kc; for band B—2,000 kc and 3,000 kc.

c. Set the signal generator to the correct frequency for band A, with the receiver loops in place. Tune the receiver to the same frequency. Check the perfection of alignment as directed in paragraph 17*k*.

d. Repeat for the second frequency on band A.

e. Repeat procedures in *c* and *d* above for band B.

32. Modulated-continuous-waves (M–C–W) Sensitivity Test

a. PREPARATION. (1) Connect a loop antenna consisting of four turns of No. 18 enameled wire to the signal generator with a shielded cable. (This loop is made by winding four turns of No. 18 enameled wire on a 3-inch diameter coil form. The spacing between turns is equal to the diameter of the wire.) Fasten the loop to an insulating support 14 inches above the workbench. The turns of the loop must be in a vertical plane.

(2) Set up the field strength meter so that its antenna is 2 or 3 feet away from the loop. Measure the distance between the loop and the center of the antenna of the field strength meter, and record this distance.

(3) Turn on the signal generator and the field strength meter. Set the signal generator to 1.0 mc and tune the signal in on the field strength meter.

(4) Adjust the signal generator output so that the field strength meter indicates 27 microvolts per meter. Record the attenuator settings of the signal generator.

(5) Adjust the signal generator output so that the field strength meter reads 15 microvolts per meter. Record the attenuator settings of the signal generator.

(6) Repeat steps described in (4) and (5) above for the following frequencies: 1.5 mc, 2.0 mc, 2.6 mc, and 3.0 mc.

(7) Remove the field strength meter and place the assembled Radio Receiver BC–973–(*) with its loop antenna so that the center of the loop antenna is in exactly the same spot that the antenna of the field strength meter occupied.

(8) Turn the receiver on and set its controls to the following positions:

METER DAMP	to OFF
CW OSC.	to OFF
AVC-MVC	to MVC
VOLUME	to half on
SENSITIVITY	on full

(9) Plug a 4,000-ohm, 1-watt resistor into the output jack of the receiver and connect an a-c vacuum-tube voltmeter across the resistor.

(10) Turn the signal generator ON and the output to zero. Set the modulation controls to 30 percent modulation at 1,000 cps (or 400 cps).

b. TEST. (1) Set the signal generator to the first frequency as shown in table I and check with the frequency meter. Set the receiver to the same frequency.

(2) Tune the tuning dial of the receiver for maximum response, and increase the output of the signal generator carefully until the pointers of the direction indicator meet at the top of the 0° line. Press the PRESS TO BALANCE control and set the pointers on the 0° line. Release the PRESS TO BALANCE control and turn the receiver loops for pointer intersection on the 0° line.

(3) Read and record the signal generator output.

(4) Adjust the volume control until the output voltmeter reads 55 volts. *Do not disturb this setting again.*

(5) Repeat for all frequencies shown in the chart.

(6) Average the sensitivities for all frequencies taken. This average must be between 15 and 27 microvolts for rated deflection of the DIRECTION INDICATOR.

Table I

M–C–W SENSITIVITY CHART				Signal generator output
Band	Frequency (megacycles)	Direction indicator readings	Audio output voltage	
A	1.0	Rated deflection*	55 volts	Average of all six readings must be between 15 and 27 microvolts.
	1.5	Rated deflection*	55 volts	
	2.0	Rated deflection*	55 volts	
B	2.0	Rated deflection*	55 volts	
	2.6	Rated deflection*	55 volts	
	3.0	Rated deflection*	55 volts	

* Rated deflection of the DIRECTION INDICATOR occurs when the tips of the pointers intersect on the 0° line. Signal generator to be 30 percent modulated at 400 cycles or 1,000 cycles.

33. Continuous-wave Sensitivity Test

a. Set up the receiver the same as for the modulated-continuous-waves sensitivity test. Turn the modulation of the signal generator off, and set the frequency of the signal generator to the first check-point shown in table I. Tune the signal in on the receiver and turn the CW OSC. ON. Set the receiver VOLUME control to maximum. Remove the 4,000-ohm load from the receiver and plug in a Headset, HS–20–(*).

b. Adjust the signal generator output for rated deflection of the DIRECTION INDICATOR. Now reduce the output of the signal generator until the signal is no longer audible in the headset. At this point the meter pointers on the DIRECTION INDICATOR must have fallen to 35° or below.

34. Receiver Sensitivity Test

a. Proceed as in the m-c-w sensitivity test (par. 32) and leave the controls as described in paragraph 32*a*(8).

b. Adjust the signal generator to the first check point frequency shown in the selectivity chart, table II (1.0 mc).

c. Tune this signal in on the receiver, as for the sensitivity measurements, and record the signal generator output voltage for rated deflection. This is V in the third column of table II.

d. (1) Shift the signal generator frequency to the first frequency shown under $10 \times V$. Set the signal generator output voltage to $10 \times V_1$. The direction indicator should give rated deflection or less.

(2) Repeat for the second frequency in the column $10 \times V$.

e. Repeat procedure in *d* above for the two frequencies under the column $100 \times V$.

f. Repeat procedure in *d* above for the two frequencies in the column $1{,}000 \times V$.

g. Repeat procedure in *d*, *e*, and *f* above for all the check point frequencies listed in column 2 of the table.

Table II

SELECTIVITY CHART					
Band	Check-point frequency (mc)	Signal generator output for rated deflection* of DIRECTION INDICATOR at check-point frequency. Voltage—V	Signal generator frequency, above and below *check-point frequency*, produces rated deflection at signal generator output voltage of— $10 \times V$	$100 \times V$	$1{,}000 \times V$
A	1.0	V_1 (par. 34*c*)	995 kc and 1,005 kc	992.5 kc and 1,007.5 kc	990 kc and 1,010 kc
	1.5	V_2	1,495 kc and 1,505 kc	1,492.5 kc and 1,007.5 kc	1,490 kc and 1,510 kc
	2.0	V_3	1,995 kc and 2,005 kc	1,992.5 kc and 2,007.5 kc	1,990 kc and 2,010 kc
B	2.0	V_4	1,995 kc and 2,005 kc	1,992.5 kc and 2,007.5 kc	1,990 kc and 2,010 kc
	2.6	V_5	2,595 kc and 2,605 kc	2,592.5 kc and 2,607.5 kc	2,590 kc and 2,610 kc
	3.0	V_6	2,995 kc and 3,005 kc	2,992.5 kc and 2,007.5 kc	2,990 kc and 3,010 kc

Rated deflection of the DIRECTION INDICATOR occurs when the tips of the pointers intersect on the 0° line.

35. Audio Output Test

Adjust the receiver and signal generator as for the M–C–W SENSITIVITY TEST (par. 32*a* (8)), to give full deflection on the DIRECTION

INDICATOR. The a-c vacuum tube voltmeter at the receiver output must read 55 volts.

36. Sense Circuit Test

a. Connect the signal generator and receiver as for first sensitivity test on band A. (See table I.)

b. Tune in the signal and reduce the SENSITIVITY control until the pointers intersect about half way up the 0° line.

c. Extend the sense antenna. Adjust the position of the loops for the azimuth. (See par. 39*d.*)

d. Push the SENSE button. The intersection of the pointers should move to the left when the loop sights are pointed directly at the transmitting loop. The intersection should move to the right when the receiver loops are rotated 180° from this position.

e. Repeat for all frequencies shown in table I.

37. Dial Calibration

a. Set the signal generator at 1,000 kc. Set the completely assembled receiver to 1,000 kc on band A, and tune the receiver dial for maximum response.

b. The receiver dial must indicate between 995 kc and 1,005 kc. Repeat for the following frequencies:

Receiver band	Signal generator frequency	Acceptable readings on receiver dial
A	1,000	995 to 1,005 kc.
A	2,000	1,995 to 2,006 kc.
B	2,000	1,994 to 2,006 kc.
B	3,000	2,991 to 3,009 kc.

38. Tuning Curve (Wobble)

a. Set the signal generator and receiver to 2,000 kc with the SENSITIVITY control at maximum.

b. Tune in the signal and adjust the loop antenna for 0° indication on the DIRECTION INDICATOR.

c. De-tune the receiver both above and below resonance until the tips of the meter pointers fall to the 10° lines. Watch the meter pointer intersection carefully, noting the maximum deviation from the 0° line at all points. The maximum permissible deviations, and differences between deviations above resonance and below resonance are listed below.

Range of meter pointer deflection	Maximum deviation from 0° line
0°– 2°	½°
2°– 5°	1°
5°–10°	3°

d. If the intersections of the pointers above and below resonance lie on opposite sides of the 0° line, the receiver channels have not been aligned to the same frequency and the alignment should be checked.

39. Operational Test

a. GENERAL. Connect the power supply, headset, loop antennas, and sense antennas.

b. TUNING IN A STATION OF KNOWN FREQUENCY. (1) Throw the ON-OFF power switch to the ON position.

(2) Throw the LIGHTS-OFF switch to LIGHTS if you need light. Leave the METER DAMP-OFF and CW OSC.-OFF switches on OFF when tuning in a modulated signal.

(3) Throw the AVC-MVC switch to AVC.

(4) Turn the SENSITIVITY control up to 10.

(5) Adjust the VOLUME control to maximum, or to a comfortable volume level for understandable reception, by turning the knob in a clockwise direction.

(6) Set the frequency band switch to the proper frequency range, and tune in the desired station by turning the frequency dial to the correct frequency. *If you cannot locate the transmitter immediately, search a few kilocycles above and below the proper dial frequency.*

(7) If the meter pointers of the DIRECTION INDICATOR go off scale (which usually happens, except in the case of very weak stations) reduce the sensitivity immediately by turning the SENSITIVITY control knob in a counterclockwise direction, until the pointers intersect near the center of the dial.

(8) Turn the AVC-MVC switch to MVC, and readjust the SENSITIVITY control if necessary.

(9) Readjust the frequency dial for maximum DIRECTION INDICATOR deflection (resonance) which indicates correct tuning for the station. TUNE IN THE STATION ACCURATELY.

(10) If the desired station is sending c-w signals, turn the beat oscillator switch to CW OSC. If the code is being sent slowly it is also necessary to throw the METER DAMP-OFF switch to METER DAMP. This meter damping reduces the amount of pointer fluctuation due to the code signal.

c. Tuning in an Unknown Station. (1) Set the AVC-MVC switch to AVC, the SENSITIVITY at maximum and the VOLUME CONTROL as high as the noise level will permit.

(2) Tune over the band very carefully. Watch the pointers of the DIRECTION INDICATOR. If they go off scale as the station is tuned in, reduce the SENSITIVITY control setting.

(3) Throw the AVC-MVC switch to MVC and readjust the SENSITIVITY control if necessary.

d. Taking An Azimuth Reading. (1) Tune in the station very carefully.

(2) Adjust the SENSITIVITY control so that the pointers on the DIRECTION INDICATOR cross on the upper half of the meter scale.

(3) MAKE SURE THAT THE AVC-MVC SWITCH IS ON MVC.

(4) Press the PRESS TO BALANCE control knob. If the pointers collapse, the direction or azimuth is incorrect by 90°. Turn the loops 90°. The pointers will again intersect on the 0° line, but they will not collapse when the PRESS TO BALANCE control knob is depressed.

(5) Push the PRESS TO BALANCE control knob in and turn it clockwise or counterclockwise until the pointers intersect on the 0° center line. The gain in the two channels of the receiver is then balanced. Release the control knob and if the pointers do not cross on the 0° line, ROTATE THE LOOP ASSEMBLY UNTIL THEY DO, MAKING CERTAIN THAT THE POINTERS CROSS EXACTLY ON THE 0° LINE WHEN THE PRESS TO BALANCE CONTROL KNOB IS DEPRESSED. IF NECESSARY, REPEAT BALANCE AND LOOP ADJUSTMENTS. The azimuth scale will now indicate in degrees either the direct or the reciprocal azimuth.

(6) Extend the vertical sense antenna.

(7) Press the SENSE button, and if the intersection of the pointers swings to the left (marked DIRECT above the meter), the loop sights are sighting directly toward the transmitter. Read the angle on the lower white azimuth scale. If, on the other hand, the pointer intersection swings to the right (marked RECIP'L) above the meter, the loop sights are pointing directly away from the transmitter. Read the correct angle on the upper small red reciprocal scale. It is possible to rotate the loop 180° and read this same angle on the white scale.

e. Testing for Noise and Microphonic Conditions. (1) Tune in a signal.

(2) Tap the set repeatedly, in various places, with a padded mallet and listen for cutting off of the signal, extraneous noises indicative of loose contacts or microphonic conditions. None of these should be present. *Do not strike set hard enough to damage it.*

(3) Repeat procedure described in *e* above while listening to a C.W. signal with the CW OSC. turned on.

f. Testing the Meter Damp Circuit. Turn the METER DAMP switch ON while listening to a keyed c-w signal. The meter pointers should become very sluggish in their motion. With the METER DAMP switch turned OFF, the pointers will follow the keying of the signal. Tune the receiver to the signal generator. Turn the METER DAMP switch on and off. There must be no change of bearing indicated on the DIRECTION INDICATOR as the METER DAMP switch is turned on and off. Any change on the DIRECTION INDICATOR shows a defective electrolytic capacitor in the meter-damp circuit.

Section VIII

INDIVIDUAL STAGE AND CIRCUIT REPAIR DATA

40. General

a. After localizing the trouble to a particular stage, the defective part or parts in that particular stage can be located by a socket voltage and resistance test.

b. The part numbers are stamped on the chassis or on the part itself. This, in conjunction with the schematic and picture diagrams, will enable the repairman to locate the defective component in the stage.

c. Keep the following points in mind before disconnecting any defective component:

(1) If the d-c electrode voltage on a tube element is low, such as the cathode, screen, or plate voltage, and the resistance (with power turned off) to ground at these points is also low, it is most likely due to a leaky bypass capacitor. When measuring the d-c resistance of a circuit containing an electrolytic capacitor, try reversing the ohmmeter test leads. The correct reading is the one indicating the higher d-c resistance.

(2) A resistor which has been overheated, discolored, or cracked, may have changed value. If it is cracked, it must be replaced; if overheated or discolored, it should be disconnected and measured with an ohmmeter.

(3) Locate and correct the cause for an overloaded resistor before turning the power on with a new one in place. Overloading may be caused by a shorted capacitor, coil, or vacuum tube connected to the resistor.

(4) A capacitor from which the oil or electrolyte has leaked out should be replaced.

(5) Never cut the leads off a resistor or capacitor since you may have to use it again if it proves to be good.

41. Intermediate-frequency (I-F) Transformer Replacement

a. If an i-f transformer proves to be defective, do not try to repair it. The entire transformer including coils, capacitors, and resistors must be replaced by one which will match the corresponding transformer of the other channel in bandwidth and amplification, otherwise it will be impossible to balance the receiver.

b. Whenever an i-f transformer has been replaced, line up the set very carefully. Check the sensitivity and bandwidth of both channels. These should be identical. If the bandwidth is not the same for both channels, the intersection of the pointers of the DIRECTION INDICATOR will not follow the 0° line as the receiver is tuned through a station, or as the signal generator frequency is rocked about the receiver frequency. WHENEVER POSSIBLE, THE CORRESPONDING I-F TRANSFORMERS OF BOTH CHANNELS SHOULD BE REPLACED SIMULTANEOUSLY, TO INSURE BALANCE OF THE RECEIVER.

42. Abbreviations

The following abbreviations are used on the diagrams which follow:

Ω = ohm
M = 1,000 ohms
MEG = megohm
MF = microfarad
MMF = micromicrofarad
SW. = switch
BAL. = balance

43. Voltage and Resistance Measurements

a. RECEIVER BC–973–A. (1) All voltage measurements are made with a 1,000 ohm-per-volt voltmeter.

(2) The front panel controls are set as follows:

SENSITIVITY	at maximum
MVC-AVC SW.	at MVC
CW OSC. SW.	at OFF; set to ON only when checking the beat-frequency oscillator

(3) There must be no signal voltage applied to the receiver.

A + voltage = 12 volts
B + voltage = 230 volts

(4) All voltages and resistances are measured between the test point and chassis.

(5) All resistance measurements are made with the dynamotor connected and power off. The front panel controls are set as for the voltage measurements in (2) above.

b. RECEIVER BC–973–B. (1) All voltage measurements are made with a 20,000 ohm-per-volt voltmeter, or with a d-c vacuum tube voltmeter (electronic voltmeter).

(2) The front panel controls are set as follows:

SENSITIVITY	at maximum
MVC-AVC SW.	at MVC
CW OSC.	at OFF; set to ON only when checking the beat-frequency oscillator

(3) There must be no signal voltage applied to the receiver.

A + voltage = 12 volts
B + voltage = 230 volts

(4) All voltages and resistances are measured between the test point and chassis.

(5) All resistance measurements are made with the dynamotor disconnected from the receiver. The front panel controls are set as for the voltage measurements in (2) above.

44. A-F Amplifier, Radio Receiver BC-973-A (fig. 21)

a. SPECIAL CIRCUIT FEATURES. The a-f amplifier consists of a Tube JAN-12A6 and transformer coupled to the output jack. The volume control is in the secondary of the output transformer. See paragraphs 42 and 43 for voltage and resistant measurements.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
36–6	3DA2–66	CAPACITOR, fixed: 0.002-mf; ±10%; 500-vdcw.	Bypass audio plate.
38–3	3DA100–112.1	CAPACITOR, fixed: 0.1-mf; ±20%; 400-vdcw.	Audio amplifier grid coupling.
41–3	3DB25–11	CAPACITOR, fixed: 25-mf; 25-volt dcw; electrolytic.	Cathode bypass, audio amplr.
2a	2Z7284.63	RESISTOR, variable: wire-wound; 20,000-ohm; ±20%; 2 watt; "dual control" with variable resistor ref No. 2b and switch ref No. 3.	Volume (audio gain) control.
8	3RC31AE102J	RESISTOR, fixed: carbon composition element; ceramic coating; 1,000-ohm; ±5%; 1-watt.	Cathode bias of audio amplr.
17–3	3RC20AE514J	RESISTOR, fixed: carbon composition element; ceramic coating; 500,000-ohm; ±5%; ½-watt.	Grid leak audio amplr.
44	2Z9632.174	TRANSFORMER, audio; primary 7,500 ohms; secondary 4,000 ohms tapped at 250 ohms.	Audio output.
56–1	2Z5534A	JACK, phone: single open circuit; Signal Corps Type JK–34–A.	Receptacle for headset plug or patch cord plug.
V7	2J12A6–	TUBE: JAN 12A6 (VT–134).	

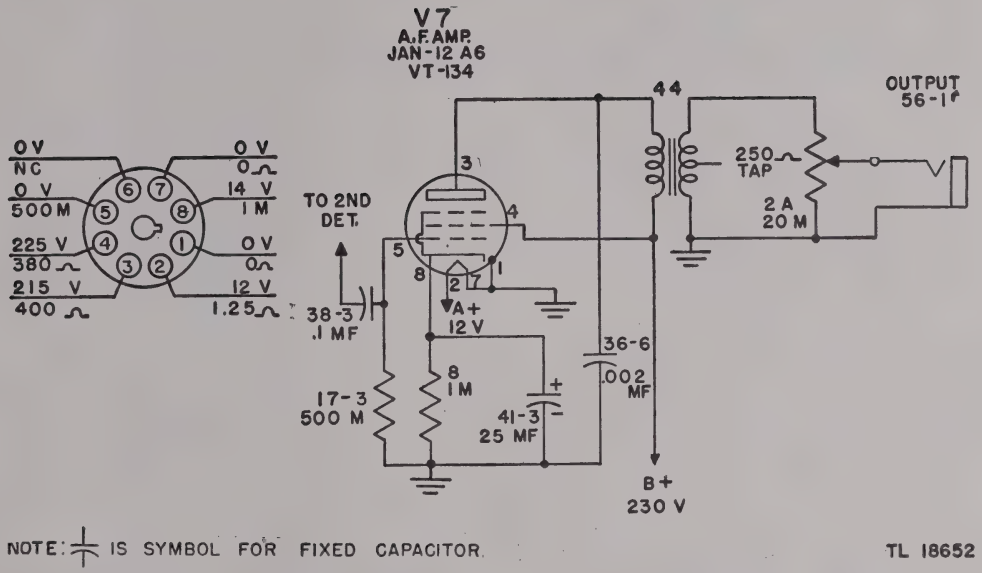


Figure 21. Radio Receiver BC-973-A, audio-frequency amplifier circuit diagram and voltage and resistance measurements. (See pars. 42 and 43 for test conditions.)

45. Second Detector, Radio Receiver BC-973-A (fig. 22)

a. SPECIAL CIRCUIT FEATURES. The second detectors use i-f transformers with two secondaries and Tubes JAN-12C8. One diode circuit in each channel supplies current for one coil of the DIRECTION INDICATOR (bearing meter). The second diodes supply the AVC circuit. The pentode section is arranged as a grid leak detector. See paragraph 41 for transformer replacement.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
28–3	3D9100–95.1	CAPACITOR, fixed: mica; 100-mmf; ±10%; 500-vdcw; bakelite case.	R-f filter bypass 2d detector plate, left.
28–4		Same as 28–3.	R-f filter bypass 2d detector plate, right.
36–3	3DA2–66	CAPACITOR, fixed: mica; 0.002-mf; ±10%, 500-vdcw; bakelite case.	Plate filter, 2d detector, left.
36–4		Same as 36–3.	Plate filter, 2d detector, right.
40–4	3DA500–182	CAPACITOR, fixed: paper; 0.5-mf; ±10%; 400-vdcw.	Decoupling of 2d detector plate.
14–1	3RC20AE753J	RESISTOR, fixed: carbon composition element; ceramic coating; 75,000-ohm; ±5%; ½-watt.	Plate filter, 2d detector, left.
14–2		Same as 14–1.	Plate filter, 2d detector, right.
14–3		Same as 14–1.	Plate filter 2d detector.
14–4		Same as 14–1.	Plate filter, 2d detector.
17–4	3RC20AE514J	Same as 14–1 except 500,000 ohm.	Drops screen 2d detector, left and right.
103–1 and 103–2	2Z9641.105	TRANSFORMER, i-f: 458 kc; 3d i-f and diode; matched pair.	3d i-f transformers, left and right channel.
V–5	2J12C8	TUBE: JAN 12C8 (VT–153).	2nd detector right channel.
V–11		Same as V–5.	2nd detector left channel.

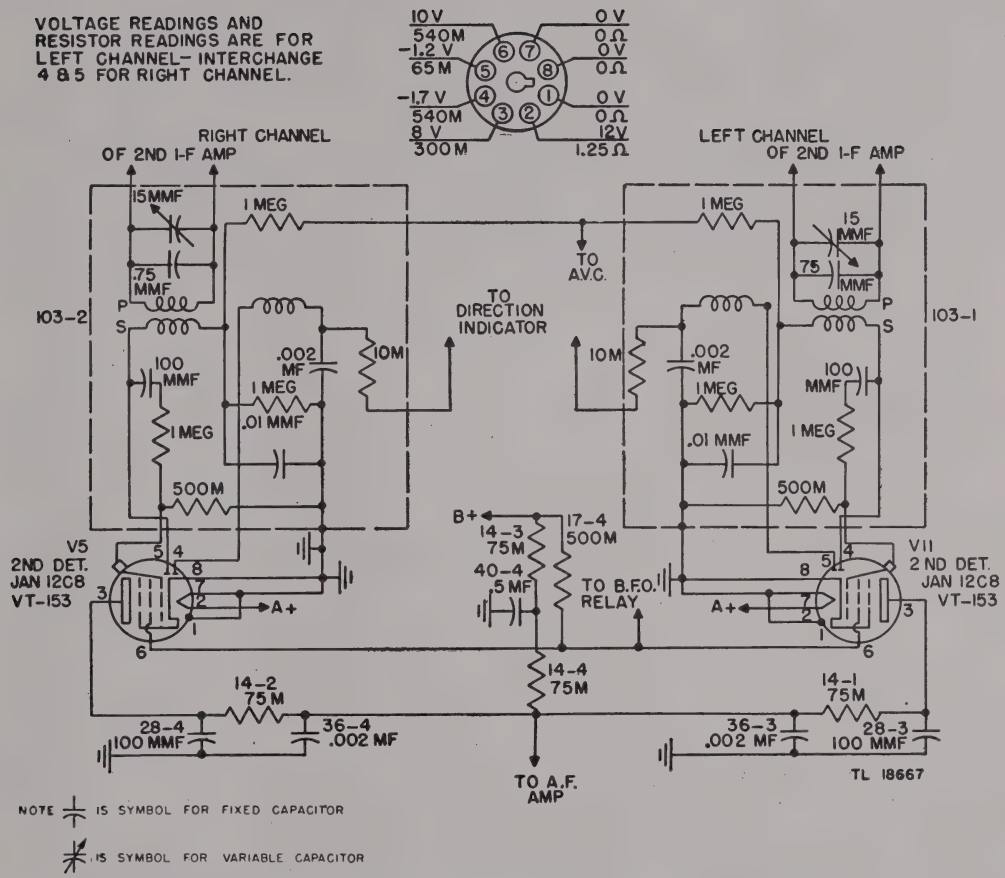


Figure 22. Radio Receiver BC-973-A, second detector circuit diagram and voltage and resistance measurements. (See pars. 42 and 43 for test conditions.)

46. Beat Frequency Oscillator, Radio Receiver BC-973-A (fig. 23)

a. SPECIAL CIRCUIT FEATURES. The beat-frequency oscillator (bfo) is an electron-coupled oscillator coupled to the screen circuits of both second detector tubes. It is turned on by a relay controlled from a switch on the front panel. The CW OSC. switch must be ON when the grid, screen, and plate voltage of the bfo tube are measured.

b. PARTS LIST.

Ref No.	Signal Corps stock No	Name of part and description	Function
37–3	3DA10–50	CAPACITOR, fixed: 0.01-mf; ±10%; 300-vdcw; bakelite case.	Bypass, screen, b-f-o.
38–4	3DA100–112.1	CAPACITOR, fixed: 0.1-mf; ±20%; 400-vdcw.	Plate coupling b-f-o or VT153 screen bypass.
16–1	3RC20AE154J	RESISTOR, fixed: carbon; 150,000-ohm; ±5%; ½-watt.	Drops plate voltage (bfo).
18–8	3RC20AE105J	Same as 16–1, except 1 megohm.	Drops screen voltage (bfo).
105	2Z9644.18	COIL, radio: r-f; b-f-o; 458-kc; in can.	Coil assembly bfo.
67	2Z7588–38	RELAY, general purpose: DPDT; coil, 12-volt dc, 150-ohm; 0.08-amp.	Bfo switch circuit.
62–2	3Z9849.10–2	SWITCH, toggle SPST: 3-amp; 250-volt.	Cw osc.
V6	2J12SJ7	TUBE: JAN 12SJ7 (VT 162).	Beat-frequency oscillator tube.

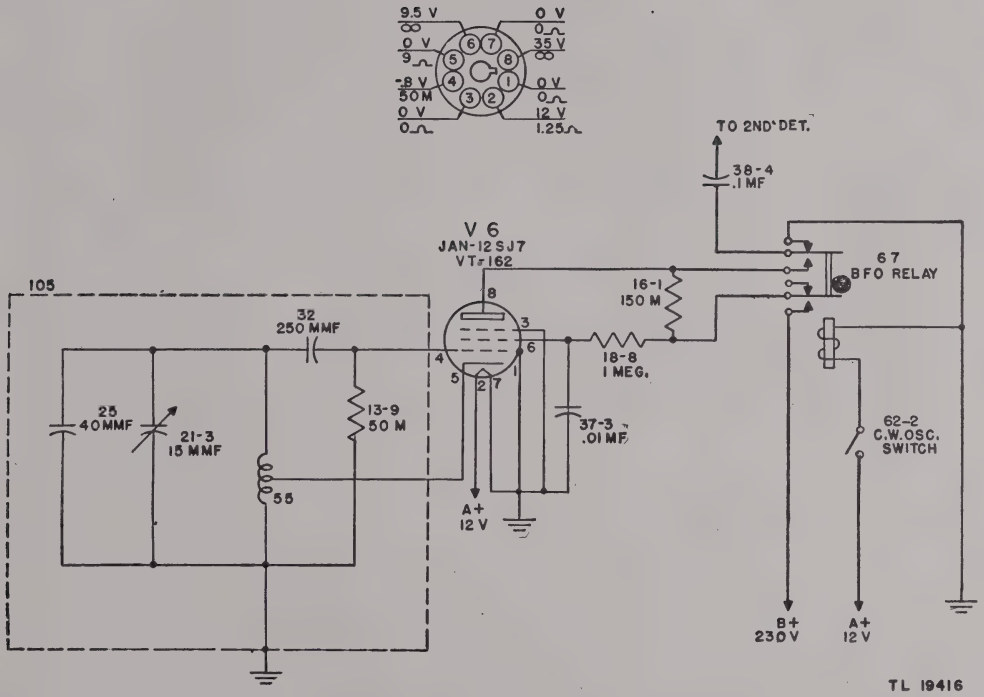


Figure 23. Radio Receiver BC–973–A, beat-frequency oscillator circuit diagram and voltage and resistance measurements. (See pars. 42 and 43 for test conditions.)

47. Direction Indicator, Radio Receiver BC-973-A (fig. 24)

a. SPECIAL CIRCUIT FEATURES. The direction indicator consists of two moving coil microammeters in a single case. The current for the meters is supplied by the second detectors. The two channels are balanced by the balance control. Provision is made to switch an electrolytic condenser across each meter coil, for use with i-c-w signals.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
38–1	3DA100–112.1	CAPACITOR, fixed: paper, 0.1-mf; ±20%; 400-vdcw.	Meter bypass, left.
38–2		Same as 38–1.	Meter bypass, right.
42–1	3DB500–16	CAPACITOR, fixed: electrolytic, 500-mf, ±75%, −0%; 6-v dc, metal case.	Meter damping, right movement.
42–2		Same as 42–1.	Meter damping, left movement.
2b	2Z7284.63	RESISTOR, variable: wire-wound; 60,000-ohm; 2-watt; in "dual control" with variable resistor ref No. 2a, switch ref No. 3.	Balance output circuits.
13–12	3RC20AE513J	RESISTOR, fixed: carbon composition element, ceramic coating; 50,000-ohm; −5%; 12-watt.	Bleeder, right movement, meter circuit
13–13		Same as 13–12.	Bleeder, left movement, meter circuit
43	3F3308	AMMETER, dc. 0–100 microamps; 2% accuracy; 2 D'Arsonval movements.	Direction indicator.
59		PLUG: 4-pin; standard insulation; AN 3106 14S–2F	Connects meter to meter receptacle in chassis.
60	2ZK7114.21	RECEPTACLE: 4 pin; standard insulation; 4 pins are cut down from 1 inch to 7/8 inch over-all; AN3106 14S2P	Receptacle for direction indicator meter.
64–2	3Z9849.30–1	SWITCH: DPST; toggle, rear lug type, 3 amps, 250 volts; bakelite case.	Meter damp on and off.

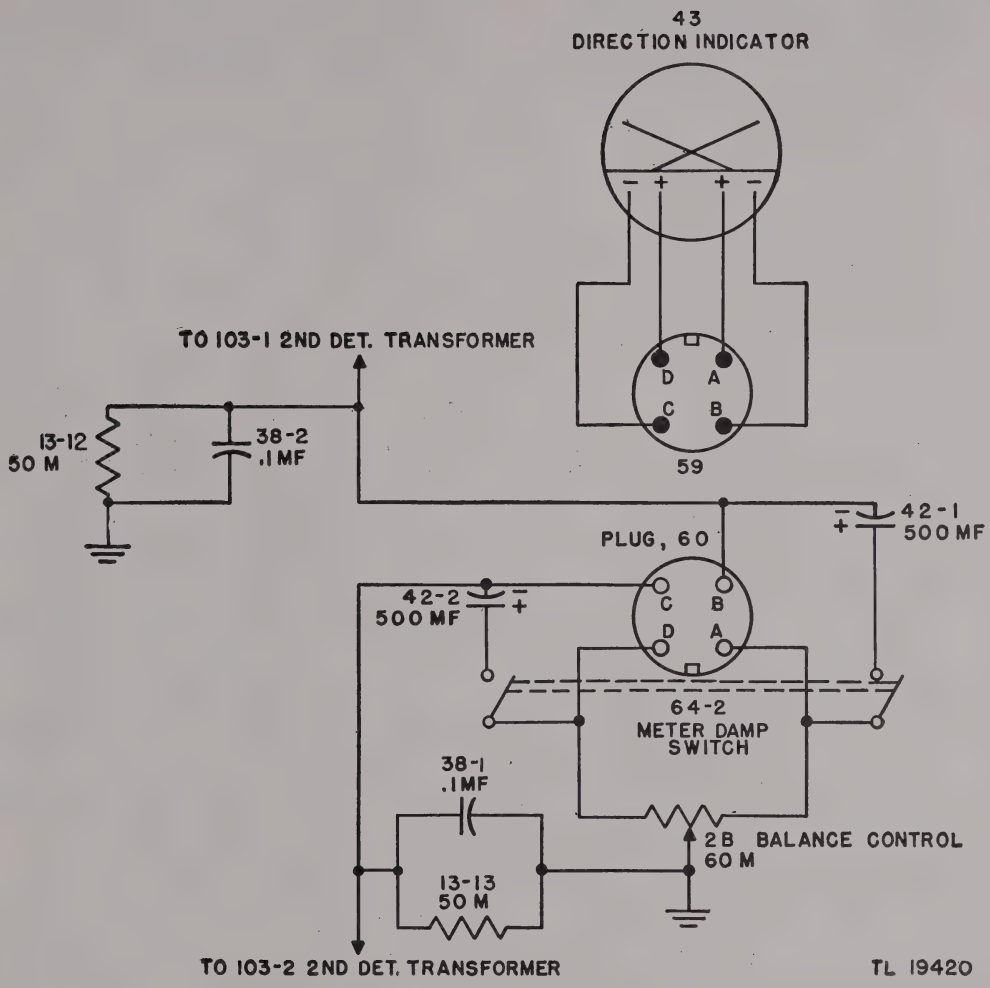


Figure 24. Radio Receiver BC–973–A, direction indicator circuit diagram. (See pars. 42 and 43 for test conditions.)

48. Second I-F Amplifier, Radio Receiver BC-973-A (fig. 25)

a. SPECIAL CIRCUIT FEATURES. The second i-f amplifiers are standard transformer coupled circuits using Tube JAN-12SG7. See paragraph 41 for transformer replacement.

b. PARTS LIST.

Ref No.	Signal Corps stock No	Name of part and description	Function
39–7b	3DA100–206	CAPACITOR, fixed: paper, 2 sections each, 0.1-mf; ±10%; 400-vdcw.	Bypass, 2d i-f grid, left.
39–8b		Same as 39–7b.	Bypass, 2d i-f grid, right.
39–9a		Same as 39–7b.	Bypass, 2d i-f cathode left.
39–10a		Same as 39–7b.	Bypass, 2d i-f cathode right.
39–9b		Same as 39–7b.	Bypass, 2d i-f screen left.
39–10b		Same as 39–7b.	Bypass, 2d i-f screen right.
40–1	3DA500–182	CAPACITOR, fixed: paper; 0.5-mf; ±10%; 400-vdcw.	Bypass 2d i-f plate, left.
40–2		Same as 40–1.	Bypass, 2d i-f plate, right.
6–3	3RC20AE–301J	RESISTOR, fixed: carbon composition element; ceramic coating; 300-ohm; ±5%; ½-watt.	Cathode bias 2d i-f amplr left.
6–4		Same as 6–3.	Cathode bias 2d i-f amplr right.
9–5	3RC20AE202J	RESISTOR, fixed: carbon composition element; ceramic coating; 2,000-ohm; ±5%, ½-watt.	Plate decoupling resistor, 2d i-f, left.
9–6		Same as 9–5.	Plate decoupling resistor, 2d i-f, right.
12–5	3Z6635–9	RESISTOR, fixed: carbon composition element; ceramic coating; 35,000-ohm; ±5%, ½-watt.	Screen dropping resistor, 2d i-f amplr left.
12–6		Same as 12–5.	Screen dropping resistor, 2d i-f amplr right.
13–5	3RC20AE513J	Same as 12–5, except 50,000-ohm.	Screen bleeder 2d i-f, left.
13–6		Same as 13–5.	Screen bleeder 2d i-f, right.
15–5	3RC20AE104J	Same as 12–5, except 100,000-ohm.	Grid decoupling, 2d i-f amplr left.
15–6		Same as 15–5.	Grid decoupling, 2d i-f amplr right.
120–3	3RC21AE101J	RESISTOR, fixed: carbon; insulated; 100-ohm; ½-watt; ±5% tolerance.	2d i-f cathode, left.
120–4		Same as 120–3.	2d i-f cathode, right.
102–1 and 102–2	2Z9641 104	TRANSFORMER, i-f: 458-kc; matched pair.	2d i-f transformer, left and right channel.
V4	2J12SG7	TUBE: JAN 12SG7 (VT–209).	2d i-f amplifier tube, right.
V10	2J12SG7	TUBE: JAN 12SG7 (VT–209).	2d i-f amplifier tube, left.

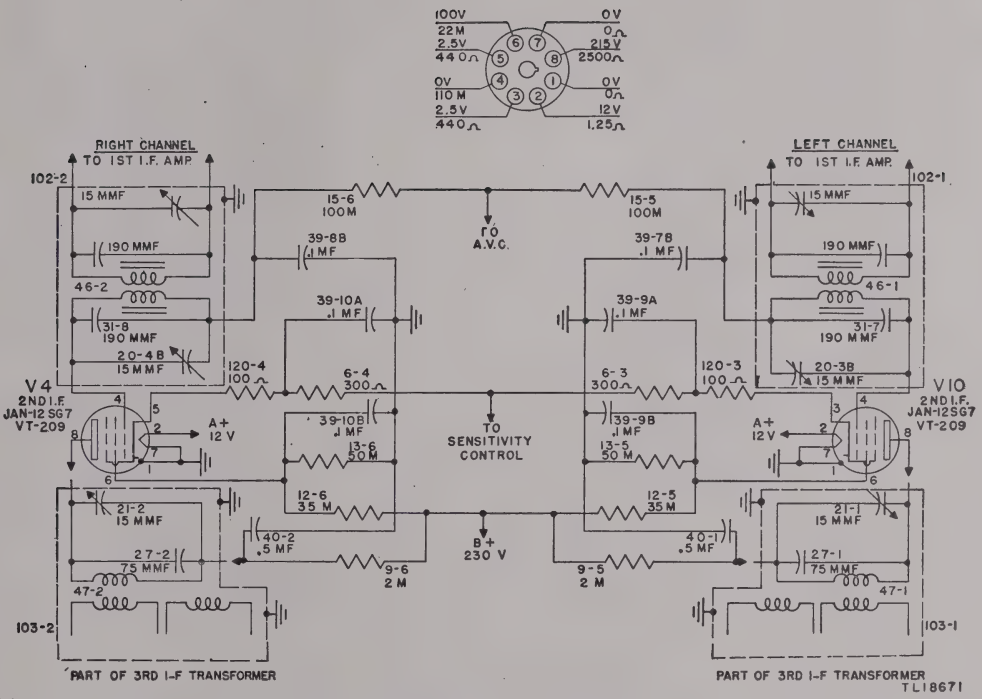


Figure 25. Radio Receiver BC–973–A, second i-f amplifier circuit diagram and voltage and resistance measurements. (See pars. 42 and 43 for test conditions.)

49. First I-F Amplifier, Radio Receiver BC-973-A (fig. 26)

a. SPECIAL CIRCUIT FEATURES. The 1st i-f amplifiers are standard transformer coupled circuits using Tube JAN-12SG7. See paragraph 41 for transformer replacement.

b. PARTS LIST.

Ref No	Signal Corps stock No	Name of part and description	Function
39–3b	3DA100–206	CAPACITOR, fixed: paper; 2-section, each 0.1 mf; ±10%; 400-vdcw.	Bypass, 1st i-f grid, left.
39–4b		Same as 39–3b.	Bypass, 1st i-f grid, right.
39–5a		Same as 39–3b.	Bypass, 1st i-f cathode, left.
39–6a		Same as 39–3b.	Bypass, 1st i-f cathode, right.
39–5b		Same as 39–3b.	Bypass, 1st i-f screen, left.
39–6b		Same as 39–3b.	Bypass, 1st i-f screen, right.
39–7a		Same as 39–3b.	Bypass, 1st i-f plate, left.
39–8a		Same as 39–3b.	Bypass, 1st i-f plate, right.
6–1	3RC20AE301J	RESISTOR, fixed: carbon composition element; ceramic coating; 300-ohm; ±5%; ½-watt.	Cathode bias 1st i-f amplr left.
6–2		Same as 6–1.	Cathode bias 1st i-f amplr right.
9–3	3RC20AE202J	RESISTOR, fixed: carbon composition element ceramic coating; 2,000-ohm; ±5%; ½-watt.	Plate decoupling resistor, 1st i-f amplr left.
9–4		Same as 9–3.	Plate decoupling resistor, 1st i-f amplr right.
12–3	3Z6635–9	RESISTOR, fixed: carbon composition element ceramic coating; 35,000-ohm; ±5%; ½-watt.	Screen dropping resistor, 1st i-f amplr left.
12–4		Same as 12–3.	Screen dropping resistor 1st i-f amplr right.
13–3	3RC20AE513J	Same as 13–2, except 50,000-ohm.	Screen bleeder 1st i-f, left.
13–4		Same as 13–3.	Screen bleeder 1st i-f, right.
15–3	3RC20AE104J	Same as 12–3, except 100,000-ohm.	Grid decoupling 1st i-f, amplr left.
15–4		Same as 15–3.	Grid decoupling 1st i-f amplr right.
120–1	3RC21AE101J	RESISTOR, fixed: carbon; insulated; 100-ohm; ±5% tolerance; ½-watt.	1st i-f cathode, left.
120–2		Same as 120–1.	1st i-f cathode, right.
101–1 and 101–2	2Z9641.103	TRANSFORMER, i-f: 458-kc; matched pair.	1st i-f transformers, left and right channels.
V3	2J12SG7	TUBE: JAN 12SG7 (VT–209).	1st i-f amplifier tube, right.
V9	2J12SG7	TUBE: JAN 12SG7 (VT–209).	1st i-f amplifier tube, left.

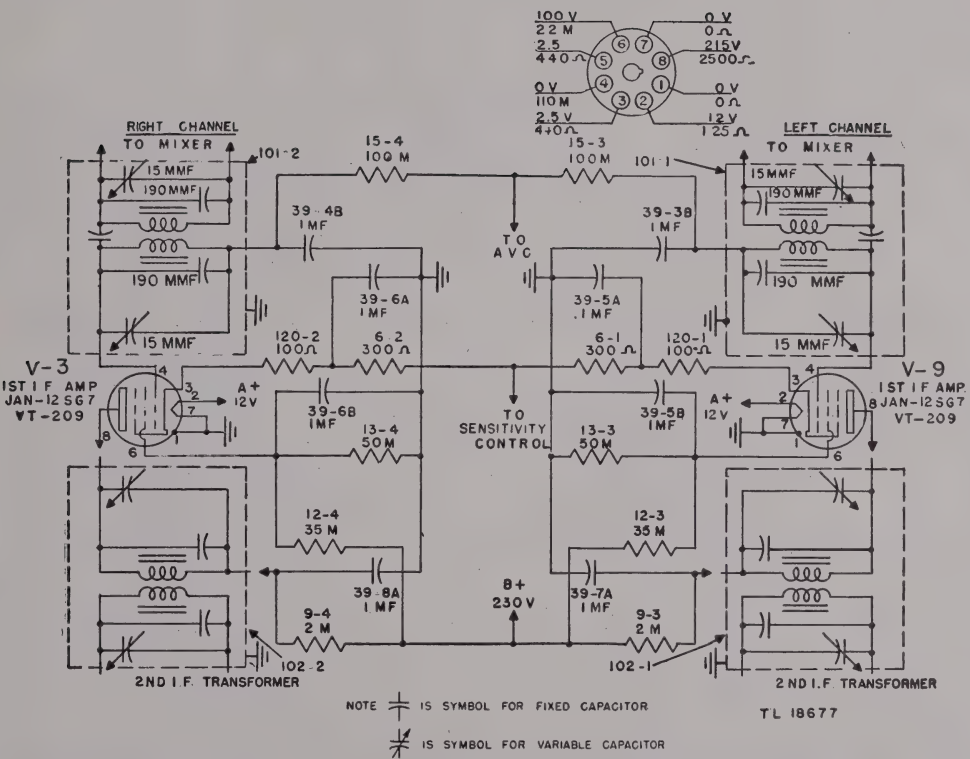


Figure 26. Radio Receiver BC-973-A, first i-f amplifier circuit diagram and voltage and resistance measurements. (See pars. 42 and 43 for test conditions.)

50. Mixer Stage, Radio Receiver BC-973-A (fig. 27)

a. SPECIAL CIRCUIT FEATURES. Both mixer tubes get their h-f oscillator voltage from one local oscillator. The plate circuits contain the 1st i-f transformers. The signal grid circuits of each mixer contain a tuning condenser and one loop antenna. A four-gang wafer switch changes the grid circuits of the mixer tubes for band switching. See paragraph 41 for transformer replacement.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
19–a	3D9600V–1	CAPACITOR, variable; air dielectric; 4-section; 600-, 120-, 400-, 600-mmf (part of).	Main tuning 600 mmf. capacitor (loop tuning).
19–d		Same as 19–a.	Main tuning 600 mmf. capacitor (loop tuning).
26–1	3D9050–13	CAPACITOR, fixed: silver mica; 50-mmf; ±2%; 500-vdcw.	Couples h-f osc to injector grid, left.
26–2		Same as 26–1.	Couples h-f osc to injector grid, right.
39–1a	3DA100–206	CAPACITOR, fixed: paper; 2-section, each 0.1-mf; ±10%; 400-volt dc.	Bypass, mixer cathode left.
39–2a		Same as 39–1a.	Bypass, mixer cathode right.
39–1b		Same as 39–1a.	Bypass, mixer screen, left.
39–2b		Same as 39–1a.	Bypass, mixer screen, right.
39–3a		Same as 39–1a.	Bypass, mixer plate, left.
39–4a		Same as 39–1a.	Bypass mixer plate, right.
7–1	3RC20AE511J	RESISTOR, fixed: carbon composition element; ceramic coating; 500-ohm; ±5%; ½-watt.	Cathode bias detector mixer, left.
7–2		Same as 7–1.	Cathode bias detector mixer, right.
9–1	3RC20AE202J	RESISTOR, fixed: carbon composition element; ceramic coating; 2,000-ohm; ±5%; ½-watt.	Plate decoupling resistor, detector mixer left.
9–2		Same as 9–1.	Plate decoupling resistor, detector mixer right.
12–1	3Z6635–9	RESISTOR, fixed: carbon composition element; ceramic coating; 35,000-ohm; ±5%; ½-watt.	Grid leak of left detector mixer injector left.
12–2		Same as 12–1.	Grid leak of right detector mixer injector right.
13–1	3RC20AE513J	Same as 12–1, except 50,000-ohm.	Screen bleeder detector mixer, right.
13–2		Same as 13–1.	Screen bleeder detector mixer, left.
13–11		Same as 13–1.	Drops screen voltage detector mixer, left.
13–10		Same as 13–1.	Drops screen voltage detector mixer, right.
101–1 and 101–2	2Z9641.103	TRANSFORMER, i-f: 458–kc; matched pair.	1st i-f transformer, left and right channels.
V2 and V8		TUBES: JAN 12SA7 (VT–161).	Right and left channel mixer tubes.

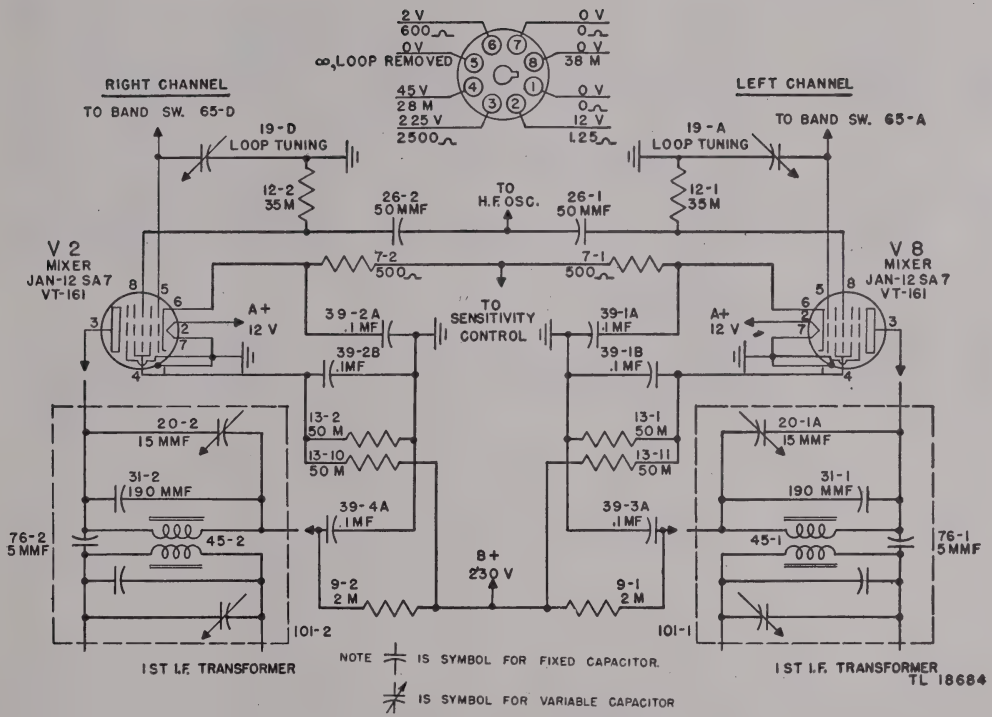


Figure 27. Radio Receiver BC–973–A, mixer circuit diagram and voltage and resistance measurements. (See pars. 42 and 43 for test conditions.)

51. High Frequency Oscillator, Radio Receiver BC-973-A (fig. 28)

a. SPECIAL CIRCUIT FEATURES. The High Frequency Oscillator is a Hartley circuit. The two tank coils are switched in and out by the band switch. See paragraph 41 for coil replacement.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
19–c	3D9600V–1	CAPACITOR, variable: air dielectric; 4-section; same as 19a.	Main tuning capacitor, oscillator section.
30	3D9150–30	CAPACITOR, fixed: silver mica; 150-mmf; ±2%; 500-vdcw.	Band-B fixed trimmer.
22–2	3D9015V–18.1	CAPACITOR, variable: air dielectric; 15-mmf.	Band-B variable trimmer.
24–2	3D254	CAPACITOR, variable: air dielectric; 100-mmf.	Band-B variable padder.
35		CAPACITOR, fixed: silver mica; 2,640-mmf; ±500-mmf in individual sets. Made up of 35A; 190-mmf, ±5%, 500-vdcw; Signal Corps stock Nos. 39D190–2 and 35B; 2,400-mmf; ±2%; 500-vdcw; Signal Corps stock No. 3DA2.400–6.	Band-B fixed padder.
36–5	3DA2–66	CAPACITOR, fixed: mica; 2000 mmf ±10%; 500-vdcw.	Couples h-f osc tube to h-f osc circuit.
22–1		Same as 22–2.	Band-A trimmer.
24–1		Same as 24–2.	Band-A variable padder.
34	3D9800–14.1	CAPACITOR, fixed: silver mica; 800-mmf; ±5%; 500-vdcw.	Band-A fixed padder.
11	3RC31AE–203J	RESISTOR, fixed: carbon composition element; ceramic coating; 20,000-ohm; ±5%; 1-watt.	Plate dropping resistor of h-f osc.
13–7	3RC20AE513J	RESISTOR, fixed: carbon composition element; ceramic coating; 50,000-ohm; ±5%; ½-watt.	Grid leak, h-f osc.
65–b	3Z9826–39	SWITCH, rotary; 4 gang; 2 position.	Band selection.
65–c		Same as 65–b.	Band selection.
53	2C4973/C1	COIL, radio: r-f; 1,458- to 2,458-kc; tapped.	Band-A h-f osc coil.
54	2C4973/C2	COIL, radio: r-f; 2,458- to 3,485-kc; tapped.	Band-B h-f osc coil.
104	2C4973A/C1	COIL, radio: r-f; h-f osc assembly; 2-band.	R-f heterodyne osc.
V1	2J12SJ7	TUBE: JAN–12SJ7.	High frequency osc tube.

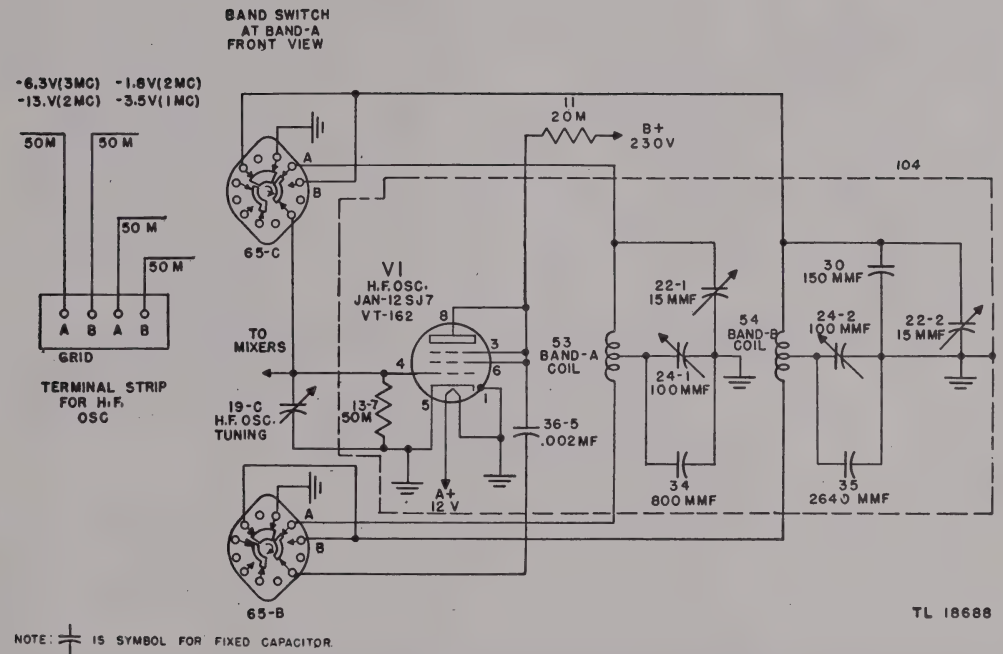


Figure 28. Radio Receiver BC–973–A, high frequency oscillator circuit diagram and voltage and resistance measurements. (See pars. 42 and 43 for test conditions.)

52. Loop Antenna Circuits, Radio Receiver BC-973-A (fig. 29)

a. SPECIAL CIRCUIT FEATURES. The two loops are connected to the signal grids of the mixer tubes through two wafers of the band switch. On the low frequency band, a series coil is connected in series with each loop to lower the frequency range of the loop. Separate loop trimmers are used for each frequency band. Replace both loop loading coils with a matched pair if one is defective. Do not try to repair the loop antenna; replace it if it is defective.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
23–1	3D9035V–27	CAPACITOR, variable: air dielectric; 35-mmf.	Loop trimmer, B-band, left.
23–2		Same as 23–1.	Loop trimmer, B-band, right.
23–3		Same as 23–1.	Loop trimmer, A-band, left.
23–4		Same as 23–1.	Loop trimmer, A-band, right.
29–1	3D9090–8	CAPACITOR, fixed: silver mica; 90-mmf: ±2%; 500-vdcw; low-loss bakelite case.	Loop tuning A-band, left.
29–2		Same as 29–1.	Loop tuning A-band, right.
33–1	3D9280	CAPACITOR, fixed: silver mica; 280-mmf; ±2%; 500-vdcw; low-loss bakelite case.	Loop tuning B-band, left.
33–2		Same as 33–1.	Loop tuning B-band, right.
107	2A1923–A	ANTENNA, LOOP LP–23–A.	Antenna voltage pickup.
52–1 and 52–2	2C4973/C4	COIL, radio: r-f; loop-loading, matched pair.	Loop series loading coil, left and right channel.
65–a	3Z9826–39	SWITCH, rotary: 4-gang, 2-position.	Band selection.
65–d		Same as 65–a.	Band selection.
57		RECEPTACLE: special 5-pin socket, bakelite insulation.	Connects loop antenna to loop slip rings.
58		PLUG: special 5-prong plug, bakelite insulation.	Connects loop slip rings to loop antenna.
108		LOOP APPENDAGE: 5-wire coaxial line approx 8 inches long, leads for loop No. 1 and loop No. 2 are shielded electrostatically from each other internally, 5 silver slip rings.	Connects loop antenna to loop brush can.
66–1 and 66–2		See balance circuit, paragraph 53.	
50		SLIP RINGS.	Loop slip rings.

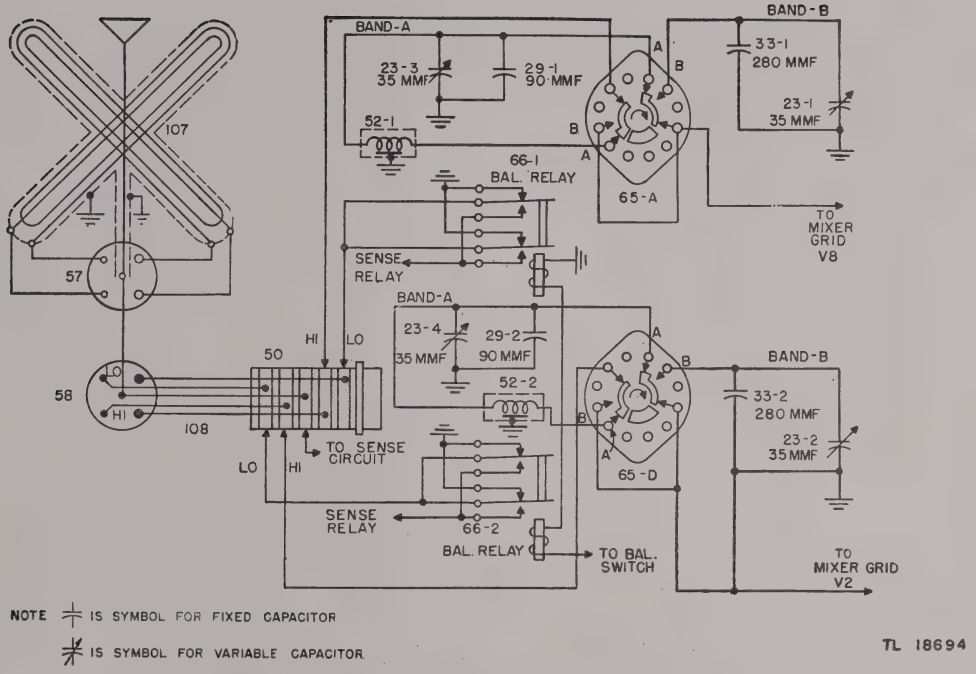


Figure 29. Radio Receiver, BC–973–A, loop antenna circuit diagram.
(See pars. 42 and 43 for test conditions.)

53. Balance Circuit, Radio Receiver BC-973-A (fig. 30)

a. SPECIAL CIRCUIT FEATURES. The balance relays disconnect the low ends of the loops from ground and put them in series.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
3	3Z9824–58	SWITCH: SPST; push type; special; contained in "dual control" with variable resistors ref Nos. 2a and 2b.	Switches in balance control variable resistor ref No. 2b.
41–2	3DB25–11	CAPACITOR, fixed: electrolytic; 25-mf; 25-vdcw.	Bypass balance switch.
5–2	3RC31AE510J	RESISTOR, fixed: carbon composition element; 50-ohm; ±5%; 1-watt.	Ground return for balance circuit.
66–1	2Z7588–39	RELAY: DPDT; coil, 4-vdc; 16-ohm 0.25-amp.	Balance circuit switching.
66–2		Same as 66–1.	Same as 66–1.
63, 41–1		See sense circuit, paragraph 54.	

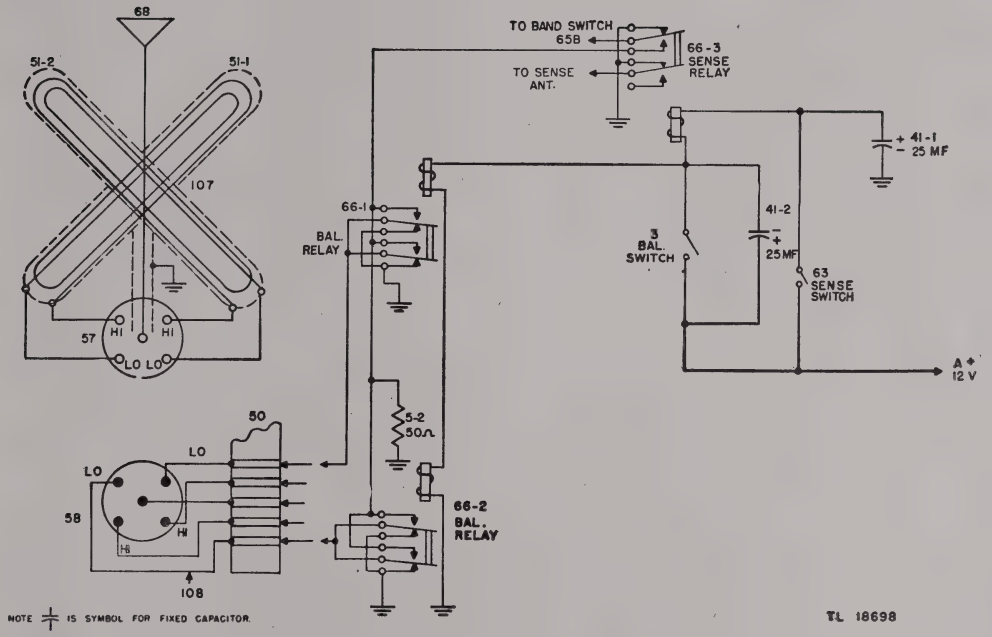


Figure 30. Receiver BC-973-A—balance circuit diagram

54. Sense Circuit, Radio Receiver BC-973-A (fig. 31)

a. SPECIAL CIRCUIT FEATURES. The sense circuit relay and balance relays disconnect the low ends of the loops from ground, and switch the sense antenna voltage between the low ends of the loop and ground. A separate sense transformer is used for each band.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
19–b	3D9600V–1	CAPACITOR, variable: air dielectric; 4 sections; 120-mmf.	Main tuning capacitor (sense section).
5–2		See balance circuit	
41–1	3DB25–11	CAPACITOR fixed: 25-mf; 25-vdcw; electrolytic.	Bypass sense relay.
10–1	3RC20AE512J	RESISTOR, fixed: carbon composition element; 5,000-ohm; ±5%; ½-watt.	Reduce sense voltage.
48	2C4973/C5	COIL: r-f sense; Band-B.	B-band sense transformer.
49	2C4973/C6	COIL: r-f sense; Band-A.	A-band sense transformer.
65–b	3Z9826–39	SWITCH, rotary: 4-gang, 2-position.	Band selection.
65–c		Same as 65–b.	Band selection.
63	3Z9824–29.5	SWITCH: SPST; push-button.	Sense switch on and off.
66–3	2Z7588–39	RELAY: DPDT; coil; 4-vdc; 16-ohm; 0.25-amp.	Sense circuit switching.
68	2AZ45	ANTENNA AN–45: telescopic.	Sense antenna.
66–1 66–2 41–2 3		See balance circuit, paragraph 53.	

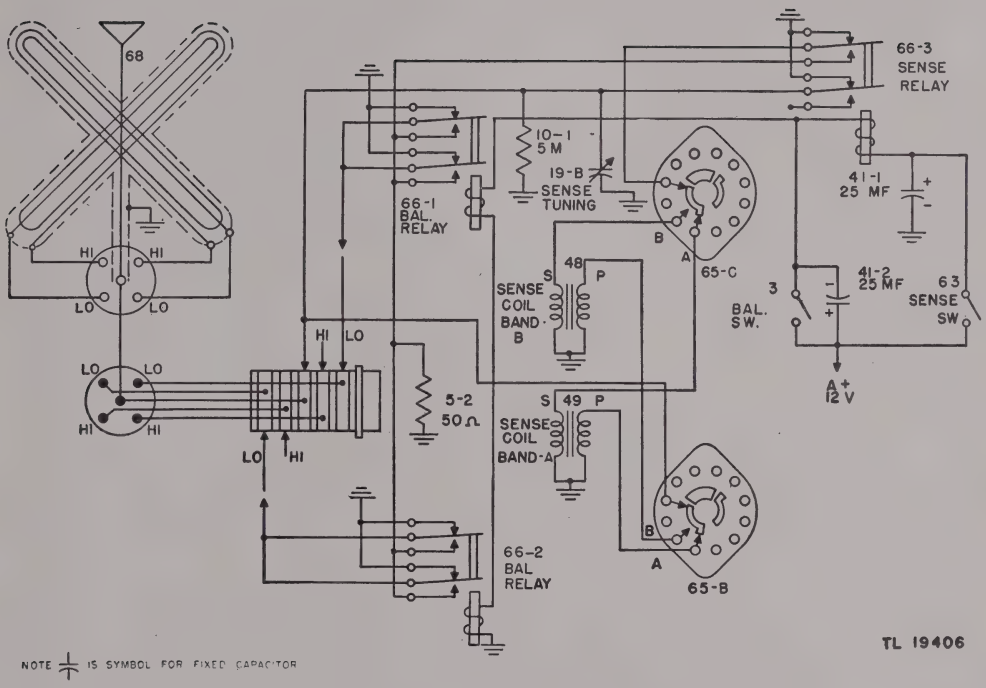


Figure 31. Radio Receiver BC–973–A, sense circuit diagram.
(See pars. 42 and 43 for test conditions.)

55. Sensitivity Control and A-V-C Circuit, Radio Receiver BC-973-A

a. SPECIAL CIRCUIT FEATURES. (1) The AVC-MVC switch shorts out the a-v-c voltage in the MVC position.

(2) The sensitivity control adjusts the gain of the i-f tubes and mixer tubes by adjusting the voltage of the tubes between cathode and ground.

(3) See schematic circuit diagram for the sensitivity and AVC circuit connections. (See fig. 51.)

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
37–4	3DA10–50	CAPACITOR, fixed: mica; 0.01-mf; ±10%; 300-vdcw; brown bakelite case.	Bypass, avc, left.
37–5		Same as 37–4.	Bypass, avc, right.
38–5	3DA100–112.1	CAPACITOR, fixed: paper; 0.1-mf; ±20%; 400-vdcw.	Sensitivity control bypass.
1	2Z7279–45	RESISTOR, variable: wire-wound, 1,500-ohm; 2-watt; V-taper.	Radio gain or sensitivity control.
4		RESISTOR, fixed: 25-ohm: 1 watt: ±5%.*	Fixed portion of sensitivity control.
16–2	3RC20AE154J	RESISTOR, fixed: carbon composition element; 150,000-ohm; ±5%; ½-watt.	Drops AVC voltage.
75	3RC31AE513J	RESISTOR, fixed: carbon composition; 50,000-ohm; ±5%; 1-watt.	Extends attenuation range of sensitivity control.
62–3	3Z9849.10–2	SWITCH, toggle: SPST.	AVC on and off switch.

* This resistor limits the sensitivity of the receiver. Replace with exact value whenever possible. The value of the resistor depends on the individual set. Some sets use 7½ ohm resistors.

56. Light and Power Circuit, Radio Receiver BC-973-A (fig. 32)

a. SPECIAL CIRCUIT FEATURES. The 12-volt storage battery supplies current for the tube filaments, pilot lights, relay coils, and the microphone. The dynamotor is turned on simultaneously with the filaments by the power switch.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
40–3	3DA500–182	CAPACITOR, fixed: 0.5-mf; ±10%; 400-vdcw.	B + bypass.
40–5		Same as 40–3.	A + bypass.
5–1	3RC31AE510J	RESISTOR, fixed: carbon composition element, 50-ohm; ±5%, 1-watt.	Voltage dropping for control unit microphone supply.
56–2	2Z5534A	JACK: JK–34–A, phone single open.	Receptacle for patch cord plug.
61	2Z8769	RECEPTACLE: SO–69.	Connects power cable to receiver.
62–1	3Z9849.10–2	SWITCH: SPST; toggle; 3-amp; 250-volt.	Light switch.
64–1	3Z9849.30–1	SWITCH: DPST; toggle; rear lug type; 3-amp; 250-volt.	Power switch on and off.
69–1	2Z5877–4	LAMP, incandescent; tungsten filament, clear finish; miniature; screw-base; 12–16 volt, 0.20 amp.	Pilot light.
69–2		Same as 69–1.	Same as 69–1.
69–3		Same as 69–1.	Same as 69–1.

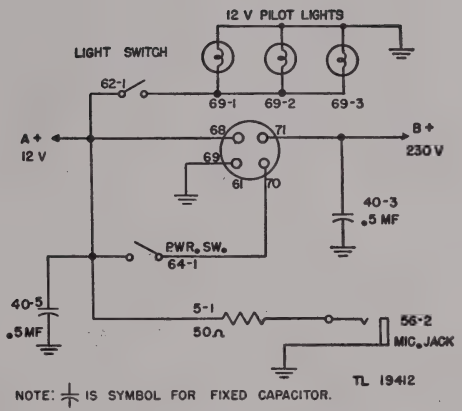


Figure 32. Radio Receiver BC–973–A, light and power circuit diagram.

57. Miscellaneous Parts, Radio Receiver BC-973-A

Ref No.	Signal Corps stock No.	Name of part and description	Function
319		LOOP BRUSH CAN.	Loop brush can assembly connecting loop slip ring.
214	2A245	BATTERY: storage; 12–v.	Dynamotor supply source.
306	3F2670–323	COMPASS MC–323: magnetic; moving needle.	Taking magnetic bearings.
250	2C680–35A	CONTROL UNIT RM–35–A.	Control box mixing receiver output and microphone to telephone line.
215	3E1673	CORD—CD673; power; rubber-jacketed; PL–89 on each end (connects PE–133–A to BC–973–(*)).	Cable between dynamotor and receiver.
308	2Z3400–133	COVER BG–133: canvas; (for radio receiver).	Cover for receiver.
71–1 through 71–11	2Z8678.31	SOCKET, tube: std octal, ceramic.	Tube sockets.
309	2Z3400–134	COVER BG–134: transparent.	Transparent cover for loop for hand wheel.
200	3H1899–133	DYNAMOTOR UNIT PE–133.	Power supply.
310	3B829	HEADSET HS–29.	Audible reception telephone line and receiver.
338	2Z7104–13	BUTTON, plug: trimmer; brass, black nickeled; with screw driver slot; Radio Navigation dwg No. A–801–A.	To cover trimmers on front panel.
	2Z5820.6	KNOB: round; brass; $\frac{1}{8}$ inch-diam shaft; engraved "Press to balance."	For volume and balance control.
	2Z5882–22	LAMPHOLDER: center pilot light; miniature screw base; brass shell.	For center pilot lights.
	2Z5882–15	LAMPHOLDER: end pilot lights; miniature base; brass shell.	For end pilot lights.
334	2Z8403–8	MOUNT: vibration; square; Lord No. 100P–187–6.	For tuning capacitor.

58. A-F Amplifier, Radio Receiver BC-973-B

a. SPECIAL CIRCUIT FEATURES. The a-f amplifier consists of a 6V6, Tube JAN- and transformer coupled to the output jack. The volume control is in the secondary of the output transformer.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
41–1	3DB10–110	CAPACITOR, fixed: electrolytic; 10-mf; 25-vdcw.	JAN–6V6 cathode bypass.
55–2	3DA2–61.2	CAPACITOR, fixed: mica; 2,000-mmf; ±20%; 500-vdcw.	JAN–6V6 plate bypass.
9–1	3RC31AE102J	RESISTOR, fixed: carbon; insulated; 1,000-ohm; ±5%; 1-watt.	Cathode resistor for JAN–6V6.
11–1	3RC20AE514J	RESISTOR, fixed: carbon; insulated; 500,000-ohm; ±5%; ½-watt.	Grid resistor for JAN–6V6.
17–1	3ZK6001E5–10	RESISTOR, fixed: wire-wound; insulated; 15 ohm; ±5%; 10-watt.	Filament dropping resistor, JAN–6V6.
22–1	2Z7284.63	POTENTIOMETER: wire-wound; 20,000-ohm; ±20%. Part of balance and volume control assembly.	Volume control.
79–1	2Z5534A	JACK, single contact open. Signal Corps Type JK–34–A.	Output.
79–2		Same as 79–1.	Output.
79–3		Same as 79–1.	Output.
92–1	2Z9632.180	TRANSFORMER, A–F: power requirements, ½-watt; primary, 8,000 ohms; secondary 4,000 ohms, tapped at 250 ohms.	Audio output.
V7	2J6V6GT	TUBE: JAN 6V6G (VT–107A).	A-f amplr tube.

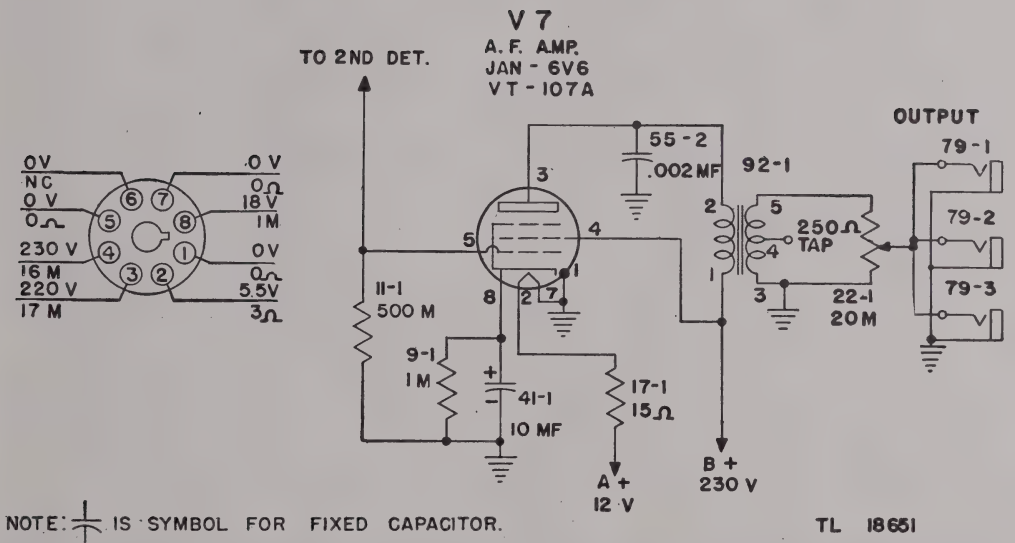


Figure 33. Radio Receiver BC–973–B, audio frequency amplifier circuit diagram and voltage and resistance measurement. (See pars. 42 and 43 for test conditions.)

59. Second Detector, Radio Receiver BC-973-B (fig. 34)

a. SPECIAL CIRCUIT FEATURES. The second detectors use i-f transformers with two secondaries and Tubes JAN-12C8. One diode circuit in each channel supplies current for one coil of the DIRECTION INDICATOR (bearing meter). The second diodes supply the avc circuit. The pentode section is arranged as a grid leak detector. See paragraph 41 for transformer replacements.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
45–1	3DA30–25	CAPACITOR, fixed: paper; 0.03-mf; ±20%; 400-vdcw.	VT–107–A grid coupling.
55–3	3DA2–61.2	CAPACITOR, fixed: mica; 2,000-mmf; ±20%; 500-vdcw.	R-f filter.
56–1	3R2010/14	CAPACITOR, fixed: mica; 100-mmf; ±20%; 500-vdcw.	R-f filter, left channel.
56–2		Same as 56–1.	R-f filter, left channel.
56–3		Same as 56–1.	R-f filter, right channel.
56–4		Same as 56–1.	R-f filter, right channel.
13–2	3RC20AE–105J	RESISTOR, fixed; carbon; insulated; 1-meg; ±5%; ½-watt.	Screen dropping resistor.
15–1	3RC31AE753J	RESISTOR, fixed: carbon; insulated; 75,000-ohm; ±5%; 1-watt.	R-f filter, left channel.
15–2		Same as 15–1.	Plate load.
15–3		Same as 15–1.	R-f filter, right.
77–1 and 77–2	2Z9641.148	TRANSFORMER, i-f; 3d i-f, 458-kc; matched pair.	Right channel, 3d i-f and left channel 3d i-f transformer (2d i-f amplr).
V5	2J12C8	TUBE: JAN–12C8 (VT–153).	2d detector right channel.
V11	2J12C8	TUBE: JAN–12C8 (VT–153).	2d detector left channel.

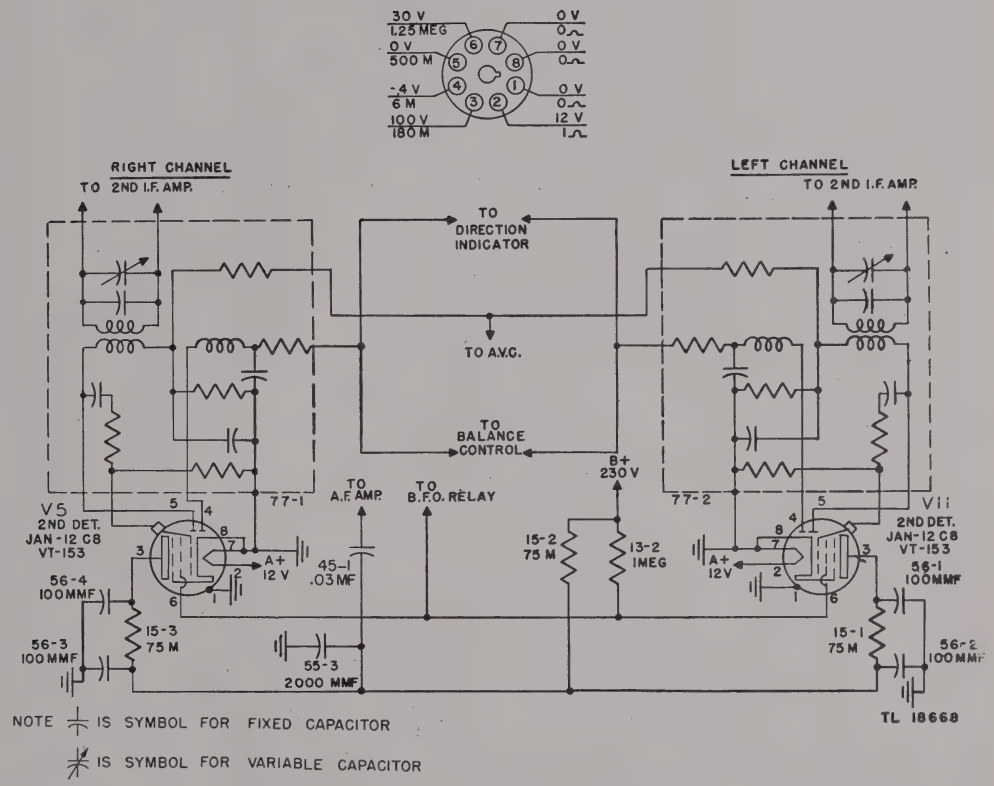


Figure 34. Radio Receiver BC–973–B, second detector circuit diagram and voltage and resistance measurements. (See pars. 42 and 43 for test conditions.)

60. Beat Frequency Oscillator, Radio Receiver BC-973-B (fig. 35)

a. SPECIAL CIRCUIT FEATURES. The beat-frequency oscillator is an electron-coupled oscillator coupled to the screen circuits of both second detector tubes. It is turned on by a relay controlled from a switch on the front panel. See paragraph 41 for transformer replacement.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
44–2	3DA100–112.1	CAPACITOR, fixed: paper; 0.1-mf; ±20%; 400-vdcw.	Beat oscillator coupling capacitor.
46–3	3DA10–140.2	CAPACITOR, fixed: paper; 0.01 mf; ±20%; 400-vdcw.	Screen bypass, beat oscillator.
13–1	3RC20AE–105J	RESISTOR, fixed: carbon; insulated; 1-meg; ±5%, ½-watt.	Screen dropping resistor, beat oscillator screen.
14–1	3RC20AE154J	RESISTOR, fixed: carbon; insulated; 150,000-ohm; ±5%, ½-watt.	Plate load, beat oscillator.
16–2	3RC41BE200J	RESISTOR, fixed: carbon, insulated; 20-ohm; ±5%; 2-watt.	Relay dropping resistor.
81–2	3Z9849.10–2	SWITCH, toggle; SPST; 3-amp; 250-v.	CW OSC. switch.
91–1	2Z7588–38	RELAY, general purpose: DPDT; rating 40 ohms at 60 volts; (relay must operate on 5 volts).	Beat oscillator relay.
78–1	2C4973B/C13	COIL, radio: r-f; b-f-o coil; tapped winding.	Beat-oscillator coil assembly.
V6	2J12SJ7	TUBE: JAN–12SJ7 (VT–162).	Beat-frequency oscillator tube.

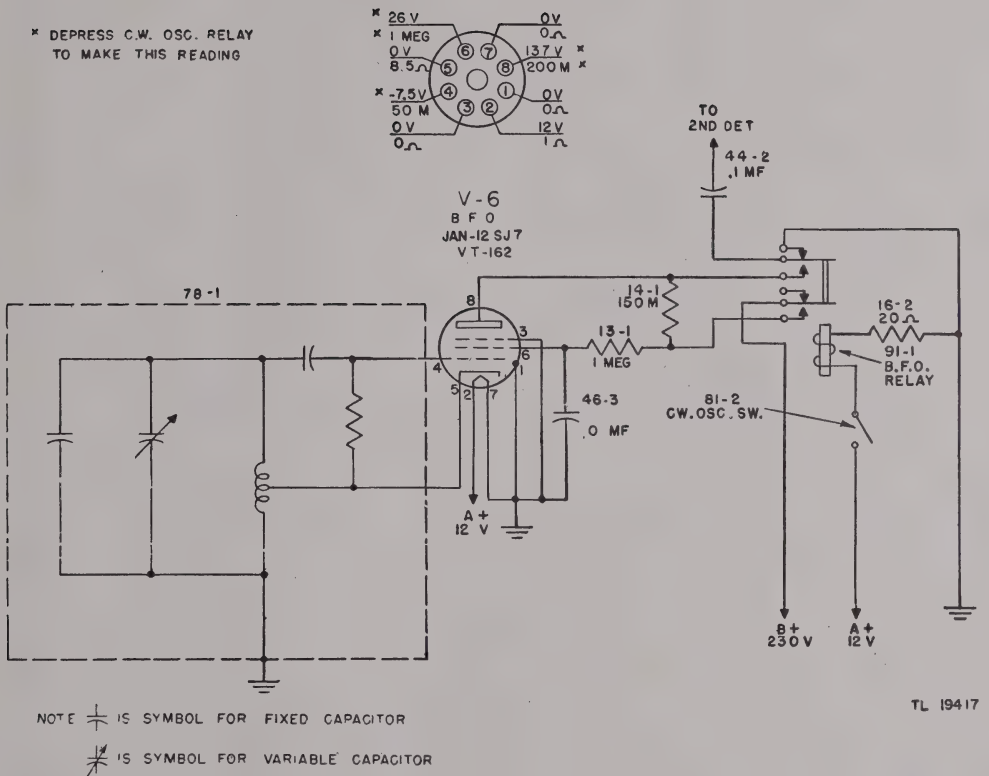


Figure 35. Radio Receiver BC–973–B, beat frequency oscillator circuit diagram an voltage and resistance measurements. (See pars. 42 and 43 for test conditions.)

61. Direction Indicator, Radio Receiver BC-973-B (fig. 36)

a. SPECIAL CIRCUIT FEATURES. The direction indicator consists of two moving coil microammeters in a single case. The current for the meters is supplied by the second detectors. The two channels are balanced by the balance control. Provision is made to switch an electrolytic condenser across each meter coil.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
44–3	3DA100–112.1	CAPACITOR, fixed: paper; 0.1-mf; ±20%; 400-vdcw.	Right, meter bypass.
44–4		Same as 44–3.	Left, meter bypass.
47–1	3DB500–20	CAPACITOR, fixed: electrolytic; 500-mf; ±20%; 6-vdcw.	Right, meter damping.
47–2		Same as 47–1.	Left, meter damping.
12–1	3RC20AE103J	RESISTOR, fixed: carbon; insulated; 10,000-ohm; ±5%; ½-watt.	Meter isolating resistor, right.
12–3		Same as 12–1.	Meter isolating resistor, left.
23–1	2Z7284.63	POTENTIOMETER: wire-wound; 60,000-ohm; ±20%. Part of balance and volume control assembly.	Balance control.
25–1	3RC20AE562K	RESISTOR, fixed: carbon; insulated; 5,600-ohm: ±10%; ½-w.	Diode series resistor, right.
25–2		Same as 25–1.	Diode series resistor, left.
82–1	3Z9849.27	SWITCH, toggle: DPST; 6-amp; 125-v.	Meter damping.
103–1	3F3308	METER, direction indicator: with cross pointers: 0–100 microamps. WESTON Model No. 635 Type 52 or SIMPSON Special Type Cross Pointer.	Direction indicator.
186–1		CONNECTOR, meter plug. Type AN 3106–14S–2S (female contacts).	Meter plug connector.
187–1	2Z4868.101	GASKET, synthetic rubber.	For meter.

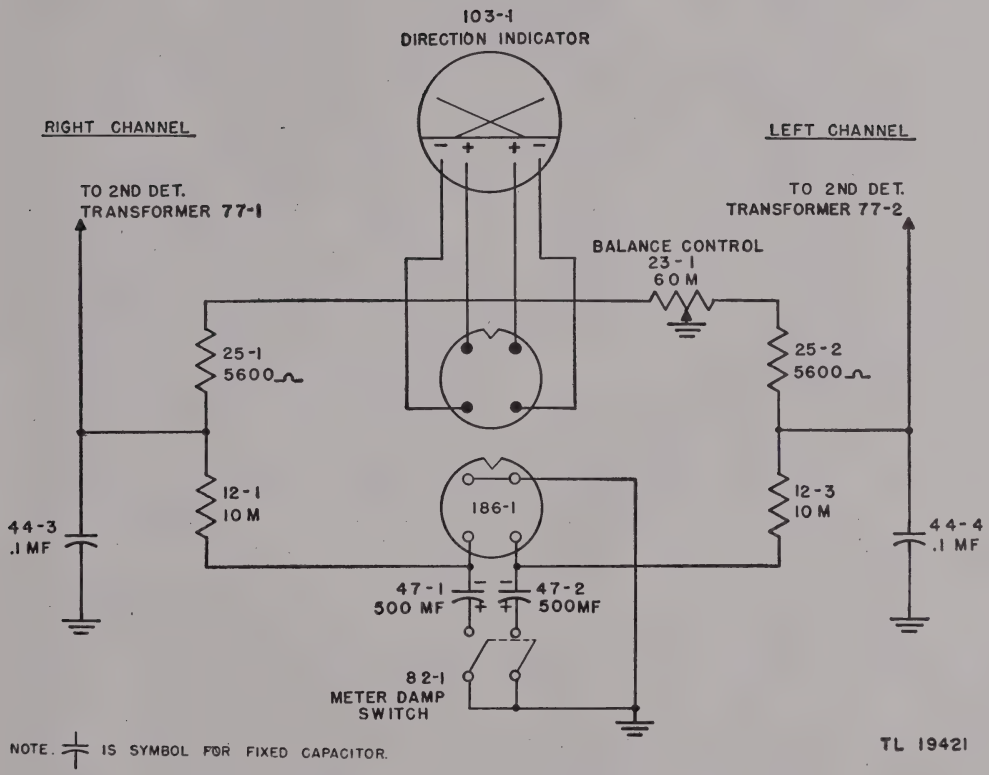


Figure 36. Radio Receiver BC–973–B, direction indicator circuit diagram.
(See pars. 42 and 43 for test conditions.)

62. Second I-F Amplifier, Radio Receiver BC-973-B (fig. 37)

a. SPECIAL CIRCUIT FEATURES. The second i-f amplifiers are standard transformer coupled circuits using Tubes JAN-12SG7. See paragraph 41 for transformer replacements.

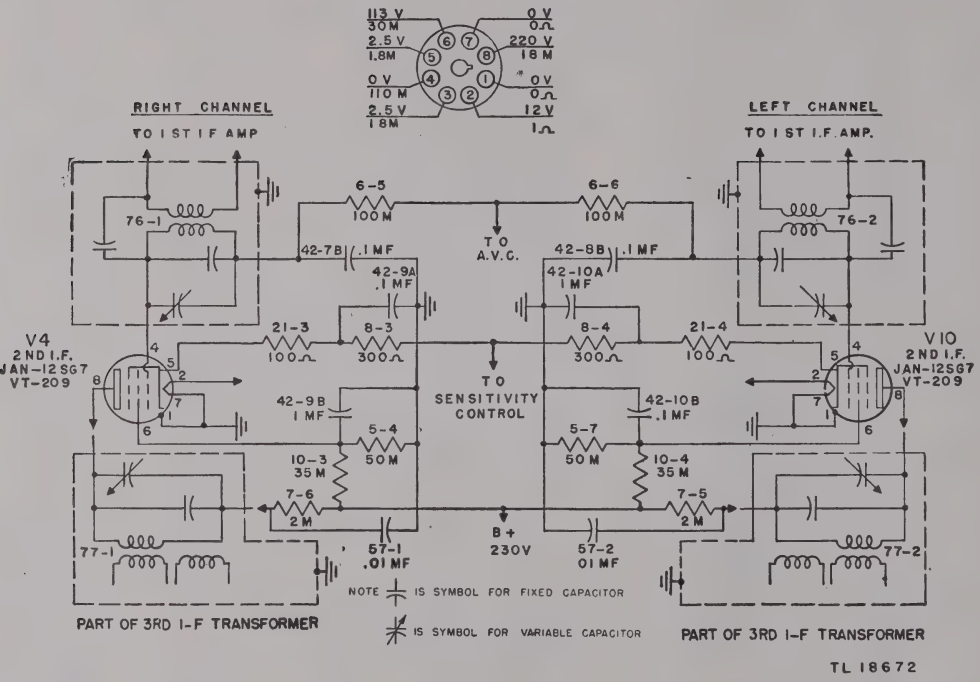


Figure 37. Radio Receiver BC-973-B, second i-f amplifier circuit diagram and voltage and resistance measurements. (See pars. 42 and 43 for test conditions.)

b. Parts List.

Ref No.	Signal Corps stock No.	Name of part and description	Function
42–7b	3DA100–342	CAPACITOR, (fixed; 2-section); +14%; −15%; 0.1-mf; 400-vdcw; bathtub case.	2d i-f, a-v-c bypass, right.
42–8b		Same as 42–7b.	2d i-f a-v-c bypass, left.
42–9a		Same as 42–7b.	Cathode bypass, 2d i-f VT–209, right.
42–10a		Same as 42–7b.	Cathode bypass, 2d i-f, VT–209 left.
42–9b		Same as 42–7b.	Screen bypass, 2d i-f VT–209, right.
42–10b		Same as 42–7b.	Screen bypass. 2d i-f, VT–209, left.
57–1	3K3510322	CAPACITOR, fixed: mica; 0.01-mf; ±20%; 300-vdcw.	B+ bypass, 3d i-f, right.
57–2		Same as 57–1.	B+ bypass, 3d i-f, left.
5–4	3RC20AE513J	RESISTOR, fixed: carbon; insulated; 50,000-ohm; ±5%; ½-watt.	Screen bleeder resistor, 2d i-f, left.
5–7		Same as 5–4.	Screen bleeder resistor, 2d i-f, right.
6–5	3RC31AE104J	RESISTOR, fixed: carbon; insulated; 100,000-ohm; ±5%; 1-watt.	2d i-f, right, avc isolating resistor.
6–6		Same as 6–5.	2d i-f, left, avc isolating resistor.
7–5	3RC31AE202J	RESISTOR, fixed: carbon; insulated; 2,000-ohm; ±5%; 1-watt.	3d i-f, left B+ isolating resistor.
7–6		Same as 7–5.	3d i-f right, B+ isolating resistor.
8–3	3RC20AE–301J	RESISTOR, fixed: carbon; insulated; 300-ohm; ±5%; ½-watt.	Cathode resistor, 2d i-f right.
8–4		Same as 8–3	Cathode resistor, 2d i-f left.
10–3	3RC31AE363J	RESISTOR, fixed: carbon; insulated; 35,000-ohm; ±5%; 1-watt.	Screen dropping resistor, 2d i-f, right
10–4		Same as 10–3.	Screen dropping resistor, 2d i-f, left.
21–3	3RC21AE101J	RESISTOR, fixed: carbon; insulated; 100-ohm; ±5%; ½-watt.	2d i-f cathode, right.
21–4		Same as 21–3.	2d i-f cathode, left.
76–1 and 76–2	2Z9641.149	TRANSFORMER, i-f; interstage: 458-kc; matched pair.	Right channel and left channel, 2d i-f transformer.
V4	2J12SG7	TUBE: JAN–12SG7 (VT–209).	2d i-f amplr tube right channel.
V10	2J12SG7	TUBE: JAN–12SG7 (VT–209).	2d i-f amplr tube left channel.

63. First I-F Amplifier, Radio Receiver BC-973-B (fig. 38)

a. SPECIAL CIRCUIT FEATURES. The first i-f amplifiers are standard transformer coupled circuits using Tubes JAN-12SG7. See paragraph 41 for i-f transformer replacements.

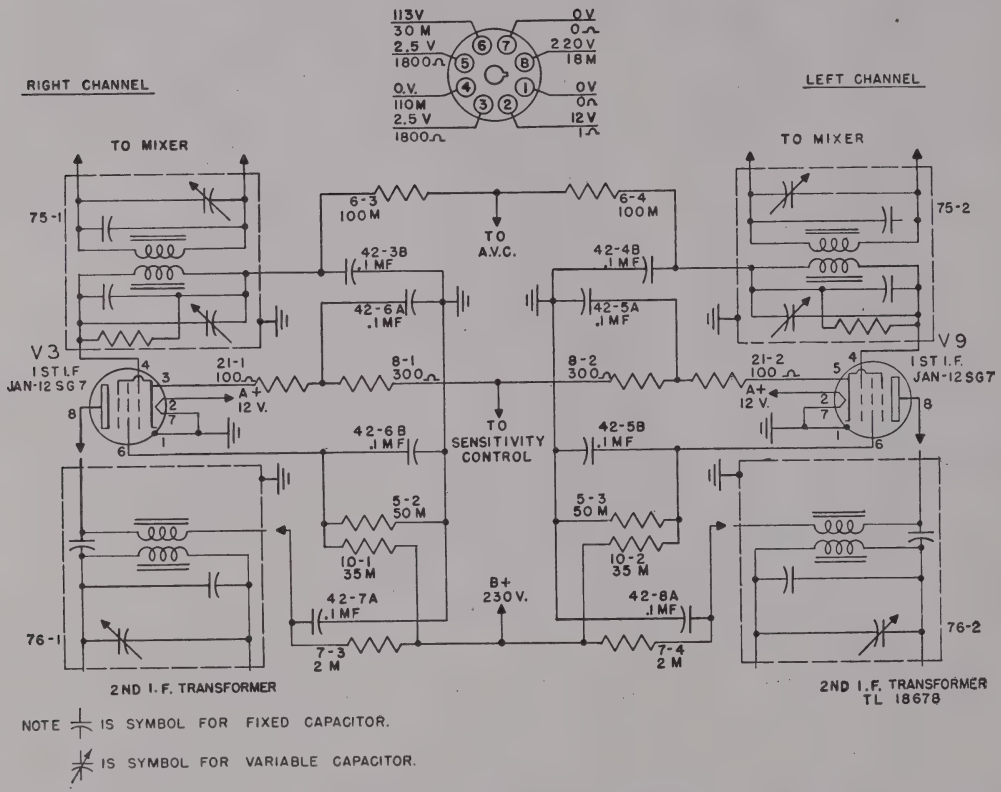


Figure 38. Radio Receiver BC–973–B, first i-f amplifier circuit diagram and voltage and resistance measurements. (See pars. 42 and 43 for test conditions.)

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
42–3b	3DA100–342	CAPACITOR, fixed: dual, 0.1-mf; +14%; −15%; 400-vdcw; bathtub case.	1st i-f, a-v-c bypass, right.
42–4b		Same as 42–3b.	1st i-f, a-v-c bypass, left.
42–5a		Same as 42–3b.	Cathode bypass, 1st i-f VT-209, left.
42–6a		Same as 42–3b.	Cathode bypass, 1st i-f VT–209, right.
42–5b		Same as 42–3b.	Screen bypass, 1st i-f VT–209 left.
42–6b		Same as 42–3b.	Screen bypass, 1st i-f VT–209 right.
42–7a		Same as 42–3b.	2d i-f, B+ bypass, right
42–8a		Same as 42–3b.	2d i-f, B+ bypass, left.
5–2	3RC20AE513J	RESISTOR, fixed: carbon; insulated; 50,000-ohm; ±5%; ½-watt.	Screen bleeder resistor, 1st right.
5–3		Same as 5–2.	Screen bleeder resistor, 1st left.
6–3	3RC31AE104J	RESISTOR, fixed: carbon; insulated; 100,000-ohm; ±5%; 1-watt.	1st i-f right, a-v-c isolating resistor.
6–4		Same as 6–3.	1st i-f left, a-v-c isolating resistor.
7–3	3RC31AE202J	RESISTOR, fixed: carbon; insulated; 2,000-ohm; ±5%; 1-watt.	2d i-f right, B+ isolating resistor.
7–4		Same as 7–3.	2d i-f left B+ isolating resistor.
8–1	3RC20AE301J	RESISTOR, fixed: carbon; insulated; 300-ohm; ±5%; ½-watt.	Cathode resistor, 1st i-f right.
8–2		Same as 8–1.	Cathode resistor, 1st i-f left.
10–1	3RC31AE363J	RESISTOR, fixed; carbon insulated; 35,000-ohm; ±5%; 1-watt.	Screen dropping resistor, 1st i-f right.
10–2		Same as 10–1.	Screen dropping resistor, 1st i-f left.
21–1	3RC21AE101J	RESISTOR, fixed: carbon insulated; 100-ohm; ±5%; ½-watt.	1st i-f cathode right.
21–2		Same as 21–1.	1st i-f cathode left.
75–1 and 75–2	2Z9641.150	TRANSFORMER, i-f: 458-kc; 1st i-f; matched pair.	Right channel and left channel 1st i-f transformer.
V3	2J12SG7	TUBE: JAN–12SG7 (VT–209).	1st i-f amplifier right channel.
V9	2J12SG7	TUBE: JAN–12SG7 (VT–209).	1st i-f amplifier left channel.

64. Mixer Stage, Radio Receiver BC-973-B (fig. 39)

a. Special Circuit Features. Both mixer tubes get their h-f oscillator voltage from one local oscillator. The plate circuits contain the first i-f transformers. The signal grid circuits of each mixer contains a tuning condenser and one loop antenna. A four-gang wafer switch changes the grid circuits of the mixer tubes for band switching. See paragraph 41 for i-f transformer replacement.

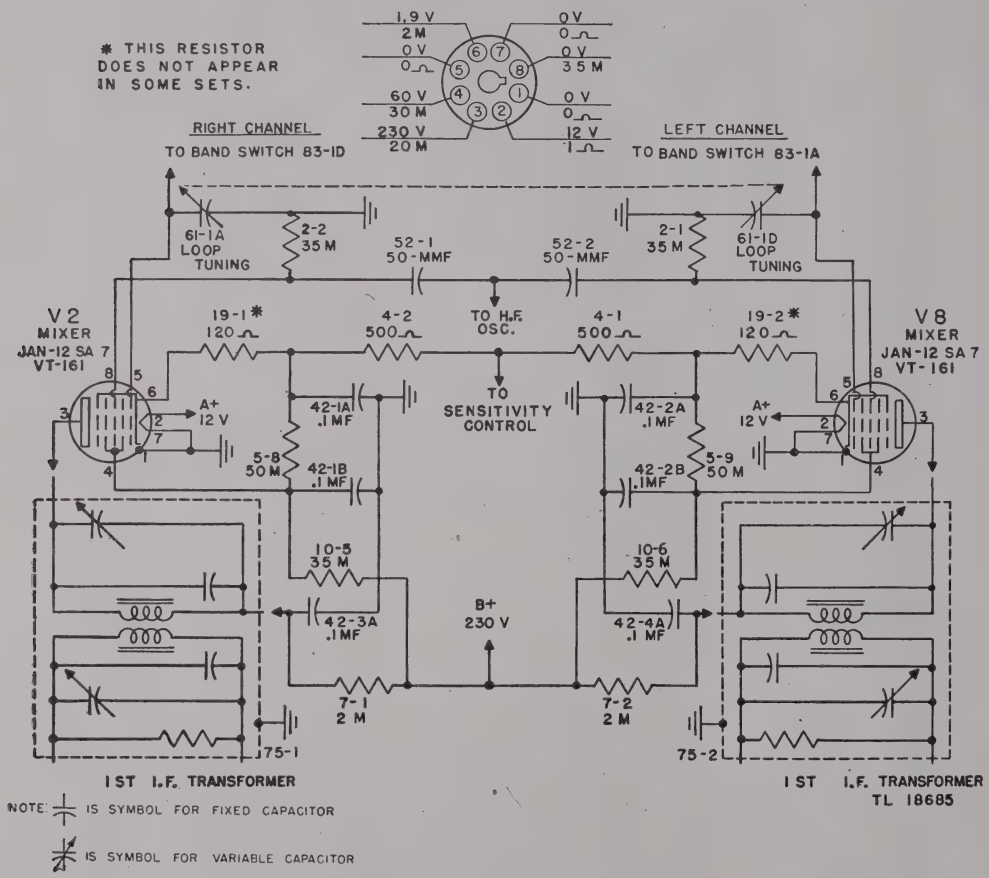


Figure 39. Radio Receiver BC–973–B, mixer circuit diagram and voltage and resistance measurements. (See pars. 42 and 43 for test conditions.)

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
42–1a	3DA100–342	CAPACITOR, fixed: paper; dual; 0.1–mf; +14%; −15%; 400-vdcw; bathtub case.	Cathode bypass for VT 161 mixer, right.
42–2a		Same as 42–1a.	Cathode bypass for VT 161 mixer, left.
42–1b		Same as 42–1a.	Screen bypass for VT 161 mixer, right.
42–2b		Same as 42–1a.	Screen bypass for VT 161 mixer, left.
42–3a		Same as 42–1a.	Mixer B+ bypass, right.
42–4a		Same as 42–1a.	Mixer B+ bypass, left.
52–1	3K2051033	CAPACITOR, fixed: silver mica; 50-mmf; ±2%; 500-vdcw.	Oscillator coupling.
52–2		Same as 52–1.	Oscillator coupling.
61–1a	3D9603V	CAPACITOR, variable: air dielectric; 4-section gang; loop tuning sections; Section 1----------31 plate Section 4----------31 plate	Main tuning capacitor.
61–1d		Same as 61–1a.	Main tuning capacitor.
2–1	3Z6635–9–	RESISTOR, fixed: carbon; insulated; 35,000-ohm; ±5%; ½-watt.	Injector grid return mixer tube, left.
2–2		Same as 2–1.	Injector grid return mixer tube, right.
4–1	3RC31AE511J	RESISTOR, fixed: carbon; insulated; 500-ohm; ±5%; 1-watt.	Left, mixer cathode.
4–2		Same as 4–1.	Right, mixer cathode.
5–8	3RC20AE513J	RESISTOR, fixed: carbon; insulated; 50,000-ohm; ±5%; ½-watt.	Screen bleeder resistor, mixer, right.
5–9		Same as 5–8.	Screen bleeder resistor, mixer, left.
7–1	3RC31AE202J	RESISTOR, fixed: carbon; insulated; 2,000-ohm; ±5%; 1-watt.	1st i-f right, B+ isolating resistor.
7–2		Same as 7–1.	1st i-f left, B+ isolating resistor.
10–5	3RC31AE363J	RESISTOR, fixed: carbon; insulated; 35,000-ohm; ±5%; 1-watt.	Screen dropping resistor, mixer, right.
10–6		Same as 10–5.	Screen dropping resistor, mixer. left.
V–2	2J12SA7	TUBE: JAN–12SA7 (VT–161).	Mixer tube, left channel.
V–8	2J12SA7	TUBE: JAN–12SA7 (VT–161).	Mixer tube, right channel.
19–1	3RC20AE121K	RESISTOR, fixed: carbon; insulated; 120-ohm; ±10%; ½-watt.	Cathode resistor, mixer, right.
19–2		Same as 19–1.	Cathode resistor, mixer, left.

65. High-Frequency Oscillator, Radio Receiver BC-973-B (fig. 40)

a. SPECIAL CIRCUIT FEATURES. The high-frequency oscillator is a Hartley circuit. The two tank coils are switched in and out by the band switch.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
50–1	3D900–7	CAPACITOR, fixed: silver mica; 900-mmf; ±2%; 500-vdcw.	A band, oscillator pad.
51–1	3D9010–22	CAPACITOR, fixed: silver mica; 10-mmf; ±5%; 500-vdcw.	A band, oscillator trimmer shunt.
58–1	3D9024VE3–1	CAPACITOR, variable: air dielectric; 22-mmf effective capacity.	Oscillator trimmer A band.
53–1	3DA2.450–1	CAPACITOR, fixed: silver mica; 2,450-mmf; ±3%; 500-vdcw.	Oscillator pad, B band.
54–1	3D9140–2	CAPACITOR, fixed: silver mica; 140-mmf; ±3%; 500-vdcw.	Oscillator trimmer shunt, B band.
59–1	3D9024VE3–2	CAPACITOR, variable: air dielectric; 22-mmf effective capacity.	Oscillator trimmer B band.
55–1	3DA2–61.2	CAPACITOR, fixed: mica; 2,000-mmf; ±20%; 500-vdcw.	Oscillator, plate bypass.
61–1b	3D9603V	CAPACITOR, variable. 4-section gang: Section 2----------19 plate	Main tuning capacitor oscillator section.
2–3	3Z6635–9	RESISTOR, fixed: carbon; insulated; 35,000-ohm; ±5%; ½-watt.	Oscillator grid return.
20–1	3RC40AE392K	RESISTOR, fixed: carbon; insulated; 4,000-ohm; ±5%; 2-watt.	Oscillator plate load.
72–1	2C4973B/C8	COIL, radio: rf, tapped; covers 1 to 2 megacycles.	A band, oscillator.
73–1	2C4973B/C10	COIL, radio: rf, tapped; covers 2 to 3 megacycles.	B band, oscillator coil.
83–1c	3Z9826–38	SWITCH, rotary: 4 sections, 2 operating positions.	Band change switch.
V–1	2J12SJ7	TUBE; JAN–12SJ7 (VT–162).	H-f oscillator tube.

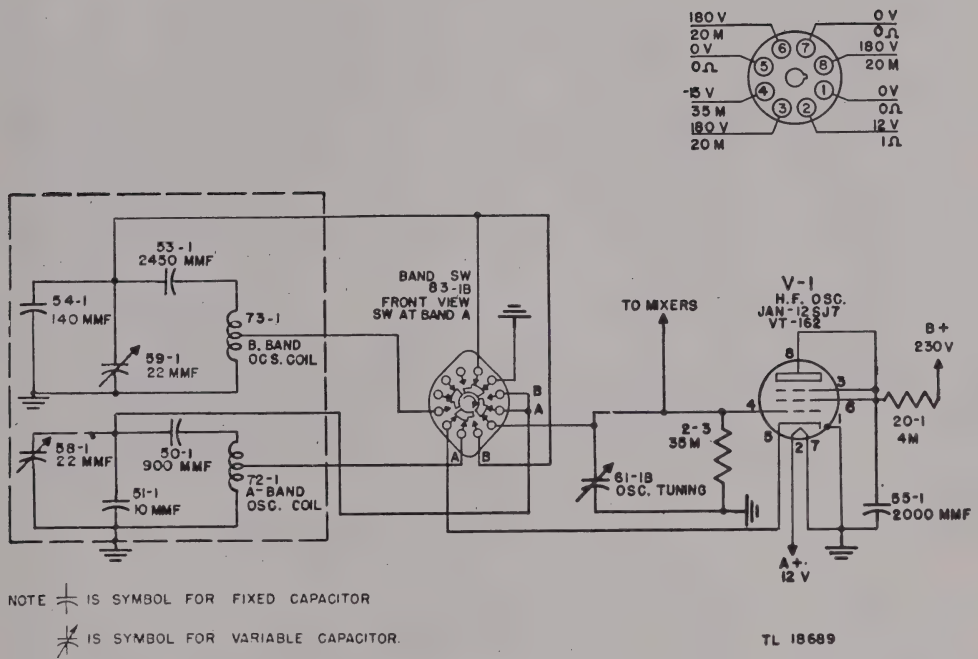


Figure 40. Radio Receiver BC–973–B, h-f oscillator circuit diagram and voltage and resistance measurements. (See pars. 42 and 43 for test conditions.)

66. Loop Antenna Circuits, Radio Receiver BC-973-B (fig. 41)

a. SPECIAL CIRCUIT FEATURES. The two loops are connected to the signal grids of the mixer tubes through two wafers of the band switch. On the low frequency band a series coil is switched in series with each loop to lower the frequency range of the loop. Separate loop trimmers are used for each frequency band. See paragraph 41 for coil replacements. If one of the loop coils is defective, replace the entire loop.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
48–1	3K2082033	CAPACITOR, fixed: silver mica; 80-mmf; ±2%; 500-vdcw.	Right, A band trimmer shunt
60–1	3D9035V–27	CAPACITOR, variable: air dielectric; 35-mmf effective capacity.	Loop trimmer, right A band.
48–2	3K2082033	CAPACITOR, fixed: silver mica, 80-mmf ±2% 500-vdcw.	Left, A band trimmer A band.
60–3	3D9035V–27	CAPACITOR, variable: air dielectric; 35-mmf.	Loop trimmer, left, A band.
49–1	3D9285–3	CAPACITOR, fixed: silver mica; 285-mmf; ±2%; 500-vdcw.	Right, B band trimmer shunt.
60–2		Same as 60–1.	Loop trimmer, right, B band.
49–2		Same as 49–1.	Left, B band trimmer shunt.
60–4		Same as 60–1.	Loop trimmer, left, B band.
74–1 and 74–2	2C4973B/C9	COIL, radio, r-f: loop loading coil assembly.	Right channel and left channel loop loading coil.
625–1	2A1923–B	LOOP; LP–23–B, consisting of two windings.	To commute r-f signals to Radio Receiver BC–973–B
83–1a	3Z9826–38	SWITCH, rotary: 4-section, 2 operating positions.	Band change switch.
83–1d		Same as 83–1a.	Band change switch.
637–1		LOOP SOCKET: special.	Connects loop to loop commutator.
640–1		LOOP COMMUTATOR ASSEMBLY.	Transfers r-f signals from loop to receiver.
644–1		LOOP PLUG: 5-contact, special.	Connects loop to commutator.
90–1 } 90–2 }		See balance circuit, paragraph 67.	

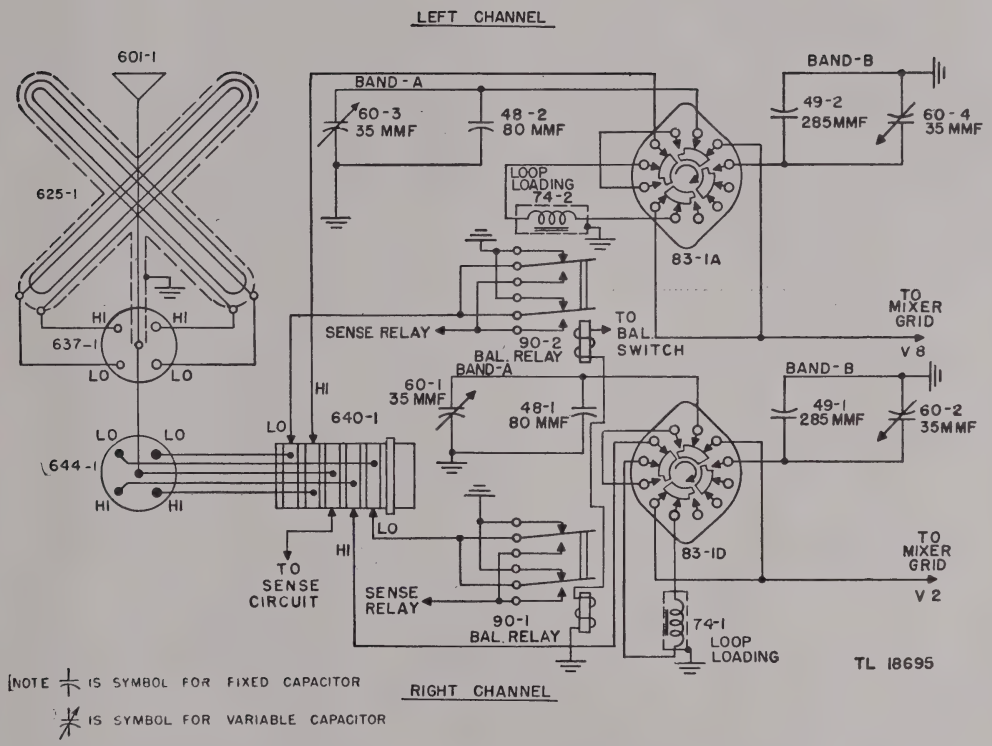


Figure 41. Radio Receiver BC–973–B, loop antenna circuit diagram.
(See pars. 42 and 43 for test conditions.)

67. Balance Circuit, Radio Receiver BC-973-B (fig. 42)

a. SPECIAL CIRCUIT FEATURES. The balance relays disconnect the low ends of the loops from ground and put them in series.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
40–1	3DB25–51	CAPACITOR, fixed: electrolytic; 25-mf; 25-vdcw.	Bypass for balance switch.
1–1	3RC31AE510J	RESISTOR, fixed: carbon; insulated; 50-ohm; ±5%; 1-watt.	Sense antenna load.
84–1	2Z7284.63	SWITCH, balance: spring contact; 2 silver points, part of assembly.	Balance switch.
90–1	2Z7588–39	RELAY, general purpose: DPDT type; rating −11 ohms at 3 volts (relay must operate at 2½ volts).	Right, balance relay.
90–2		Same as 90–1.	Left, balance relay.
80–1 40–2 90–3		See sense circuit, paragraph 68.	

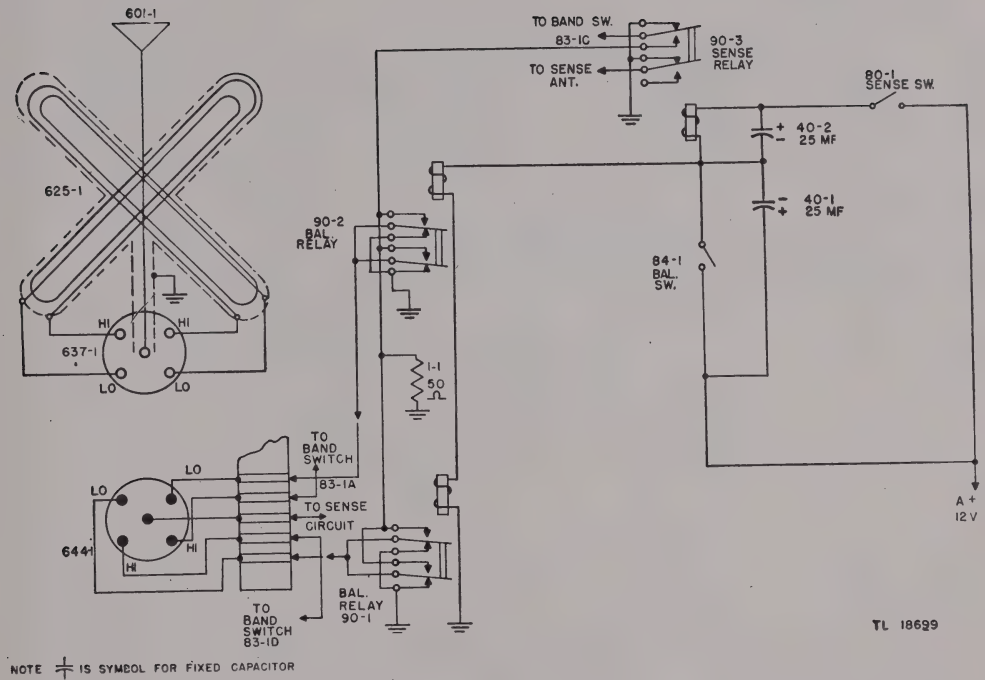


Figure 42. Radio Receiver BC–973–B. balance circuit diagram.
(See pars. 42 and 43 for test conditions.)

68. Sense Circuit, Radio Receiver BC-973-B (fig. 43)

a. SPECIAL CIRCUIT FEATURES. The sense circuit disconnects the low ends of the loops from ground and switches the sense antenna voltage between the low-ends of the loops and ground. A separate sense transformer is used for each band.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
1–1		See balance circuit, paragraph 67.	
40–2	3DB25–51	CAPACITOR fixed: 25-mf, 25-vdcw.	Bypass for sense relay.
52–3	3K2051033	CAPACITOR, fixed: silver mica; 50-mmf, ±2%; 500-vdcw.	Band B sense coil load.
61–1c	3D9603V	CAPACITOR, variable: 4-section gang: Section 3----------7 plate	Main tuning capacitor sense section.
80–1	3Z9824–29.5	SWITCH, push button: SPST; 3-amp; 125-v; momentary contact.	Sense switch.
83–1b and 83–1c	3Z9826–38	SWITCH, rotary: 4-section; 2 operating positions.	Band change switch.
90–3	2Z7588–39	RELAY, general purpose: d-c DPDT type rating 11 ohms at 3 volts (relay must operate at 2½ volts).	Right, sense relay.
71–1	2C4973B/C11	COIL, radio. r-f; sense; covers 2 to 3 megacycles.	B band, sense coil.
70–1	2C4973B/C12	COIL, radio, r-f; sense; covers 1 to 2 megacycles.	A band, sense coil.
3–1	3RC31AE512J	RESISTOR, fixed: carbon; insulated; 5,000-ohm; ±5%; 1-watt.	A band, sense coil damping.
90–1 90–2 84–1 40–1		See balance circuit, paragraph 67.	
601–1		ANTENNA, AN–45: telescopic.	Sense antenna.

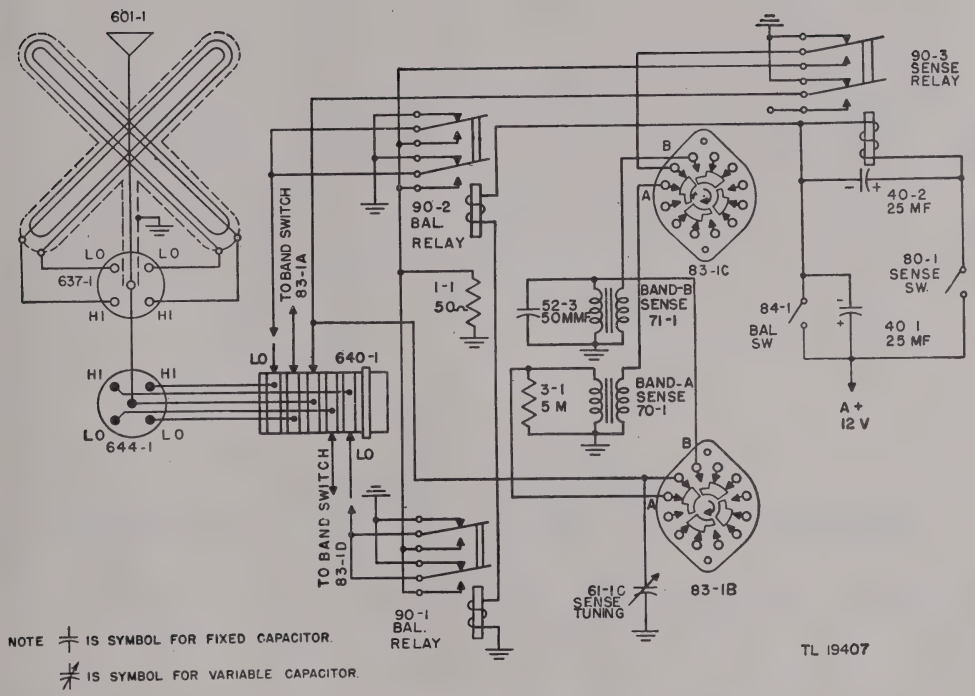


Figure 43. Radio Receiver BC–973–B, sense circuit diagram.
(See pars. 42 and 43 for test conditions.)

69. Sensitivity Control and A-V-C Circuit, Radio Receiver BC-973-B

a. SPECIAL CIRCUIT FEATURES. (1) The AVC-MVC switch shorts out the a-v-c voltage in the MVC position.

(2) The sensitivity control adjusts the gain of the i-f tubes and mixer tubes by adjusting the voltage of the tubes between cathode and ground.

(3) See schematic circuit diagram for the sensitivity control and avc circuit connections, figure 57.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
44–1	3DA100–112.1	CAPACITOR, fixed: paper; 0.1-mf; ±20%; 400-vdcw.	Sense control bypass.
46–1	3DA10–140.2	CAPACITOR, fixed: paper; 0.01-mf; ±20%; 400-vdcw.	Avc bypass.
46–2		Same as 46–1.	Avc bypass.
16–1	3RC41BE200J	RESISTOR, fixed: carbon; insulated; 20-ohm; ±5%; 2-watt.	Bias resistor.
24–1	2Z7279–45	POTENTIOMETER, variable: wire wound; 1,500-ohm; ±20%, 2-watt.	Sensitivity control.
81–3	3Z9849.10–2	SWITCH, toggle: SPST; 3-amp; 250-v.	Avc switch.

70. Light and Power Circuit, Radio Receiver BC-973-B (fig. 44)

a. SPECIAL CIRCUIT FEATURES. The 12-volt storage battery supplies current for the tube filaments, pilot lights, relay coils, and the microphone.

b. PARTS LIST.

Ref No.	Signal Corps stock No.	Name of part and description	Function
43–3	3DA500–265	CAPACITOR, fixed: paper; 0.5-mf; +14%; −6%; 400-vdcw; bathtub case.	B+ bypass.
43–4		Same as 43–3.	Filament bypass.
82–2	3Z9849.27	SWITCH, toggle: DPST; 6-amp; 125-v.	Power switch.
81–1	3Z9849.10–2	SWITCH, toggle: SPST; 3-amp; 250-v.	Light switch.
98–1	2Z5877–4	Pilot light bulb: 12 volt, with miniature screw base.	Light bulb front panel, left.
98–2		Same as 98–1.	Light bulb, front panel, right.
98–3		Same as 98–1.	Light bulb, front panel, center.
79–4	2Z5534A	JACK, single-contact: Signal Corps type JK–34–A.	Microphone supply.
18–1	3RC40AE–101J	RESISTOR, fixed: carbon; insulated; 100-ohm; ±5%; 2-watt.	Microphone current limiter.
125–1	2Z8769	RECEPTACLE SO–69.	Connects power cable to receiver.

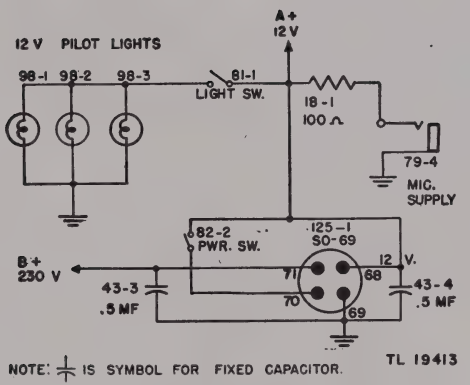


Figure 44. Radio Receiver BC–973–B, light and power circuit diagram. (See pars. 42 and 43 for test conditions.)

71. Miscellaneous Parts, Radio Receiver BC-973-B

Ref No.	Signal Corps stock No.	Name of part and description	Function
513–1	2Z3352.58	COVER, jack: engraved "Mis. Supply."	Jack cover.
181–1	2Z3352.57	COVER, jack: engraved "Output."	Jack cover.
179–1	2Z4868.101	GASKET: synthetic rubber.	Dial gasket.
118–1 and 118–2	2Z5820.5	KNOB, round: brass.	Switch knob for brake, sensitivity, band switch.
106–1	2Z5822–108	KNOB, round: brass.	Tuning knob, small.
114–1	2Z5820.6	KNOB, round: brass; engraved "Press to balance."	Balance knob.
105–1	2Z5822–107	KNOB, round: brass.	Tuning knob, large.
121–1	2Z5882–38	LAMPHOLDER: center pilot light; miniature screw base; brass shell.	
122–1 and 122–2	2Z5882–39	LAMPHOLDER: end pilot lights; miniature screw base; brass shell.	
124–1	2Z8403–8	MOUNT: vibration; square; Lord No. 100P–187–6.	Shock absorber.
189–1	2Z4880–30	WINDOW, dial: glass; $2^{55}/_{64}$" OD x $^{3}/_{32}$" thick; radio Navigation dwg. No. A261–A or Admiral No. P952–112.	Glass for frequency dial.
609–1	3B65	BATTERY, storage.	
618–1	3F2670–323	COMPASS MC–323: magnetic; moving needle.	
500	2C680–35B	CONTROL UNIT RM–35–B.	
619–1	3E66	CORD CC–66: 2-conductor; rubber jacketed; PL–55 on each end.	
	3E1605–6.5	CORD CD–605: PL–55 on one end.	For HS–29–E.
	3E1656E	CORD CD–565–E.	For HS–29.
620–1	3E1673	CORD CD–673: power; rubber-jacketed; PL–89 on each end.	Connects PE–113–(*) to BC–973–(*).
622–1	2Z3400–133	COVER BG–133: canvas.	For radio receiver.
623–1	2Z3400–134	COVER BG–134: transparent.	For radio receiver.
200	3H1899–133	DYNAMOTOR UNIT PE–133.	
624–1	2B829	HEADSET HS–29–E.	
	2B1300	INSERT M–300	For HS–29.
627–1	4G1335	MICROPHONE T–35.	
621–1	2Z7189	PLUG PL–89: male contact; 4-conductor; brass; $1^{5}/_{8}$" diam x $2^{5}/_{8}$" over-all.	
185–1 through 185–11	2Z8678–1	SOCKET, tube: std octal; molded bakelite.	Tube sockets.

SECTION IX

SUPPLEMENTARY DATA

72. Parts Identification

The following illustrations are provided to aid in identifying and servicing the various component parts of Radio Receiver BC-973-(*).

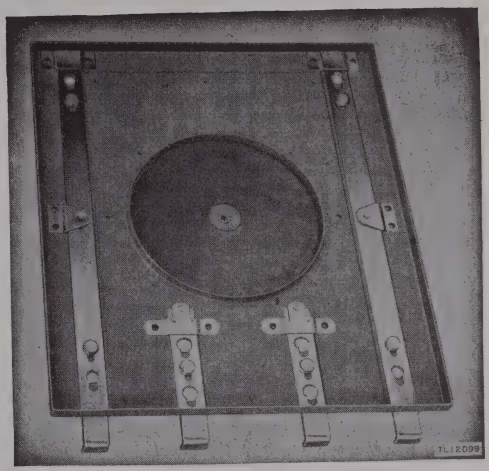
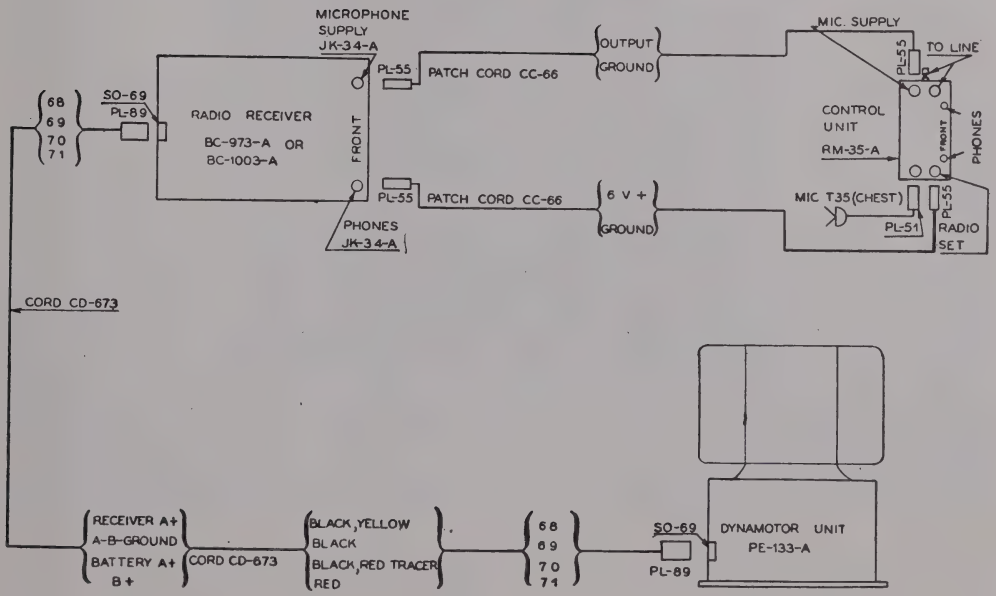


Figure 45. Mounting plate FT-363-B—bottom view.



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Figure 46. Radio Set SCR-503-A—cording diagram.

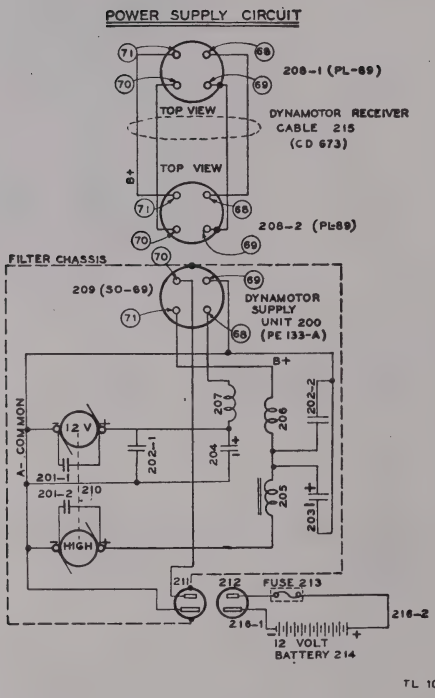


Figure 47. Power supply for Radio Receiver BC-973-A—schematic diagram.

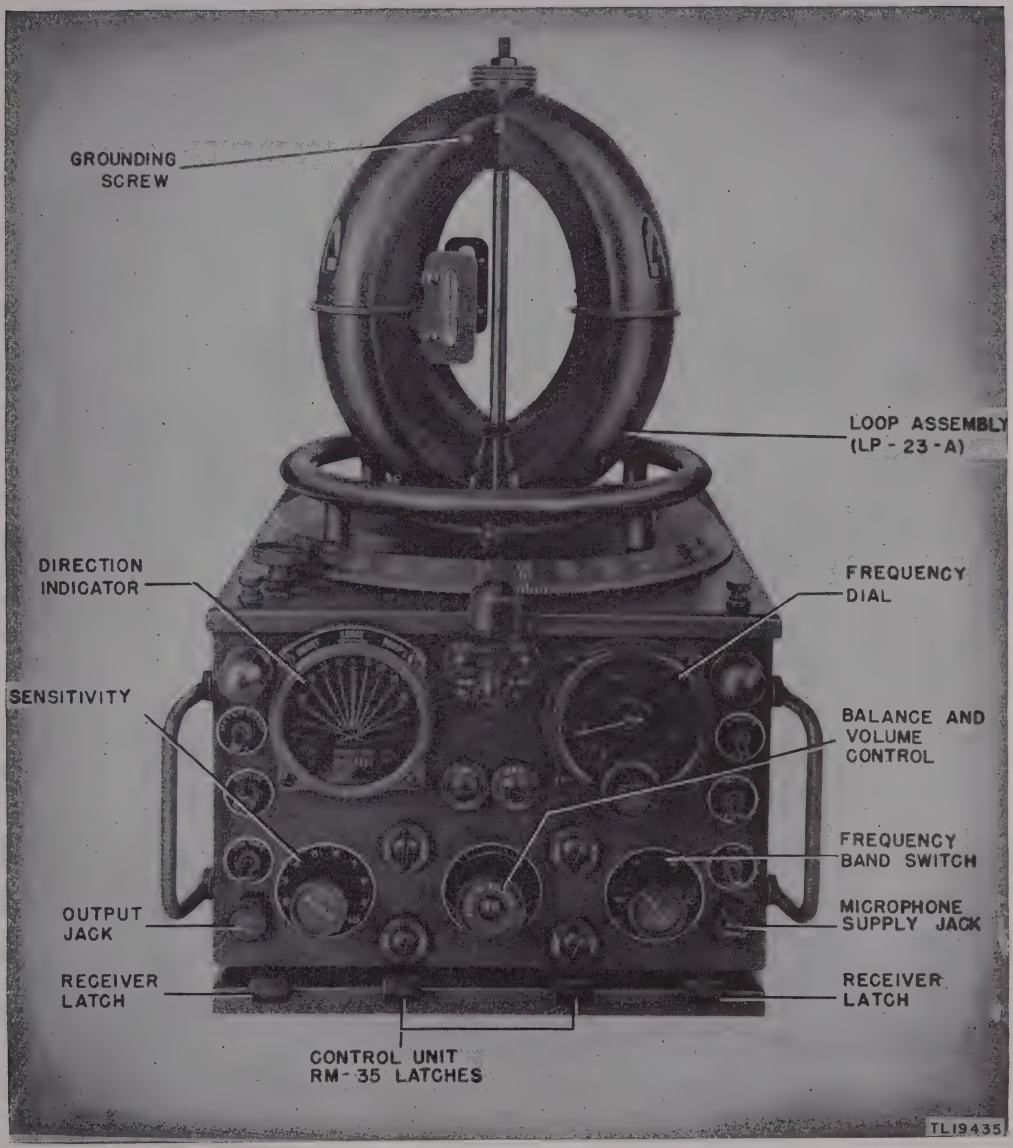


Figure 48. Radio Receiver BC-973-A—front view, showing controls.

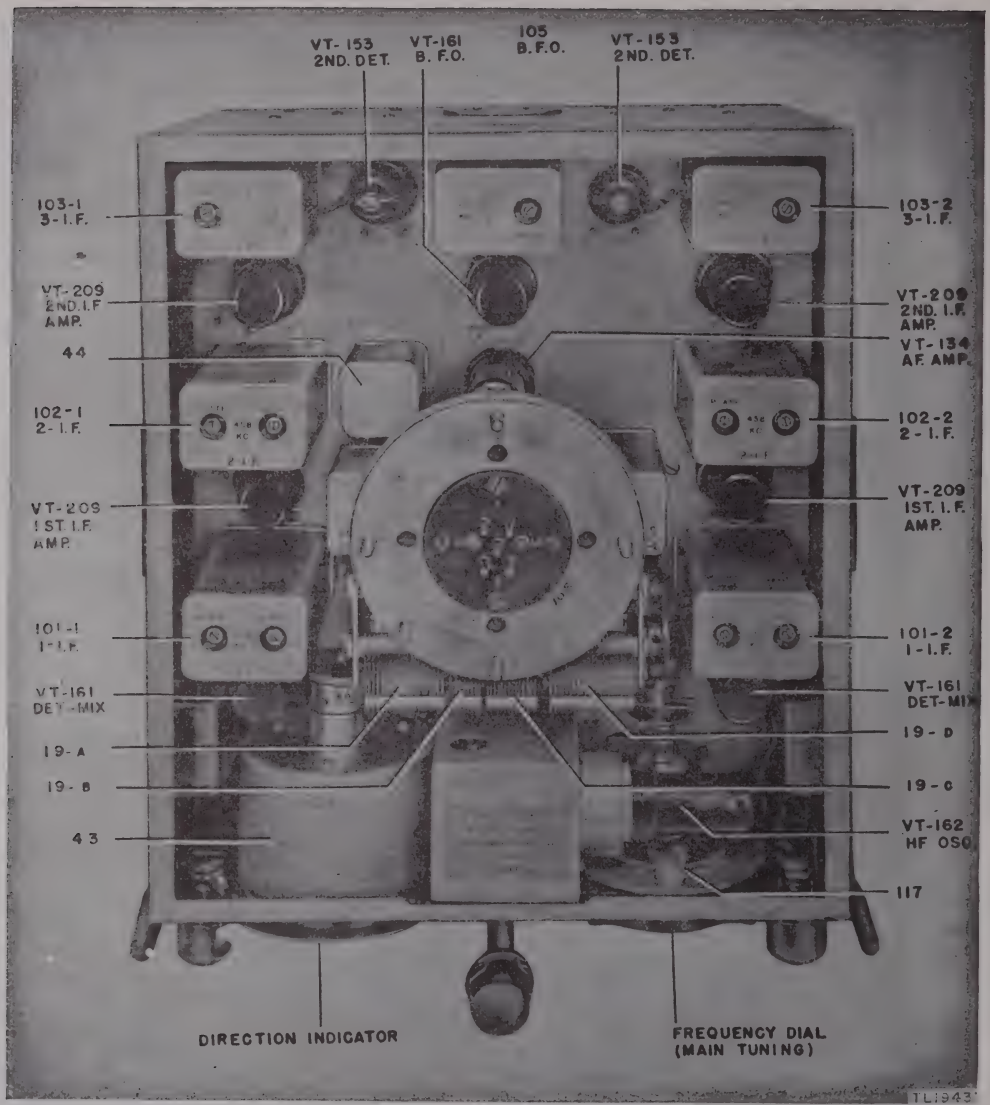


Figure 49. Radio Receiver BC–973–A—top view.

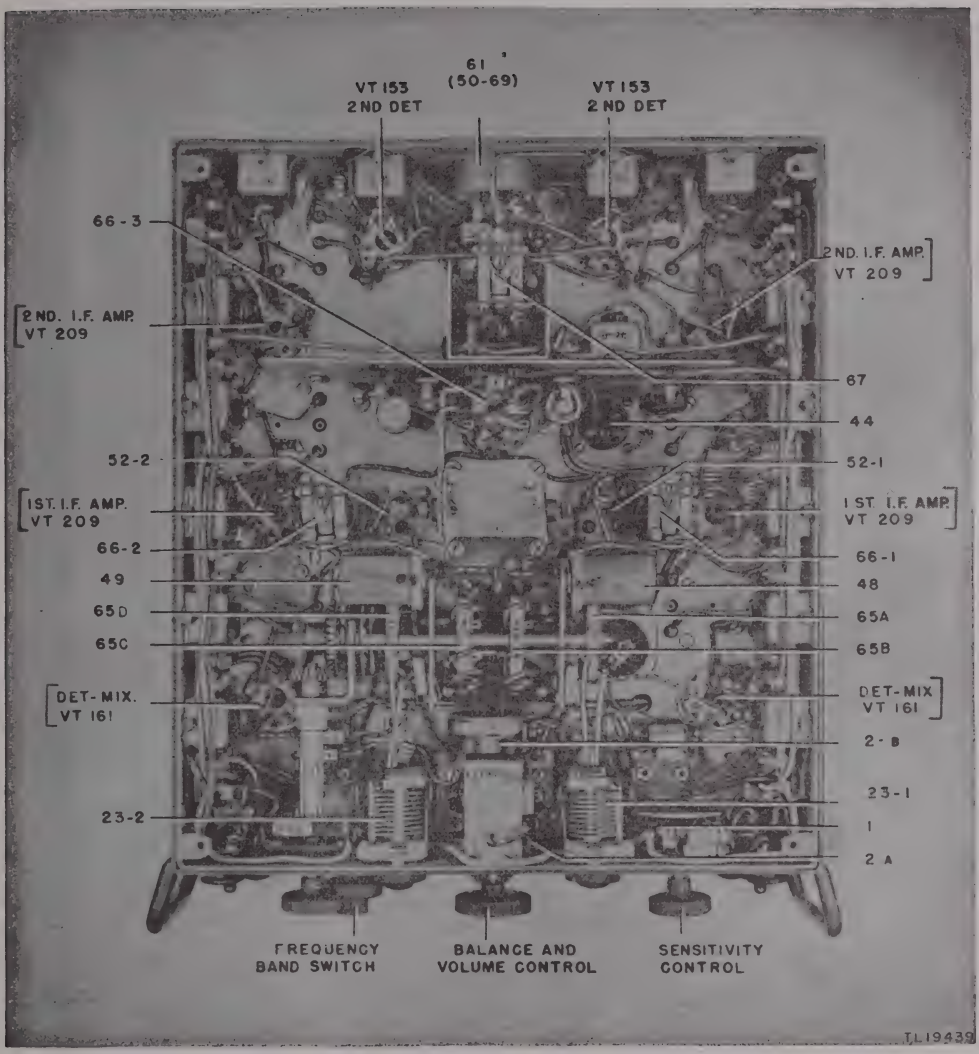


Figure 50. Radio Receiver BC–973–A—bottom view.

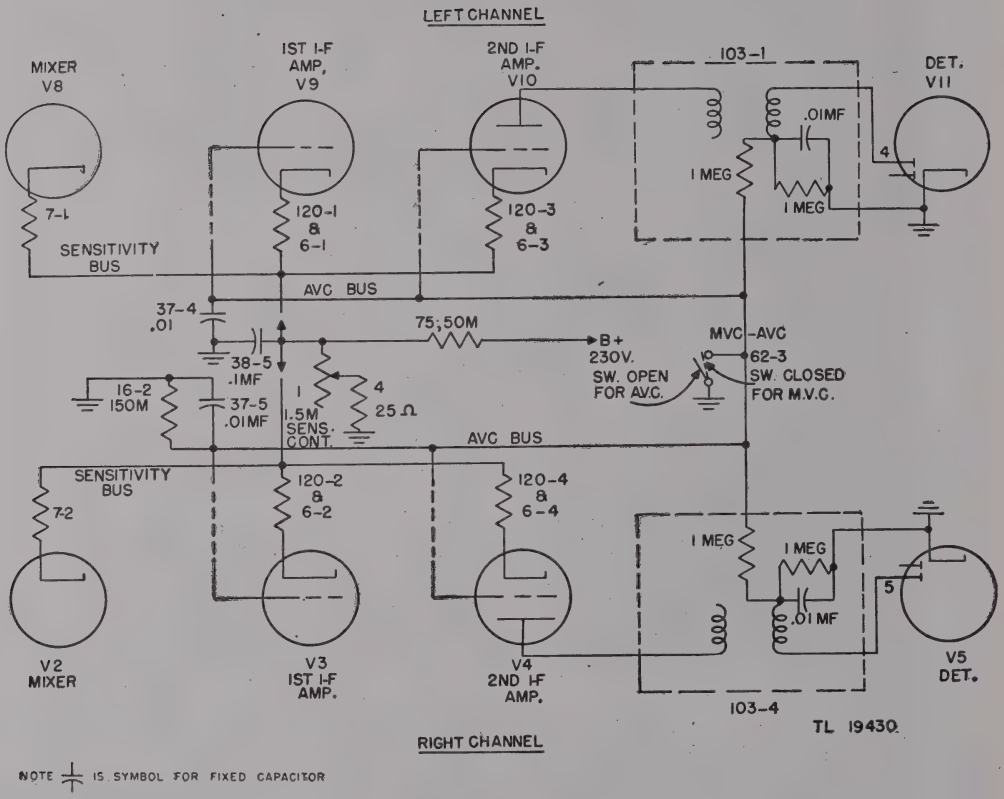


Figure 51. Radio Receiver BC–973–A—sensitivity and a-v-c circuit.

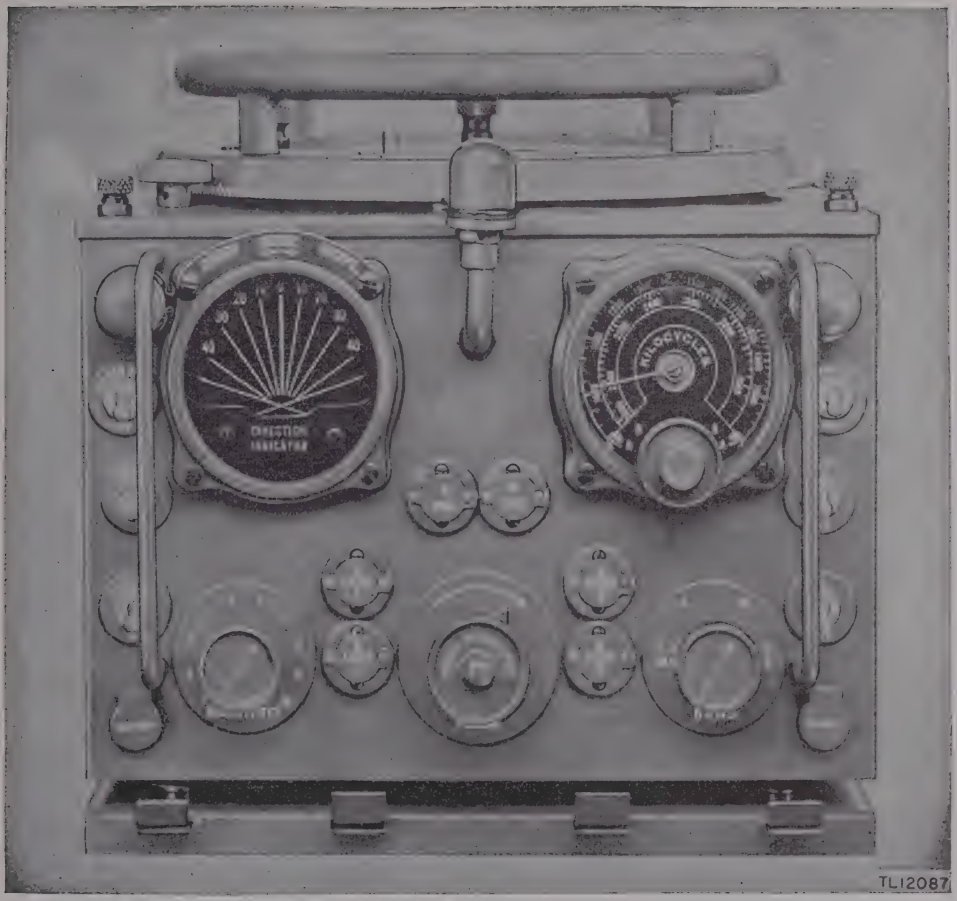


Figure 54. Radio Receiver BC–973–B—front view, showing controls.

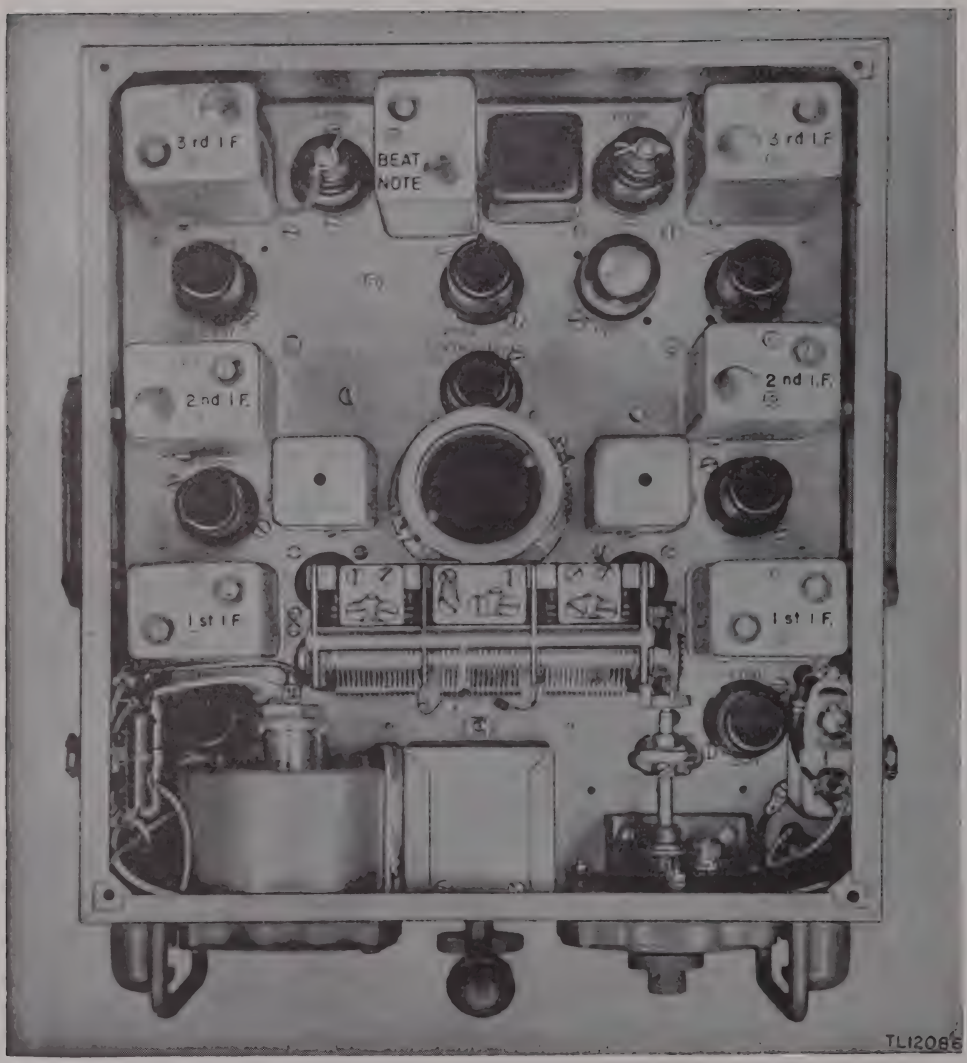


Figure 55. Radio Receiver BC–973–B—top view.

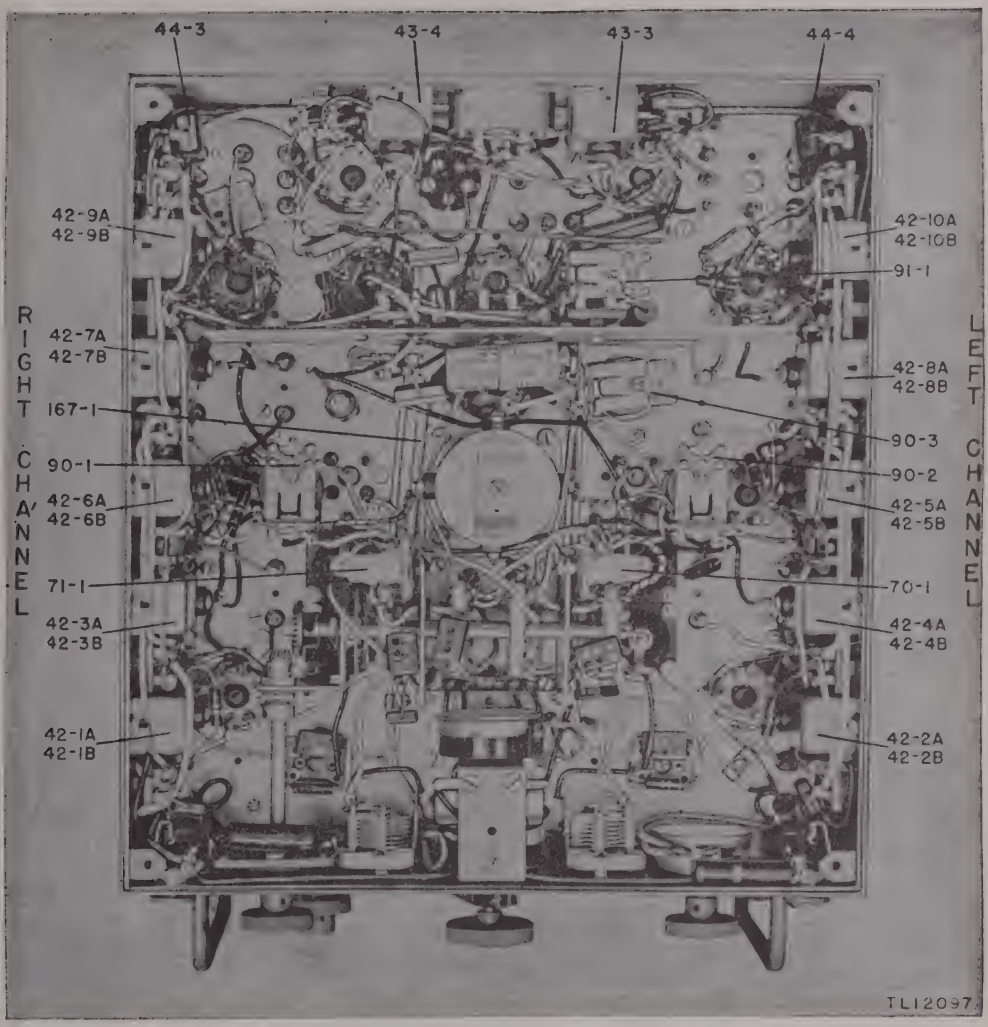


Figure 56. Radio Receiver BC–973–B—bottom view.

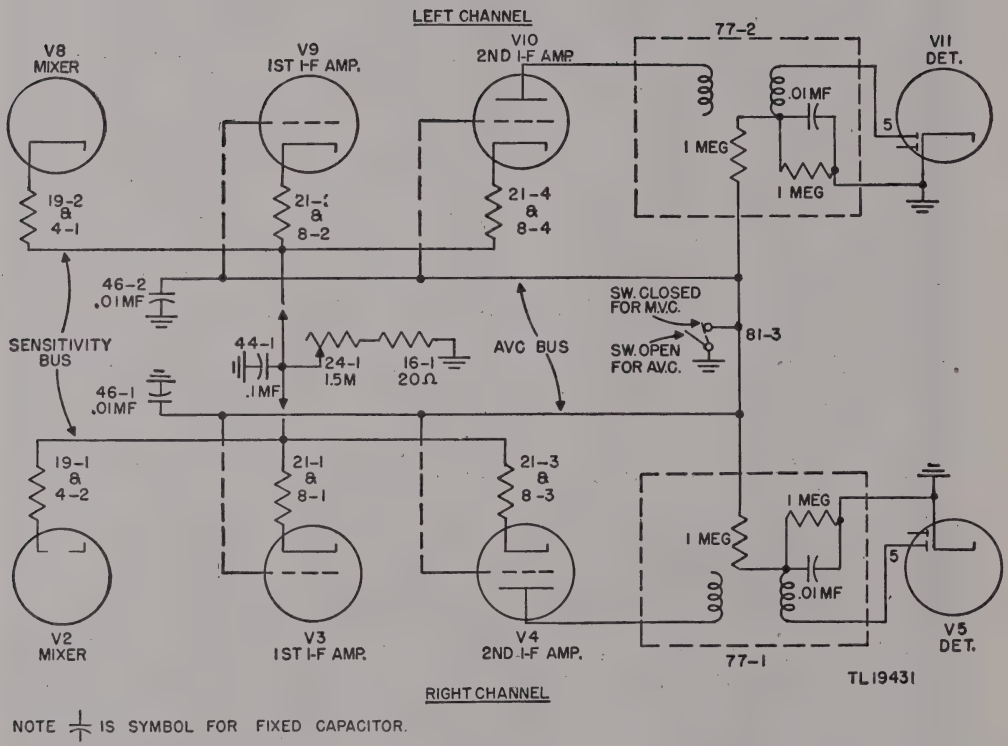


Figure 57. Radio Receiver BC–973–B—sensitivity and a-v-c circuit.

2ND DET. JAN 12C8 VT-153
28-3 100MMF
.002 MF
14-1 75 M
36-3
105
40 MMF
15 MMF
250 MMF
50 M
V 6 B-F-O JAN 12SJ7 VT-162
A+ 12V
37-3 .01 MF
38-4 .1 MF
14-4 75M
40-4 .5 MF
14-3 75M
18-8 1 MEG
16-1 150 M
62-2 CW OSC. OFF
28 60 M
BALANCE CONTROL
67 B-F-O RELAY
LEFT
RIGHT
43 DIRECTION INDICATOR
59
60
42-2 500 MF
64-2 METER DAMP
42-1 500 MF
V11
V10
V9
V8
V7
V6
V5
V4
V3
V2
V1
A+ 12V
B+ 230 V
SENSITIVITY CONTROL
75 50M
62-3 AVC-MVC
38-5 .1 MF
1500
4 25
17-4 500M
40-3 .5 MF
40-5 .5MF
64-1 POWER
71
68
70
69
61 50-69
5114
2ND DET. JAN 12C8 VT-153
14-2 75-M
.002 MF
28-4 100MMF
36-4
V7 A-F AMP. JAN 12A6 VT-134
17-3 500M
41-3 25 MF
8 1M
38-3 .1 MF
36-6 .002 MF
44
250 TAP
VOL CONTROL 2A 20M
62-1 LIGHTS
51-1 50 A
56-1 OUTPUT
56-2 MIC. SUPPLY
69-3
69-2
69-1
PILOT LIGHTS 12V

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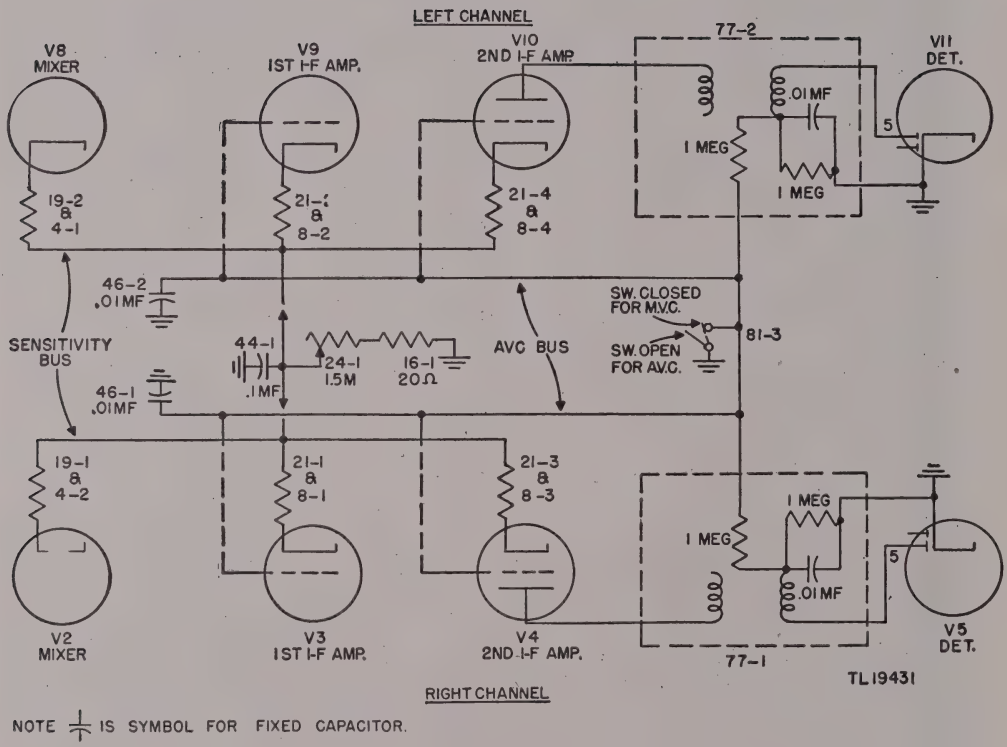


Figure 57. Radio Receiver BC-973-B—sensitivity and a-v-c circuit.

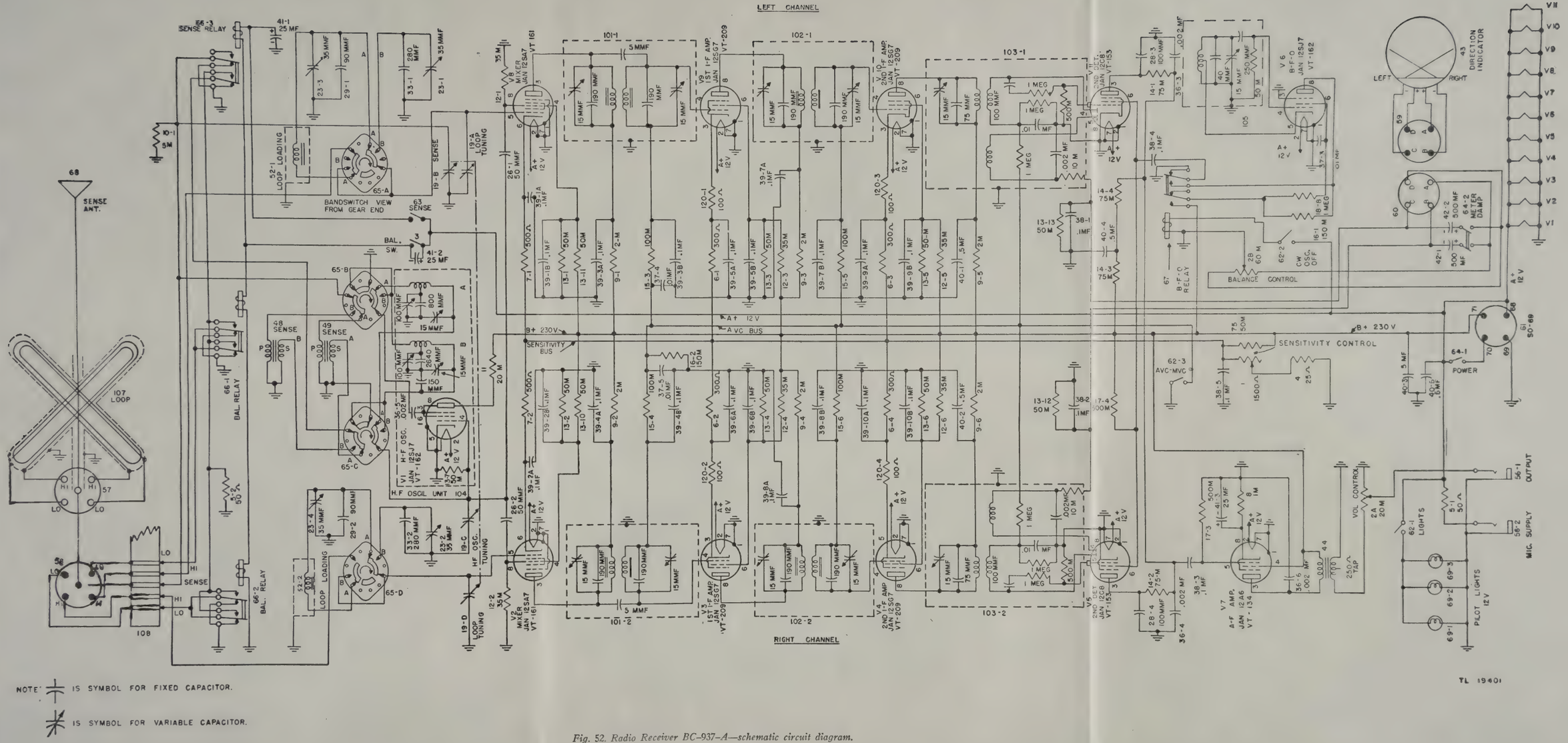
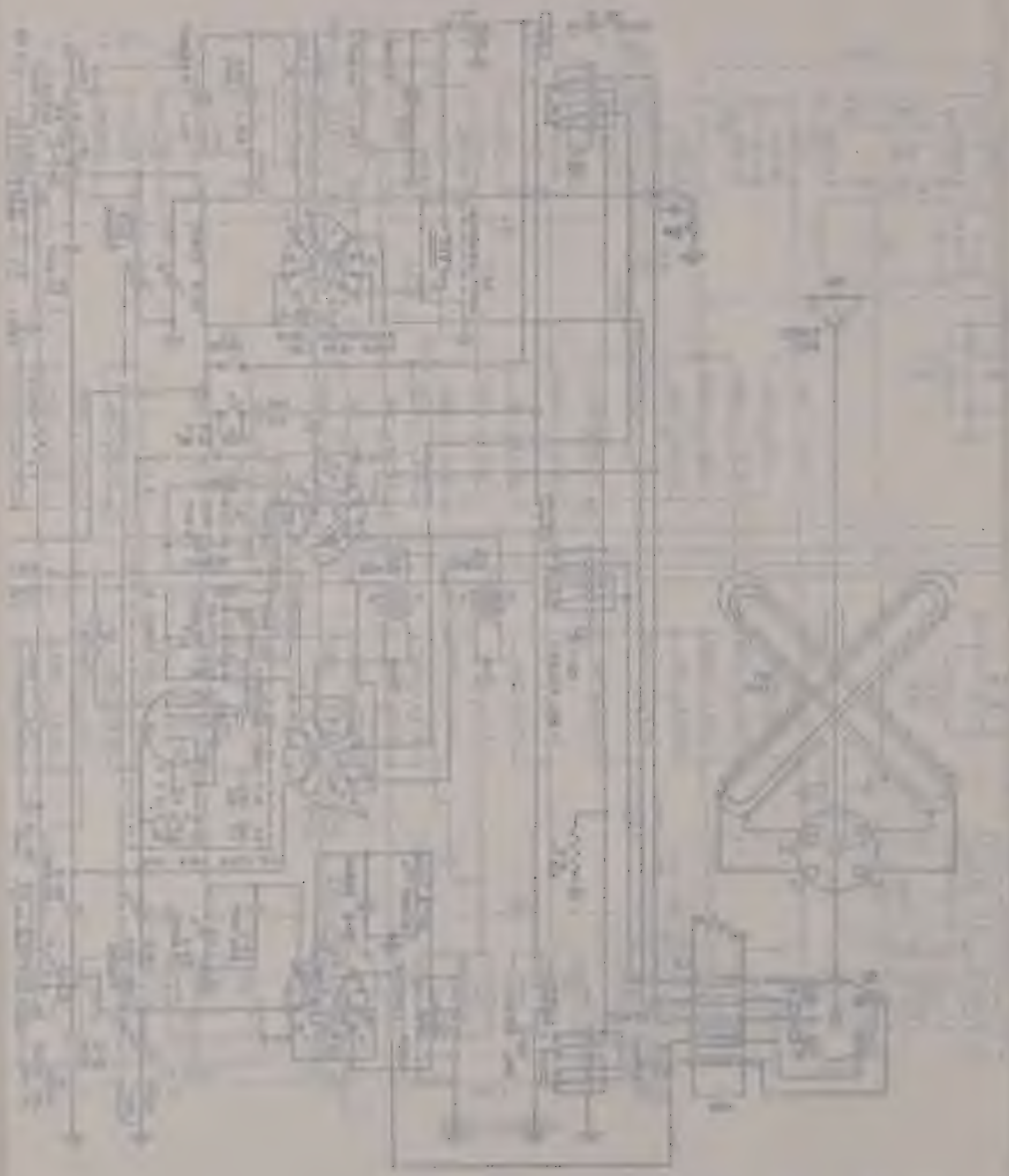
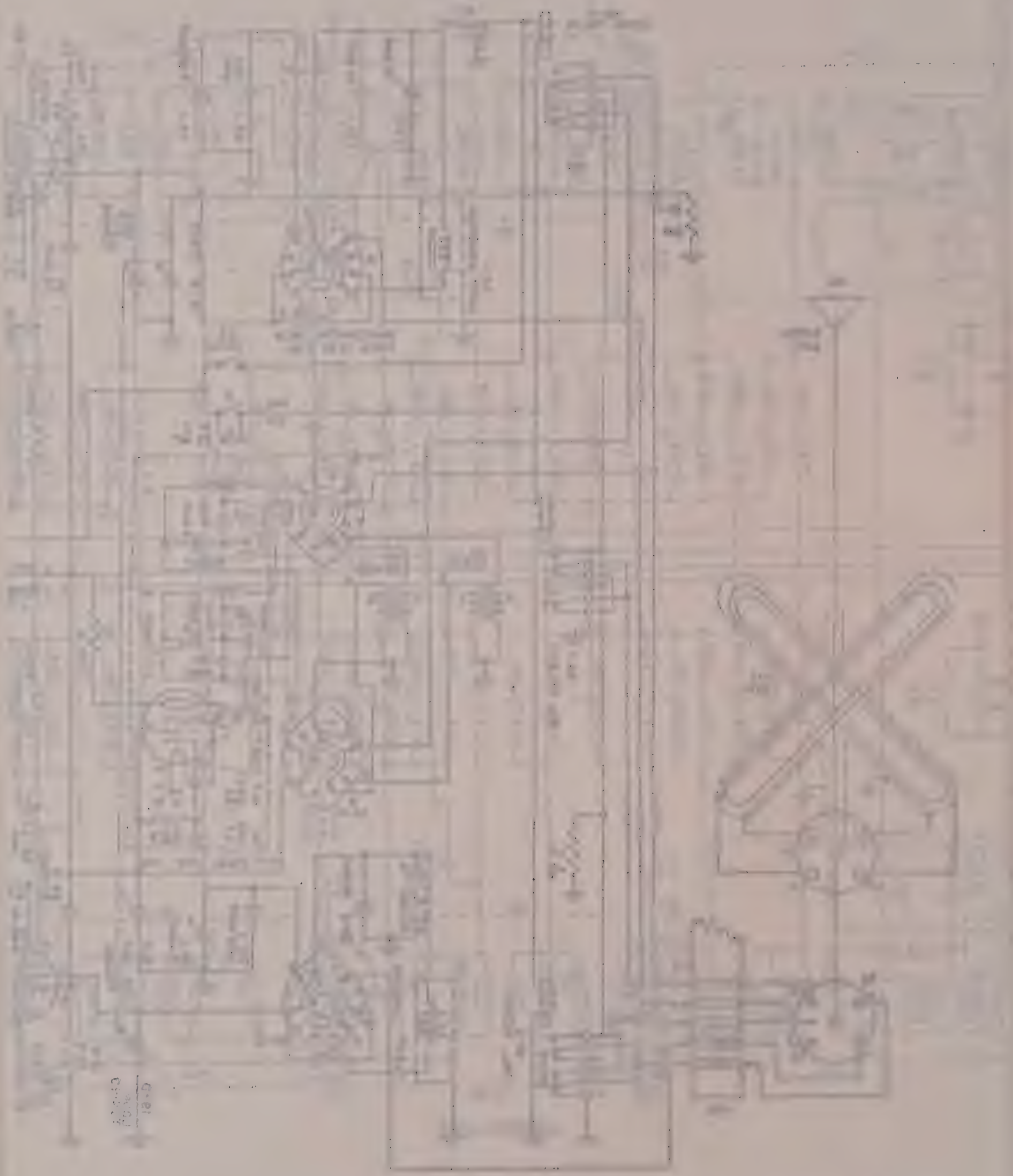


Fig. 52. Radio Receiver BC-937-A—schematic circuit diagram.







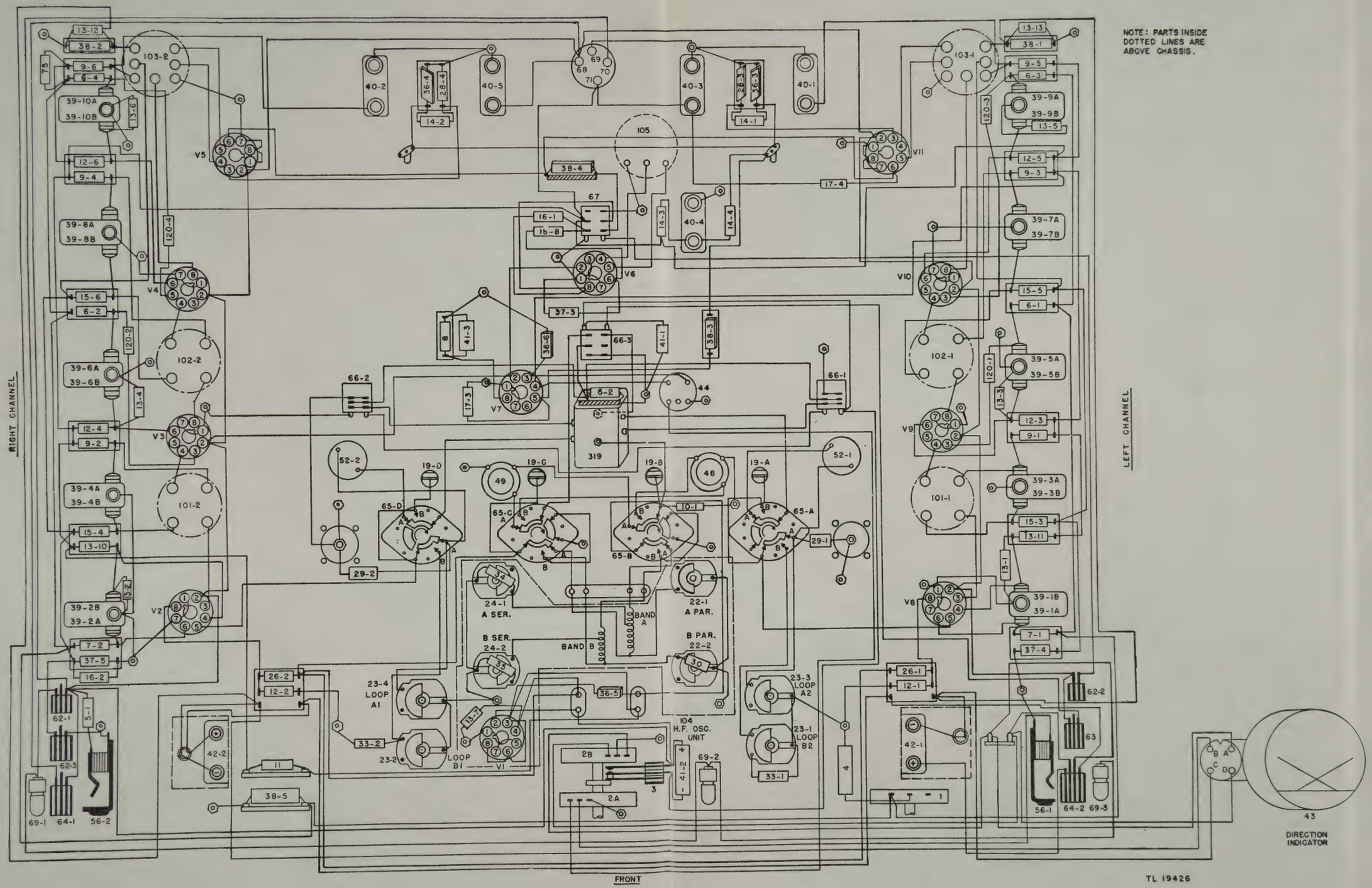
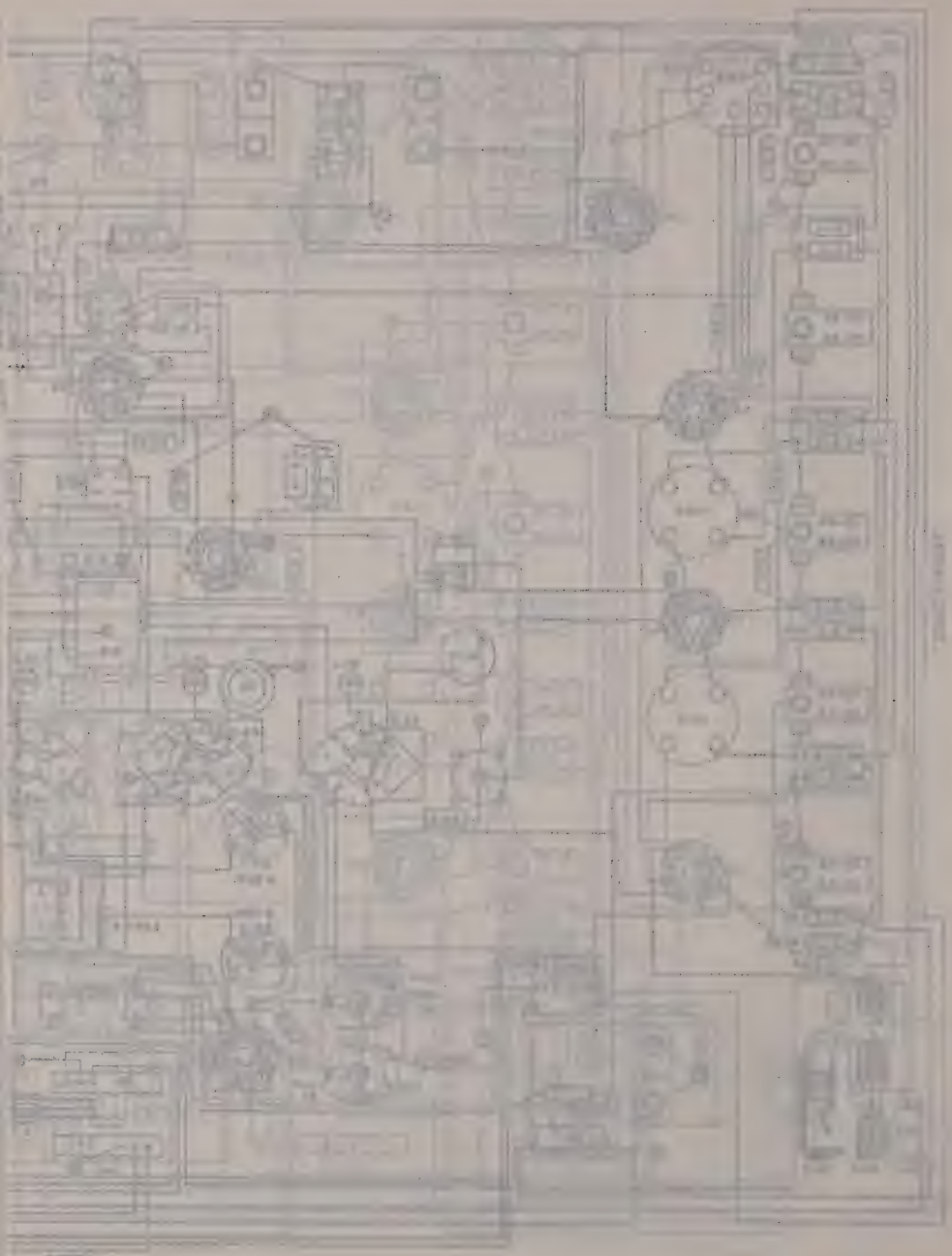
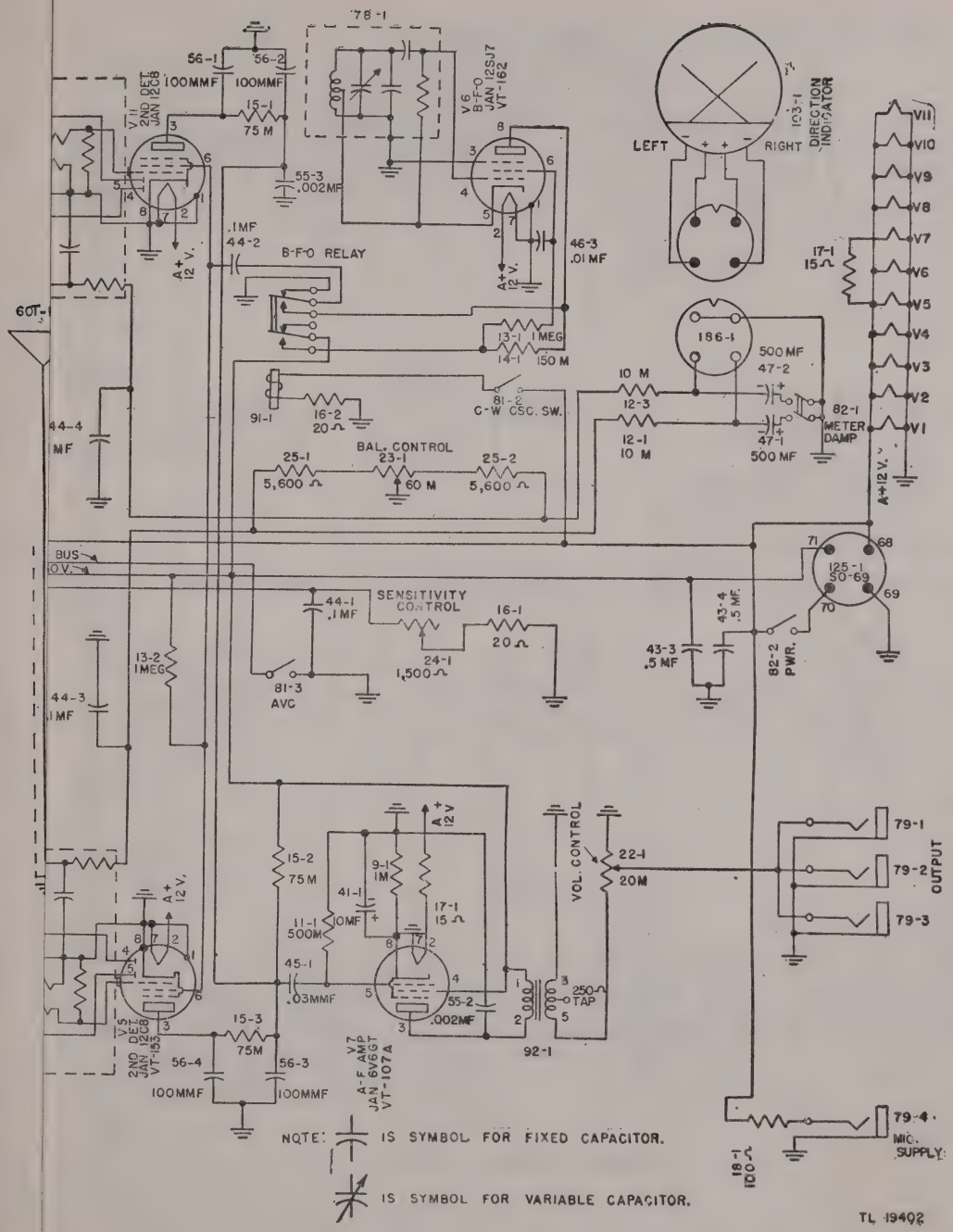
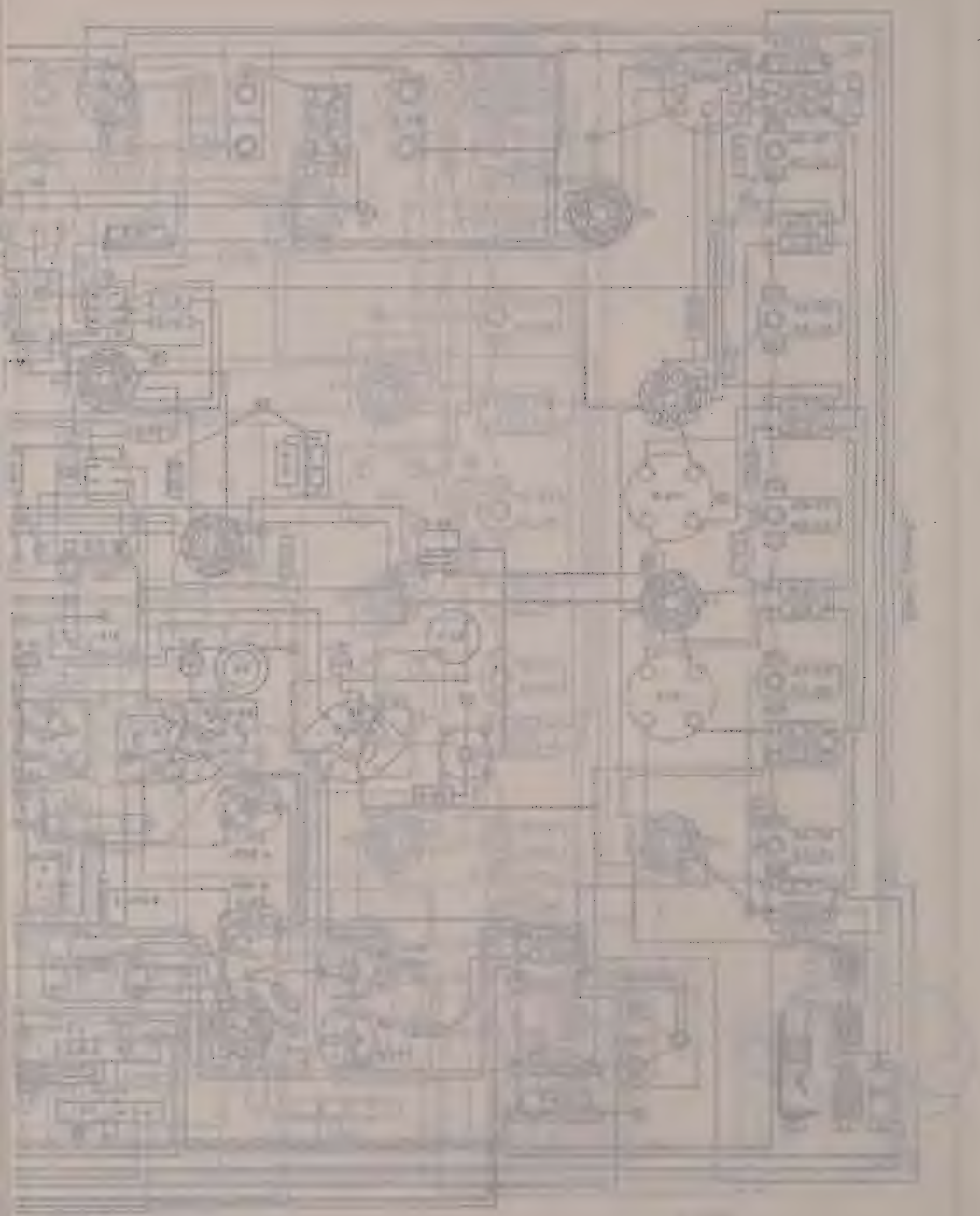


Figure 53. Radio Receiver BC–973–A—wiring diagram.




78-1
56-1
100MMF
56-2
100MMF
15-1
75 M
55-3
.002MF
V11
2ND DET
JAN 12SR8
V6
B-F-O
JAN 12SJ7
VT-162
.1MF
44-2
B-F-O RELAY
46-3
.01MF
A+
12 V.
60T-1
44-4
.1MF
13-1 1MEG
14-1 150 M
91-1
16-2
20
81-2
C-W OSC. SW.
BAL. CONTROL
25-1
5,600
23-1
60 M
25-2
5,600
10 M
12-3
12-1
10 M
186-1
500 MF
47-2
47-1
500 MF
82-1
METER
DAMP
103-1
DIRECTION
INDICATOR
LEFT
RIGHT
17-1
15
V11
V10
V9
V8
V7
V6
V5
V4
V3
V2
V1
A+12 V.
BUS
0 V.
71
68
125-1
50-69
69
70
82-2
PWR.
43-4
.5 MF
43-3
.5 MF
44-1
.1MF
SENSITIVITY
CONTROL
16-1
20
24-1
1,500
81-3
AVC
44-3
.1MF
13-2
1MEG
A+
12 V.
15-2
75 M
9-1
1M
41-1
.01MF
11-1
500M
17-1
15
45-1
.03MMF
55-2
.002MF
VOL. CONTROL
22-1
20M
250
TAP
92-1
79-1
79-2
79-3
OUTPUT
79-4
MIC.
SUPPLY
18-1
100
V5
2ND DET
JAN 12C8
VT-153
15-3
75M
56-4
100MMF
56-3
100MMF
V7
A-F AMP
JAN 6V6GT
VT-107A
NOTE: IS SYMBOL FOR FIXED CAPACITOR.
IS SYMBOL FOR VARIABLE CAPACITOR.
TL 19402



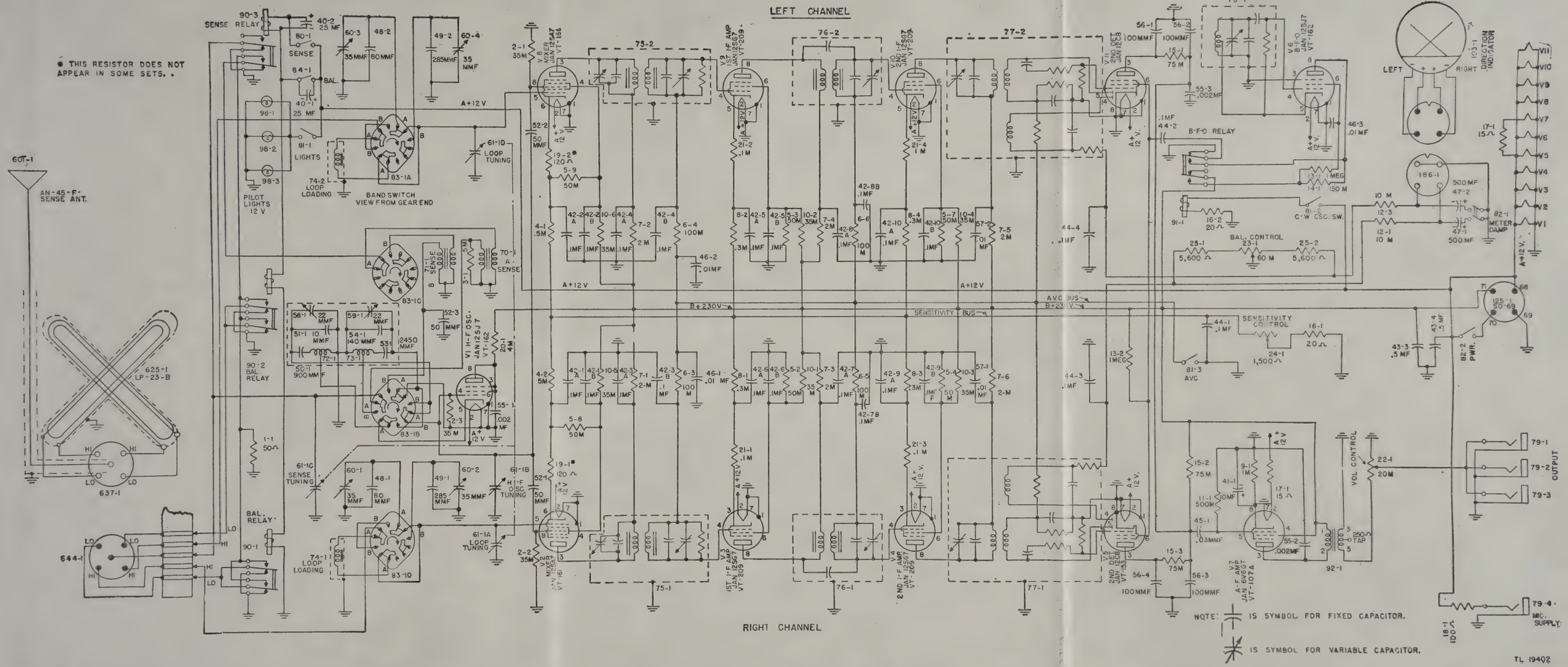
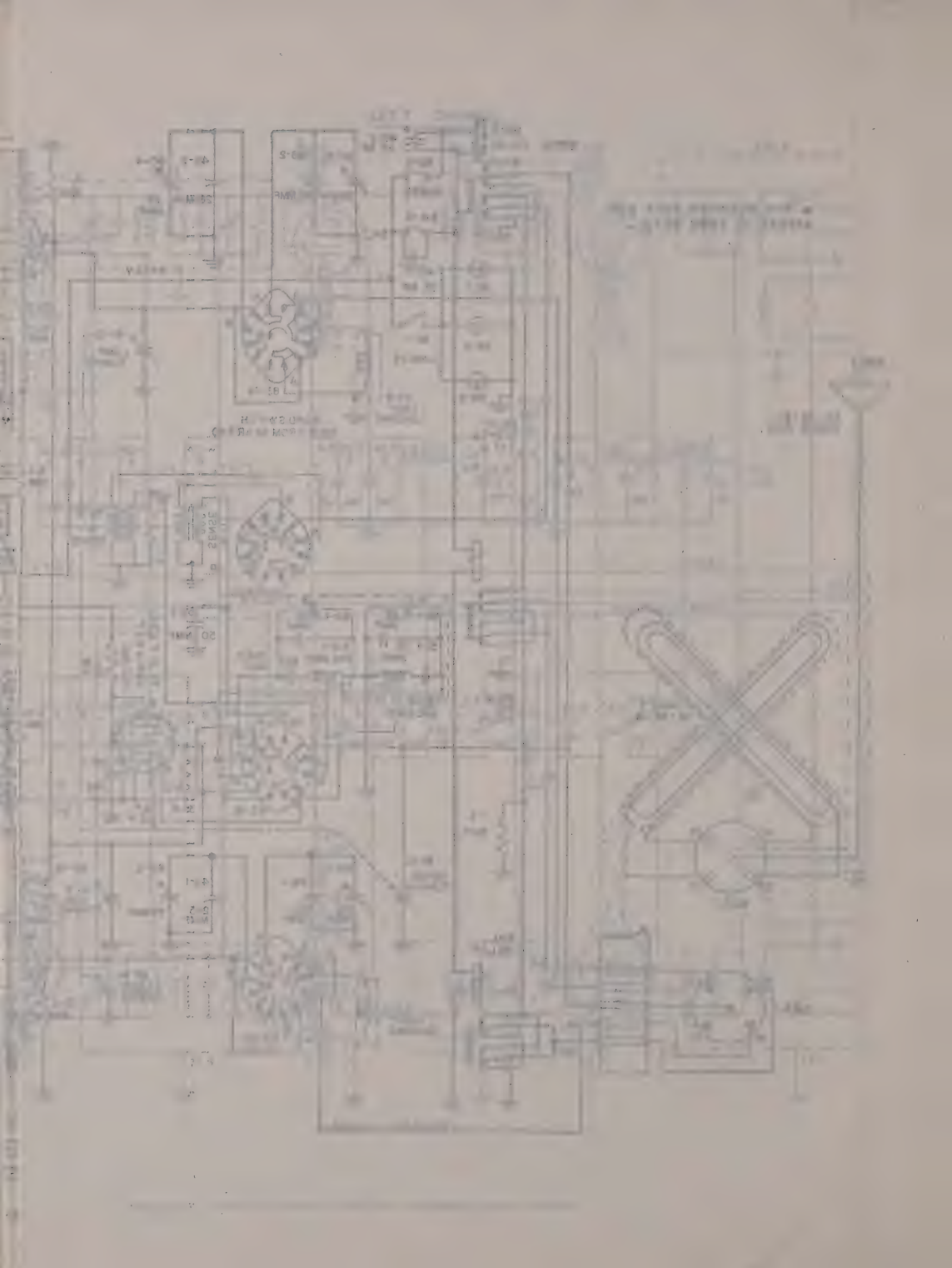
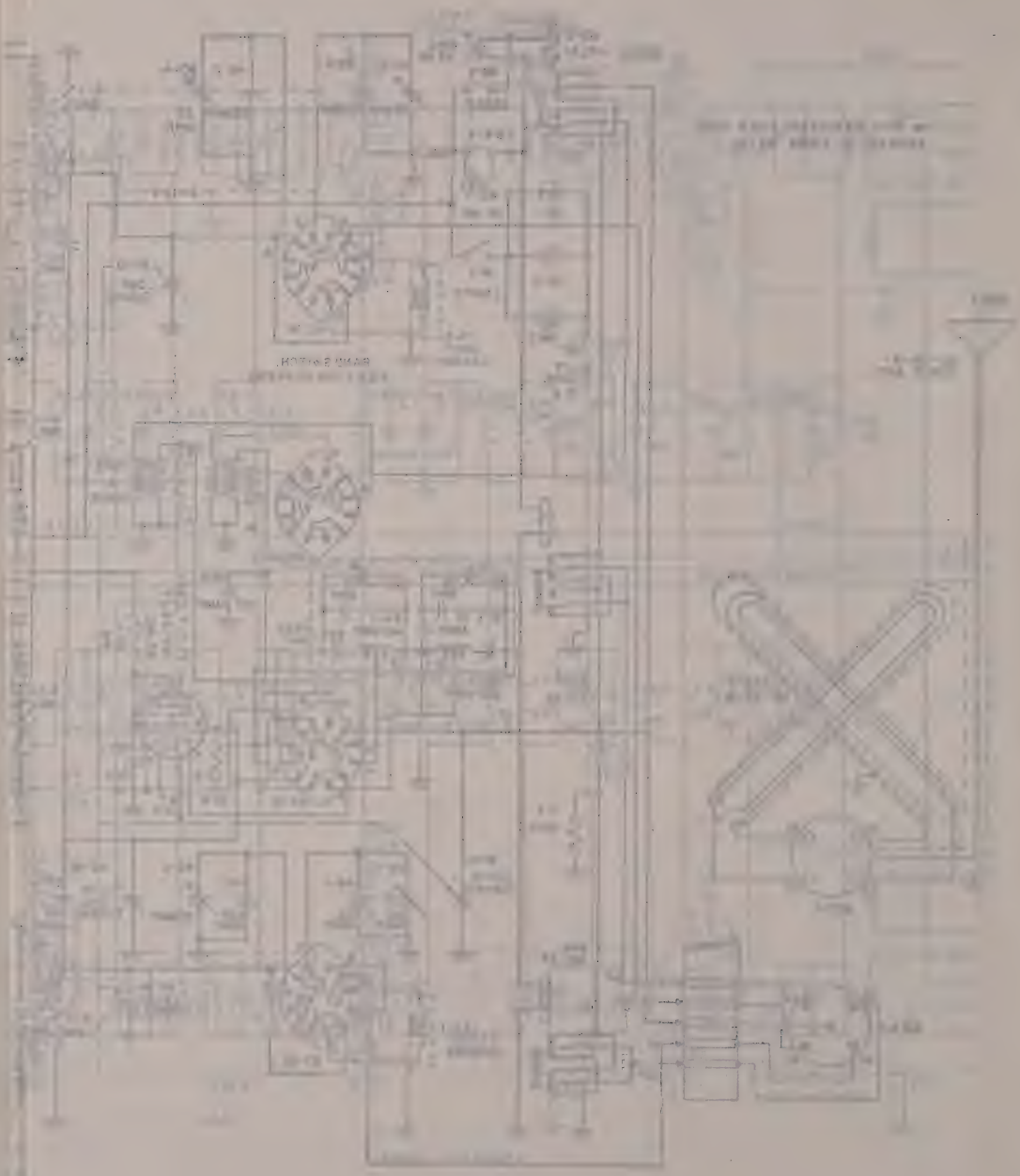


Figure 58. Radio Receiver BC-973-B—schematic circuit diagram.







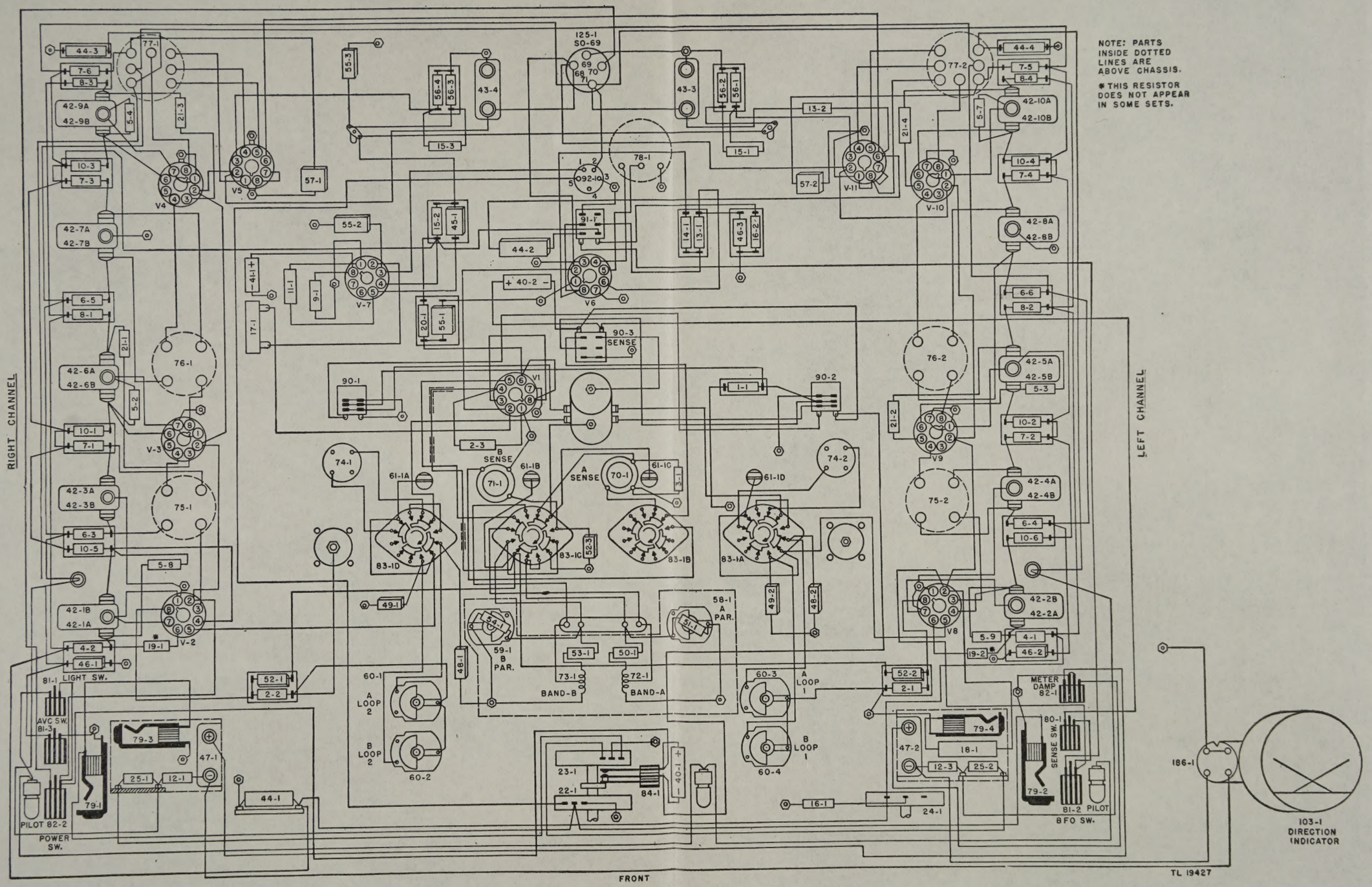
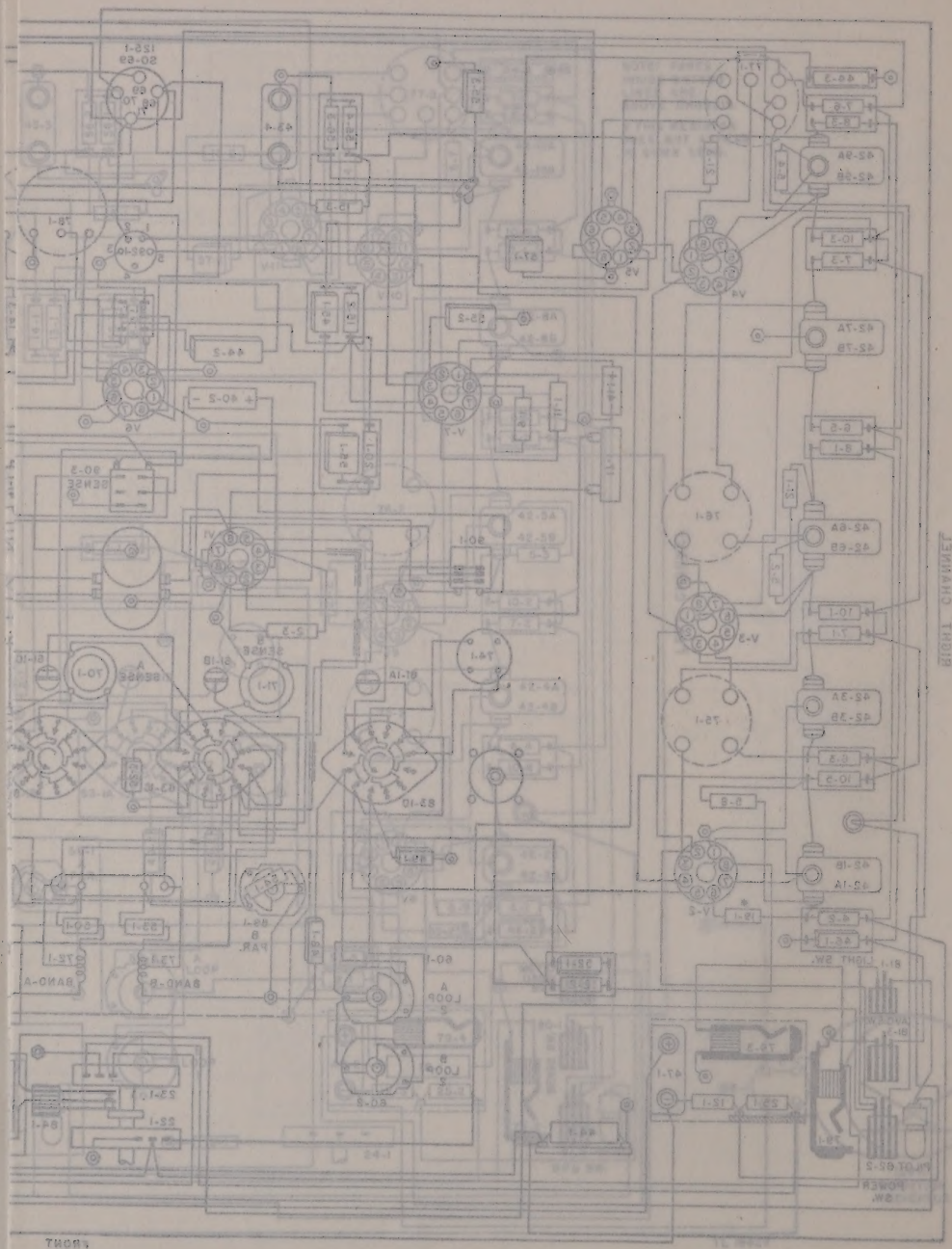


Figure 59. Radio Receiver BC–973–B—wiring diagram.


RIGHT CHANNEL
FRONT