TM 11-4008

WAR DEPARTMENT TECHNICAL MANUAL

B-20

RADIO RECEIVER

BC-652-A

REPAIR INSTRUCTIONS

CLASSIFICATION REMCVED,PER.W.D. CIR 231 -,1945

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WAR DEPARTMENT · *MAY 1945*

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WAR DEPARTMENT

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TM 11–4008, Radio Receiver BC–652–A, Repair Instructions is published for the information and guidance of all concerned.

[AG 300.7 (11 Apr 44)]

BY ORDER OF THE SECRETARY OF WAR:

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

WARNING

HIGH VOLTAGE

is used in the operation of
this equipment.

DEATH ON CONTACT

may result if operating personnel fail
to observe safety precautions.

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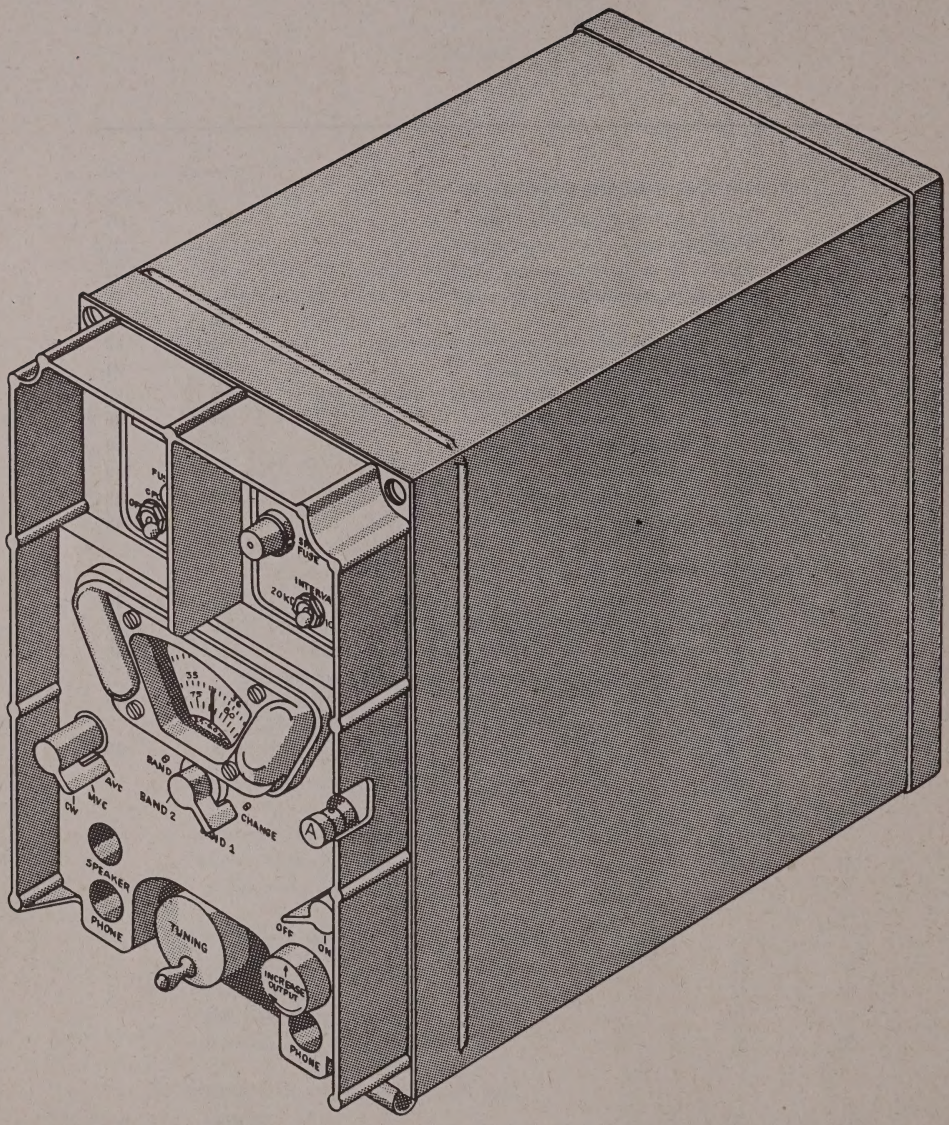


Figure 1. Radio Receiver BC–652–A.

SECTION I

DESCRIPTION OF RADIO RECEIVER BC–652–A[1]

1. Characteristics

a. GENERAL. Radio Receiver BC–652–A is a combined superheterodyne receiver and crystal-frequency-calibrator unit, operated in conjunction with Radio Transmitter BC–653–A. The receiver and transmitter rest on Mounting FT–253–A and are components of Radio Set SCR–506–A. Power supply leads to the receiver and interconnections between receiver and transmitter are made when the radio receiver is slid into place on the mounting.

b. RECEIVER UNIT. The receiver is an eight tube superheterodyne circuit designed to receive c-w (continuous-wave) and voice signals in a frequency range from 2 to 6 mc (megacycles) in two bands: 2–3.5 mc in band 1, and 3.5–6 mc in band 2. The receiver output may be coupled to either a headset or loudspeaker.

c. CRYSTAL - FREQUENCY - CALIBRATOR UNIT. The crystal-calibrator unit is a three tube crystal controlled multivibrator circuit furnishing either a 20-kc (kilocycle) or a 100-kc output, as selected by the INTERVAL switch, and is used for calibrating Radio Receiver BC–652–A and Radio Transmitter BC–653–A. The output is capacitively coupled to the antenna post of the receiver.

d. POWER SUPPLY. Power for Radio Set SCR–506–A is supplied by either a 12-volt or a 24-volt storage battery through Mounting FT–253–A. On the 12-volt battery, drain for Radio Set SCR–506–A averages 42 amperes; on the 24-volt storage battery, 30 amperes. The receiver unit draws about 50 watts. High voltage is supplied by Dynamotor DM–40–A or Dynamotor DM–41–A. Dynamotor DM–40–A operates from a 12- to 14-volt source, and Dynamotor DM–41–A operates from a 24- to 28-volt source. Insertion of the proper dynamotor for the available supply voltage automatically adjusts the receiver filament circuits correctly.

[1]See TM 11–630 for installation, operation, and other maintenance data on this equipment.

2. Theory of Operation

a. GENERAL. The block diagrams for the receiver and the crystal-frequency-calibrator circuits of Radio Receiver BC–652–A are shown in figure 2. The block diagram for the receiver unit shows the signal path from the input at the antenna to the output at the headset or loudspeaker. The block diagram for the crystal-frequency-calibrator shows the path of the output from the crystal-frequency oscillator to the output at the antenna post of the receiver.

b. RECEIVER UNIT. (1) *Radio - frequency stage.* The input signal from the antenna post is coupled (inductively and capacitively in band 1, and inductively in band 2) to a tuned resonant circuit. The output from this circuit is capacitively-coupled to the grid of the r-f (radio-frequency) amplifier Tube JAN–12SG7 (V301).

(2) *First detector and converter stage.* The output of the r-f stage is coupled inductively to a tuned resonant circuit which in turn, is capacitively coupled to the grid of the first detector and converter stage Tube JAN–12K8 (V302). In this stage the incoming signal is mixed with the output of the high-frequency oscillator, to produce an i-f (intermediate-frequency) of 915 kc. This oscillator is a tuned plate type and uses the triode section of Tube JAN–12K8 (V302).

(3) *Intermediate-frequency stages.* The 915 kc output of the converter stage is inductively coupled through the first i-f transformer to the grid of first i-f amplifier Tube JAN–12SK7 (V303). The amplified output of the first i-f stage is inductively coupled through the second i-f transformer to the grid of second i-f amplifier Tube JAN–12C8 (V304). The pentode section of this tube amplifies the i-f signal and the diode section is used as a noise limiter. The output of the second i-f stage is inductively coupled through the third i-f transformer to the grid of third i-f amplifier Tube JAN–12SK7 (V305). The cathode of this stage is connected to grounding switch in Radio Transmitter BC–653–A through Mounting FT–253–A. When the trans-

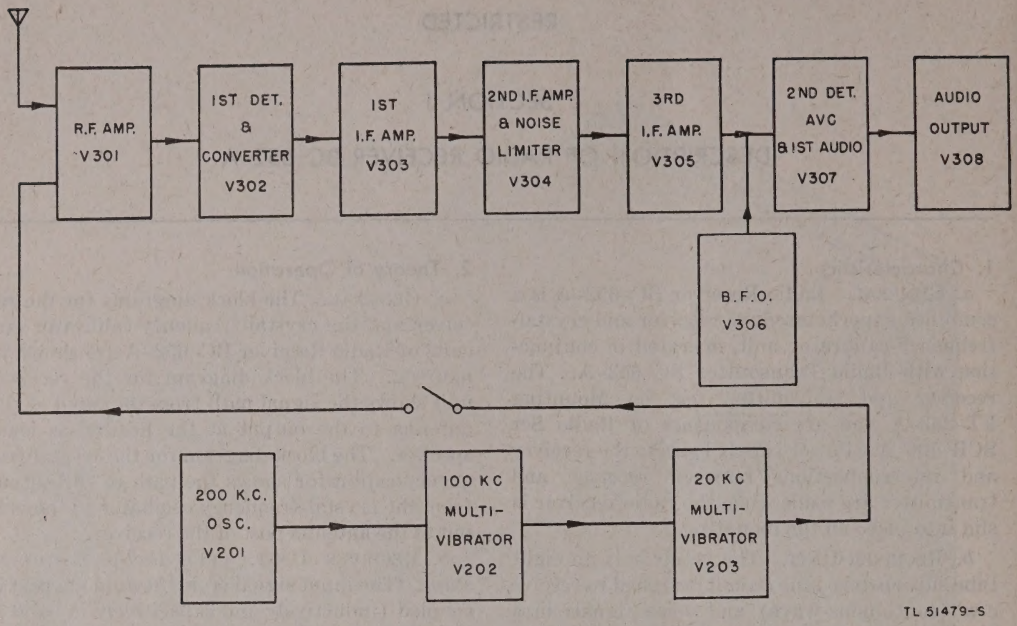


Figure 2. Block diagram, Radio Receiver BC–652–A.

mitter is operated, a break-in relay in the transmitter opens the cathode grounding circuit, thereby making the receiver inoperative.

(4) *Beat-frequency oscillator stage.* The beat-frequency oscillator stage consists of a Hartley oscillator circuit using Tube JAN–12K8 (V306) as the oscillator tube. The output from the plate of this tube is coupled to the plate of tube V305 in the third i-f amplifier stage.

(5) *Second detector and audio stages.* The output of the third i-f amplifier stage is inductively coupled through the fourth i-f transformer to the diode sections of the second detector and first audio amplifier Tube JAN–12SR7 (V307) which rectify the i-f signal producing both an audio voltage and a voltage used for automatic volume control. The audio voltage is coupled to the grid of the triode section (first audio stage) of this same tube and amplified; the a-v-c (automatic-volume-control) voltage is applied to the grids of the r-f and i-f tubes, controlling the over-all gain of the receiver. The output of the first audio stage is capacitively coupled to the grid of audio-frequency output amplifier Tube JAN–6Y6G (V308). The output of this tube is coupled through an audio output transformer to loudspeaker and headset jacks. Sidetone is fed from the transmitter to the receiver output during transmission, enabling the operator to monitor the c-w keying and voice transmission.

c. CRYSTAL - FREQUENCY - CALIBRATOR UNIT. (1) *200-KC oscillator stage.* The 200-kc oscillator stage is a combined crystal-controlled oscillator and buffer amplifier. The oscillator uses the triode section of Tube JAN–6K8 (V201) with the 200-kc crystal in the grid circuit and a resonant tank circuit in the plate circuit. The output of the triode oscillator is electron-coupled to the pentode buffer amplifier section of this tube. The plate circuit of the buffer amplifier has a resonant tank circuit tuned to 200 kc.

(2) *Multivibrator stages.* The 200-kc output of the crystal oscillator feeds into the 100 kc multivibrator stage which uses Tube JAN–6SC7 (V202). The 100 kc multivibrator generates harmonic signal frequencies in steps of 100 kc. When the INTERVAL switch is set at 20 kc, the signal from the 100-kc multivibrator is capacitively coupled to the grid input circuit of the 20 kc multivibrator which uses Tube JAN–6SC7. (V203). This causes the 20 kc multivibrator to generate harmonic signal frequencies in steps of 20 kc. The 100 kc and 20 kc harmonics are fed to the antenna post of the receiver.

SECTION II

DIFFERENCES BETWEEN MODELS

(Not applicable)

SECTION III

INITIAL REPAIR PROCEDURE

NOTE. Before making any repairs or adjustments, all authorized MWO's should be applied. See War Department Pamphlet 12–6 for list of applicable MWO's.

3. General

Maintenance personnel should follow the procedure outlined in this manual when repairing and overhauling Radio Receiver BC–652–A. 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 will permit repair of the equipment in the shortest time possible and will result in performance comparable to that of new equipment.

4. Tools, Test and Cleaning Equipment

The equipment in table I should be available for the proper repair of Radio Receiver BC–652–A.

Table I

Tools, test and cleaning equipment.

Item	Description
Dental mirror	
Assorted hand tools	Soldering iron, pliers, screwdrivers, small socket wrenches, small adjustable wrench, and two Allen head pocket wrenches (fastened in back of case)
Flashlight or probing light	
Solvent, Dry-Cleaning (SD)	
Assorted brushes	
Compressed air	Clean, dry low-pressure
Sandpaper	Fine grade
Crocus cloth	
Tube tester	Dynamic or emission type
Vacuum-tube voltmeter (VTVM)	Range 0-150 volts a-c; 0-300 volts d-c
R-f signal generator with metered output	Range 200-8,000 kc with provision for modulating the output at 400 cycles
Output meter	4,000-ohm impedance
Voltohmmeter	Sensitivity of 1,000 ohms per volt, with ranges from 0–10 volts and 0–150 volts
Dummy antenna	100-mmf mica capacitor
Output load resistor	8,000-ohm, 5-watt, noninductive resistor
Plug PL–55	With two 6-in. wires terminating in alligator clips
Heterodyne frequency meter	Range 200–8,000 kc
Radio Transmitter BC–653–A	With Dynamotor DM–42–A
Mounting FT–253–A	With Cords CO–280
Key J–45	
Loudspeaker LS–3	
Cord CD–314	
Headset HS–18 or HS–23–A	High impedance
Storage battery	12 volts

5. Removal of Crystal-Frequency-Calibrator Chassis

a. PRELIMINARY. Loosen two front wingnuts holding Radio Receiver BC–652–A to its Mounting FT–253–A and slide the receiver forward, thereby disconnecting rear plug P302 (figs. 3 and 4) of the receiver from its socket in the mounting. Lift the receiver off its mounting. Loosen the two Dzus fasteners in the front panel and one in the lower rear of the case, which holds the receiver to the case. Pull the receiver out of the case.

b. CRYSTAL-FREQUENCY-CALIBRATOR CHASSIS. The crystal-frequency-calibrator chassis is located in the upper section of Radio Receiver BC–652–A. Remove the two fuses from the upper face of the front panel by unscrewing the plastic fuse holders. Remove plug P251 (figs. 3 and 4) from the receiver (lower section) chassis, by pressing side spring clips and pulling plug up. Remove grid clip from rear of antenna binding post A. Remove the two rear screws holding the crystal-frequency-calibrator chassis to the vertical supporting posts. Remove the screws and posts. Support the chassis with the free hand and remove the six screws which hold the upper section to the front panel. Remove the crystal-frequency-calibrator chassis from the main (receiver) chassis.

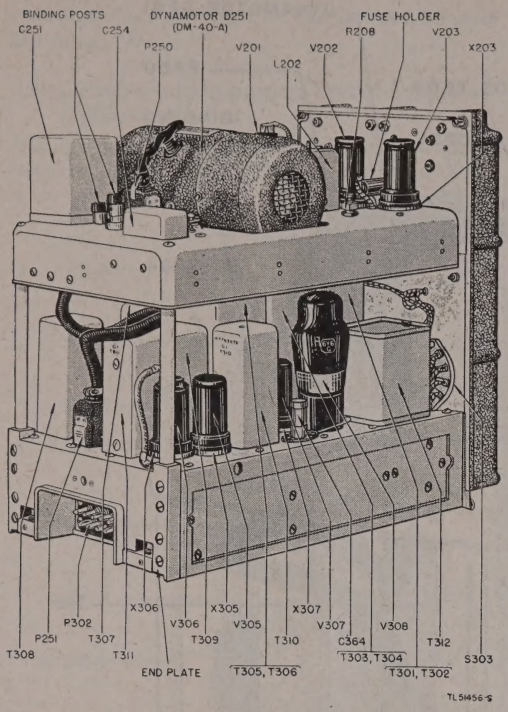


Figure 3. Radio Receiver BC–652–A, without case, rear oblique, left-side view.

6. Removal of Parts From Receiver Chassis

a. DIAL LIGHTS. Remove four screws holding the plastic cover plate to the front panel, and remove the cover plate. Remove the two bayonet type dial lights by pressing them into their sockets, turning one-quarter turn counterclockwise and lifting them out.

b. BOTTOM PLATE. Remove screws holding bottom plate to the chassis and remove bottom plate.

c. TUBES. Remove grid clips from Tubes JAN–12K8, (V302), JAN–12C8 (V304) and JAN–12K8 (V306). All eight tubes can now be removed by pulling them up from their sockets.

7. Cleaning, Inspecting, and Lubricating Receiver Chassis

Use clean, dry, low-pressure compressed air to blow out all dust particles in the unit. Use clean brush to remove dust from corners and other spots difficult to reach. Remove corrosion from terminals, pins and unpainted parts of unit using a fine grade of sandpaper. *Do not use abrasives on switch contacts.* Apply dry-cleaning solvent (SD) with a brush, to switch contact points and other parts difficult to reach. Blow out loosened particles with compressed air. Inspect wires for broken connections, frayed ends, shorts, and poor insulation. Check resistors, capacitors, and other components for broken parts, charred spots, and other signs of overload. Inspect safety glow Lamp LM–54 (V309, fig. 5) for breakage and loose or damaged connections. Inspect terminals to see that they are secure and properly soldered. Check for chipped and broken parts in sockets, plugs, switches, jacks, and binding posts. Check for loose, bent, or broken prongs and pins on plugs. Tighten all screws and nuts. Straighten all bent parts of chassis. Repaint all painted surfaces that are worn and chipped after removing corrosion. Clean the tuning capacitor gear drive assembly with dry-cleaning solvent, applied with a brush. Check for smoothness of operation in moving and rotating parts throughout the limit of their motion. Check for backlash and slipping of controls. Check toggle and rotary switches to see that they snap firmly into each contact position. Insert appropriate plugs into the jacks to check for firm seating and good contact.

8. Cleaning, Inspecting, and Testing Removed Parts of Receiver Chassis

a. TUBES. Inspect the removed tubes. Clean pins of each tube with dry-cleaning solvent, applied with a brush. For heavier corrosion use crocus cloth applied with care to nickel-plated surfaces of pins. Inspect tubes for bent pins, also internal and external breaks. Shake tubes to detect loose pins and loose elements. Check tubes on tube tester, allowing sufficient time for tubes to warm up. Tap tubes gently during test for loose or defective elements. Check for shorts between elements.

b. DIAL LIGHTS. Clean bases of pilot lights with dry-cleaning solvent, applied with a brush, and remove corrosion with crocus cloth.

c. BOTTOM PLATE. Remove corrosion with a fine grade of sandpaper. Blow away all loosened particles. Clean surfaces with dry-cleaning solvent. Straighten all bent parts.

9. Removal of Parts from Crystal-Frequency-Calibrator Chassis

a. TUBES. Remove grid clip from Tube JAN–6K8 (V201). All three tubes can now be removed by pulling them up from their sockets.

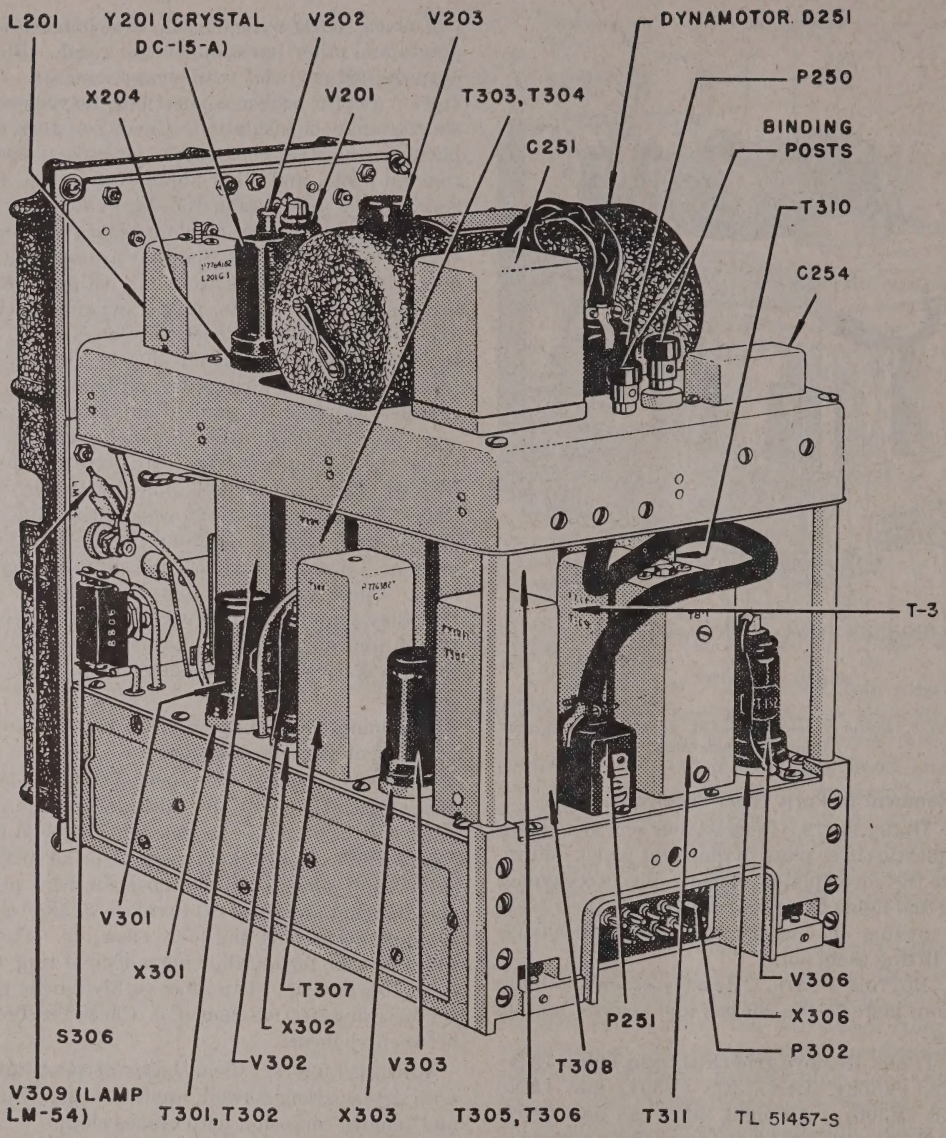


Figure 4. Radio Receiver BC-652-A, without case, rear oblique, right-side view.

b. CRYSTAL. Loosen screw holding crystal spring clamp. Turn clamp and remove crystal. *Note the V marks, indicating the contacts into which the crystal prongs are inserted.*

c. DYNAMOTOR. Remove dynamotor plug P250 (figs. 3 and 4) from its socket by pressing the side spring clip (fig. 6) and pulling up. Press snap slides together on both sides of the dynamotor and lift dynamotor from the chassis.

d. BOTTOM PLATE. Remove screws holding bottom plate to the chassis. Slide the plate to one side and push rubber grommet out of slot in bottom plate. Remove bottom plate.

e. FUSES. Remove fuses from the front of

chassis by unscrewing the two holders housing the fuses.

10. Cleaning and Inspecting Crystal-Frequency-Calibrator Chassis

Use clean, dry, low-pressure compressed air to blow out all dust particles in unit. Use clean brush to remove dust from corners and other spots difficult to reach. Exercise care when cleaning terminal contact points, switches, jacks, binding posts, and other nickel-plated parts. Remove corrosion from terminals, pins and unpainted parts of unit using a fine grade of sandpaper. Apply dry-cleaning solvent with a brush

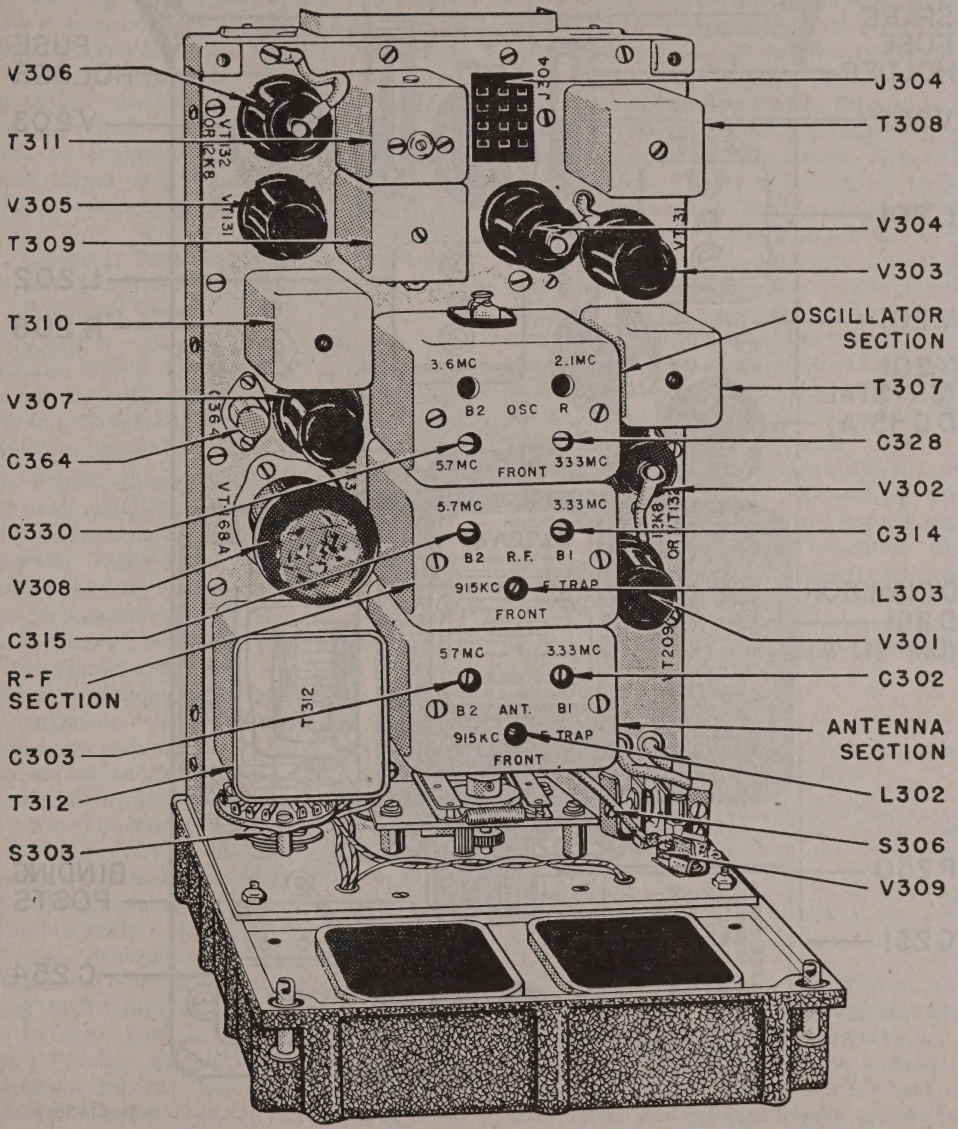


Figure 5. Top view of receiver unit, Radio Receiver BC–652–A.

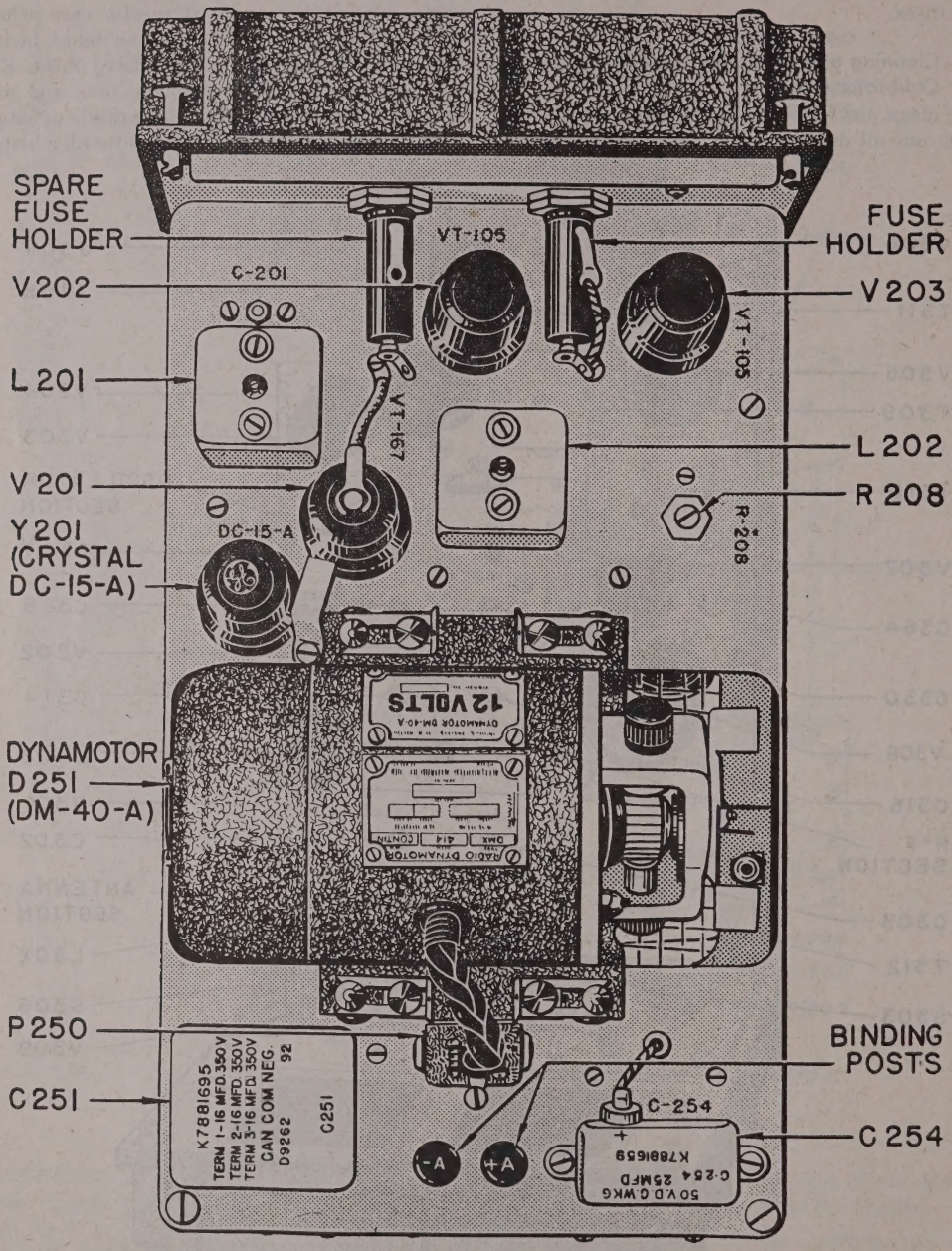


Figure 6. Top view of crystal-frequency-calibrator chassis, Radio Receiver BC-652-A.

to parts difficult to reach. Blow out loosened particles with compressed air. Inspect wires for broken connections, frayed ends, shorts, and poor insulation. Check resistors, capacitors, and other components for broken parts, charred spots and other signs of overload. Inspect terminals to see that they are secure and properly soldered. Check for chipped and broken parts in sockets, plugs, switches, jacks, binding posts, and other elements. Check for loose, bent, or broken prongs and pins on plugs. Tighten all screws and nuts. Straighten all bent parts of chassis. Repaint all painted surfaces that are worn or chipped after removing corrosion. Check toggle switches to see that they snap firmly into each contact position.

11. Cleaning, Inspecting, Testing, and Lubricating Removed Parts of Crystal-Frequency-Calibrator Chassis

a. CRYSTAL. Clean pins of crystal with dry-cleaning solvent applied with a brush. For heavier corrosion, use crocus cloth applied with care to nickel-plated surfaces of pins. Inspect crystal for bent or loose pins, or cracked housing.

b. FUSES. Remove fuses from their holders, and clean metal contacts with dry-cleaning solvent. Inspect for broken glass, or other broken elements. Replace faulty fuses with new ones. Insert fuses into their holders.

c. DYNAMOTOR. Cut lockwires which hold end bell screws, loosen two screws on either end of dynamotor, and remove end bells. Remove four screws holding dynamotor bracket support to dynamotor. Note the two types of screw washers on each side of the bracket (the larger ones are on the inside curve), and when assembling, replace nuts and washers in the same manner. Note also that the bracket projects over the low voltage (LV) end and when replacing bracket, reassemble it properly. Remove fan on LV end by loosening screw holding the fan to the armature shaft. Note that the blades extend outward. Remove the brush-holder caps and brushes on both low- and high-voltage ends. Mark each brush so that it can be replaced in the same position and in the same hole. Clean brushes with a cloth moistened with petroleum spirits. Replace worn or broken brushes. Clean the bearing brackets and brush holders with petroleum spirits applied with a clean cloth or brush. Blow out loose dust and dirt with compressed air. Clean metal parts, if corroded, with a fine grade of sandpaper. Blow out loosened particles with compressed air. Clean commutator with a lintless cloth and petroleum spirits. Do not oil or lubricate commutators in any manner. Clean commutators lightly with No. 0000 sandpaper. Remove all dust and dirt after sanding. *Do not use emery cloth for cleaning commutator.* If commutators are badly scored, replace dynamotor with a new unit. If new brushes are installed, run the dynamotor for 5 hours without load to seat the brushes properly. Remove two flathead screws holding end bearing plates over roller bearings on both high- and low-voltage ends. Remove end bearing plates. The roller bearings are then exposed. Remove old and hardened lubricant from bearings and cover plates with a brush and petroleum spirits. *Use no abrasives.* Insert sufficient Grease, General Purpose No. 2 to cover bell retainers. *Do not pack hard. Keep grease off commutators.* Replace end bearing plates. Replace fan on LV end. Clean bell end and remove corrosion with a fine grade of sandpaper. Blow out all loosened particles. To reassemble dynamotor replace brushes and brush caps in the same receptacle and in the same position they occupied before disassembly. Replace end covers and screws, and insert lockwires through screw-heads to prevent screws from loosening. Check dynamotor with available dynamotor test equipment for output at rated load, as shown in table II. Check for vibration and chattering. Replace dynamotor bracket support on the dynamotor.

Table II

ELECTRICAL RATINGS OF DYNAMOTORS, DM–40–A AND DM–41–A

Unit	Input voltage (volts)	Input current (amp)	Output voltage (volts)	Input current (amp)
Dynamotor DM–40–A	14	3.5	172	138
Dynamotor DM–41–A	28	1.7	172	138

d. TUBES. Inspect the removed tubes. Clean pins of each tube with dry-cleaning solvent applied with a brush. For heavier corrosion, use crocus cloth applied with care to nickel-plated surfaces of pins. Inspect tubes for bent pins, and internal and external breaks. Shake tubes to detect loose pins and loose elements. Check tubes on tube tester, allowing sufficient time for tubes to warm up. Tap tubes gently during test

for loose or defective elements. Check for shorts between elements.

e. BOTTOM PLATE. Remove corrosion with a fine grade of sandpaper. Blow away all loosened particles. Clean surfaces with dry-cleaning solvent. Straighten all bent parts.

12. Cleaning, Inspecting and Repairing Outer Case

Use clean, dry, low-pressure compressed air to blow out all dust particles in the unit. Remove corrosion with a fine grade of sandpaper. Blow out all loosened particles with compressed air. Straighten all bent parts of case. Inspect felt washers in rear and around air filters to see that they are in good condition. Replace felt washers if torn or missing. Examine air filters located on left side and rear of receiver case. If dirty, use compressed air and blow out dirt that has accumulated within the filters. Should the accumulation of dirt be too great to remove in this manner, discard the filter pads and insert new ones. The filter pads can be replaced by loosening four screws on the outer faces of the case. *When handling the spun glass air filter, take care to prevent small splinters of glass from entering the fingers.* Repaint all painted surfaces that are worn or chipped.

13. Replacement of Defective Parts

a. Before replacing any part which, on inspection, indicates improper electrical operation, or signs of overload, such as charring and burning, make a thorough electrical check of the circuit to discover the cause of improper operation. Check voltages and resistances as outlined in section VIII, and correct trouble before replacing defective parts.

b. Replace all wires having charred or poor insulation. Resolder all broken or poor connections. Replace broken rubber grommets. Replace all defective parts, lamps, and tubes. If crystal is changed, capacitor C201 must be readjusted as outlined in paragraph 20. Replace all missing or defective screws, washers, bolts and nuts.

14. Replacement of Removed Parts

a. DYNAMOTOR. Place dynamotor into crystal-frequency-calibrator chassis. Press snap slides together until dynamotor is properly seated over lugs in chassis. Push snap slides into lugs until they engage the lugs firmly. Place dynamotor plug P250 into chassis socket.

b. TUBES. Replace tubes in both chassis in their proper sockets and attach grid clips to proper tubes.

c. CRYSTAL. Replace crystal in its socket on crystal-frequency-calibrator chassis.

d. FUSES. Replace fuses into their proper positions on front panel of crystal-frequency-calibrator chassis.

e. DIAL LIGHTS. Replace dial lights into their sockets on receiver chassis and fasten plastic cover plate to the front panel with four screws.

SECTION IV

PRELIMINARY TROUBLE-SHOOTING PROCEDURES

15. Input Resistance Measurements

a. GENERAL. Trouble within the superheterodyne receiver and crystal-frequency-calibrator unit can often be detected by checking the resistance of the filament and high voltage circuits at the power input terminals before applying power to the equipment, thereby, preventing damage to the unit or the power supply.

b. PREPARATION. (1) Make certain that plug P251 (figs. 3 and 4) is not plugged into receptacle on receiver chassis.

(2) Turn receiver and the crystal-frequency-calibrator unit ON-OFF switches to ON position, and CW-MVC-AVC switch to CW.

c. PROCEDURE. (1) *Input resistance check of crystal-frequency-calibrator unit.* Check the input resistance to ground (crystal-frequency-calibrator chassis) from the six terminals of the crystal-frequency-calibrator chassis receptacle J–250 (fig. 8) (bottom view) as shown in table III below:

Table III

INPUT RESISTANCES AT TERMINALS OF RECEPTACLE J–250

Receptacle	Pin No.	Resistance (ohms)
J–250	1	0
	2	0
	3	1
	4	0
	5	1
	6	80

(2) *Input resistance check of receiver BC–652–A.* Insert crystal-frequency-calibrator connector plug P251 into its receptacle J304 on the receiver chassis. Check the input resistance to ground (receiver chassis) from the 12 terminals of receptacle J304 (fig. 5) and the nine pins of plug P302 (figs. 3 and 4) which connects Radio Receiver BC–652–A to Mounting FT–253–A, as shown in table IV below:

Table IV

INPUT RESISTANCES AT RECEPTACLE J–304 AND PLUG P–302

Receptacle	Pin No.	Resistance (ohms)
J–304	1	1
	2	Infinite
	3	0
	4	0.3
	5	Infinite
	6	1
	7	0
	8	Infinite
	9	400
	10	80
	11	5,000
	12	Infinite
P–302	1	0
	2	0
	3	0
	4	0
	5	0
	6	Infinite
	7	29
	8	Infinite
	9	Infinite

(3) *Trouble location.* If the input resistances do not agree with the values shown in tables III and IV, see paragraph 35.

16. Preliminary Operating Tests

a. PREPARATION. (1) Replace the connection from crystal-frequency-calibrator unit to stud at the rear of the antenna post.

(2) Complete the receiver protective circuit by grounding pin No. 8 on plug P302.

(3) Unscrew Fuse FU–42 (F251) located on the front panel.

(4) Connect a 12-volt battery to the binding posts on the rear of the crystal-frequency-cali-

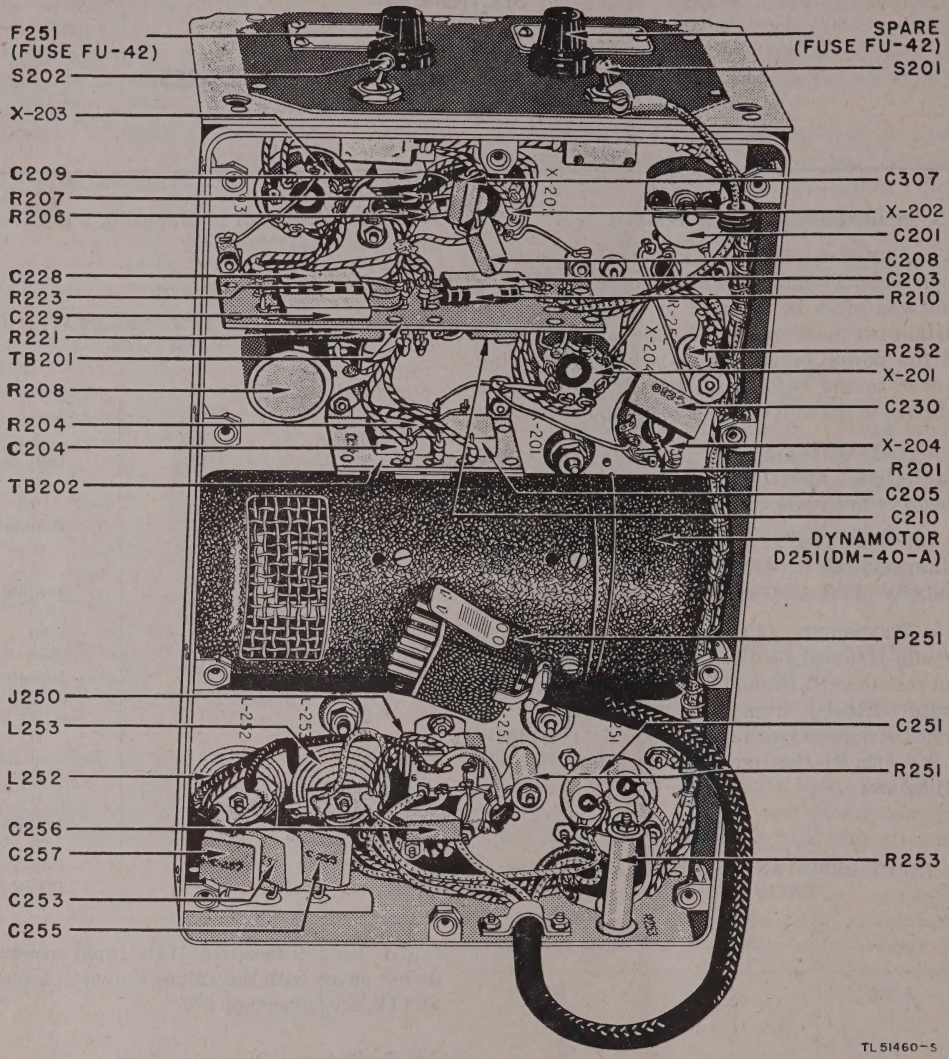


Figure 7. Bottom view from front of crystal-frequency-calibrator chassis, Radio Receiver BC–652–A.

brator unit chassis. Make sure Dynamotor DM–40–A is in use.

(5) Turn CFC ON-OFF switch to ON and INTERVAL switch to 20 kc.

b. PROCEDURE. (1) Turn on receiver by screwing fuse F251 into socket on front panel. The dial lamps should light. If they fail to light, replace fuse with spare fuse.

(2) After power is turned on, inspect set for any signs of abnormal operation, such as smoking, arcing, crackling, or burning.

(3) Touch the dynamotor case to check whether it is operating at too high a temperature. This should be done after the set has been operating for a short period of time.

(4) If signs of abnormal operation are indi-

cated, turn off the set immediately. See figures 7 through 10 to determine the reference numbers of the faulty parts. See the schematic wiring diagram, figure 29, and determine the stage in which the part is included. Correct the fault, see section VIII.

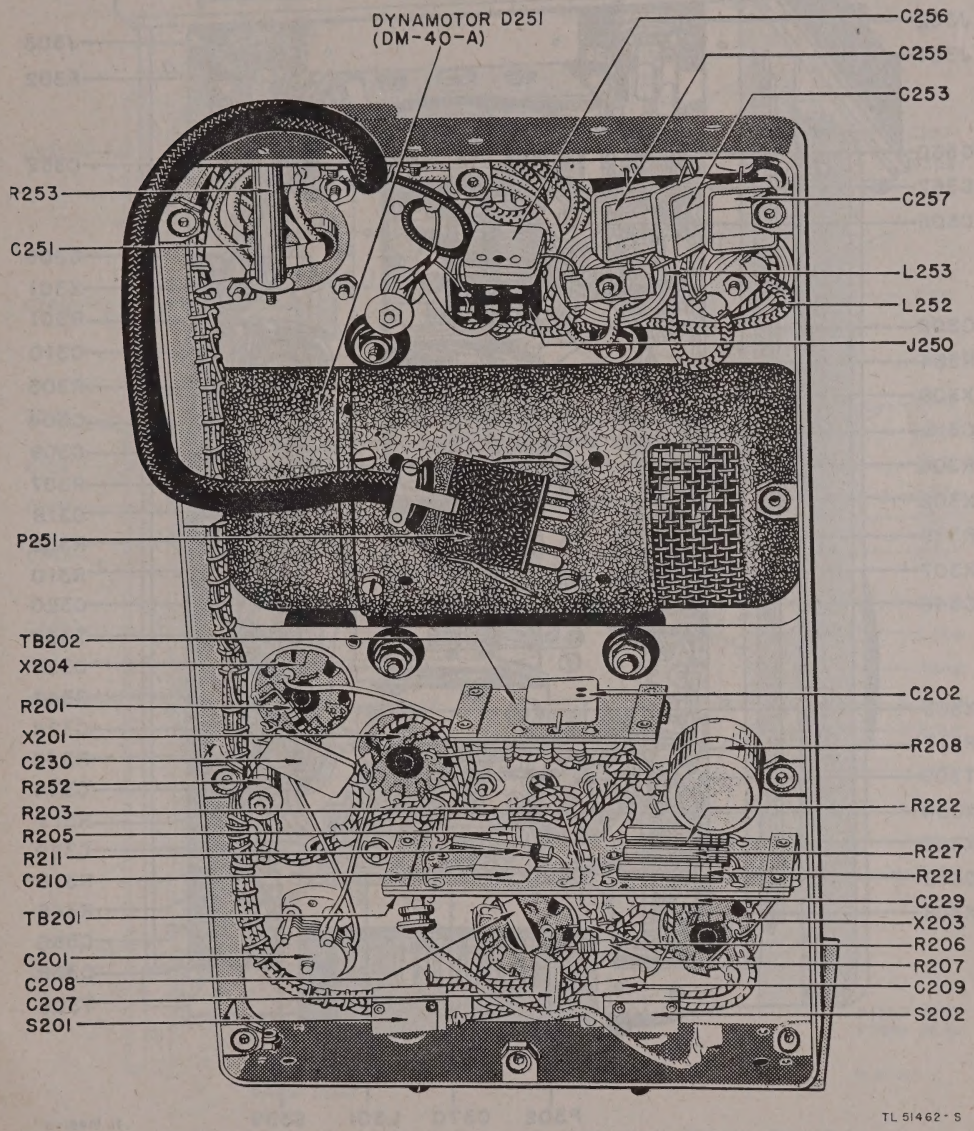


Figure 8. Bottom view from rear of crystal-frequency-calibrator chassis, Radio Receiver BC–652–A.

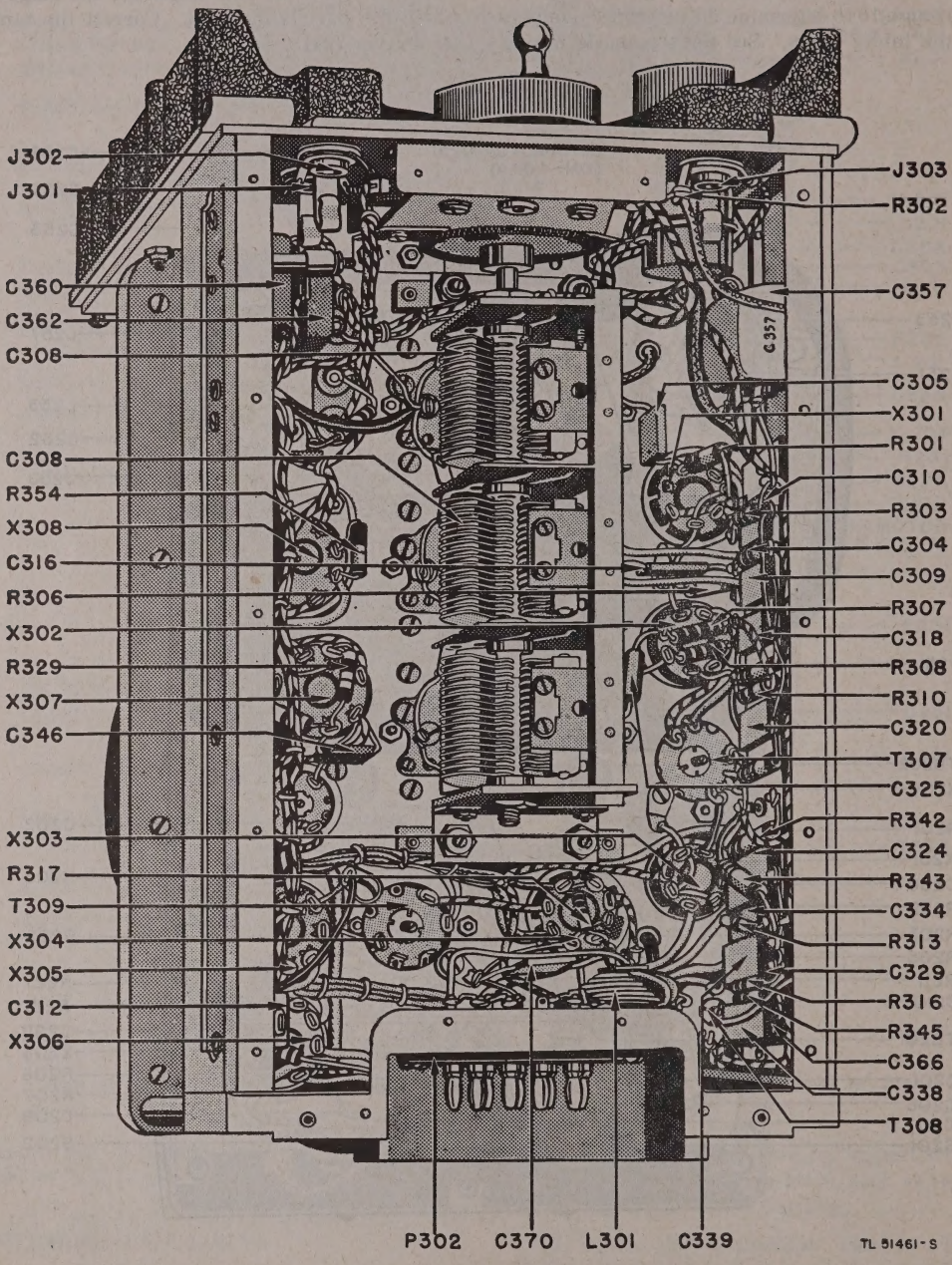


Figure 9. Bottom view of receiver unit chassis, oblique left-side view, Radio Receiver BC–652–A.

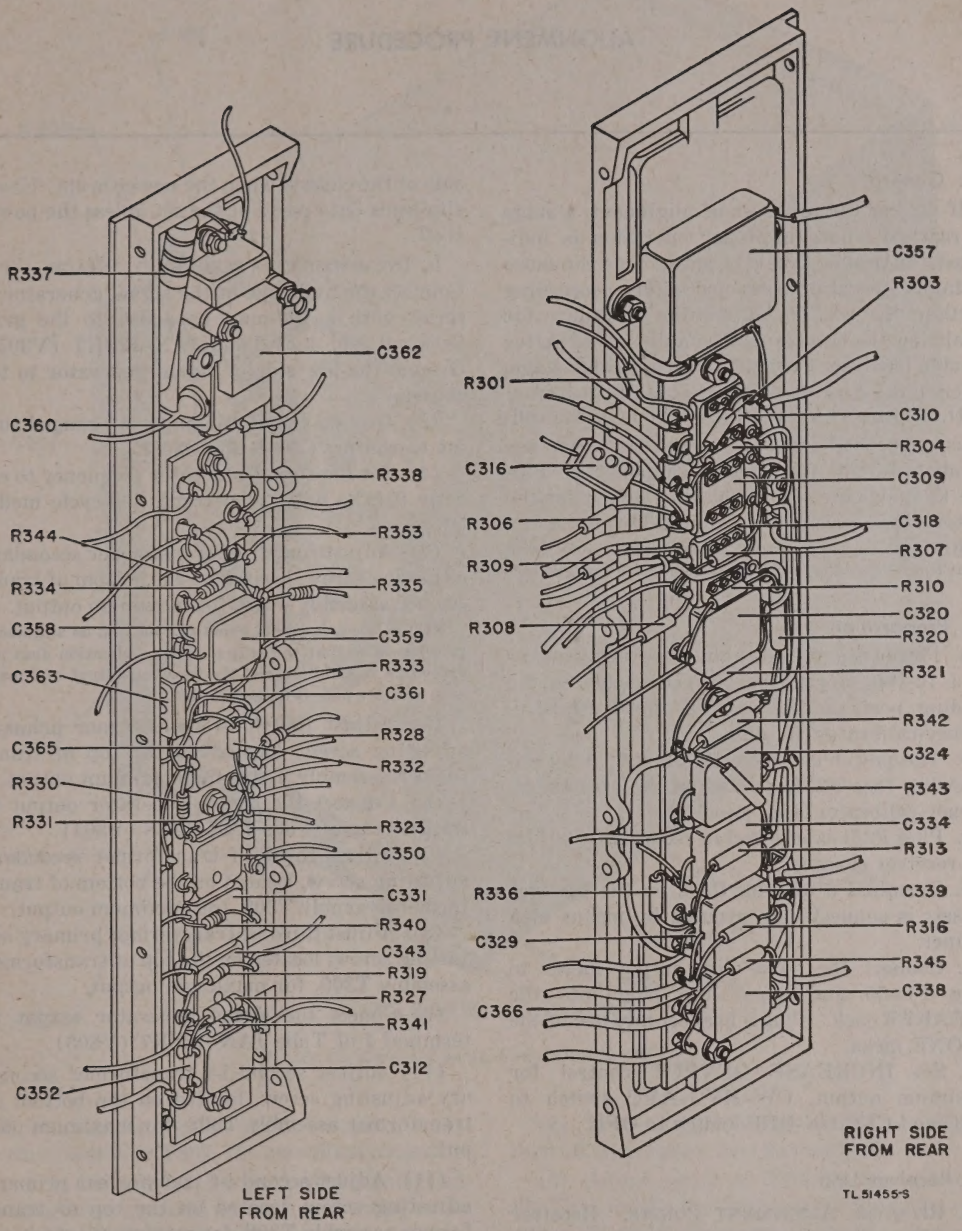


Figure 10. Receiver unit chassis, lower side panels, Radio Receiver BC–652–A.

SECTION V

ALIGNMENT PROCEDURE

17. General

If during the progress of alignment, a stage is reached where improper operation is indicated, the trouble should be located and the cause of faulty operation corrected before proceeding further. See section VI, for the procedure for localizing the trouble to the faulty stage. After trouble has been localized to a particular stage, refer to the data given for that stage in section VIII. Figure 11 shows the locations of the controls mentioned in the text and the reference numbers for the front panel components. Figure 12 shows the socket and tube layout for the receiver and crystal-frequency-calibrator units.

NOTE. Allow receiver and signal generator to warm up at least 15 minutes before proceeding with alignment.

18. Preparation

a. Power is supplied to the receiver by means of a 12-volt storage battery connected to the binding posts at the rear of the crystal-frequency-calibrator chassis.

b. The power of the set is turned off by unscrewing fuse F251, located on the crystal-frequency-calibrator front panel.

c. Plug P251 is inserted in receptacle J304 on the receiver chassis.

d. Terminal 8 of plug P302 on the receiver chassis is connected to ground, by means of a jumper.

e. Connect the 4,000-ohm output meter to Plug PL–55 and insert the plug into the SPEAKER jack. Plug a headset into one of the PHONE jacks.

f. Set INCREASE OUTPUT control for maximum output, CW–MVC–AVC switch to MVC and CFC ON-OFF switch to OFF.

19. Receiver Unit

a. RECEIVER ALIGNMENT POINTS. Receiver alignment points are shown in figure 13. Use an insulated aligning screw driver when making adjustments.

CAUTION: High voltages exist at the underside of the chassis when the power is on. Never clip leads onto parts of the set unless the power is off.

b. INTERMEDIATE-FREQUENCY STAGE. (1) Connect the high side of the signal generator in series with a 100-mmf capacitor to the grid, terminal No. 4 of Tube JAN–12SK7 (V305). Ground the low side of signal generator to the chassis.

(2) Ground the stator plates of ganged tuning capacitors C308B and C308C.

(3) Set the signal generator frequency to exactly 915 kc with 30 percent, 400-cycle modulation.

(4) Adjust fourth i-f transformer secondary adjusting screw, located on the bottom of transformer assembly T310, for maximum output.

NOTE. Reduce signal generator output, as alignment progresses so that the output meter indication does not exceed 25 volts. Listen to the receiver output and make sure that the note is undistorted.

(5) Adjust fourth i-f transformer primary adjusting screw, located on the top of transformer assembly T310, for maximum output.

(6) Connect the signal generator output to the grid cap of Tube JAN–12C8 (V304).

(7) Adjust third i-f transformer secondary adjusting screw, located on the bottom of transformer assembly T309, for maximum output.

(8) Adjust third i-f transformer primary adjusting screw, located on the top of transformer assembly T309, for maximum output.

(9) Conect the signal generator output to terminal 4 of Tube JAN–12SK7 (V303).

(10) Adjust second i-f transformer secondary adjusting screw, located on the bottom of transformer assembly T308, for maximum output.

(11) Adjust second i-f transformer primary adjusting screw, located on the top of transformer assembly T308, for maximum output.

(12) Connect the signal generator output to the grid cap of Tube JAN–12K8 (V302).

(13) Adjust first i-f transformer secondary

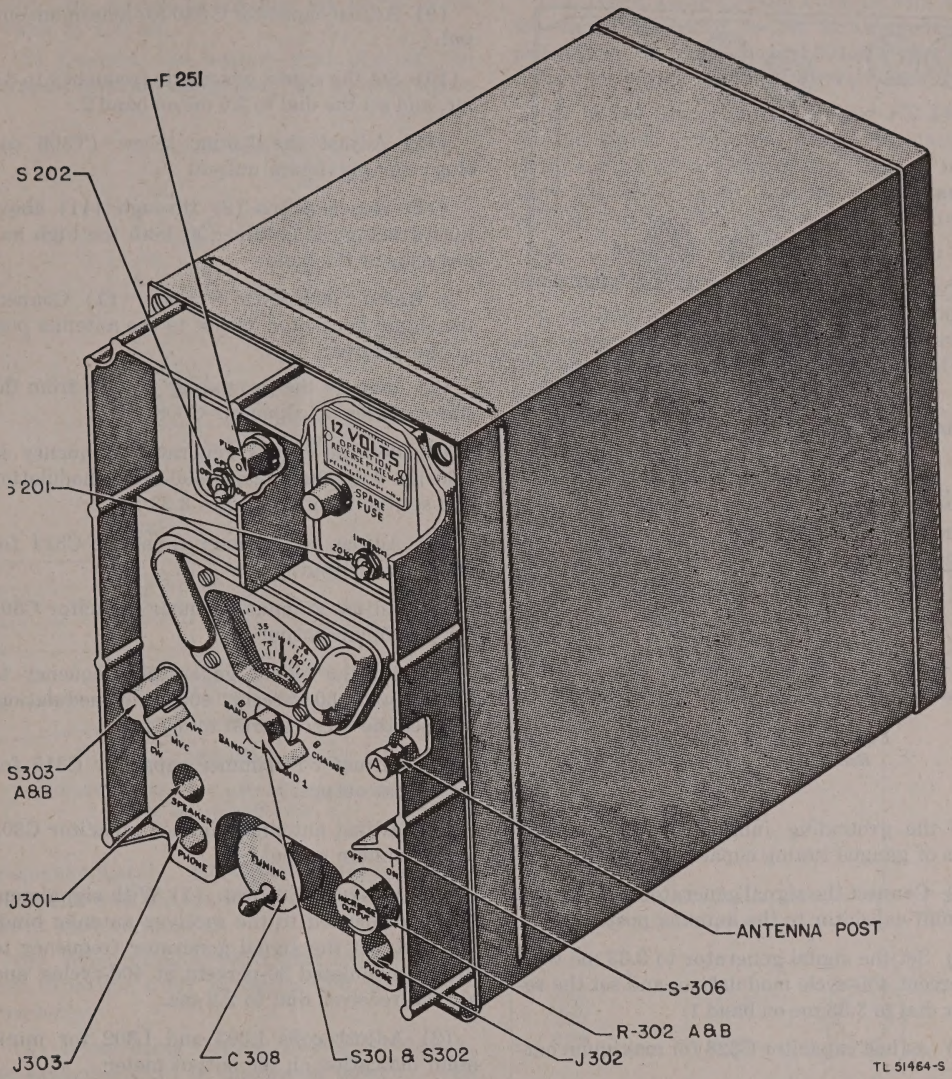


Figure 11. External parts, Radio Receiver BC–652–A.

adjusting screw, located on the bottom of transformer assembly T307, for maximum output.

(14) Adjust first i-f transformer primary adjusting screw, located on the top of transformer assembly T307, for maximum output.

c. BEAT-FREQUENCY OSCILLATOR. (1) The signal generator is connected to the grid cap of Tube JAN–12K8 (V302) and its frequency is set to 915 kc.

(2) Turn CW-MVC-AVC switch to CW and turn off signal generator modulation.

(3) Adjust screw of C356, on top of assembly T311 until a desirable output tone (between 400 cycles and 1,000 cycles) is heard in the headset. Either side of the intermediate-frequency may be used.

(4) Set CW-MVC-AVC switch to MVC.

d. HIGH-FREQUENCY OSCILLATOR. (1) Re-

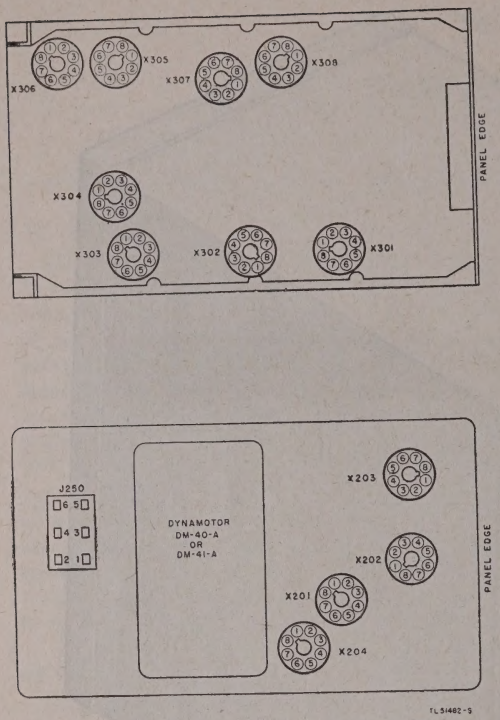


Figure 12. Tube socket lay-out, Radio Receiver BC–652–A.

move the grounding jumper from the stator plates of ganged tuning capacitor C308C.

(2) Connect the signal generator through the 100-mmf capacitor to the antenna post.

(3) Set the signal generator to 3.33 mc with 30 percent 400-cycle modulation, and set the receiver dial to 3.33 mc on band 1.

(4) Adjust capacitor C328 for maximum output.

(5) Set the signal generator frequency to 2.1 mc, and set the receiver dial to 2.1 mc on band 1.

(6) Adjust the 2.1 mc screw (T305 coil slug) for maximum output.

(7) Repeat steps (3) through (6) above until tracking is obtained at both the high and low ends of the band.

(8) Set signal generator to 5.7 mc with 30-percent, 400-cycle modulation, and set the receiver dial to 5.7 mc on band 2.

(9) Adjust capacitor C 330 for maximum output.

(10) Set the signal generator frequency to 3.6 mc, and set the dial to 3.6 mc on band 2.

(11) Adjust the 3.6-mc screw (T306 coil slug) for maximum output.

(12) Repeat steps (8) through (11) above until tracking is obtained at both the high and low ends of the band.

e. RADIO-FREQUENCY STAGES. (1) Connect the signal generator output to the antenna post of the receiver.

(2) Remove the grounding jumper from the stator plates of capacitor C308B.

(3) Set the signal generator frequency to 3.33 mc with 30-percent, 400-cycle modulation and set the receiver dial to 3.33 mc.

(4) Adjust r-f trimmer capacitor C314 for maximum output.

(5) Adjust antenna trimmer capacitor C302 for maximum output.

(6) Set the signal generator frequency to 5.7 mc with 30-percent, 400-cycle modulation, and set the receiver dial to 5.7 mc.

(7) Adjust r-f trimmer capacitor C315 for maximum output.

(8) Adjust antenna trimmer capacitor C303 for maximum output.

f. WAVE-TRAP TUNING. (1) With signal generator connected to the receiver antenna binding post, set the signal generator frequency to 913 kc modulated 30-percent at 400-cycles, and set the receiver dial to 2.2 mc.

(2) Adjust coils L303 and L302 for minimum indication on the output meter.

(3) Turn off and disconnect the signal generator. Disconnect the output meter.

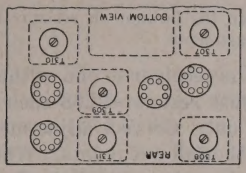
20. Crystal-Frequency-Calibrator Unit

a. CRYSTAL - FREQUENCY - CALIBRATOR ALIGNMENT POINTS. Crystal - frequency - calibrator alignment points are shown in figure 14. Use an insulated aligning screw driver when making adjustments.

b. ADJUSTMENT OF CAPACITOR C201. (1)

Turn CFC switch to ON and set INTERVAL switch to 100 KC.

(2) Connect the output grid clip of the crystal-frequency-calibrator to a heterodyne



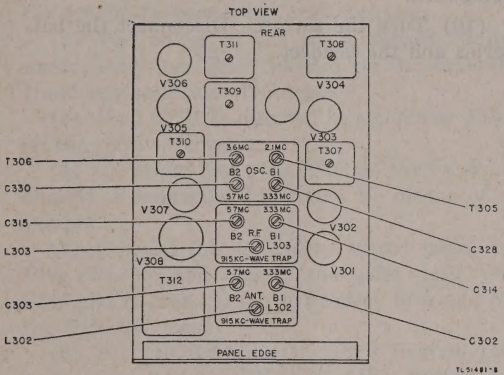


Figure 13. Receiver unit alignment points, Radio Receiver BC–652–A.

frequency meter. Allow the crystal-frequency calibrator and the frequency meter to warm up for at least 10 minutes.

(3) When using Crystal Unit DC–15–A, adjust capacitor C201 to secure 200 kc crystal-frequency.

(4) When using Crystal Holder FT–241–A, set capacitor C201 at maximum capacity (red dot at rear; slot in line with mounting screws).

c. ADJUSTMENT OF COIL L201. (1) Turn off receiver and disconnect frequency meter.

(2) Connect the signal generator which is in series with a 75,000-ohm resistor, so that it is in parallel with coil L201. Also connect an a-c (alternating-current) vacuum-tube voltmeter in series with a 0.01-mf capacitor, in parallel with L201. Make connections so that minimum stray capacity is shunted across the coil.

(3) When using Crystal Unit DC–15–A, set the signal generator to 235 kc, unmodulated, and adjust the slug of coil L201 for maximum indication on the vacuum-tube voltmeter.

(4) When using Crystal Holder FT–241–A, set the signal generator to 200 kc, unmodulated, and adjust the slug of coil L201 for maximum indication on the vacuum-tube voltmeter, with CFC ON-OFF switch at OFF position.

(5) Disconnect the signal generator and vacuum-tube voltmeter.

d. ADJUSTMENT OF COIL L202. (1) Connect an a-c vacuum-tube voltmeter in series with a 0.01-mf capacitor from the high side of coil L202 to ground.

(2) Turn on the receiver and crystal-frequency calibrator.

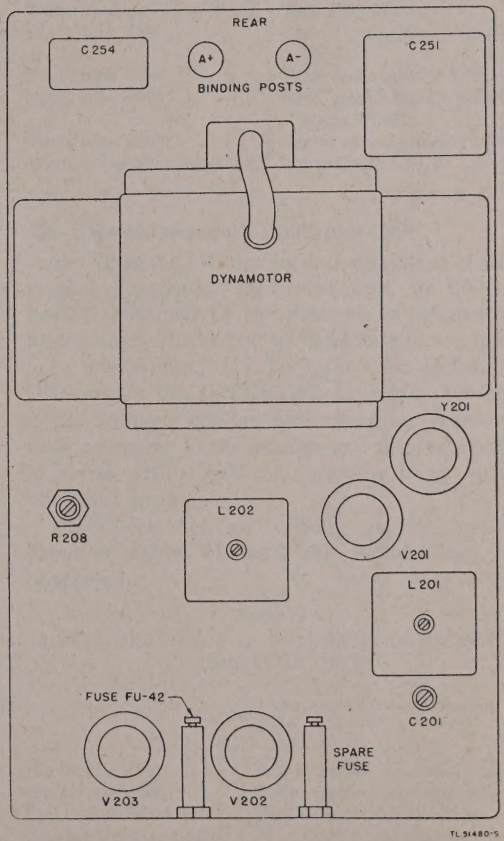


Figure 14. Crystal-frequency-calibrator unit alignment points, Radio Receiver BC–652–A.

(3) Adjust the slug of coil L202 for maximum indication on the vacuum-tube voltmeter.

(4) Turn off the set and disconnect the vacuum-tube voltmeter. Connect the CFC output lead to the stud in back of the receiver antenna post.

e. ADJUSTMENT OF RESISTOR R 208. (1) Turn on the set. The CFC switch should be ON and the INTERVAL switch should be set to 100 KC.

(2) Plug a headset into one of the receiver PHONE jacks.

(3) Set the receiver dial to 2.0 mc. Turn CW-MVC-AVC switch to CW and listen for a beat note in the headset.

(4) Set the receiver dial to 2.1 mc and listen for a beat note in the headset.

(5) Set the INTERVAL switch to 20 KC.

(6) Turn the receiver from 2.0 mc to 2.1 mc and count the number of beats. There should be four, one every 20 kc.

(7) If more or less than four beats are obtained, adjust resistor R208 until four are obtained.

NOTE. Loosen the locknut on resistor R208 before making any adjustments.

(8) Tune the receiver to one of the four beat notes and adjust resistor R208 each way until the beat falls out. Correct adjustment is midway between the fall-out points. When operating region is less than 120°, check for faulty tubes.

(9) Tighten the locknut when adjustment is completed.

(10) Turn the set off. Disconnect the batteries and the headset.

SECTION VI

DETAILED TROUBLE-SHOOTING PROCEDURES

21. General

a. PURPOSE. The purpose of this section is to give the procedure for localizing trouble to a stage. When trouble has been localized to a particular stage, see the data given for that stage in section VIII.

b. PREPARATION. (1) Power is supplied to the set by means of a 12-volt storage battery connected to the binding posts at the rear of the crystal-frequency-calibrator chassis.

(2) The power of the set is turned off by unscrewing fuse F251 located on the crystal-frequency-calibrator front panel.

(3) Plug P251 is inserted in receptacle J304 on the receiver chassis.

(4) Terminal 8 of plug P302 on the receiver chassis is connected to ground by means of a jumper.

(5) Connect the 4,000-ohm output meter to Plug PL–55 and insert the plug into the SPEAKER jack. Plug a headset into one of the PHONE jacks.

(6) Set INCREASE OUTPUT control for maximum output, CW-MVC-AVC switch to MVC and CFC ON-OFF switch to OFF.

22. Receiver Unit

a. GENERAL. The alignment procedure of section V localizes any trouble which may occur in the stages preceding the third i-f amplifier stage. Thus trouble localization procedure is given in this section only for the third i-f amplifier, second detector and first audio, and audio output stages.

b. PROCEDURE. (1) Connect the high side of the signal generator in series with a 100-mmf capacitor to the grid, terminal No. 4 of Tube, JAN–12SK7 (V305). Ground the low side of the signal generator to the chassis.

(2) Ground the stator plates of ganged tuning capacitors C308B and C308C.

(3) Set the signal generator frequency to exactly 915 kc with 30 percent 400-cycle modulation.

(4) If the output meter does not indicate with a signal generator output voltage of 1 volt, connect the low side of an a-c vacuum-tube voltmeter to the chassis ground and the high side to an insulated test prod through a 0.01-mf series capacitor. Test for voltages at the points listed in table V until the faulty circuit is bracketed.

Table V

SIGNAL TRACING FOR RECEIVER UNIT

Test point	Faulty circuit (if no indication on the a-c VTVM is obtained)
Term. 1, transformer T310	Third i-f amplifier stage, V305
Term. 4, transformer T310	Assembly T310
Pin 2, tube V307	Second detector section, V307
Pin 6, tube V307	First audio section V307
Pin 5, tube V308	Grid circuit, audio output stage, V308
Pin 3, tube V308	Audio output stage, V308
Term. 5, transformer T312	Transformer T312

23. Crystal-Frequency-Calibrator Unit

a. GENERAL. If, during the alignment of the crystal - frequency - calibrator unit, no 200-kc beat is obtained in the heterodyne frequency meter, check the circuit as described in *b* below.

b. PROCEDURE. (1) Turn the CFC switch to ON and set the INTERVAL switch to 100 kc.

(2) Connect the low side of an a-c vacuum-tube voltmeter to the chassis and the high side, in series with a 0.01-mf capacitor to an insulated test prod.

(3) Check for r-f voltage at the points listed in table VI until the faulty stage is bracketed.

Table VI

SIGNAL TRACING FOR CRYSTAL-FREQUENCY-CALIBRATOR UNIT

Test point	Faulty circuit (if no indication on the a-c VTVM is obtained)
Pin 6, tube V201	Triode section, oscillator stage
Pin 3, tube V201	Buffer section, oscillator stage
Pine 3, tube V203	100-kc multivibrator stage
Crystal-frequency-calibrator output clip	20-kc multivibrator stage

24. Moistureproofing, Fungiproofing, and Refinishing

After the repairs have been completed on the receiver, check the date of last moistureproofing and fungiproofing treatment. If a new treatment is required, see TB SIG 13 for method of application. If the receiver case has been scarred or chipped, remove any rough spots with fine sandpaper and apply paint to spots with small brush. If the case is sufficiently scarred and scratched to warrant complete refinishing, remove the chassis from the case, and remove all dirt and rust with kerosene when necessary. Spray entire case with the proper paint authorized by existing regulations.

SECTION VII

FINAL TESTING

25. Alignment Check

Although the unit was correctly aligned during the repair procedure, a recheck of the alignment is necessary after moistureproofing and fungiproofing have been completed. Check alignment as given in section V.

26. Over-All Performance Tests

a. TESTS. After the alignment has been checked, the following performance tests are to be made:

Sensitivity and noise (mcw).
Sensitivity and noise (cw).
Selectivity.
Image-frequency rejection ratio.
Intermediate-frequency rejection ratio.
Automatic volume control.
Crystal-frequency-calibrator output.
Operational test.

b. PREPARATION.

Caution: Operation of this equipment involves the use of high voltages which are dangerous to life. Operating personnel must at all times observe all safety regulations. When working on the electrical connections of mounting FT–253–A or on its supply line fuse FU–22, the main battery switch must be off.

(1) Replace all tubes in their sockets. Replace bottom plate of receiver chassis. Insert grommet of grid clip wire into slot in bottom of crystal-frequency-calibrator chassis and replace bottom plate. Place crystal-frequency-calibrator on the two rear supporting posts and replace the two screws. Replace the six screws that hold the crystal-frequency-calibrator chassis to the front panel. Replace the grid clip on the stud in the rear of the antenna binding post. Insert plug P251 into socket J304 on the receiver chassis.

(2) Install Dynamotor DM–40–A on the crystal-frequency-calibrator chassis.

(3) Make certain that the 200-kc crystal is properly installed in its socket.

(4) Replace the receiver in its case, fastening the two Dzus fasteners on the upper corner of the front panel and the one on the rear of the case.

(5) Remove the patch cover at the right end of the top shield of Radio Transmitter BC–653–A and note that the six links are set for 12-volt operation.

(6) Make sure that Dynamotor DM–42–A is installed in the transmitter and that the nameplate on the front panel of the Radio Transmitter BC–653–A is set for 12-volt operation.

(7) Remove the three patch covers on top of Radio Transmitter BC–653–A by loosening the Dzus fasteners. Insert the vacuum tubes in their respective sockets. Note that the sockets of Tubes VT–100 and VT–154 are equipped with clamps which secure these larger tubes in place. Tighten these clamps by turning them one-quarter turn in a clockwise direction, using the long-bladed screw driver located to the left of Tube VT–100, as viewed from the rear of the radio transmitter. Replace the patch covers.

(8) Make sure that all fuses are in. Slide Radio Receiver BC–652–A and Radio Transmitter BC–653–A into position on Mounting FT–253–A and secure them in position with the five wingnuts provided along the lower edge of the front panels. This operation automatically connects the power supply leads and the interconnections to the radio transmitter. Ground Mounting FT–253–A to an external ground.

(9) With receiver ON-OFF switch set to OFF, and with the battery switch off, connect the ends of Cords CO-280 to the 12-volt battery posts. *Be absolutely certain that the polarity marking of the wire and the post correspond. The plus wire from Mounting FT–253–A must be connected to the plus post in the terminal box.*

c. PRELIMINARY OPERATIONAL TEST. (1) Turn on the main battery switch, and turn the receiver ON-OFF switch to ON.

(2) Plug in Headset HS–18 or HS–23–A and rotate the INCREASE OUTPUT control until

receiver hiss is heard, indicating that the vacuum tubes have warmed up and are functioning.

(3) Turn the CFC ON-OFF switch ON.

(4) With the receiver CW-MVC-AVC switch at CW rotate the TUNING control and listen to the crystal signals. These signals will occur at either 20 or 100 kc intervals, depending upon the position of the INTERVAL switch on the crystal-frequency-calibrator.

(5) Start Radio Transmitter BC–653–A by turning the POWER AND EMISSION switch to CAL & NET. The dynamotor will start and the red pilot lamp will glow.

(6) Plug in Key J–45 and close it. The antenna break-in relay within Radio Transmitter BC–653–A will operate, and Radio Receiver BC–652–A will be desensitized each time the key is closed. A 1,000-cycle sidestone will be heard in Headsets HS–18 or HS–23–A.

(7) Set the METER SW switch to PA FIL and adjust the PA FIL rheostat until the needle on the FIL & PL CURRENT meter points to the white triangle.

(8) While holding Key J–45 closed, turn the receiver ON-OFF switch to OFF. IF INSTALLATION AND ADJUSTMENTS HAVE BEEN PROPERLY MADE, THIS WILL SHUT DOWN BOTH RADIO TRANSMITTER BC–653–A AND RADIO RECEIVER BC–652–A.

(9) Turn the transmitter POWER AND EMISSION switch OFF, and open Key J–45.

(10) Set receiver CW-MVC-AVC switch to MVC.

(11) Set receiver INCREASE OUTPUT control for maximum volume.

(12) Set receiver CFC switch to OFF.

(13) Connect signal generator through a 100-mmf dummy antenna capacitor to the antenna post of the receiver.

(14) Connect the 4,000-ohm output meter to PLUG PL–55 and insert the plug into receiver SPEAKER jack.

(15) Turn receiver ON-OFF switch to ON.

d. SENSITIVITY AND NOISE (MODULATED CONTINUOUS WAVE). (1) Set the signal generator output to 5.7 megacycles with 30-percent, 400-cycle modulation. Accurately tune the receiver to this frequency.

(2) Set the signal generator output antennuator for 4 microvolts and reduce the setting of the INCREASE OUTPUT control so as to obtain 6.3-volts indication on the output meter. It is a requirement that this condition be obtainable.

NOTE. When measuring output voltages, first set the meter to the highest available range and then adjust to the appropriate range.

(3) Turn off the signal generator modulation. The new indication on the output meter must not be more than 2.0 volts.

(4) Repeat steps (1) through (3) above at each of the check-point frequencies of table VII.

Table VII

MCW SENSITIVITY AND NOISE

Frequency (mc)	Signal generator output voltage (mc)	Receiver noise plus signal output (volts)	Receiver noise output (volts)
5.7	4	6.3	2.0 max
3.6	4	6.3	2.0 max
3.3	4	6.3	2.0 max
2.1	4	6.3	2.0 max

e. SENSITIVITY AND NOISE (CONTINUOUS WAVE). (1) Set the signal generator output to 5.7 megacycles with 30-percent, 400-cycle modulation. Accurately tune the receiver to this frequency.

(2) Set the signal generator output voltage to 2 microvolts and turn off the modulation.

(3) Set the receiver CW-MVC-AVC switch to CW and adjust the INCREASE OUTPUT control to obtain an indication upon the output meter of 6.3 volts. It is a requirement that this condition be obtainable.

(4) Set the receiver CW-MVC-AVC switch to MVC. The new indication of the output meter must not be more than 2.0 volts.

f. SELECTIVITY. (1) Set the receiver CW-MVC-AVC switch to MVC.

(2) Set the signal generator output to 5.700 megacycles with 30-percent, 400-cycle modulation. Accurately tune the receiver to this frequency.

(3) Set the signal generator output voltage to 4 microvolts and adjust the receiver INCREASE OUTPUT control to obtain a 6.3-volt indication upon the output meter.

(4) Increase the output of the signal generator to 40 microvolts and, without changing any of the receiver control settings, vary the signal generator frequency, in turn, to 5.711 megacycles and 5.689 megacycles. At both of these frequencies the output meter indication must not be more than 6.3 volts.

(5) Repeat steps (2) through (4) above at the check-point frequencies of 3.6 mc, 3.3 mc, and 2.1 mc. At each of these frequencies the signal generator output should first be set for 4 microvolts with 30-percent, 400-cycle modulation and the INCREASE OUTPUT control set so as to obtain 6.3 volts indication on the output meter. The signal generator output should then be increased to 40 mv (microvolts) and its frequency detuned by plus 11 kc and then by minus 11 kc. At the detuned frequencies the output meter indication must not be more than 6.3 volts.

g. IMAGE-FREQUENCY REJECTION RATIO. (1) Set the signal generator output to 5.7 megacycles with 30-percent, 400-cycle modulation. Accurately tune the receiver to this frequency.

(2) Set the signal generator output attenuator for 4 mv and adjust the setting of the INCREASE OUTPUT control so as to obtain 6.3-volt indication on the output meter.

(3) Without changing any of the receiver control settings increase the frequency of the signal generator to 7.530 mc and increase its output voltage to 12,000 mv. Vary the signal generator frequency slightly until the output meter indication reaches a maximum value. This value must not be more than 6.3 volts.

(4) Repeat steps (1) through (3) above at each of the check-point frequencies of table VIII.

Table VIII

IMAGE-FREQUENCY REJECTION RATIO

Tune receiver to: (mc)	Approximate image-frequency (mc)	Signal generator input at image-frequency (mv)	Max output meter indication (volts)
5.700	7.530	12,000	6.3
3.600	5.430	32,000	6.3
3.300	5.130	14,000	6.3
2.100	3.930	120,000	6.3

h. INTERMEDIATE - FREQUENCY REJECTION RATIO. (1) Set the signal generator output to 2.1-mc with 30-percent, 400-cycle modulation. Accurately tune the receiver to this frequency.

(2) Set the signal generator output attenuator for 4 mv and adjust the setting of the INCREASE OUTPUT control so as to obtain 6.3 volts indication on the output meter.

(3) Without changing any of the receiver control settings, reduce the frequency of the signal generator to 915 kc and increase its output to 400,000 mv.

(4) The indication on the output meter must not be more than 6.3 volts.

(5) Repeat steps (1) through (4) above with the receiver tuned to 3.6 mc.

i. AUTOMATIC VOLUME CONTROL. (1) Set the signal generator output to 2.1 megacycles with 30-percent, 400-cycle modulation. Accurately tune the receiver to this frequency.

(2) Set the signal generator output attenuator for 50 mv. Turn the receiver CW-MVC-AVC switch to AVC.

(3) Set the INCREASE OUTPUT control to obtain a 10-volt indication on the output meter.

(4) Increase the signal generator output voltage to 500,000 mv. The indication on the output meter must not be more than 30 volts.

j. CRYSTAL-FREQUENCY-CALIBRATOR OUTPUT. (1) Turn off the signal generator. Disconnect output meter.

(2) Set CFC switch to ON.

(3) Set INTERVAL switch to 20 kc.

(4) Set receiver CW-MVC-AVC switch to CW.

(5) Tune receiver to 5.760 kc.

(6) Connect an 8,000-ohm, 5-watt, noninductive resistor to a phone Plug PL–55 and insert the phone plug into the SPEAKER jack. Connect a 0-to 150-volt, 1,000 ohm-per-volt a-c voltmeter in parallel with the 8,000 ohm resistor.

(7) Plug the high-impedance headset into one of the PHONE jacks. Adjust the beat note by slightly detuning the receiver to give a beat frequency of approximately 1,000 cycles.

(8) Set the INCREASE OUTPUT control for maximum volume. The indication on the output meter must not be less than 140 volts.

(9) Set INTERVAL switch to 100 kc.

(10) Tune receiver to 5,800 kc.

(11) Adjust beat note as in step (7) above.

(12) With the INCREASE OUTPUT control set for maximum output, the indication on the output meter must not be less than 140 volts.

k. OPERATIONAL TEST. (1) Turn the receiver ON-OFF switch OFF and disconnect the 8,000-ohm resistor and the a-c voltmeter from the receiver SPEAKER jack. Connect Loudspeaker LS–3 to the SPEAKER jack using cord CD-314.

(2) Connect an antenna wire to the receiver antenna post.

(3) Set CFC switch to OFF and the CW-MVC-AVC switch to MVC.

(4) Turn the receiver ON-OFF switch to ON and tune in a voice-modulated station on the receiver.

(5) Make certain that the output is free from regenerative squeals or whistles, unusual noise and distortion. Rock the INCREASE OUTPUT control back and forth and make sure that noise due to intermittent contact is not present.

(6) Repeat step (5) above with the CW-MVC-AVC switch set to AVC.

(7) Plug a headset into each of the receiver PHONE jacks in turn and check to see that reception is obtained.

(8) Set the CW-MVC-AVC switch to CW, the CFC INTERVAL switch to 100 kc and the CFC switch to ON.

(9) Set the receiver dial to 2.1-mc and check for a beat note in the loudspeaker. Turn the receiver TUNING control counterclockwise. The next beat note should occur when the dial is set to 2.2 mc.

(10) Set the CFC INTERVAL switch to 20 kc. With the receiver dial set to 2.2 mc, turn the receiver TUNING control clockwise to 2.1 mc. Check for beat notes at 2.180, 2.160, 2.140 and 2.120 mc.

(11) Turn the transmitter POWER AND EMISSION switch to CAL & NET and insert Key J–45 into the transmitter KEY jack.

(12) Depress the transmitter key and check that the receiver is desensitized. Check also for 1,000-cycle sidetone.

(13) Turn the transmitter POWER AND EMISSION to OFF, the receiver CFC switch to OFF, and the receiver ON-OFF switch to OFF. Disconnect the antenna wire from the receiver antenna post. Disconnect the power supply.

SECTION VIII

INDIVIDUAL STAGE AND CIRCUIT REPAIR DATA

27. Radio-Frequency Amplifier Stage

a. STAGE DATA. (1) Radio-frequency stage schematic shown in figure 15.

(2) Voltage and resistance values for socket terminals of Tube JAN–12SG7 (V301) to ground, shown on stage schematic.

(3) Parts data for radio-frequency amplifier stage, table IX.

Table IX
(fig. 15)
PARTS DATA, R-F AMPLIFIER STAGE

Ref. symbol	Signal Corps stock No.	Name of part, description and function
C301	3D9010–17	CAPACITOR, fixed: mica; 10-mmf ±10%; 500-vdcw; (wave trap ant.)
C302	3D9050V–41	CAPACITOR, variable: 50-mmf; air trimmer; (ant. band 1)
C303	3D9050V–28	CAPACITOR, variable: 50-mmf; air trimmer; (ant. band 2)
C304	3D9005–16	CAPACITOR, fixed: mica; 5-mmf ±10%; 500-vdcw; (band 1 capacity cplg.)
C305	3D9400–15	CAPACITOR, fixed: mica; 400-mmf ±10%; 500-vdcw; (r-f grid cplg.)
C307	3D9040–7	CAPACITOR, fixed: mica; 40-mmf ±10%; 500-vdcw; (ant. tuning)
C308A	3D9236	CAPACITOR, variable: 3 sec; 236-mmf; (included with C308; r-f amplr.)
C308B	3D9236	CAPACITOR: same as C308A; (1st det.)
C309	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300 vdcw; (r-f screen)
C310	3DA6–47	CAPACITOR: same as C809; (r-f cathode)
C311	3D9030–9	CAPACITOR, fixed: mica; 30-mmf ±10%; 500-vdcw; (r-f plate wave trap)
C313	3DA6–47	CAPACITOR: same as C309; (r-f plate bypass)
C314	3D9050V–41	CAPACITOR, variable: 50-mmf; air trimmer; (r-f band 1)
C315	3D9050V–28	CAPACITOR, variable: 50-mmf; air trimmer; (r-f band 2)
C317	3D9040–7	CAPACITOR, fixed: mica; 40-mmf ±10%; 500 vdcw; (r-f tuning)
C357B	3DB12–11	CAPACITOR, electrolytic; dual sec; 12 mf +100%, —10%; 50 vdcw; (included in C357; m-v-c bypass)
L302	2C4452A/C2	COIL: (915-kc wave trap (ant.))
L303	2C4452A/C3	COIL: (915-kc wave trap)
R301	3Z6801–19	RESISTOR: metallized; 1.0 meg ±10%; ½ w; (r-f grid)
R302A	2C4452A/R1	RESISTOR: dual adjustable; 20,000 ohm max.; volume control; (included in R302; m-v-c sensitivity)
R303	3Z6033–2	RESISTOR: metallized; 330 ohm ±5%; ½ w; (r-f cathode)
R304	3Z6120–5	RESISTOR: metallized; 1,200 ohm ±5%; ½ w; (r-f screen filter)
R305	3Z6220–3	RESISTOR: metallized; 2,200 ohm ±10%; ½ w; (r-f plate filter)
R343	3Z6627–3	RESISTOR: metallized; 27,000 ohm ±10%; 1 w; (m-v-c control bleeder)
S301A	2C4452A/S1	SWITCH: included with S301; (ant. section band)
S301B	2C4452A/S1	SWITCH: included with S301; (ant. section band)
S301C	2C4452A/S1	SWITCH: included with S301; (ant. section band)
S302A	2C4452A/S2	SWITCH: included with S302; (r-f section band)
S302B	2C4452A/S2	SWITCH: included with S302; (r-f section band)
S302C	2C4452A/S2	SWITCH: included with S302; (r-f section band)
S303A	2C4452A/S3	SWITCH: included with S303; (CW-MVC-AVC)
T301	2C4452A/C4	COIL: (ant. band 1)
T302	2C4452A/C5	COIL: (ant. band 2)
T303	2C4452A/C6	COIL: (r-f band 1)
T304	2C4452A/C7	COIL: (r-f band 2)
V301	2T209	TUBE JAN–12SG7 (VT–209): (r-f)
X301	2C6530–653A/S9	SOCKET: (r-f tube)
V309	2Z5954	LAMP LM–54: (input voltage limiter)
		ANTENNA POST

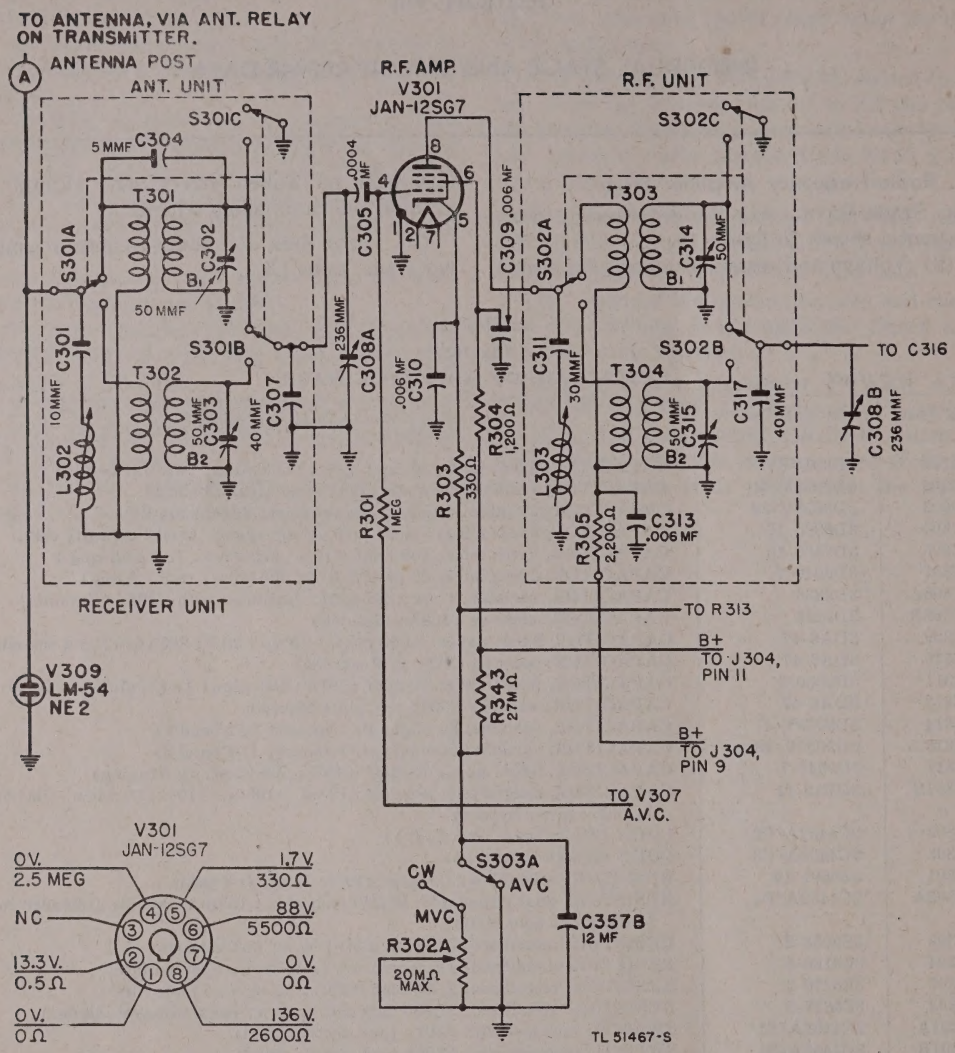


Figure 15. Radio-frequency amplifier stage schematic, Radio Receiver BC–652–A.

b. TROUBLE LOCATION. (1) *Tube check.* Remove the tube from the socket. Test with the tube checker and replace with a new tube if necessary. When replacing the tube, see that it is seated firmly in its socket.

(2) *Tube socket voltage and resistance check.* Check the voltages and resistances from the socket terminals to ground with the diagram shown on the radio-frequency stage schematic. After trouble has been localized to a particular portion of the stage make a check of each component associated with that portion of the stage. Check the resistance from terminal No. 8 with the BAND CHANGE switch in both positions. The voltage of terminal No. 4 will have an appreciable negative value when measured with a d-c vacuum-tube voltmeter.

(3) *Point-to-point continuity check.* If the preceding steps fail to indicate the cause of trouble, perform a point-to-point continuity

check, referring to the parts location drawings, figures 9 and 10. Check switches in all positions. Check for broken leads, faulty soldered joints and shorts.

(4) *Additional checks.* (*a*) If the stage does not operate on one particular band, and if the foregoing procedure gives no indication of the cause, test the transformers for that particular band. Apply the signal generator output to the antenna input terminals. Set its frequency to a frequency in the band in question and set the receiver dial to the same frequency. Set the signal generator output to 1 volt. Connect a test prod, in series with a 0.01-mf capacitor to the r-f terminal of an a-c vacuum-tube voltmeter. Starting with the input transformer, use the vacuum-tube voltmeter to test for r-f voltage at the inputs and outputs of the transformers of the band in question until the faulty transformer is bracketed.

(*b*) If the stage gain is suspected of being low on both bands, check capacitors C309 and C310 for open-circuit by paralleling each with

Table X

(fig. 16)

FIRST DETECTOR AND CONVERTER STAGE

Ref. symbol	Signal Corps stock No.	Name of part, description and function
C308C	3D9236	CAPACITOR, variable: 3 sec; 236-mmf; (included with C308; osc)
C316	3D9400–15	CAPACITOR, fixed: mica; 400-mmf ±10%; 500-vdcw; (mixed grid cplg)
C318	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (mixer cathode bypass)
C319	3D9050–43	CAPACITOR, fixed: mica; 50-mmf ±5%; 250-vdcw; (osc grid)
C320	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10% +30%; 300-vdcw; (mixer screen bypass)
C321	3D9500–53	CAPACITOR, fixed: mica; 500-mmf ±5%; 250-vdcw; (included with T307; i-f transf No. 1 pri)
C322	3D9500–53	CAPACITOR: same as C321; (i-f transf No. 1 sec)
C323	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (included with T307; mixer plate bypass)
C324	3DA6–16	CAPACITOR, fixed: mica; 6,000-mmf ±10%; 300-vdcw; (1st i-f grid bypass)
C325	3D9500–42	CAPACITOR, fixed: mica; 500-mmf ±10%; 500-vdcw; osc plate blocking)
C326	3D9650	CAPACITOR, fixed: mica; 650-mmf ±0.5%; 250-vdcw; (osc padder band 1)
C327	3DA1.100–1	CAPACITOR, fixed: mica; 1,100-mmf ±0.5%; 250-vdcw; (osc padder band 2)
C328	3D9050V–14	CAPACITOR, variable: 25-mmf; air trimmer; (osc band 1)
C330	3D9025V–15	CAPACITOR, variable: 25-mmf; air trimmer; (osc band 2)
C332	3D9030–11	CAPACITOR: 30-mmf +10%, —0%; (h-f osc band 1 and band 2)
C333	3D9030–7	CAPACITOR, fixed: mica; 30-mmf ±5%; 250-vdcw; (osc tuning band 2)
C368	3D9030–6	CAPACITOR: 30-mmf ±5%; (band 1 padder comp)
R306	3Z6801–19	RESISTOR: metallized; 1.0 meg; (mixer grid)
R307	3Z6033–2	RESISTOR: metallized; 330-ohm ±5%; ½ w; (mixer cathode bias)
R308	3Z6651–1	RESISTOR: metallized; 51,000-ohm ±5%; ½ w; (osc grid)
R309	3Z6639	RESISTOR: metallized; 39,000-ohm ±5%; ½ w; (osc plate)
R310	3Z6611–6	RESISTOR: metallized; 12,000-ohm ±5%; ½ w; (mixer screen)
R311	3Z6220–3	RESISTOR: metallized; 2,200-ohm ±10%; ½ w; (included with T307; mixer plate filter)
R312	3Z6647–3	RESISTOR: metallized; 47,000-ohm ±10%; ½ w; (included with T307; 1st r-f grid filter)
R347	3Z6682	RESISTOR: metallized; 82,000-ohm ±10%; ½ w; (included with T307; i-f transf)
R348	3Z6682	RESISTOR: same as R347; (i-f transf)
S305A	2C4452A/S4	SWITCH: (included with S305; osc section band)
S305B	2C4452A/S4	SWITCH: (included with S305; osc section band)
S305C	2C4452A/S4	SWITCH: (included with S305; osc section band)
T305	2C4452A/C8	COIL: (osc band 1)
T306	2C4452A/C9	COIL: (osc band 2)
T307	2C4452A/T7	TRANSFORMER: (1st i-f)
V302	2T132	TUBE: JAN–12K8 (VT–132); or JAN–12K8Y (VT–132); (converter)
X302	2C6530–653A/S9	SOCKET: (converter tube)

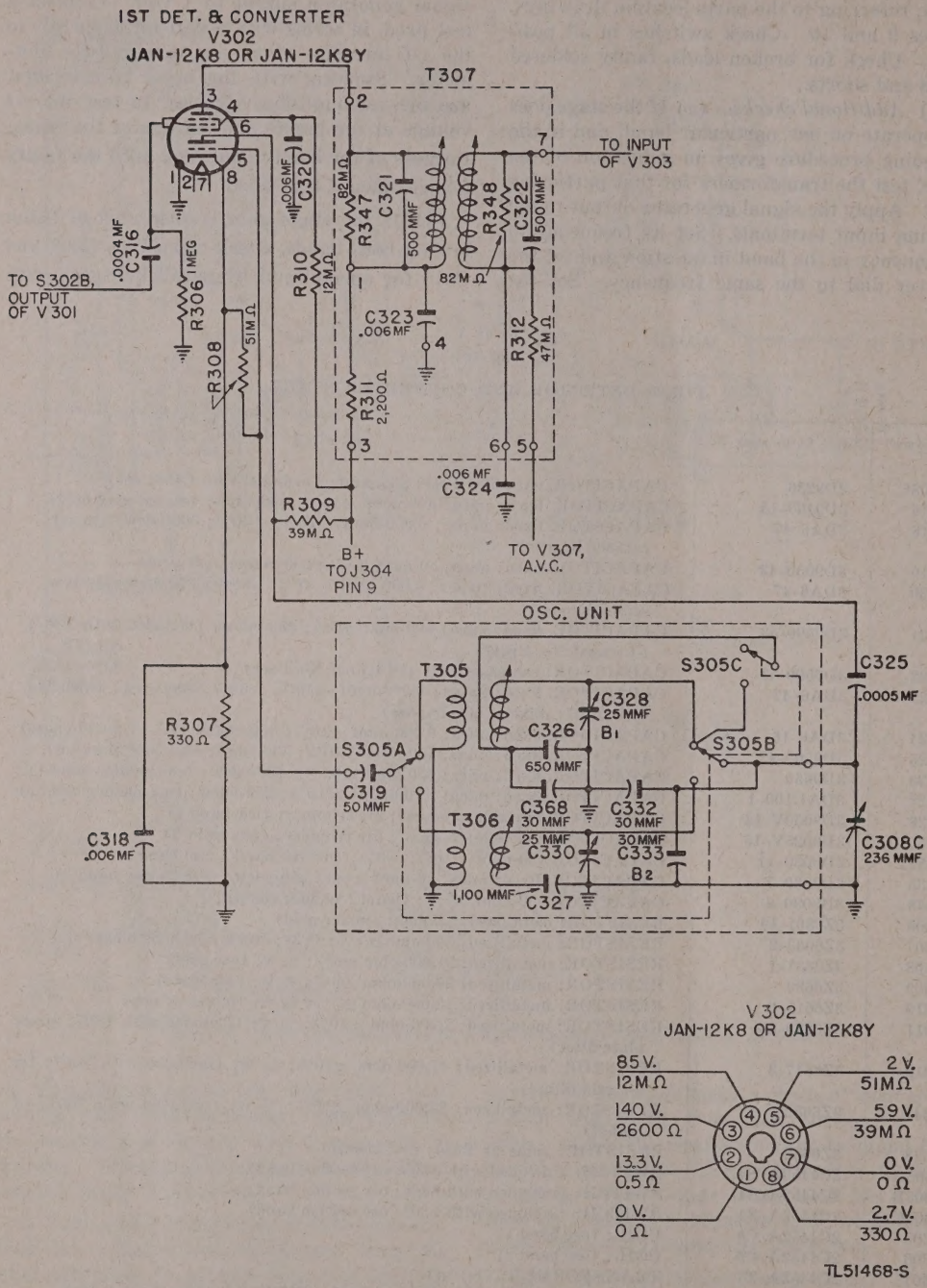


Figure 16. First detector and converter stage schematic, Radio Receiver BC-652-A.

a 0.006-mf capacitor and noting the effect upon the gain.

c. REPLACEMENT OF PARTS. (1) *Ganged tuning capacitor.* (See par. 41.)

(2) *Antenna or radio-frequency coil assemblies.* (See par. 42.)

28. First Detector and Converter Stage

a. STAGE DATA. (1) First detector and converter stage schematic shown in figure 16.

(2) Voltage and resistance values for socket terminals of Tube JAN–12K8 (V302) to ground, shown on stage schematic.

(3) Parts data for first detector and converter stage, table X.

b. TROUBLE LOCATION. (1) *Tube check.* Remove the tube from socket. Test with the tube checker and replace with a new tube if necessary. In replacing tube see that it is seated firmly in its socket.

(2) *Tube socket voltage and resistance check.* Check the voltages and resistances from the socket terminals to ground with the diagram shown on the first detector and converter stage schematic. After trouble has been localized to a particular portion of the stage, make a check of each component associated with that portion of the stage. The voltage on terminal No. 5 of tube V302 may have an appreciable negative value when measured with a d-c vacuum-tube voltmeter if the oscillator is operating.

(3) *Point-to-point continuity check.* If the preceding steps fail to indicate the cause of trouble, perform a point-to-point continuity check, referring to the parts location drawings, figures 9 and 10. Check the switches in all positions. Check for broken leads, faulty soldered joints and shorts.

(4) *No oscillation on one band.* Check the transformer connections corresponding to the particular band in question.

(5) *No oscillation on both bands.* (*a*) Check that the resistance to ground from the stator plates of capacitor C308C is infinite. Make the check with the BAND CHANGE switch in both positions and with various positions of the tuning capacitor.

(*b*) Check capacitor C318 for open-circuit by paralleling it with a 0.006 mf capacitor and note the effect upon the oscillation.

c. REPLACEMENT OF PARTS. (1) *Ganged tuning capacitor.* (See par. 41.)

(2) *Oscillator coil assembly.* (See (par. 42.)

(3) *Transformer assembly T307.* (See par. 43.)

Table XI

(fig. 17)

PARTS DATA, FIRST I-F AMPLIFIER STAGE

Ref. symbol	Signal Corps stock No.	Name of part, description and function
C334	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (1st i-f cathode bypass)
C335	3D9500–53	CAPACITOR: molded silver cap; mica; 500-mmf ∓5%; 250-vdcw; (included with T308; i-f transf No. 2 pri)
C336	3D9500–53	CAPACITOR: same as C335; (i-f transf No. 2 sec)
C337	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (included with T308; 1st i-f plate bypass)
C338	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (2d i-f grid bypass)
R313	3Z6120–5	RESISTOR: metallized; 1,200-ohm ±5%; ½ w; (1st i-f cathode bias)
R314	3Z6220–3	RESISTOR: metallized; 2,200-ohm ±10%; ½ w; (included with T308; 1st i-f plate filter)
R315	3Z6647–3	RESISTOR: metallized; 47,000-ohm ±10%; ½ w; (included with T308; 2d i-f grid filter)
R336	3Z6033–2	RESISTOR: 330-ohm ±5%; ½ w; (1st i-f cathode bias)
R349	3Z6682	RESISTOR: metallized; 82,000-ohm ±10%; ½ w; (included with T308; i-f transf)
R350	3Z6682	RESISTOR: same as R349; (i-f transf)
T308	2C4452A/T8	TRANSFORMER: (2d i-f)
V303	2T131	TUBE JAN–12SK7 (VT–131): (1st i-f)
X303	2C6530–653A/S9	SOCKET: (1st i-f tube)

29. First Intermediate-Frequency Amplifier Stage

a. STAGE DATA. (1) First i-f amplifier stage schematic shown in figure 17.

(2) Voltage and resistance values for socket terminals of Tube JAN–12SK7 (V303) to ground, shown on stage schematic.

(3) Parts data for first i-f amplifier stage, table XI.

b. TROUBLE LOCATION. (1) *Tube check.* Remove the tube from socket. Test with the tube checker and replace with a new tube if necessary. In replacing the tube, see that it is seated firmly in its socket.

(2) *Tube socket voltage and resistance check.* Check the voltages and resistances from the socket terminals to ground with the diagram shown on the first i-f amplifier stage schematic. After trouble has been localized to a particular portion of the stage, make a check of each component associated with that portion of the stage. The voltage of terminal No. 4 may be appreciably negative when measured with a d-c vacuum-tube voltmeter.

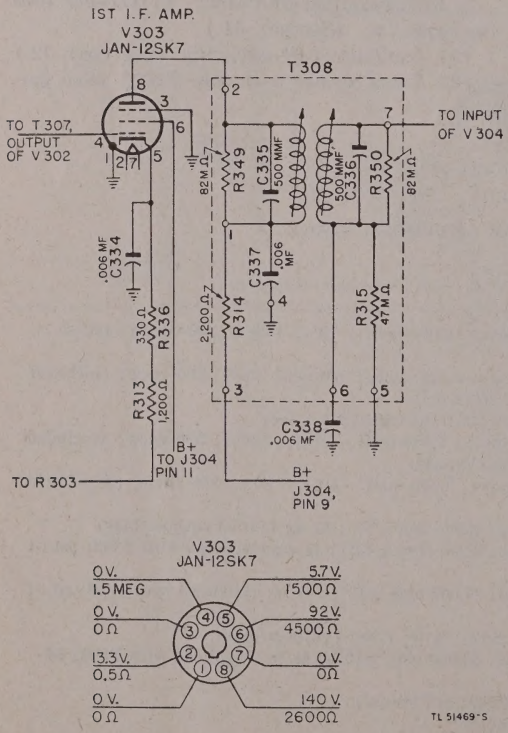


Figure 17. First intermediate-frequency amplifier stage schematic, Radio Receiver BC–652–A.

(3) *Point-to-point continuity check.* If the preceding steps fail to indicate the cause of trouble, perform a point-to-point continuity check, referring to the parts identification drawings, figures 9 and 10. Check for broken leads, faulty soldered joints and shorts.

(4) *Low gain.* Check capacitor C334 for open-circuit by paralleling it with a 0.006-mf capacitor and noting the effect upon the output.

c. REPLACEMENT OF TRANSFORMER ASSEMBLY T308. For replacement of transformer assembly T308, see paragraph 43.

30. Second Intermediate-Frequency Amplifier and Noise Limiter Stage

a. STAGE DATA. (1) Second i-f amplifier and noise limiter stage schematic shown in figure 18.

(2) Voltage and resistance values for socket terminals of Tube JAN–12C8 (V304) to ground, shown on stage schematic.

(3) Parts data for second i-f amplifier and noise limiter stage, table XII.

b. TROUBLE LOCATION. (1) *Tube check.* Remove the tube from socket. Test with the tube checker and replace with a new tube if necessary. In replacing tube, see that it is seated firmly in its socket.

(2) *Tube socket voltage and resistance check.* Check the voltages and resistances from the socket terminals to ground with the diagram shown on the second i-f amplifier and noise limiter stage schematic. After trouble has been localized to a particular portion of the stage, make a check of each individual component associated with that portion of the stage.

(3) *Point-to-point continuity check.* If the preceding steps fail to indicate the cause of trouble, perform a point-to-point continuity check referring to the parts identification drawings, figures 9 and 10. Check for broken leads, faulty soldered joints, and shorts.

(4) *Low gain.* If the stage gain is low, check capacitor C339 for open-circuit by paralleling it with a 0.006-mf capacitor and noting the effect upon the output.

c. REPLACEMENT OF TRANSFORMER T309. (See paragraph 43 when replacing transformer assembly T309).

Table XII

(fig. 18)

PARTS DATA, SECOND I-F AMPLIFIER AND NOISE LIMITER STAGE

Ref. symbol	Signal Corps stock No.	Name of part, description and function
C339	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (2d i-f cathode bypass)
C340	3D9500–53	CAPACITOR, fixed: mica; 500-mmf ±5%; 250-vdcw; (included with T309; i-f transf No. 3 pri)
C341	3D9500–53	CAPACITOR: same as C340; (i-f transf No. 3 sec)
C342	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (included with T309; 2d i-f plate bypass)
C366	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (screen bypass)
R316	3Z6033–2	RESISTOR: metallized; 330-ohm ±5%; ½ w; (2d i-f cathode bias)
R317	3Z6805A6	RESISTOR: metallized; 5.6-meg ±10%; ½ w; (noise suppressor)
R318	3Z6220–3	RESISTOR: metallized; 2,200-ohm ±10%; ½ w; (included with T309; 2d i-f plate filter)
R345	3Z6647–3	RESISTOR: metallized; 47,000-ohm ±10%; ½ w; (screen filter)
R351	3Z6682	RESISTOR: metallized; 82,000-ohm ±10%; ½ w; (included with T309; i-f transf)
R352	3Z6682	RESISTOR: same as R351; (i-f transf)
T309	2C4452A/T9	TRANSFORMER: (3d i-f)
V304	2T153	TUBE JAN-12C8 (VT–169): (2d i-f and noise suppressor)
X304	2C6530–653A/S9	SOCKET: (2d i-f and noise suppressor tube)

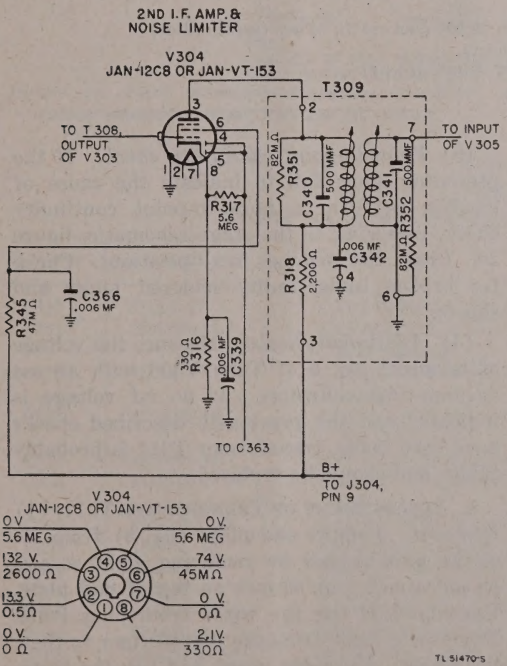


Figure 18. Second intermediate-frequency and noise limiter stage schematic, Radio Receiver BC–652–A.

31. Third Intermediate-Frequency Amplifier Stage

a. STAGE DATA. (1) Third i-f amplifier stage shown in figure 19.

(2) Voltage and resistance values for socket terminals of Tube JAN–12SK7 (V305) to ground, shown on stage schematic.

(3) Parts data for third i-f amplifier, table XIII.

b. TROUBLE LOCATION. (1) *Tube check.* Remove the tube from socket. Test with the tube checker and replace with a new tube if necessary. In replacing tube see that it is seated firmly in its socket.

(2) *Tube socket voltage and resistance check.* Ground terminal No. 8 of plug P302 and check the voltages and resistances from the socket terminals to ground with the diagram shown on the third i-f amplifier stage schematic. After trouble has been localized to a particular portion of the stage, make a check of each component associated with that portion of the stage.

(3) *Point-to-point continuity check.* If the preceding steps fail to indicate the cause of trouble, perform a point-to-point continuity check referring to the parts identification draw-

ings, figures 9 and 10. Check for broken leads, faulty soldered joints and shorts.

(4) *Low gain.* Check capacitor C343 for open-circuit by paralleling it with a 0.006-mf capacitor and noting the effect upon the output.

c. REPLACEMENT OF TRANSFORMER ASSEMBLY T310. See paragraph 43 for the method of replacing transformer T310.

Table XIII
(fig. 19)

PARTS DATA, THIRD I-F AMPLIFIER STAGE

Ref. symbol	Signal Corps stock No.	Name of part, description and function
C331	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (screen bypass)
C343	3DA6–47	CAPACITOR: same as C331; (cathode bypass)
C344	3D9525	CAPACITOR, fixed: mica; 525-mmf ±5%; 250-vdcw; (included with T310; i-f transf No. 4 pri)
C345	3D9215	CAPACITOR, fixed: mica; 215-mmf ±5%; 250-vdcw; (included with T310; i-f transf)
C347	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (included with T310; plate bypass)
C348	3D9200–19	CAPACITOR, fixed: mica; 200-mmf ±10%; 500-vdcw; (included with T310; diode filter)
C349	3D9300–3	CAPACITOR, fixed: mica; 300-mmf ±10%; 500-vdcw; (included with T310; diode filter)
R319	3Z6051	RESISTOR: metallized; 510-ohm ±5%; ½ w; (cathode bias)
R322	3Z6082–1	RESISTOR: metallized; 820-ohm ±10%; ½ w; (included with T310; plate filter)
R324	3Z6639–7	RESISTOR: metallized; 39,000-ohm ±10%; ½ w; (included with T310; diode filter)
R340	3Z6615–22	RESISTOR: metallized; 15,000-ohm ±5%; ½ w; (screen filter)
T310	2C4452A/T10	TRANSFORMER: (4th i-f)
V305	2T131	TUBE JAN–12SK7 (VT–131): (3d i-f)
X305	2C6530–653A/S9	SOCKET: (3d i-f tube)

32. Beat-Frequency-Oscillator Stage

a. STAGE DATA. (1) The beat-frequency-oscillator stage is shown in figure 20.

(2) Voltage and resistance values for socket terminals of Tube JAN–12K8 (V306) to ground, shown on stage schematic.

(3) Parts data for beat-frequency oscillator stage, table XIV.

b. TROUBLE LOCATION. (1) *Tube check.* Remove the tube from the socket. Test with the tube checker and replace with a new tube if necessary. In replacing tube see that it is seated firmly in its socket.

(2) *Tube socket voltage and resistance check.* With the CW-MVC-AVC switch set to CW, check the voltages and resistances from the socket terminals to ground with the diagram shown on the beat-frequency oscillator stage schematic. After trouble has been localized to a particular portion of the stage, make a check of each component associated with that portion of the stage.

(3) *Point-to-point continuity check.* If the preceding steps fail to indicate the cause of trouble, perform a point-to-point continuity check, referring to the stage schematic, figure 20. Check the switches in all positions. Check for broken leads, faulty soldered joints and shorts.

(4) *Additional checks.* Measure the voltage of terminal No. 6 of Tube V306 with an a-c vacuum-tube voltmeter. If no r-f voltage is indicated and the previously described checks have been made, transformer T311 is probably faulty and should be replaced.

c. REPLACEMENT OF TRANSFORMER T311. (1) *Removal.* Remove end plate (fig. 3) from receiver unit chassis by removing eight screws on sides and four screws on top of end plate. Unsolder and tag the wires from plug P302. Trace wire leads from the transformer to their terminals. Unsolder wires and tag the terminals, noting color scheme of wires. Loosen the two nuts holding the transformer to the chassis.

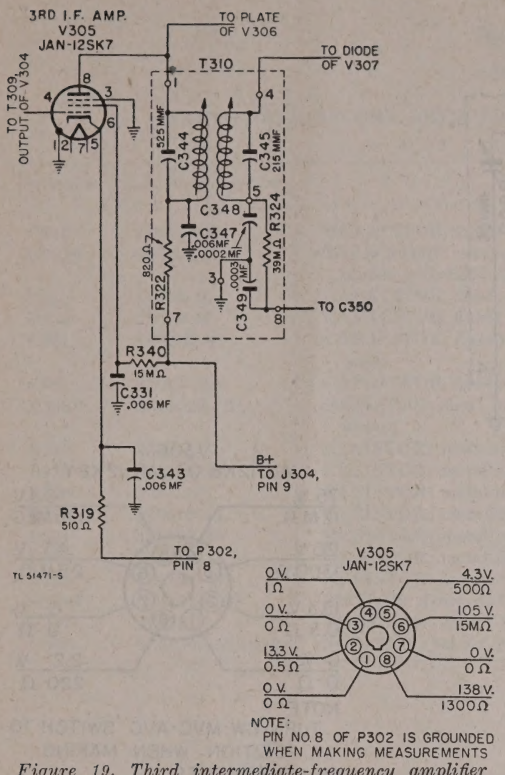


Figure 19. Third intermediate-frequency amplifier stage schematic, Radio Receiver BC–652–A.

Pull transformer and leads from the chassis.

(2) *Replacement.* Insert leads of the new transformer into the hole in the chassis, and fasten the transformer to the chassis by means of the two nuts. Remove all excess solder from disconnected wires and lugs. Resolder transformer leads to their proper lugs. Replace end plate of chassis by means of the 12 screws. Resolder wires from the receiver to the power plug.

33. Second-Detector, A-V-C, and First Audio-Amplifier Stage

a. STAGE DATA. (1) Second detector, a-v-c and first audio-amplifier stage, shown in figure 21.

(2) Voltage and resistance values for socket terminals of Tube JAN–12SR7 (V307) to ground, shown on stage schematic.

(3) Parts data for second detector, a-v-c and first audio-amplifier stage, table XV.

b. TROUBLE LOCATION. (1) *Tube check.* Remove the tube from the socket. Test with the tube checker and replace with a new tube if necessary. In replacing tube, see that it is seated firmly in its socket.

(2) *Tube socket voltage and resistance check.* Check the voltages and resistances from the socket terminals to ground with the diagram shown on the stage schematic. After trouble

Table XIV
(fig. 20)

PARTS DATA, BEAT-FREQUENCY OSCILLATOR STAGE

Ref. symbol	Signal Corps stock No.	Name of part, description and function
C312	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (plate filter)
C351	3D9025–17	CAPACITOR, fixed: mica; 25-mmf ±10%; 500-vdcw; (included with T311; grid blocking)
C352	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (screen bypass)
C353	3D9500–42	CAPACITOR, fixed: mica; 500-mmf ±10%; 500-vdcw; (included with T311; plate blocking)
C354	3D9025–18	CAPACITOR: 25-mmf ±5%; (included with T311; (compensator)
C355	3D9345–1	CAPACITOR, fixed: mica; 345-mmf ±0.5%; 250-vdcw; (included with T311; tuning)
C356	3D9050V–28	CAPACITOR, variable: 50-mmf; air trimmer; (tuning)
R325	3Z6715–14	RESISTOR: metallized; 150,000-ohm ±5%; ½ w; (included with T311; (grid)
R326	3Z6624	RESISTOR: metallized; 24,000-ohm ±5%; ½ w; (included with T311; (plate)
R327	3Z6612–6	RESISTOR: metallized; 12,000-ohm ±10%; ½ w; (screen)
R339	3Z6022–7	RESISTOR: metallized; 220-ohm ±10%; ½ w; (cathode bias)
R341	3Z6220–3	RESISTOR: metallized; 2,200-ohm ±10%; ½ w; (plate filter)
S303C	2C4452A/S3	SWITCH: (included in S303; CW–MVC–AVC)
T311	2C4452A/T11	TRANSFORMER: (b-f-o)
V306	2T132	TUBE JAN–12K8 (VT–132); or JAN–12K8Y (VT–132): (b-f-o)
X306	2C6530–653A/S9	SOCKET: (b-f-o tube)

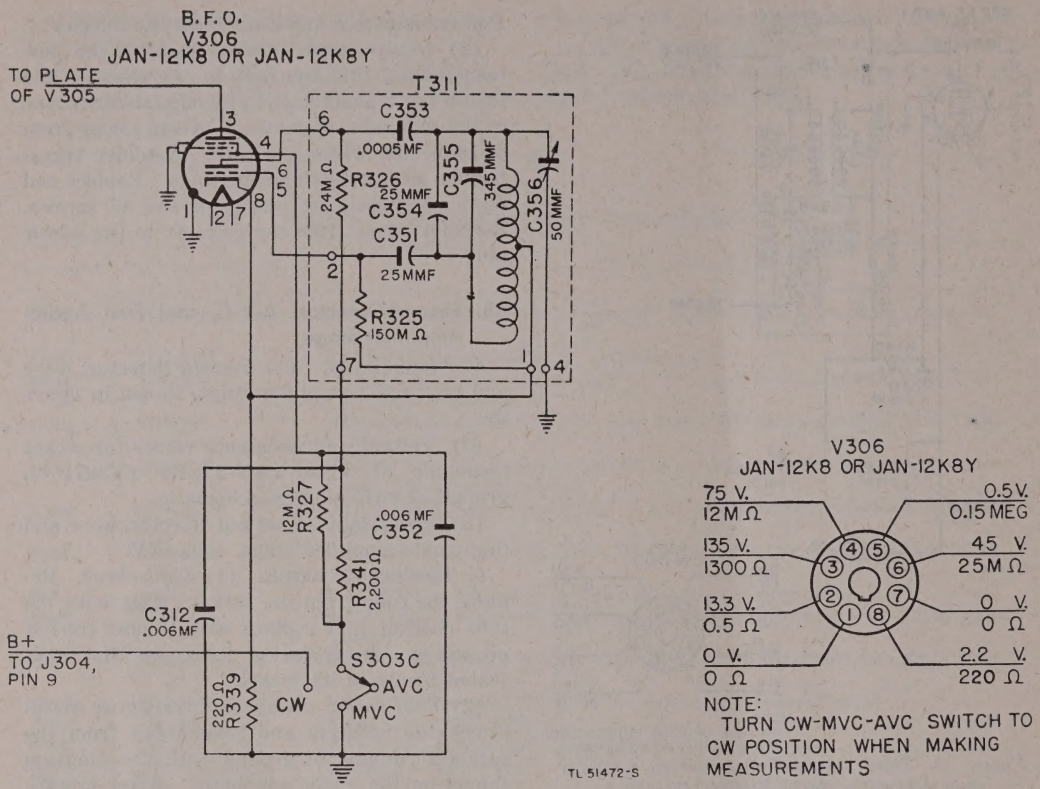


Figure 20. Beat-frequency oscillator stage schematic, Radio Receiver BC–652–A.

has been localized to a particular portion of the stage, make a check of each component associated with that portion of the stage. (The voltage on terminal No. 5 of V307 may have an appreciable negative value when measured with a d-c vacuum-tube voltmeter.)

(3) *Point-to-point continuity check.* If the preceding steps fail to indicate the cause of the trouble, perform a point-to-point continuity check, referring to the parts identification diagrams, figures 9 and 10. Check for broken leads, faulty soldered joints and shorts.

(4) *Low audio output.* Check capacitor C357A by connecting a 12-mf, 50-vdcw, electrolytic capacitor from terminal No. 3 of tube V307 to ground, with its negative terminal grounded, and noting the effect on the gain.

(5) *Distortion.* Check capacitor C361 for open circuit by connecting a 500-mmf capacitor from terminal No. 6 of tube V307 to ground and noting the effect on the output.

(6) *Noise.* See that the resistance of terminal No. 2 of tube V307 to ground varies smoothly as the INCREASE OUTPUT control is rocked back and forth with the CW-MVC-AVC switch set to AVC.

c. REPLACEMENT OF TRANSFORMER ASSEMBLY T310. See paragraph 43 for the procedure for replacing transformer assembly T310.

34. Audio-Output Amplifier Stage

a. STAGE DATA. (1) Audio-output amplifier stage schematic shown in figure 22.

(2) Voltage and resistance values for socket terminals of Tube JAN–6Y6G (V308) to ground, shown on stage schematic.

(3) Resistance values for audio-output transformer terminals to ground are shown on stage schematic.

Table XV

(fig. 21)

PARTS DATA, SECOND DETECTOR, A-V-C AND FIRST AUDIO STAGE

Ref. symbol	Signal Corps stock No.	Name of part, description and function
C346	3D9050–33	CAPACITOR, fixed: mica; 50-mmf ±10%; 500-vdcw; (a-v-c diode cplg)
C357A	3DB12–11	CAPACITOR: electrolytic; dual sec; 12-mf +100%, —10%; 50-vdcw; (included with C357; 1st a-f cathode bypass)
C350	3DA6–16	CAPACITOR, fixed: mica; 6,000-mmf ±10%; 300-vdcw; (1st a-f cplg)
C358	3DA6–16	CAPACITOR, fixed: mica; 6,000-mmf ±10%; 300-vdcw; (2d a-f cplg)
C361	3D9500–42	CAPACITOR, fixed: mica; 500-mmf ±10%; 500-vdcw; (1st audio plate bypass)
C365	3DA6–16	CAPACITOR, fixed: mica; 6,000-mmf ±10%; 300-vdcw; (a-v-c line filter)
R302B	2C4452A/R1	RESISTOR: dual sec; 800,000-ohm max; (included with R302; m-v-c sensitivity)
R323	3Z6751	RESISTOR: metallized; 510,000-ohm ±5%; ½ w; (diode load)
R328	3Z6801–19	RESISTOR: metallized; 1.0-meg ±10%; ½ w; (a-v-c filter)
R329	3Z6751	RESISTOR: metallized; 510,000-ohm ±5%; ½ w; (a-v-c diode load)
R330	3Z6610–47	RESISTOR: metallized; 10,000-ohm ±5%; ½ w; (delay voltage divider)
R331	3Z6150–20	RESISTOR: metallized; 1,500-ohm ±10%; ½ w; (1st a-f cathode bias)
R332	3Z6675–11	RESISTOR: metallized; 75,000-ohm ±5%; ½ w; (delay voltage divider)
R333	3Z6700–43	RESISTOR: metallized; 100,000-ohm ±10%; ½ w; (1st a-f plate load)
S303B	2C4452A/S3	SWITCH: (included with S303; CW–MVC–AVC)
V307	2T133	TUBE JAN–12SR7 (VT–133): (1st a-f)
X307	2C6530–653A/S9	SOCKET: (1st a-f tube)

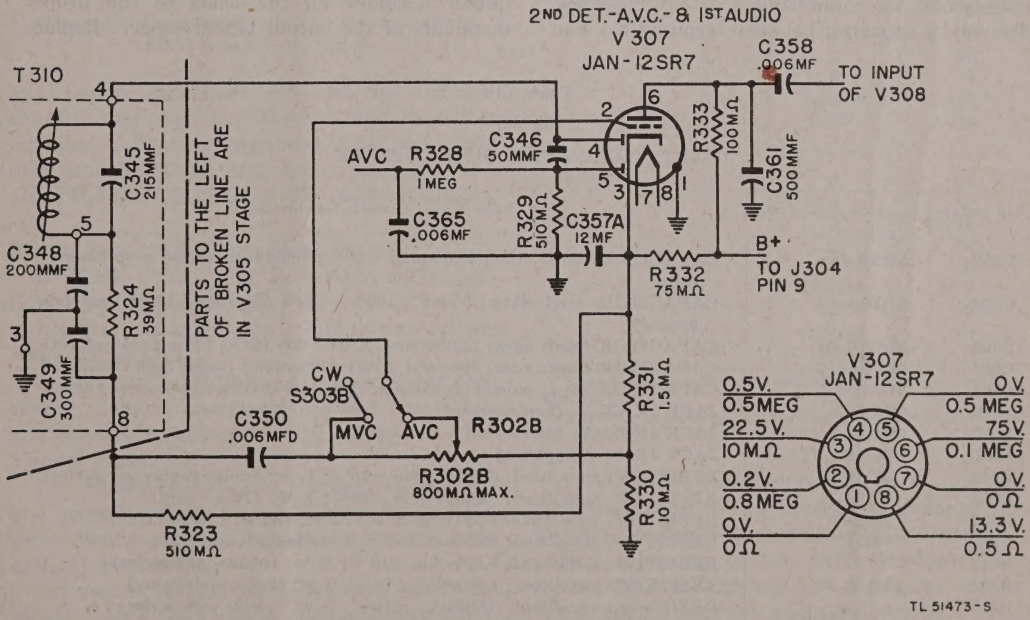


Figure 21. Second detector, a-v-c and first audio-amplifier stage schematic, Radio Receiver BC–652–A.

(4) Parts data for audio-output amplifier stage, table XVI.

b. TROUBLE LOCATION. (1) *Tube check.* Remove the tube from socket. Test with the tube checker and replace with a new tube if necessary. When replacing the tube, see that it is seated firmly in its socket.

(2) *Tube socket voltage and resistance check.* Check the voltages and resistances from the socket terminals to ground with the diagram shown on the audio-output amplifier stage schematic. After trouble has been localized to a particular portion of the stage, make a check of each component associated with that portion of the stage.

(3) *Resistance check at transformer terminals.* Check the resistances from the terminals of the audio-output transformer to ground in the plate circuit using the diagram shown on the schematic for audio-output amplifier stage.

(4) *Point-to-point continuity check.* If the preceding steps fail to indicate the cause of trouble, perform a point-to-point continuity check, referring to the parts identification diagrams, figures 9 and 10. Check for broken leads, faulty soldered joints and shorts.

(5) *Low gain.* Check capacitor C360 for open-circuit by connecting a 50-mf, 25-vdcw, electrolytic capacitor between terminal No. 8 of tube V308 and ground, connecting the negative side to ground, and noting the effect upon the output.

(6) *Distortion.* Check capacitor C362 for open circuit by paralleling it with a 0.01-mf capacitor and noting the effect upon the output.

c. REMOVAL AND REPLACEMENT OF AUDIO-OUTPUT TRANSFORMER T312. (1) *Removal.* Remove the bottom plate of receiver chassis. Remove two nuts holding capacitor C362 to posts of each side of capacitor C360, and push capacitor C362 to one side. Remove nuts and screws holding capacitor C360 to the side of the chassis, and unsolder the leads to terminal of capacitor, marking all leads. Loosen two nuts in the bottom of the chassis, holding the audio-output transformer to the chassis. Unsolder and mark all leads to the six transformer terminals. It may be necessary to cut cabling cord to unsolder red, white and black leads from transformer terminals. Note the position of the No. 1 terminal and remove the output transformer.

(2) *Replacement.* Place the new transformer on the chassis with its anchoring screws inserted in their proper holes. Place terminal angle strips over the terminal, and tighten the nuts. Resolder all the leads to the proper terminals of the output transformer. Replace

Table XVI

(fig. 22)

PARTS DATA, AUDIO OUTPUT STAGE

Ref. symbol	Signal Corps stock No.	Name of part, description and function
C359	3DA6–16	CAPACITOR, fixed: mica; 6,000-mmf ±10%; 300-vdcw; (noise suppressor cplg)
C360	3DB50–5	CAPACITOR: electrolytic; 50-mf +100%, —10%; 25-vdcw; (2d a-f cathode bypass)
C362	3DA10–76	CAPACITOR, fixed: mica; 10,000-mmf ±10%; 600-vdcw; (2d a-f plate shunt)
C363	3D9200–19	CAPACITOR, fixed: mica; 200-mmf ±10%; 500-vdcw; (audio high freq filter)
C364	3DA50–53	CAPACITOR, fixed: paper; 50,000-mmf ±10%; 400-vdcw; (h-v supply filter)
J301	2C4452A/J1	JACK JK–34–A: (loudspeaker)
J302	2C4452A/J1	JACK JK–34–A: (phone)
J303	2C4452A/J1	JACK JK–34–A: (phone)
R334	3Z6768	RESISTOR: metallized; 680,000-ohm ±10%; ½ w; (noise suppressor series)
R335	3Z6733–1	RESISTOR: metallized; 330,000-ohm ±10%; ½ w; (2d a-f grid)
R337	3Z6022–6	RESISTOR: wire-wound; 220 ohm ±10%; 2 w; (2d a-f cathode bias)
R344	2Z6051	RESISTOR: metallized; 510-ohm ±5%; ½ w; (output screen)
R346		RESISTOR: metallized; 6,800-ohm ±10%; ½ w; (phone jack series)
R354	3Z6100–48	RESISTOR: metallized; 1,000-ohm ±10%; ½ w; (audio stabilizing)
R355		RESISTOR: metallized; 6,800-ohm ±10%; ½ w; (phone jack series)
T312	2C44528/T12	TRANSFORMER: (output)
V308	2T168A	TUBE JAN–6Y6G (VT–168–A): (audio output)
X308	2Z8367	SOCKET: (audio output tube)

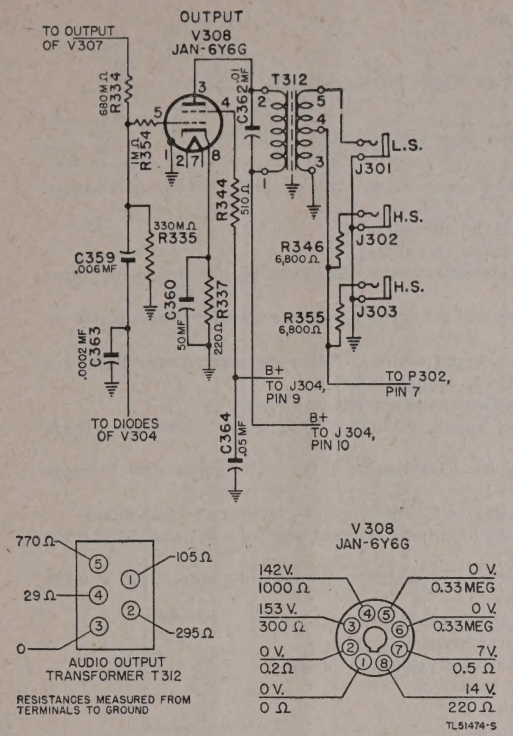


Figure 22. Audio output amplifier stage schematic, Radio Receiver BC–652–A.

and fasten capacitor C360 to the receiver chassis, and resolder leads to the capacitor terminal. Replace capacitor C362 on posts over capacitor C360, and tighten the nuts. Replace the bottom plate of the receiver chassis.

35. Power Circuit Connections Stage

a. STAGE DATA. (1) Power circuit connections stage shown in figure 23.

(2) Parts data for power circuit connections stage, table XVIII.

b. TROUBLE LOCATION. (1) *Lamps and fuse check.* Remove Lamps LM–52 and fuse F251, and check for continuity with ohmmeter. Replace if necessary.

(2) *Dynamotor check.* Remove dynamotor and inspect and clean as outlined in section III. Check dynamotor on a dynamotor test set using table II as a guide.

(3) *Power receptacles voltage and resistance check.* Check the voltages and resistances from the power receptacle terminals to ground against the values given in table XVII. After the trouble has been localized to a particular portion of the stage, make a check of each component associated with that portion of the stage. Make resistance measurements with batteries disconnected. Voltages given are applicable when Dynamotor DM–40–A is used. Plugs P250 and P251 are inserted in their respective receptacles, except where otherwise specified.

Table XVII

VOLTAGES AND RESISTANCES AT POWER RECEPTACLES

Receptacle	Pin No.	Resistance (ohms)	Voltage (volts)
J304*	1	Infinite	14
	2	Infinite	0
	3	0	0
	4	0	13.3
	5	Infinite	0
	6	1	7
	7	0	0
	8	Infinite	0
	9	19,000	143
	10	Infinite	172
	11	14,000	92
	12	Infinite	0
J250†	1	0	0
	2	0	0
	3	1	14
	4	0	0
	5	Infinite	14
	6	19,000	172
P302	1	0	14
	2	0	14
	3	0	14
	4	0	14
	5	0	0
	6	Infinite	0
	7	29	0
	8	Infinite	0
	9	Infinite	0

* Resistance measurements are made with plug P251 removed from receptable J304.

† Resistance measurements are made with plug P250 removed from receptacle J250.

(4) *Point-to-point continuity check.* If the preceding steps fail to indicate the cause of the trouble, perform a point-to-point continuity check, referring to the parts locations diagrams, figures 7 through 10. Check for broken leads, faulty soldered joints and shorts.

(5) *Oscillation, motorboating.* Check filter capacitors C251–A, C251–B and C251–C by put-

Table XVIII
(fig. 23)

PARTS DATA, POWER CIRCUIT CONNECTIONS STAGE

Ref. symbol	Signal Corps stock No.	Name of part, description and function
C251A	3DB16–2	CAPACITOR: electrolytic; 3 sec; 16-mf +75%, —10%; 350-vdcw; (included with 251; h-v filter)
C251B	3DB16–2	CAPACITOR: same as 251A; (h-v filter)
C251C	3DB16–2	CAPACITOR: same as 251A; (h-v filter)
C253	3DA6–47	CAPACITOR: paper; 0.006-mf —10%, +30%; 300-vdcw; (dynamotor input filter)
C254	3DB25–9	CAPACITOR: electrolytic; 25-mf +100%, —10%; 50-vdcw; (dynamotor input filter)
C255	3DA6–47	CAPACITOR: paper; 6,000-mmf —10%, +30%; 300-vdcw; (supply filter)
C256	3DA6–47	CAPACITOR: same as C255; (supply filter)
C257	3DA6–47	CAPACITOR: same as C255; (dynamotor input)
C258	3DA30–10	CAPACITOR: dielectric; paper; 0.03-mf +40%, —10%; 400-vdcw; (hash filter)
C329	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (screen bypass)
C370	3DA6–47	CAPACITOR: paper; 6,000-mmf —10%, +30%; 300-vdcw; (lead filter)
D251	3H1640A	DYNAMOTOR DM–40–A: d-c input, 14 v, 3.4 amp; d-c output, 172 v, 0.139 amp; 23.7 w; (receiver)
D252	3H1641A	DYNAMOTOR DM–41–A: d-c input, 28 v, 1.7 amp; d-c output, 172 v, 0.138 amp; 23.7 w; (receiver)
F251	3Z1942	FUSE FU–42; 20-amp; 25-v; (receiver input)
J250	6Z7799–6	RECEPTACLE: 6 contact; (dynamotor plug)
J304	2Z7403–3	RECEPTACLE: 12 contact; (crystal cable plug)
L252	2C4452A/C12	COIL: (dynamotor input choke)
L253	2C4452A/C12	COIL: (supply filter choke)
L301	2C4452A/C12	CHOKE COIL: (A supply r-f)
P250	2Z7228–17	PLUG: (dynamotor)
P251	2Z7228–16	PLUG: 12 contact; (connects cal. to receiver)
P302	2C4452A/P2	PLUG: 9 prong; banana plugs; (connects receiver to mounting)
R251	3Z6010–34	RESISTOR: wire-wound; 100-ohm ±5%; (filament ballast)
R252	3Z6008–2	RESISTOR: wire-wound; 80-ohm ±5%; (filament ballast)
R253	3Z6031A5	RESISTOR: wire-wound; 315-ohm ±5%; (B filter)
R320	3Z6300–16	RESISTOR: metallized; 3,000-ohm ±5%; 1 w; (screen divider)
R321	3Z6633–1	RESISTOR: metallized; 33,000-ohm ±10%; 1 w; (screen bleeder)
R338	3Z6001E9	RESISTOR: wire-wound; 15-ohm ±10%; 1 w; (dail lamp bleeder)
R342	3Z6300–16	RESISTOR: metallized; 3,000-ohm ±5%; 1 w; (screen bleeder)
R353	3Z6001E9	RESISTOR: wire-wound; 15-ohm ±10%; 1 w; (dial lamp bleeder)
S202	3Z8933	SWITCH: SPST; 3-amp, 250-v; (CFC ON-OFF switch)
S306	2C4452A/S5	SWITCH: (includes knob; receiver and trans modulator filament off-on)
V310	2Z5952	LAMP LM–52: (indicating)
V311	2Z5952	LAMP LM–52: (indicating)
X310	2C6530–653A/S11	SOCKET: (indicating lamp)
X311	2Z8724	SOCKET: (indicating lamp)

ting each in parallel with a 16-mf, 300-vdcw, electrolytic capacitor and noting whether the oscillation is stopped.

36. 200-KC Oscillator Stage

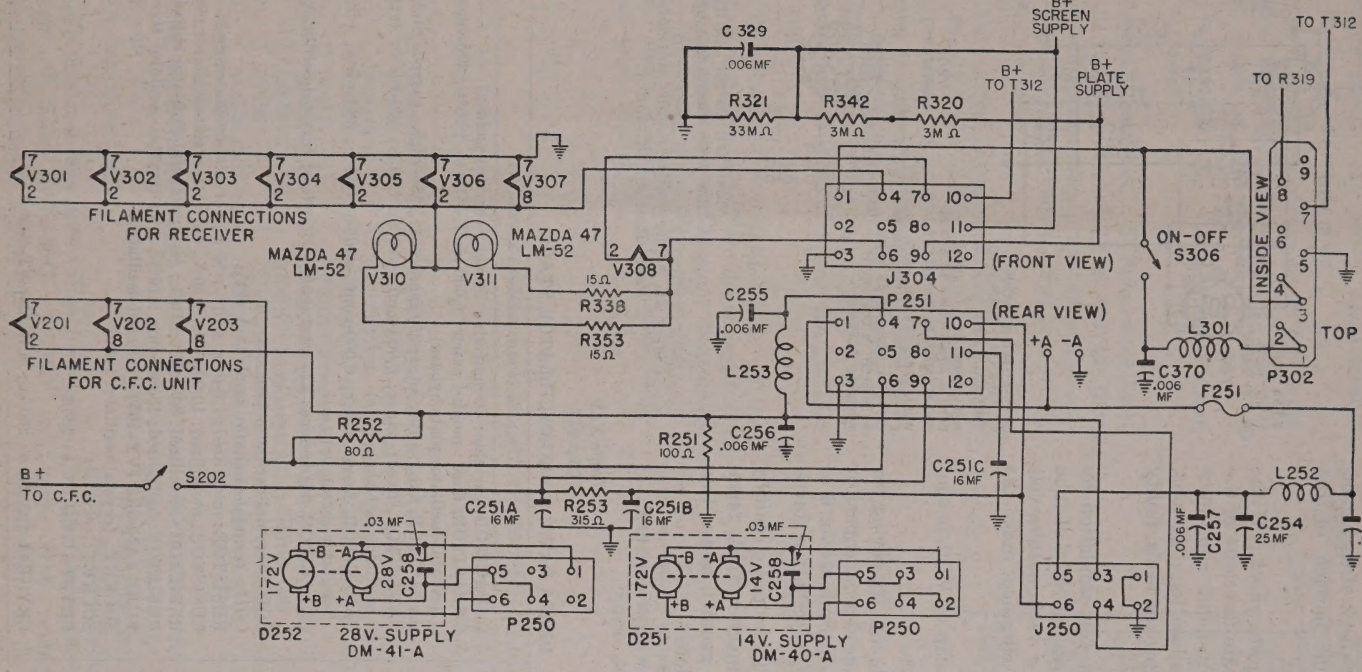
a. STAGE DATA. (1) 200-kc oscillator stage, shown in figure 24.

(2) Voltage and resistance values for socket terminals of Tube JAN–6K8 (V201) to ground, shown on stage schematic.

(3) Parts data for 200-kc oscillator stage, table XIX.

b. TROUBLE LOCATION. (1) *Tube check.* Remove the tube from socket. Test with the tube checker and replace with a new tube if necessary. In replacing tube see that it is seated firmly in its socket.

(2) *Tube socket voltage and resistance check.* Check the voltages and resistances from the socket terminals to ground with the diagram



PINS	1	2	3	4	5	6	7	8	9
RES.	0	0	0	0	0	INF	29	INF	INF
VOLTS	14	14	14	14	0	0	0	0	0

TESTS FOR PLUG P302

NOTE:
THESE TESTS ARE MADE WITH THE CASE REMOVED AND 14 VOLTS APPLIED TO THE BINDING POSTS ON THE C-F-C- CHASSIS
READINGS "INF" ARE CONSIDERED INFINITE

TL 51478-S

Figure 23. Power circuit connections, Radio Receiver BC–652–A.

shown on the 200-kc oscillator stage schematic. After trouble has been localized to a particular portion of the stage, make a check of each component associated with that portion of the stage.

(3) *Point-to-point continuity check.* If the preceding steps fail to indicate the cause of the trouble, perform a point-to-point continuity check, referring to the parts location diagrams, figures 7 and 8. Check for broken leads, faulty soldered joints and shorts.

(4) *No oscillation.* Test for oscillation by measuring the voltage of terminal No. 6 of tube V201 to ground with an a-c vacuum-tube volt meter. If no indication is obtained, make the following checks:

(*a*) Check that the grid cap of V201 is connected to ground.

(*b*) Check capacitor C230 and its wiring for open circuit by connecting a 50-mmf capacitor between terminal No. 5 and terminal No. 6 of tube V201 and noting whether oscillation starts.

(*c*) Check capacitor C204 for open circuit by connecting a 6,000-mmf capacitor from terminal No. 8 of tube V201 to ground, and noting the effect upon the oscillation.

(*d*) Replace the crystal with a new unit.

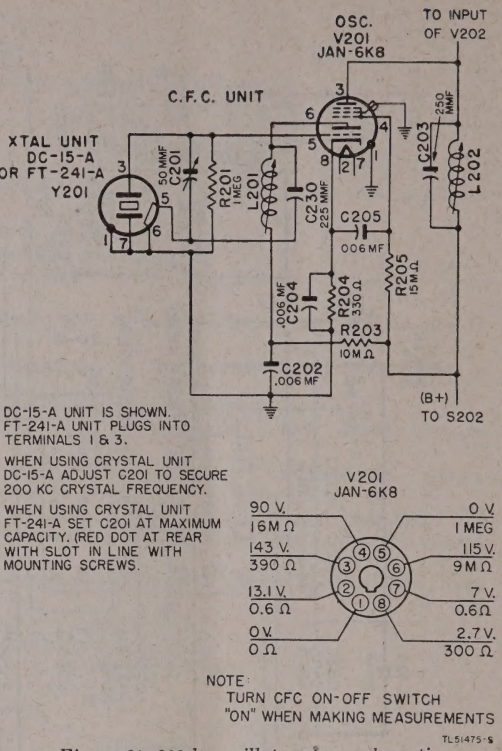


Figure 24. 200-kc oscillator stage schematic, Radio Receiver BC–652–A.

Table XIX
(fig. 24)

PARTS DATA, 200 KC OSCILLATOR STAGE

Ref. symbol	Signal Corps stock No.	Name of part, description and function
C201	3D9050V–28	CAPACITOR, variable: 50-mmf air trimmer; (crystal padder)
C202	3DA6–47	CAPACITOR, fixed: molded paper; 6,000-mmf —10%, +30%; 300-vdcw; (crystal-oscillator plate bypass)
C203	3D9250–27	CAPACITOR, fixed: silver mica; 250-mmf ±5%; 250-vdcw; (hexode tank ckt)
C204	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (crystal-oscillator cathode bypass)
C205	3DA6–47	CAPACITOR, fixed: paper; 6,000-mmf —10%, +30%; 300-vdcw; (crystal-oscillator screen bypass)
C230	3D9225	CAPACITOR, fixed: mica; 225-mmf ±5%; 250-vdcw; (crystal-oscillator tank ckt)
L201	2C4452A/C10	COIL: (crystal-oscillator tank ckt)
L202	2C4452A/C11	COIL: (crystal-oscillator amplr tank ckt)
R201	3Z6801–19	RESISTOR: metallized; 1.0-meg ±10%; ½ w; (crystal-oscillator grid)
R203	3Z6610–47	RESISTOR: metallized; 10,000-ohm ±10%; ½ w; (crystal-oscillator plate)
R204	3Z6033–2	RESISTOR: metallized; 330-ohm ±10%; ½ w; (crystal-oscillator cathode)
R205	3Z6615–4	RESISTOR: metallized; 15,000-ohm ±10%; 1 w; (crystal-oscillator screen)
V201	2T167	TUBE JAN–6K8 (VT–167): (crystal-oscillator)
X201	2C6530–653A/S9	SOCKET: (crystal-oscillator tube)
X204	2C6530–653A/S9	SOCKET: (crystal)
Y201	2Z3501–15A or	CRYSTAL DC–15–A: 200 kc.
	2Z3501–24–A	CRYSTAL DC–24–A: 200 kc; in Holder FT–241–A

37. 100-KC Multivibrator Stage

a. STAGE DATA. (1) 100-kc multivibrator stage, shown in figure 25.

(2) Voltage and resistance values for socket terminals of Tube JAN–6SC7 (V202) to ground, shown on stage schematic.

(3) Parts data for 100kc multivibrator stage, table XX.

b. TROUBLE LOCATION. (1) *Tube check.* Remove the tube from socket. Test with the tube checker and replace with a new tube if necessary. When replacing tube see that it is seated firmly in its socket.

(2) *Tube socket voltage and resistance check.* Check the voltages and resistances from the socket terminals to ground with the diagram shown on the 100-kc multivibrator stage schematic. After trouble has been localized to a particular portion of the stage, make a check of each component associated with that portion of the stage.

(3) *Point-to-point continuity check.* If the preceding steps fail to indicate the cause of the trouble, perform a point-to-point continuity check, referring to the parts location diagrams, figures 7 and 8. Check for broken leads, faulty soldered joints and shorts.

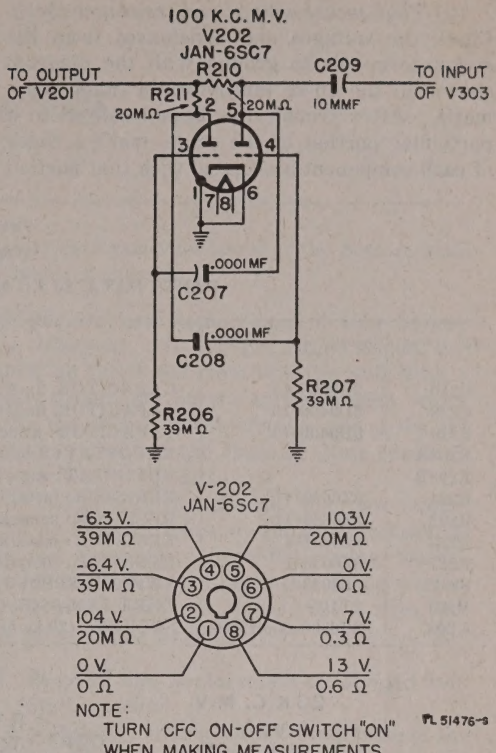


Figure 25. 100-kc multivibrator stage schematic Radio Receiver BC-652-A.

Table XX
(fig. 25)

PARTS DATA, 100-KC MULTIVIBRATOR STAGE

Ref. symbol	Signal Corps stock No.	Name of part, description and function
C207	3D9100–54	CAPACITOR, fixed: mica; 100-mmf ±10%; 500-vdcw; (feedback)
C208	3D9100–54	CAPACITOR: same as C207; (feedback)
C209	3D9010–16	CAPACITOR, fixed: mica; 10-mmf ±10%; 500-vdcw; (cplg)
R206	3Z6639	RESISTOR: metallized; 39,000-ohm ±5%; ½ w; (grid)
R207	3Z6639	RESISTOR: same as R206; (grid)
R210	3Z6620–11	RESISTOR: metallized; 20,000-ohm ±5%; 1 w; (plate)
R211	3Z6620–11	RESISTOR: same as R210; (plate)
V202	2T105	TUBE JAN–6SC7 (VT–105); (100-kc multivibrator)
X202	2C6530–653A/S9	SOCKET: (100-kc multivibrator tube)

38. 20-KC Multivibrator Stage

a. STAGE DATA. (1) 20-kc multivibrator stage, shown in figure 26.

(2) Voltage and resistance values for socket terminals of Tube JAN–6SC7 (V203) to ground, shown on stage schematic.

(3) Parts data for 20-kc multivibrator stage, table XXI.

b. TROUBLE LOCATION. (1) *Tube check.* Remove the tube from socket. Test with the tube checker and replace with a new tube if necessary. When replacing the tube, see that it is seated firmly in its socket.

(2) *Tube socket voltage and resistance check.* Check the voltages and resistances from the socket terminals to ground with the diagram shown on the 20-kc multivibrator stage schematic. After trouble has been localized to a particular portion of the stage, make a check of each component associated with that portion of the stage.

(3) *Point-to-point continuity check.* If the preceding steps fail to indicate the cause of the trouble, perform a point-to-point continuity check, referring to the parts location diagrams, figures 7 and 8. Check for broken leads, faulty soldered joints and shorts.

Table XXI

(fig. 26)

PARTS DATA, 20 KC MULTIVIBRATOR STAGE

Ref. symbol	Signal Corps stock No.	Name of part, description and function
C210	3D9005–15	CAPACITOR, fixed: mica; 5-mmf ±10%; 500-vdcw; (output cplg)
C228	3D9400–13	CAPACITOR, fixed: silver mica; 400-mmf ±5%; 250-vdcw; (feedback)
C229	3D9400–13	CAPACITOR: same as C228; (feedback)
R208A		RHEOSTAT: 2 sec; 35,000-ohm max. ±20%; (adjustable grid)
R208B		RHEOSTAT: same as R208A; (adjustable grid)
R221	3Z6620–11	RESISTOR: metallized; 20,000-ohm ±5%; 1 w; (grid)
R222	3Z6620–11	RESISTOR: same as R221; (grid)
R223	3Z6651–2	RESISTOR: metallized; 51,000-ohm ±5%; 1 w; (plate)
R227	3Z6639–1	RESISTOR: metallized; 39,000-ohm ±5%; 1 w; (plate)
S201	3Z8933	SWITCH: SPST; 3 amp; 250 v; (100 to 20-kc interval)
V203	2T105	TUBE JAN–6SC7 (VT–105); (20-kc multivibrator)
X203	2C6530–653A/S9	SOCKET: (20-kc multivibrator tube)

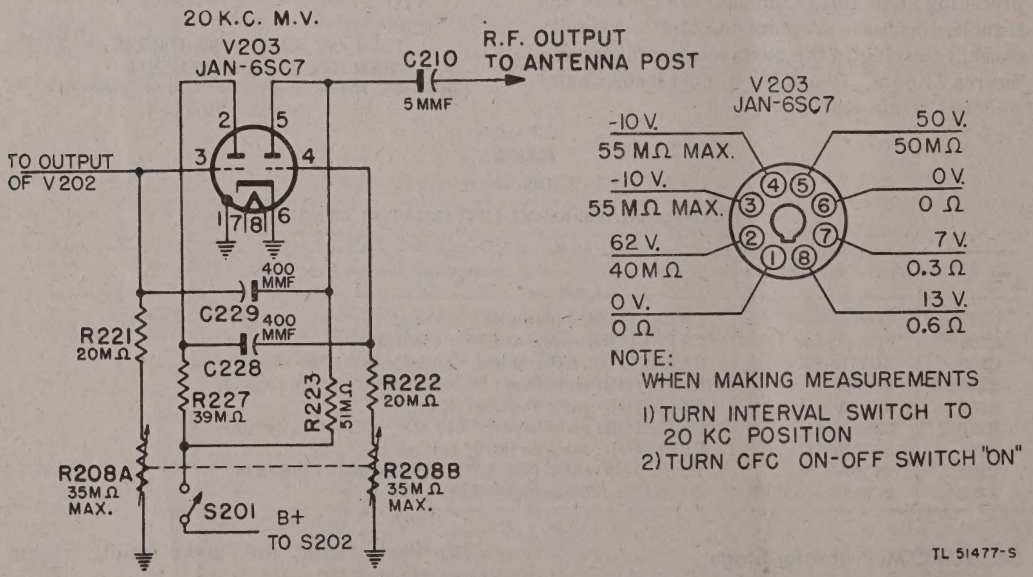


Figure 26. 20-kc multivibrator stage schematic, Radio Receiver BC–652–A.

SECTION IX

SUPPLEMENTARY DATA

39. Removal and Replacement of Front Panel

a. REMOVAL. Remove the crystal-frequency-calibrator chassis. Remove bottom plate of receiver chassis. Turn CW-MVC-AVC switch to AVC; turn BAND CHANGE knob to BAND 1 and turn ON-OFF switch to OFF. Turn INCREASE OUTPUT knob to maximum clockwise position. Using the Allen wrench clipped to back of outer case, loosen the two setscrews holding each knob and remove the knobs. Remove the TUNING knob by loosening two setscrews. Remove the washer and the spring clip from shaft of TUNING knob. Remove three screws from each side of the front panel and the two screws from the lower side of the panel. The clip angle in back of the panel will come loose. Remove the felt washers from the CW–MVC–AVC shaft and the ON-OFF shaft. Remove the plastic escutcheon on the front panel by loosening the four screws. Remove the pilot lamps and unsolder the wires from the lugs of the lamp socket. Remove front panel.

b. REPLACEMENT OF FRONT PANEL. Thread the wire lamp leads through the holes in the front panel, and place the front panel in position on the front of the receiver chassis. Be sure the lugs on the back of the front panel fit snugly into the holes of the front end of the receiver chassis. Fasten three screws on each side of the front panel. Resolder the lamp wires to the proper terminals of the lamp socket. Insert the bayonet type lamps into the sockets on the front panel, and replace the plastic escutcheon on the front panel with four screws. Place the angle clip on the back of the receiver front panel, and fasten the lower two screws through the front panel into the angle clip. Replace the metal and felt washers on the ON-OFF shaft and on the CW–MVC–AVC shaft. Replace the spring clip and the washer on the TUNING shaft. Replace all the knobs in the same position they occupied when removed, and tighten the setscrews in each knob with the Allen wrench. Replace the crystal-frequency-calibrator chassis and the bottom plate of receiver chassis.

40. Removal and Replacement of Tube Sockets

a. REMOVAL. To remove a tube socket, unsolder all the wires from the lugs and, with a screw driver, pry off the spring washer which holds the socket to the chassis, and press the tube socket out of the chassis. Note carefully the position of the keyway.

b. REPLACEMENT. Install the new socket with its keyway in exactly the same location as the one removed. Place the spring washer around the socket and press the spring washer down with a screw driver so that it slips into the grove of the socket.

41. Removal and Replacement of Ganged Tuning Capacitor

a. REMOVAL. Remove the bottom plate of the receiver chassis. Unsolder all connections to the lugs of the capacitor and mark the leads for proper reassembly. Turn the TUNING knob so that the concentric holes in the split spring gear on the ganged tuning capacitor shaft are accessible. Insert the tight-fitting pins through both holes of the split gears. Loosen the four nuts holding the unit to the receiver chassis and remove the unit.

b. REPLACEMENT. Carefully place the new or repaired unit into the receiver, making sure that the gears mesh properly. Fasten the unit to the chassis with four nuts. Resolder all wires to the proper lugs of the rotor and stator assembly. Turn the TUNING knob to the position where the pins holding the split spring gears can be removed, and remove the pins without bending the gears. Turn the TUNING knob to insure smooth operation. Replace the bottom plate of the receiver chassis.

42. Removal and Replacement of Antenna, Radio-Frequency, or Oscillator Assemblies

a. REMOVAL. Remove the crystal-frequency-calibrator chassis. Remove the bottom plate of

the receiver chassis. Loosen the setscrew in the collar (back of panel) holding the shaft to the BAND CHANGE switch. Remove tube V304 in the rear of the OSC. coil can and pull the BAND CHANGE shaft out through the back. Remove the two screws located at the top of the can. Remove the two nuts located under the receiver chassis from threaded lugs attached to the can. Lift the can off. Trace the leads leaving the coil to their terminating point under the receiver chassis. Tag and unsolder these connections under the receiver chassis. Remove the four screws holding the coil to the chassis and remove the coil.

b. REPAIR. See figure 27 for parts location within the coil assemblies.

c. REPLACEMENT. Replace the new or repaired unit on the receiver chassis. Draw the leads through the receiver chassis, and bolt the coil to the chassis by means of the four bolts. Resolder the connections under the receiver chassis. Replace the can over the coil and replace the two screws on the top of the can, and the two nuts underneath the receiver chassis. Push the BAND CHANGE shaft through the cans into the collar and tighten the setscrew in the collar with the Allen wrench. Replace tube V304. Replace the crystal-frequency-calibrator chassis.

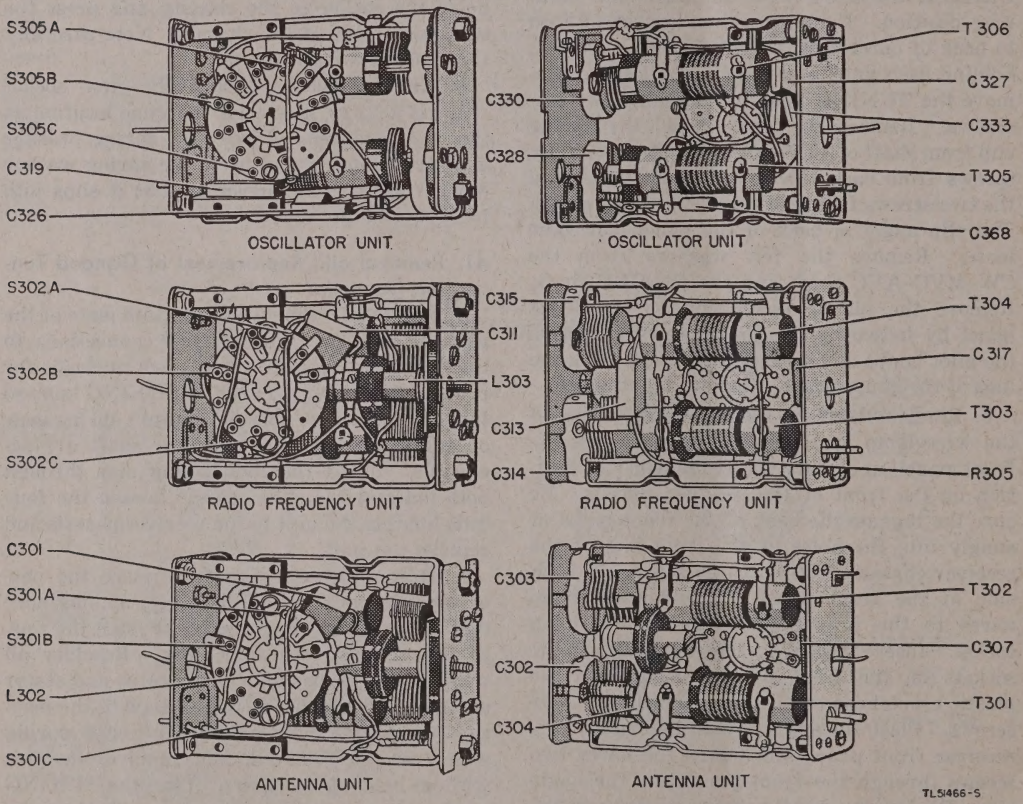


Figure 27. Antenna, radio-frequency and oscillator coil assemblies, Radio Receiver BC–652–A.

43. Removal and Replacement of Transformers T307, T308, T309, or T310

a. REMOVAL. Remove crystal-frequency-calibrator chassis. Remove the plate from the bottom of the chassis. Unsolder and tag all the leads connected to the lugs of the transformers. Note the position of lug No. 1, and when installing new transformer see that lug No. 1 oc-

cupies the same position. Remove the nuts from the screws that hold the transformer to the chassis, and remove the transformer.

b. REPLACEMENT. Set the new transformer on the chassis with lug No. 1 in the original position. Fasten the nuts to the screws holding the transformer to the chassis. Remove all the excess solder from the disconnected wires, and resolder the wires to the proper lugs. Replace the bottom plate on the receiver chassis, and replace the crystal-frequency-calibrator chassis.

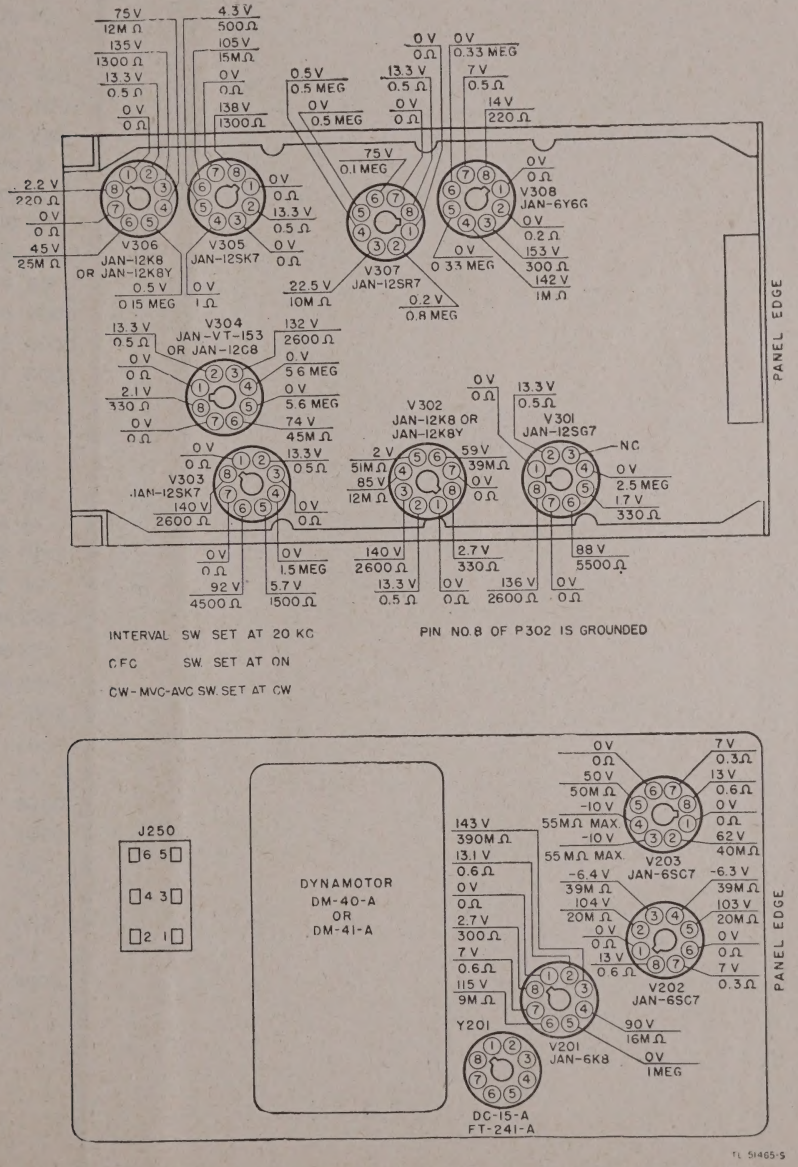


Figure 28. Tube socket voltages and resistances, Radio Receiver BC–652–A.

C201	50
C202	6000
C203	250
C204	6000
C205	6000
C207	100
C208	100
C209	10
C210	5
C228	400
C229	400
C230	225
C251A	16
C251B	16
C251C	16
C253	6000
C254	25
C255	6000
C256	6000
C257	6000
C258	.03
C301	10
C302	50
C303	50
C304	5
C305	400
C307	40
C308A	236
C308B	236
C308C	236
C309	6000
C310	6000
C311	30
C312	6000
C313	6000
C314	50
C315	50
C316	400
C317	40
C318	6000
C319	50

C201	50	MMF	C320	6000	MMF	C360	50	MF	R315	47M	Ω
C202	6000	MMF	* C321	500	MMF	C361	500	MMF	R316	330	Ω
C203	250	MMF	C322	500	MMF	C362	.01	MF	R317	5.6	MEG.
C204	6000	MMF	C323	6000	MMF	C363	200	MMF	R318	2200	Ω
C205	6000	MMF	C324	6000	MMF	C364	.05	MF	R319	510	Ω
C207	100	MMF	C325	500	MMF	C365	6000	MMF	R320	3M	Ω
C208	100	MMF	C326	650	MMF	C366	6000	MMF	R321	33M	Ω
C209	10	MMF	C327	1100	MMF	C368	30	MMF	R322	820	Ω
C210	5	MMF	C328	25	MMF	C370	6000	MMF	R323	510M	Ω
C228	400	MMF	C329	6000	MMF	R201	1	MEG.	R324	39M	Ω
C229	400	MMF	C330	25	MMF	R203	10M	Ω	R325	150M	Ω
C230	225	MMF	C331	6000	MMF	R204	330	Ω	R326	24M	Ω
C251A	16	MF	C332	30	MMF	R205	15M	Ω	R327	12M	Ω
C251B	16	MF	C333	30	MMF	R206	39M	Ω	R328	1	MEG.
C251C	16	MF	C334	6000	MMF	R207	39M	Ω	R329	510M	Ω
C253	6000	MMF	C335	500	MMF	R208A	35M	ΩMAX.	R330	10M	Ω
C254	25	MF	C336	500	MMF	R208B	35M	ΩMAX.	R331	1500	Ω
C255	6000	MMF	C337	6000	MMF	R210	20M	Ω	R332	75M	Ω
C256	6000	MMF	C338	6000	MMF	R211	20M	Ω	R333	100M	Ω
C257	6000	MMF	C339	6000	MMF	R221	20M	Ω	R334	680M	Ω
C258	.03	MF	C340	500	MMF	R222	20M	Ω	R335	330M	Ω
C301	10	MMF	C341	500	MMF	R223	51M	Ω	R336	330	Ω
C302	50	MMF	C342	6000	MMF	R227	39M	Ω	R337	220	Ω
C303	50	MMF	C343	6000	MMF	R251	100	Ω	R338	15	Ω
C304	5	MMF	C344	525	MMF	R252	80	Ω	R339	220	Ω
C305	400	MMF	C345	215	MMF	R253	315	Ω	R340	15M	Ω
C307	40	MMF	C346	50	MMF	R301	1	MEG.	R341	2200	Ω
C308A	236	MMF	C347	6000	MMF	R302A	20M	ΩMAX.	R342	3M	Ω
C308B	236	MMF	C348	200	MMF	R302B	800M	ΩMAX.	R343	27M	Ω
C308C	236	MMF	C349	300	MMF	R303	330	Ω	R344	510	Ω
C309	6000	MMF	C350	6000	MMF	R304	1200	Ω	R345	47M	Ω
C310	6000	MMF	C351	25	MMF	R305	2200	Ω	R346	6800	Ω
C311	30	MMF	C352	6000	MMF	R306	1	MEG	R347	82M	Ω
C312	6000	MMF	C353	500	MMF	R307	330	Ω	R348	82M	Ω
C313	6000	MMF	C354	25	MMF	R308	51M	Ω	R349	82M	Ω
C314	50	MMF	C355	345	MMF	R309	39M	Ω	R350	82M	Ω
C315	50	MMF	C356	50	MMF	R310	12M	Ω	R351	82M	Ω
C316	400	MMF	C357A	12	MF	R311	2200	Ω	R352	82M	Ω
C317	40	MMF	C357B	12	MF	R312	47M	Ω	R353	15	Ω
C318	6000	MMF	C358	6000	MMF	R313	1200	Ω	R354	1M	Ω
C319	50	MMF	C359	6000	MMF	R314	2200	Ω	R355	6800	Ω

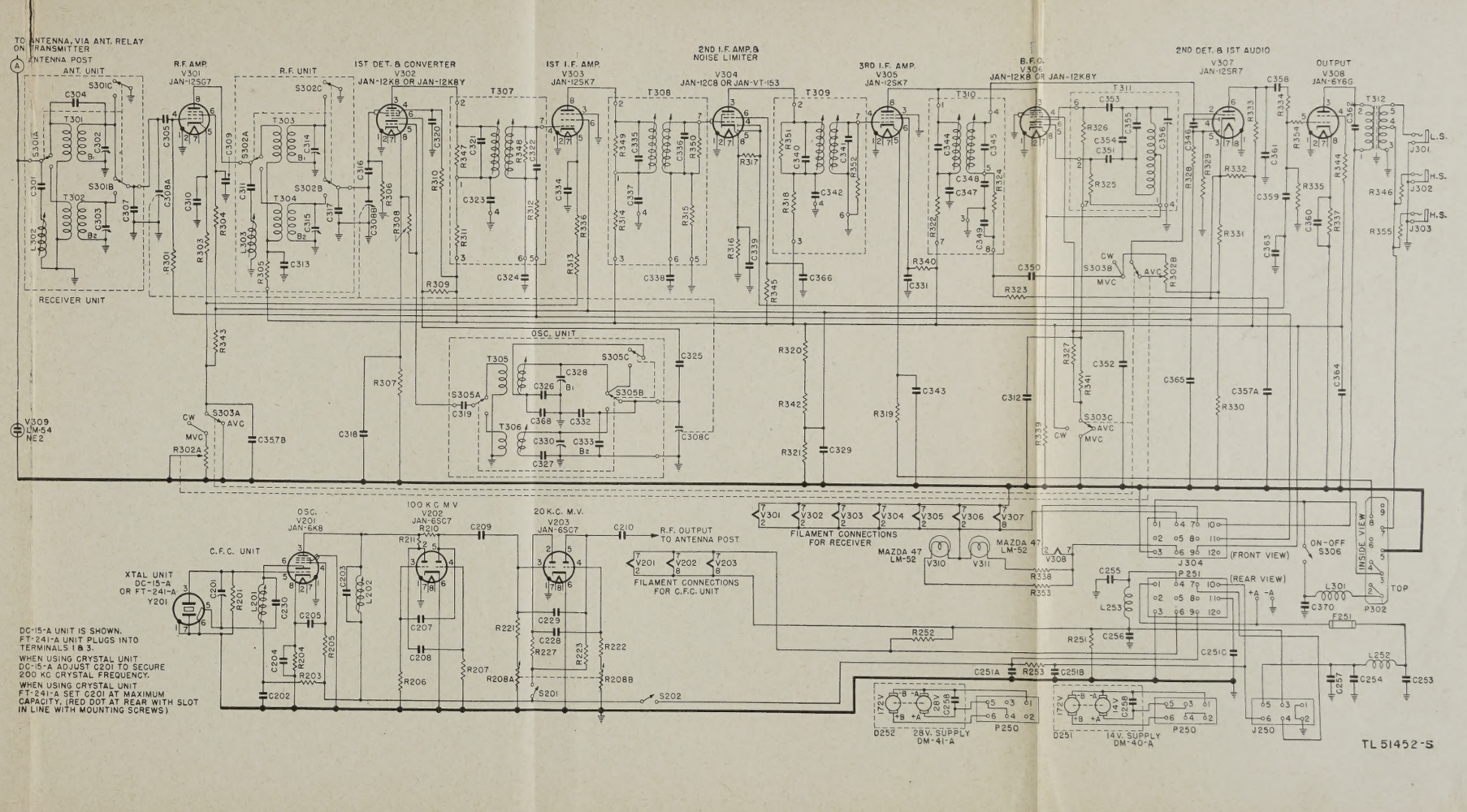


Figure 29. Schematic wiring diagram, Radio Receiver BC-652-A.