12R4-2ARR5-2

T.O. No. 16-30ARR5-2
(Old AN 08-30ARR5-2)

HANDBOOK

MAINTENANCE INSTRUCTIONS

RADIO RECEIVING SET AN/ARR-5

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

Dunlap Printing Co., Phila., Pa – 7000-2-54

29 November 1944

REVISED 1 OCTOBER 1953

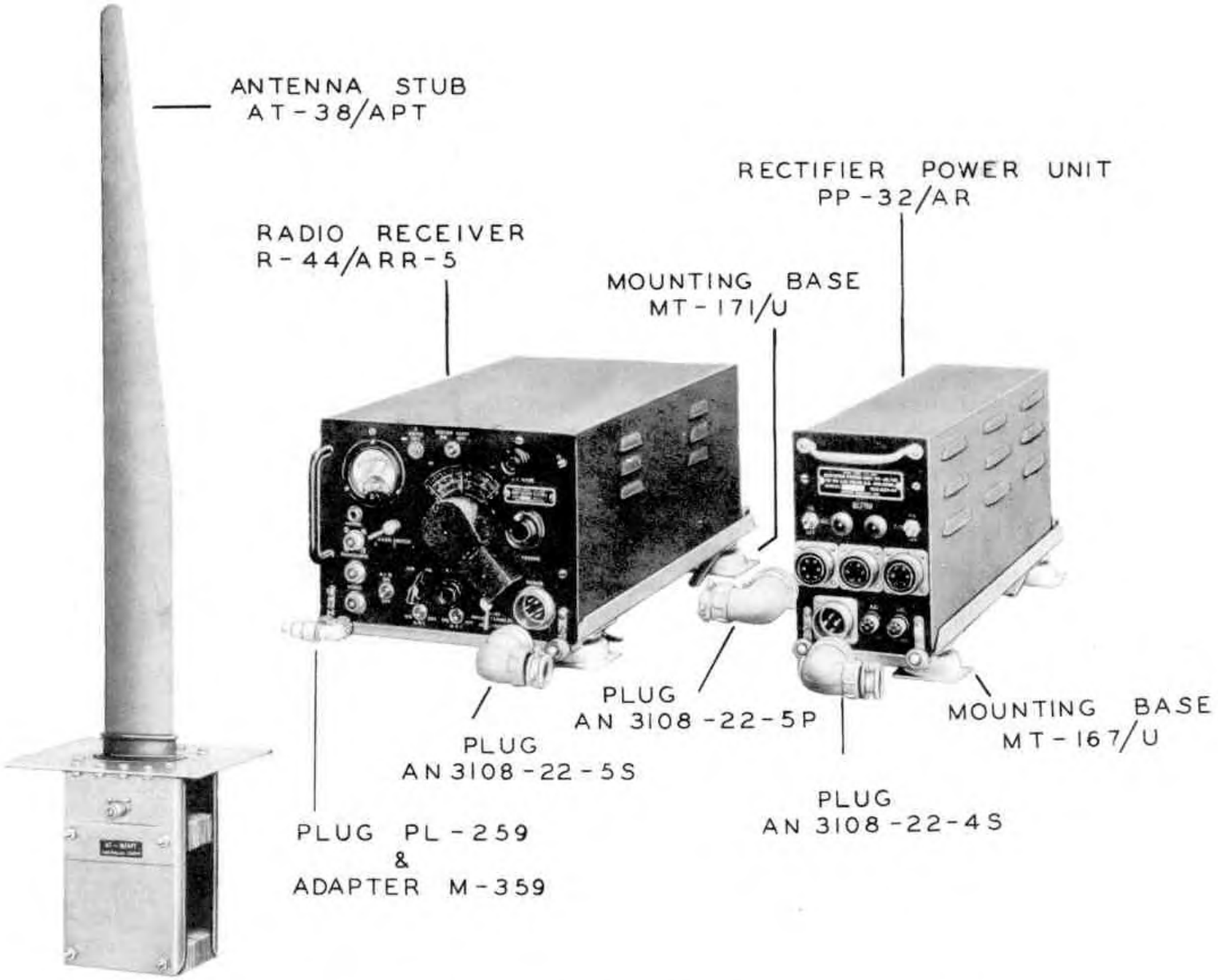

Figure 1-1. Radio Receiving Set AN/ARR-5—Major Components

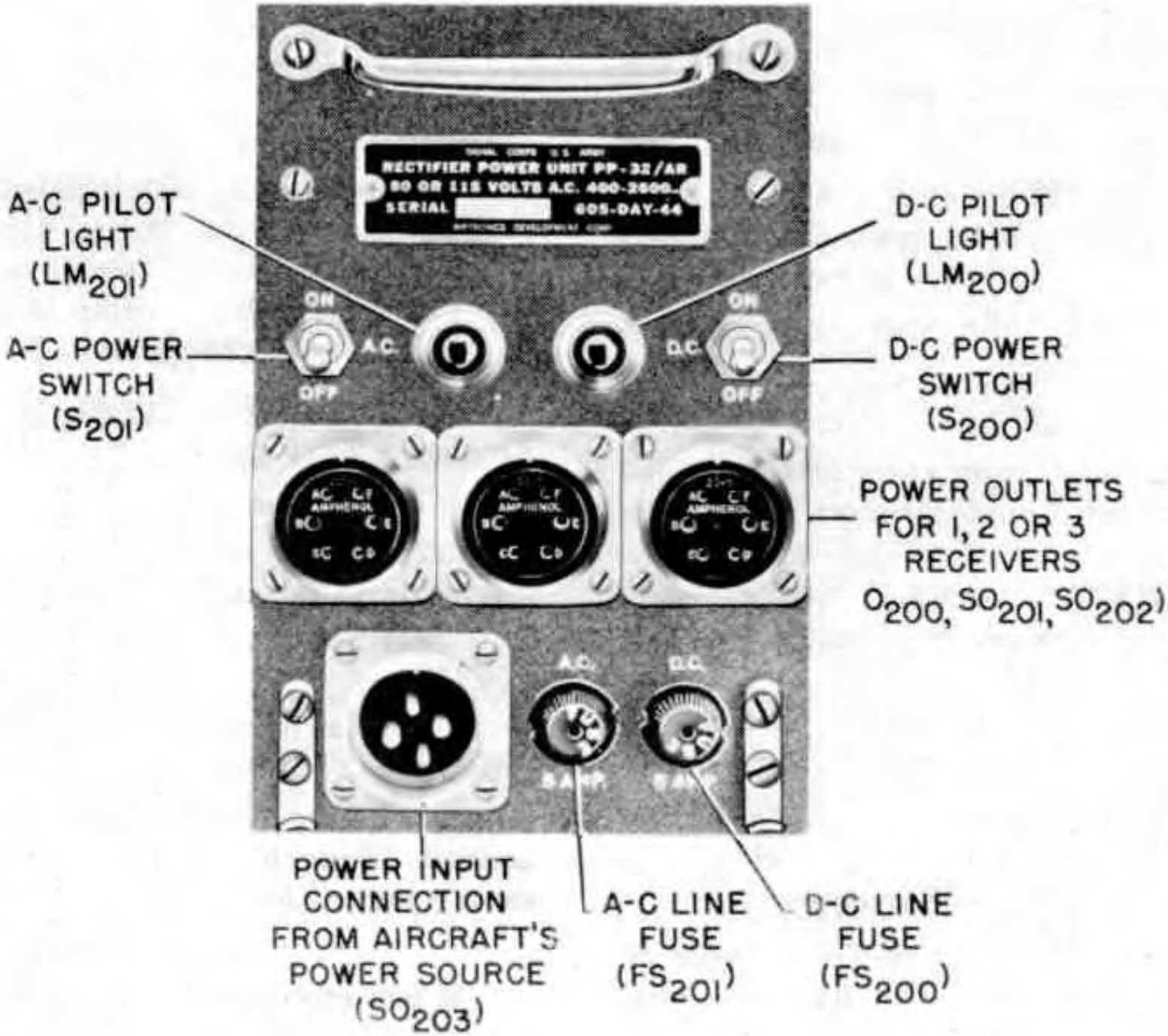

Figure 2-2. Rectifier Power Unit PP-32/AR—Front View

SECTION V

MAINTENANCE

PART I. ORGANIZATIONAL MAINTENANCE

1. GENERAL.—This section provides instructions essential for maintenance of Radio Receiving Set AN/ARR-5 by organizational maintenance activities. Before attempting to service and test this equipment, maintenance personnel should be thoroughly familiar with the physical make-up of the equipment, and reasonably familiar with its theory of operation.

Organizational maintenance of the equipment is based on periodic inspections, to be performed immediately before each flight, after each flight, and at other stated intervals. The preflight check of AN/ARR-5 (described in paragraph 3) should be made before the aircraft takes off for each mission, to ascertain that the equipment is securely fastened and will function properly in flight. The postflight check (described in paragraph 4) provides for thorough inspection of the equipment in the aircraft following its use in flight. The routine check (described in paragraph 5) is more detailed than either the preflight or postflight inspections, and should be performed by maintenance personnel whenever deemed necessary (usually every 100 operating hours) by the authority responsible for proper functioning of the equipment.

Defects disclosed during the inspections can be localized by following the associated trouble references in the TABLE OF OPERATIONAL CHECKS, paragraph 3*b*(2), below. The purpose of this trouble-shooting procedure is to quickly determine the portion of the equipment in which the fault exists. After localizing the trouble, maintenance personnel can determine what action, depending upon the time element, should be taken to eliminate it. More detailed trouble-shooting information, whereby the trouble is isolated to a single circuit or part, is given in Part II of this section.

The first step in localizing trouble in the receiving system is to check the antenna and interconnecting cables. If these prove normal, the next step is to determine whether the rectifier power unit or the receiver is at fault. Since the components in question are small, light in weight, and easily removed, trouble shooting can be expedited by replacing one or the other component to clear the trouble. If spare AN/ARR-5 components are not available, it is recommended that the rectifier power unit and the receiver be removed to a test bench where suitable checks can be followed to isolate the faulty component.

2. TEST EQUIPMENT.—The testing of Radio Receiving Set AN/ARR-5 is greatly facilitated by the proper use of applicable test equipment. A brief description of the test equipments available to organizational activities for maintenance purposes follows. For complete information concerning the operation or maintenance of any piece of test equipment, reference should be made to the appropriate equipment handbook.

a. FREQUENCY METER TS-174/U.—This set is a portable, battery-operated frequency meter which is used as a signal generator to test Radio Receiver R-44/ARR-5 for normal reception and to check the dial calibration on all three bands.

b. TUBE TESTER I-177.—This set is fundamentally a dynamic mutual-conductance tube tester which is designed to provide either "REPLACE-GOOD" readings or mutual-conductance values in micromhos for all receiving tubes used in the R-44/ARR-5 receiver. It operates on 105 to 125 volts, 60 cycles, alternating current.

c. MULTIMETER TS-297/U.—This meter is a multirange test instrument which is used to measure voltage, direct current, and resistance. Under certain conditions, it may also be used as an output meter.

3. PREFLIGHT CHECKS

a. VISUAL INSPECTION.—Make a complete visual inspection of the equipment, giving special attention to the following:

(1) Be certain that all components are securely mounted. See that the copper strap connecting the antenna stub to the connector located on the mounting clamp is mechanically secure, and making good electrical contact at both ends.

(2) See that all cable connectors are firmly seated, and hand-tighten the locking ring on each connector.

(3) Make certain that connecting cables and other objects do not interfere with the free movement of the shock-mounted components.

b. OPERATIONAL CHECK.

(1) Check the operation of the equipment by performing each step of Table 5-1. In making the tests, use an external primary source of power capable of supplying 200 watts at 115 volts, 400 to 2600 cycles per second, and 50 watts at 28 volts, d.c., to avoid having to run the aircraft engines. If any step reveals an abnormal condition, perform those tests or replacements listed in the right-hand column until the trouble is isolated. After the fault is corrected, repeat the step at which the abnormal condition was the first observed, and then continue with the operational check.

(2) TABLE OF OPERATIONAL CHECKS.

Step	*Control Settings and Instructions*	*Normal Indications*	*If Indication Is Abnormal*
1	Power switches to "ON."	A-C and d-c pilot lamps light.	Check power-cable connections. Check fuses FS_{201} (dc) and FS_{201} (ac). Check primary power source.
2	Adjust frequency meter to transmit AM signal in receiver frequency range. Place meter adjacent to receiver antenna. Tune receiver to meter frequency.	1000-cycle tone in Headset HS-33	Check antenna cable connections. Check all plugs for proper seating to ensure good contact. Check all tubes to see that they are properly seated. Replace receiver and/or rectifier power unit, if spare units are available.
3	Adjust frequency meter to transmit CW signal in receiver frequency range. Place meter adjacent to receiver antenna. Tune receiver to frequency meter. Turn "B.F.O." switch to "ON."	Audio tone in Headset HS-33, as "B.F.O." control is turned.	Check tube V_{101}, and replace if necessary. Replace receiver, if spare unit is available.
4	Set sector cams as per paragraph 2*e*, section III. Turn "MOTOR DRIVE" switch to "ON."	Sector sweep mechanism should start scanning, reversing dial rotation at end of each scanning run.	Check to see if d-c power polarity is reversed.

4. POSTFLIGHT CHECKS.

a. VISUAL INSPECTION.—Make a thorough visual inspection of the equipment, giving particular attention to the following items:

(1) See that the antenna is undamaged, securely mounted, and clean.

(2) Inspect Radio Frequency Cable RG-8/U for kinked or dented sections.

(3) Remove receiver and rectifier power unit from dust covers, and check tubes to see that they are properly seated.

(4) Visually check units for electrical defects, such as sparkovers and faulty wiring.

(5) Replace units in dust covers, and fasten in place.

(6) Continue visual inspection as directed in paragrahp 3*a*.

b. PERFORMANCE CHECK.—After completing the visual inspection, give the equipment a complete operational check by performing all steps in the Table of Operational Checks, above.

5. ROUTINE (100-HOUR) CHECK.

a. VISUAL INSPECTION.—Perform a detailed inspection of the entire equipment, giving particular attention to the items that follow:

(1) Carefully examine the antenna for damage, and see that it is securely mounted. Remove any paint or dirt from antenna base. If possible, inspect and hand-tighten the cable connection at the base of the antenna.

(2) Check the bonding straps between the receiver and fuselage, and rectifier power unit and fuselage. Make certain that they are mechanically tight and making good electrical contact.

(3) Remove all connectors from components, to see that they are free from moisture, corrosion, and dust.

(4) Examine all cables for chafing and strain, and see that the cables are properly supported and clamped.

(5) Remove the two components from their mounting racks, clean the mounting racks, and see that they are securely fastened.

(6) Place the components on test bench and remove the dust covers. Inspect each chassis for obvious signs of trouble, such as accumulated dirt, corrosion or fungus; loose, damaged or overheated parts; chafed, broken, or burned insulation; and damaged or dirty connectors.

(7) Check all vacuum tubes in tube tester. Replace all tubes that read weak or bad.

(8) Examine the gear drive of the scanning mechanism for signs of wear or dirt. Clean, and apply a few drops of light machine oil at the bearings and gear surfaces.

(9) Check brushes in the scanning motor, and replace when worn short.

(10) Replace dust covers on components.

b. OPERATIONAL CHECK.—After completing detailed visual inspection, perform the operational checks outlined in the TABLE OF OPERATIONAL CHECKS, paragraph 3*b*(2), above. In addition, check the dial calibration on all three bands, using Frequency Meter TS-174/U.

PART II. FIELD MAINTENANCE.

1. GENERAL.—This section contains instructions for servicing Radio Receiving Set AN/ARR-5 at field-maintenance levels. Procedures for checking the various functions of each component are provided, followed by systematic trouble-isolation procedures which begin with a faulty function and lead to the faulty circuit, tube, or part. Adjustment, measurement, and performance will also be found in this section.

2. TEST EQUIPMENT.—In addition to the test equipment listed in paragraphs 2*a*, *b*, and *c* of Part I, a signal

generator is required for many of the adjustments discussed in this section. A brief description of Signal Generator TS-497/URR, which is available to field activities responsible for maintenance of Radio Receiving Set AN/ARR-5, follows. This instrument is a precision signal generator capable of providing standard radio-frequency test signals of accurately known frequency and amplitude. It has a carrier-frequency range of from 2 to 400 megacycles in six bands. Choice of 400- or 1000-cycle sine-wave modulation from an internal oscillator, or external modulation over the range of 50 to 10,000 cycles is provided. The output is continuously variable from 0.1 to 100,000 microvolts.

3. TROUELE SHOOTING.

a. GENERAL.—Two steps are normally required to service a defective radio set. The first step is to sectionalize the trouble; that is, to narrow the probable cause of abnormal operation down to a major component or circuit. The second step is to localize the trouble by locating the defective part responsible for the abnormal condition.

Before applying power to the set, or making tests of any kind, a thorough visual inspection of each component should be made, as described in paragraph 3*b* below. Evidence of trouble, such as burned-out resistors, carbonized areas resulting from arc-overs, and shorted power transformers can often be discovered by sight and smell. Any faults revealed by visual inspection should be corrected before proceeding further with the trouble shooting.

Next, an operational check should be made (see paragraph 3*c*, below) with the defective component incorporated into a test bench equipment setup in which the other components are known to be in good operating condition. Observation of the performance of the component in such a setup will often indicate the section of the component which is at fault.

If the trouble cannot be located or sectionalized by a visual and operational check, consult the trouble-shooting chart given below. Then, if necessary, follow the signal-substitution procedure given in paragraph 3*d*(2), below, until the fault is narrowed down to a particular stage or circuit. At this point, the defective part can usually be located by checking the associated tubes and making voltage and resistance measurements (see paragraph 3*e*, below).

b. VISUAL INSPECTION.—When a radio set is brought in from the field for check or repair, remove the receiver and rectifier power unit from dust covers, and inspect both units for the following indications of trouble:

(1) Examine for burned insulation and resistors. Check for wax leakage and any discoloration of parts and wire.

(2) Inspect for loose or broken connections to tube sockets, plugs, and other parts. Examine for bare wires touching the chassis or other wires.

(3) Inspect for broken tubes. Check to see that the proper type tubes are in their correct sockets, as indicated on the chassis.

(4) Inspect the fuses in the rectifier power unit. Check carefully for short circuits whenever a power unit with a blown fuse is found.

(5) Examine all power plugs and cables. Replace or repair any plugs or cables that are broken.

c. OPERATIONAL CHECK. — Set up the entire equipment on a test bench where the necessary power sources are available: 115 volts, 400 to 2600 cycles per second, 200 watts, and 28 volts, dc, 50 watts.

Note

If only one component of the equipment requires maintenance, connect that component into a test bench setup in which all other components are known to be in good operating condition.

Perform the checks given in the TABLE OF OPERATIONAL CHECKS, paragraph 3*b*(2), part I of this section.

d. SECTIONALIZING TROUBLE.—The following charts are supplied as an aid in quickly sectionalizing trouble in the rectifier power unit and receiver to a particular stage or circuit. A tube check and voltage and resistance measurements in the suspected circuit ordinarily should be sufficient to isolate the defective part.

(1) TROUBLE - SHOOTING CHART FOR RADIO RECEIVING SET AN/ARR-5.

Symptom	*Probable Trouble*	*Correction*
Pilot lights on rectifier power unit do not light when "A.C." and "D.C." power switches are turned "ON."	Burned out fuses in rectifier power unit. Open circuit breakers. Defective power cable.	Check fuses. Replace if open. Check circuit breaker. Reset if open. Check cable. Repair if broken.
Dial light on, but no receiver output when "SELECTIVITY" switch is set to "BROADS" or "SHARP" position.	Defective tube. Defective headset.	Check tubes. Check headset.
Receiver operative, but excessive hum in headset.	Defective filter capacitor C_{200}, C_{201}, or C_{202}.	Replace defective part.
No signal in headset, with signal fed from audio oscillator through a .05-μf capacitor to pin 2 of V11.	Defective a-f stages. Defective headset.	Check tubes V11 and V12. Replace if defective. Use signal substitution in the audio stages (par. 5-2). Repair or replace defective part.

(1) TROUBLE - SHOOTING CHART FOR RADIO RECEIVING SET AN/ARR-5. (Continued)

Symptom	*Probable Trouble*	*Correction*
No signal output in headset, with modulated 5-25-megacycle signal applied to grid of V_{3a} as explained in par. 5. (Audio stages checked; "A.M.-F.M." switch in "A.M." position.)	Defective i-f or detector stage.	Check tubes. Use signal substitution in i-f stages (par. 5-3). Repair or replace defective part.
No signal output in receiver after previous checks have been made.	Defective h-f oscillator stage.	Check tube and replace if defective. Use signal substitution method (par. 5-4) to locate defective parts and replace.
No signal output in headset, with modulated r-f signal aplied to antenna terminals.	Defective tube V_1 or V_2. Defective reradiation suppressor or r-f amplifier stage.	Check tubes and replace if defective. Use signal substitution (par. 5-4) to locate part and replace.
Receiver output satisfactory with signal generator attached to antenna terminals, but output weak when using antenna.	Open or loose antenna lead.	Repair antenna lead. Check and repair connections to antenna.
No output signal heard as B.F.O. trimmer is rotated when an unmodulated r-f signal is applied to antenna terminals.	Defective B.F.O. stage. Defective tube V_{3b}.	Check tube, and replace if defective. Use signal substitution test (par. 5-4) to localize defective part.

(2) SIGNAL SUBSTITUTION.

(a) GENERAL.—The signal-substitution method of trouble shooting provides the repairman with a means of quickly and accurately localizing a trouble to a given stage or circuit when the general location of the trouble is not evident from visual inspection or operational tests. Signal substitution requires a source of audio, i-f, and r-f signals. While making the signal-substitution tests listed below, the following general considerations should be observed:

1. Note the volume, and listen for serious distortion in the headset at various points in the signal-substitution procedure. When possible, compare operation with a receiver known to be in good condition.

2. Check wiring and soldering in each stage during the procedure.

3. Misalignment of one or more stages of the receiver will cause reduced output. Misalignment of the h-f (high-frequency) oscillator may prevent any output.

4. When trouble is localized in a given stage, test the tube and measure the voltages and resistances at the tube socket of that stage.

5. Trouble in a circuit or stage may not cause changes in voltage and resistance measurements at the tube socket. The notes included in this paragraph are merely a guide and should suggest other procedures, such as voltage and resistance measurements on individual parts.

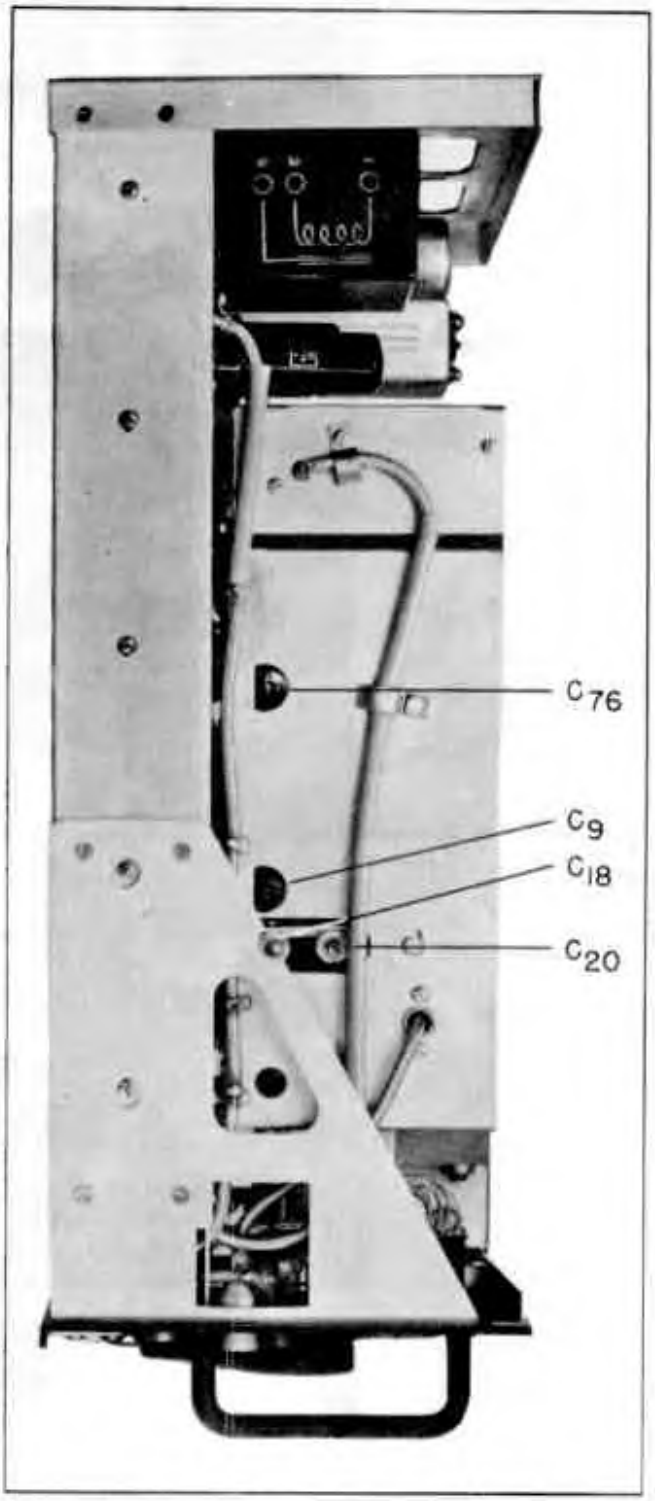

Figure 5-1—Radio Receiver R-44/ARR-5—Side View Showing Alignment Points

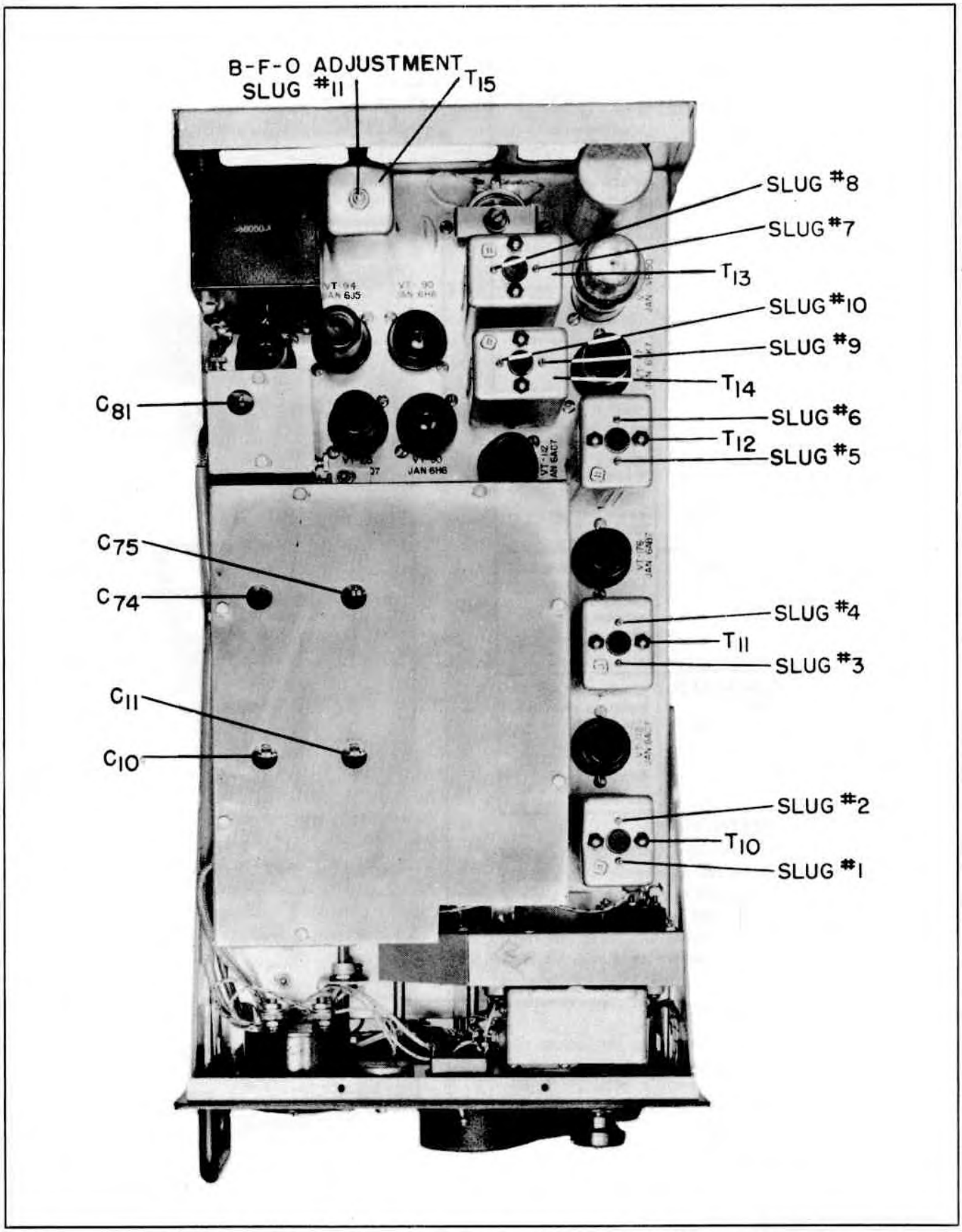

Figure 5-2 –Radio Receiver R-44/ARR-5–Top View Showing Alignment Points

6. Remove only one tube at a time when testing. Check the number of the tube and test it; if the tube is not defective, return it to its proper socket before removing another tube.

7. Each step presupposes the satisfactory completion of all previous steps. Isolate and clear any trouble located before proceeding with any succeeding steps.

8. Do not remove r-f and i-f shield cans from the tuned units until the trouble has been traced definitely to the particular unit. Do not damage wiring by pushing it back and forth during inspection.

(b) A-F SIGNAL-SUBSTITUTION TESTS.

1. Apply a 1000-cycle audio signal from a signal generator, through a .05-μf (microfarad) capacitor, to the points indicated below.

2. Pin 3 of V_{12} (plate of a-f output). Listen for a low-volume signal in the headset. This will check capacitor C_{66}, phone jack J_1 and headset. If there is no signal, inspect these components and associated wiring.

3. Pin 5 of V_{12} (grid of a-f output). Listen for increased output (relative to 2 above). If output is weak or distorted, check tube. If no signal is heard, take voltage and resistance readings of the stage, as explained in paragraph 8. Check resistors R_{59}, R_{61}, R_{62}, R_{63}, R_{69}, and R_{70}, capacitors C_{63}, C_{64}, and C_{65}, and associated wiring.

4. Pin 6 of V_{11} (plate of a-f amplifier). Listen for signal. If no signal is heard, check capacitors C_{63} and C_{72} and resistor R_{58}.

5. Pin 2 of V_{11} (grid of a-f amplifier). Listen for an increased output (relative to 2, 3, and 4 above). If signal is weak, check plate voltage. If there is no signal, check tube and wiring. Check all resistors and capacitors associated with the stage.

(c) I-F SIGNAL-SUBSTITUTION TESTS.

1. Remove mixer tube (V_3). Set receiver controls es follows:

a. "R.F. GAIN" control at maximum gain (extreme clockwise).
b. "A.F. GAIN" control at maximum gain (extreme clockwise).
c. "SELECTIVITY" switch at "SHARP."
d. "BAND SWITCH" at band 1.
e. "A.M.-F.M." switch at "A.M."
f. "A.V.C." switch at "OFF."
g. "A.N.L." switch at "OFF."
h. "B.F.O." switch at "OFF."

2. Set the r-f signal-generator frequency at 5.25 megacycles, with the 400- or 1000-cycle modulation turned on. Feed this signal in series with a 110-$\mu\mu$f capacitor into the set at the points indicated below.

3. Pins 4 and 5 of V_{10} (second detector). If there is no signal, check tube V_{10}. Check resistors R_{46}, R_{50}, R_{51}, R_{52}, and R_{53}, and capecitors, C_{55}, C_{56}, and C_{57}. Secondary winding of transformer T_{13} may be open, capacitor C_{54} in the transformer may be shorted, or the transformer may be misaligned.

4. Pin 8 of V_9 (plate of third i-f amplifier). If there is no signal, primary of T_{13} may be open, misaligned, or shorted. Check winding and internal capacitor.

5. Pin 4 of V_9 (grid of third i-f amplifier). If there is no signal, check tube V_9, the plate and screen voltages, resistor R_{37}, and capacitor C_{42}. The secondary winding of transformer T_{12} may be shorted or misaligned, or capecitor C_{38} in the transformer may be shorted.

6. Pin 8 of V_8 (plate of second i-f amplifier). If there is no signal, or if signal is weak or distorted, check corresponding components of stage as explained in 4 above.

7. Pin 4 of V_8 (grid of second i-f amplifier). If there is no signal, or if signal is weak or distorted, check corresponding components of stage as explained in 5 above.

8. Pin 8 of V_5 (plate of first i-f amplifier). If there is no signal, or if signal is weak or distorted, check corresponding components of stage as explained in 4 above.

9. Pin 4 of V_5 (grid of first i-f amplifier). If there is no signal, or if signal is weak or distorted, check corresponding components of stage as explained in 5 above.

10. Top pin of V_3 (plate of converter). If there is no signal, or if signal is weak or distorted, check primary of T_{10}—it may be open, shorted, or misaligned. Check winding and capecitor C_{24} in the transformer.

(d) R-F SIGNAL-SUBSTITUTION TESTS.

1. Replace mixer tube (V_3) if it was removed to make i-f signal-substitution test. Set receiver control as for i-f signal-substitution tests.

2. Set the r-f signal generator to 45 megacycles, and apply 400- or 1000-cycle modulated signal through a 50-$\mu\mu$f capacitor to the points indicated below.

3. Bottom pin of V_3 (grid of converter). Tune the receiver for an output signal in the headset. If no signal is heard, the r-f section of the tube may be inoperative. Check tube, and plate and screen voltages. Check resistor R_4 and capacitor C_{14}. The grid circuit may be shorted. Check capaciror C_7. The winding on transformer T_4 may be open, shorted, or misaligned, or the capecitor connected across the transformer may be shorted.

4. The h-f oscillator may be inoperative. Check the tube. Use a vacuum-tube voltmeter to measure the grid voltage. Voltage should read —.3 volt. If no voltage is present, check all resistors and capacitors in the circuit. Check oscillator transformer (T_7) winding for open, short, or misalignment.

5. Repeat step 3 above for all bands. Set signal-generator frequency to 80 megacycles for band 2, and 135 megacycles for band 3. Tune the receiver to the signal-generator frequency.

6. Repeat step 4 above for all bands.

7. Top pin of V_2 (plate of r-f amplifier). Perform signal substitution in the same manner as for the converter stage. If no signal is heard, check the primary

of T_4 (band 1). Check all bands, using frequencies indicated above.

8. Bottom pin of V_8 (grid of r-f amplifier). If no signal is heard, check tube V_2. Check screen and plate voltages. Check secondary of transformer T_1 for open or short. Check all bands.

9. Top pin of V_1 (plate of re-radiation suppressor). If no signal is heard, check the secondary of transformer T_1 for misalignment. Check primary and secondary windings for opens or shorts. Check all bands.

10. Bottom pin of V_1 (grid of re-radiation suppressor). If no signal is heard, check tube. Check plate and screen voltages. Check resistors R_{72} and R_{74}, and capacitors C_{78} and C_{80}.

e. VOLTAGE AND RESISTANCE READINGS. The voltage readings shown in the following table were made under the following conditions: 1. "A.M.-F.M." switch at "A.M."; 2. "A.F. GAIN" and "R.F. GAIN" controls at maximum gain (extreme clockwise); 3. "A.V.C.," "A.N.L.," and "B.F.O." switches at "ON"; 4. "SELECTIVITY" switch at "SHARP"; 5. "MOTOR DRIVE" switch at "ON"; and 6. "A.C." and "D.C." switches at "ON." The resistance readings were taken with the controls set as mentioned above, but with the tubes, pilot lights, *and all connectors to the front panel removed.* All voltage and resistance readings shown in the table are between the terminal indicated and the chassis or ground. Unless otherwise specified, voltages are direct current. The resistance readings are in ohms.

Note

All readings were taken with a Weston Model 772.

(1) RADIO RECEIVER R-44/ARR-5.

Component	*Connection*	*Pin*	*Voltage to ground (1,000-ohm/volt meter)*	*Voltage to ground (20,000-ohm/volt meter)*	*Resistance to Ground*
Tube V_1 (JAN-956)	Heater	H	0	0	0
	Cathode	K	.7	.7	300
	Heater	H	6.3 (a-c)	6.3 (a-c)	Very high
	Control grid	Bottom	0	0	5,000
	Plate	Top	32	34	4,000
	Screen grid	G_2	20	27	100,000
	Suppressor grid	G_1	0	0	0
Tube V_2 (JAN-956)	Heater	H	0	0	0
	Cathode	K	3	3	300
	Heater	H	6.3 (a-c)	6.3 (a-c)	Very high
	Control grid	Bottom	0	0	8
	Plate	Top	115	115	10,500
	Screen grid	G_2	115	115	7,500
	Suppressor grid	G_1	3	3	0
Tube V_3 (JAN-954)	Heater	H	0	0	0
	Cathode	K	3.6	4	2,200
	Heater	H	6.3 (a-c)	6.3 (a-c)	Very high
	Control grid	Bottom	0	0	0
	Plate	Top	152	152	Very high
	Screen grid	G_2	70	90	Vecy high
	Suppressor grid	G_1	0	0	0
Tube V_4 (JAN-955)	Heater	H	0	0	0
	Cathode	K	0	0	0
	Heater	H	6.3 (a-c)	6.3 (a-c)	Very high
	Control grid	G	−.15	−.3	25,000
	Plate	P	108	108	Very high
Tube V_5 (JAN-6AC7)	Shield	1	0	0	0
	Heater	2	0	0	0
	Suppressor grid	3	0	0	0
	Control grid	4	0	0	1.3 megohm
	Cathode	5	3.2	3.2	400
	Screen grid	6	210	225	55,000
	Heater	7	6.3 (a-c)	6.3 (a-c)	Vecy high
	Plate	8	300	300	10,000
Tube V_6 (JAN-6AB7)	Shield	1	0	0	0
	Heater	2	0	0	0
	Suppressor grid	3	0	0	0
	Control grid	4	0	0	1.3 megohm
	Cathode	5	2	2	220
	Screen grid	6	152	152	Very high
	Heater	7	6.3 (a-c)	6.3 (a-c)	Very high
	Plate	8	300	300	10,000
Tube V_7 (JAN-6AC7)	Shield	1	0	0	0
	Heater	2	0	0	0
	Suppressor grid	3	0	0	0
	Control grid	4	0	−.2	350,000
	Cathode	5	0	0	0
	Screen grid	6	73	73	Vecy high
	Heater	7	6.3 (a-c)	6.3 (a-c)	Very high
	Plate	8	75	73	Very high
Tube V_8 (JAN-6H6)	Shield	1	0	0	0
	Heater	2	6.3 (a-c)	6.3 (a-c)	Very high
	Plate #2	3	−.3	−.5	100,000
	Cathode #2	4	0	−.2	200,000
	Plate #1	5	−.3	−.7	100,000
	No connection	6	−.3	−.7	100,000
	Heater	7	0	0	0
	Cathode #1	8	0	0	0
Tube V_9 (JAN-6SK7)	Shield	1	0	0	0
	Heater	2	0	0	0
	Suppressor grid	3	3.6	3.8	300
	Control grid	4	0	0	500,000
	Cathode	5	3.6	3.8	300
	Screen grid	6	115	115	7,000
	Heater	7	6.3 (a-c)	6.3 (a-c)	Very high
	Plate	8	280	280	10,000

RADIO RECEIVER R-44/ARR-5—Continued.

Component	*Connection*	*Pin*	*Voltage to ground (1,000-ohm/volt meter)*	*Voltage to ground (20,000-ohm/volt meter)*	*Resistance to Ground*
Tube V_{10} (JAN-6H6)	Shield	1	0	0	0
	Heater	2	6.3 (a-c)	6.3 (a-c)	Very high
	Plate #2	3	0	−.25	1.7 megohms
	Cathode #2	4	0	−.15	600,000 ohms
	Plate #1	5	−.3	−.55	800,000 ohms
	No connection	6	0	0	Very high
	Heater	7	0	0	0
	Cathode #1	8	0	0	0
Tube V_{11} (JAN-6SQ7)	Shield	1	0	0	0
	Control grid	2	0	0	1 megohm
	Cathode	3	1.6	2	3,600
	No connection	4	0	0	Very high
	No connection	5	0	0	Very high
	Plate	6	145	210	180,000
	Heater	7	6.3 (a-c)	6.3 (a-c)	Very high
	Heater	8	0	0	0
Tube V_{12} (JAN-6V6)	Shield	1	0	0	0
	Heater	2	0	0	0
	Plate	3	135	135	17,000
	Screen grid	4	130	140	80,000
	Control grid	5	—	—	500,000
	No connection	6	—	—	Very high
	Heater	7	6.3 (a-c)	6.3 (a-c)	Very high
	Cathode	8	7.4	7.4	350
Tube V_{13} (JAN-6J5)	Shield	1	0	0	0
	Heater	2	0	0	0
	Plate	3	125	125	36,000
	No connection	4	0	0	Very high
	Control grid	5	0	−.3	50,000
	No connection	6	0	0	Very high
	Heater	7	6.3 (a-c)	6.3 (a-c)	Very high
	Cathode	8	0	0	0
Tube V_{14} (JAN-0D3/ VR-150-30)	No connection	1	0	0	0
	Cathode	2	0	0	0
	Jumper	3	152	152	13,000
	No connection	4	—	—	—
	Plate	5	152	152	13,000
	No connection	6	—	—	Very high
	Jumper	7	152	152	Very high
	No connection	8	—	—	Very high

(2) RECTIFIER POWER UNIT PP-32/AR.

Note

Measurements made with no external load.

Component	*Connection*	*Pin*	*Voltage to ground (1,000-ohm/volt meter)*	*Voltage to ground (20,000-ohm/volt meter)*	*Resistance to Ground*
Power input Socket	A-C	A C	115 (a-c)*	115 (a-c)*	Very high
	D-C	B D	24*	24*	Very high
Power Outlets SO_{200}, SO_{201} and SO_{202}	Ground	A	0	0	0
	A-C	B E	6.3 (a-c)*	6.3 (a-c)	Very high
	D-C	C D	24*	24*	Very high
	D-C	F	340	340	10,000
Tube V_{200} V_{201} and V_{202} (JAN-5U4G or (JAN-5R4GY)	No Connection	1	0	0	Very high
	Filament	2	340	340	10,000
	No Connection	3	0	0	Very high
	Plate #2	4	390 (a-c)	390 (a-c)	3.4
	No Connection	5	0	0	Very high
	Plate #1	6	390 (a-c)	390 (a-c)	3.4
	No Connection	7	0	0	Very high
	Filament	8	340	340	10,000

*Voltage measured between terminals indicated.

4. SENSITIVITY CHECK.—The operating efficiency of Radio Receiving Set AN/ARR-5 can readily be determined by performing a receiver sensitivity test. To perform this test, proceed as follows:

a. Connect Signal Generator TS-497/URR, or equivalent, to the antenna connector, and wire a dummy-antenna resistor (50-ohm, noninductive resistor) across the signal-generator terminals.

b. Apply a 400-cycle, 30% modulated, r-f signal of 10 microvolts to the input of the receiver.

c. Measure the output of the receiver across an 8000-ohm load. This should give an audio output of 11 volts across the 8000-ohm load.

5. RECEIVER ALIGNMENT.

a. GENERAL. — This receiver has been carefully aligned at the factory, and alignment should not be attempted unless it is known that the adjustments have been tampsred with or that tubes of different manufacture have been substituted. The following equipment will be needed:

(1) Signal Generator capable of tuning from 5 to 140 megacycles (Signal Generator TS-497/URR).

(2) Nonmetallic screwdriver.

(3) 50-ohm noninductive resistor for dummy antenna.

(4) Output meter.

b. I-F ALIGNMENT.

(1) Disconnect the grid of the JAN-954 converter tube (V_3), and connect the signal-generator output between the grid and ground. Make the connection with a small clip or wind a piece of flexible wire around the grid terminal, but do not attempt to solder a lead to the terminal as the heat is sure to crack the glass envelope. Connect the output meter to thephone jack.

(2) Set the controls on the receiver as follows:

(a) "R.F. GAIN" control at maximum gain (extreme clockwise).

(b) "A.F. GAIN" control at maximum gain (extreme clockwise).

(c) "SELECTIVITY" switch at "SHARP."

(d) "BAND SWITCH" at band "2."

(e) "A.V.C." switch at "OFF."

(f) "A.N.L." switch at "OFF."

(g) "B.F.O." switch at "OFF."

(3) Set the signal-generator frequency to 5.25 megacycles, and, with the 400-cycle modulation turned on, align transformer T_{10}, T_{11}, T_{12}, and T_{13}, by adjusting the position of the two slugs in each transformer (slugs 1, 2, 3, 4, 5, 6, 7, and 8) for maximum audio output as indicated on the output meter connected to the phone jack. (See figure 5-1 for location of these adjustment screws.) A bakelite screwdriver with a metal or insulated tip is necessary for accurate alignment.

(4) Repeat the alignment procedure outlined above at least once, to ensure an accurate alignment.

(5) After the i-f transformers are tuned, apply glyptal to the slug adjustment screws to keep them in place.

c. DISCRIMINATOR TRANSFORMER (T_{14}) ALIGNMENT.

(1) Set the "SELECTIVITY" switch at "BROAD" and "A.M.-F.M." switch at "F.M."

(2) With the signal generator set to 5.25 megacycles and the 400-cycle modulation turned on, rotate slug adjustment screw No. 10, in the secondary winding of transformer T_{14}, until the signal level on the output meter drops to zero. This null point is approached very suddenly, therefore, the control must be turned very slowly. (See figure 5-1 for location of this slug adjustment screw.)

(3) Now detune this adjustment slightly, so that the output meter gives a readable indication.

(4) Adjust the primary slug (No. 9) of the discriminator transformer for maximum response.

(5) Reset the secondary slug (No. 10) untll the output again drops to zero.

(6) Detune the signal generator to a frequency lower than the i-f frequency until the maximum-output point is reached. Note the output-meter reading and the frequency deviation from the i-f frequency (5.25 megacycles).

(7) Repeat the procedure in (6), using a frequency above the i-f frequency. The frequency deviation and maximum output in both cases should be the same for good balance. If they are not, then tune the signal generator to the lower of the two peaks and adjust the primary slug (No. 9) untll the output rises an amount equal to about one half the difference of the two outputs previously noted.

(8) Retest the balance as above, and readjust the primary slug (No. 9) until both maximum readings are alike when the signal generator is detuned approximately the same amount on either side of resonance (5.25 megacycles). If a balance cannot be obtained, it is an indication that the discriminator transformer secondary slug (No. 10) requires a very slight readjustment in either direction. The directlon of adjustment that will cause the off-tune peaks to assume the same values is the correct one. Care must be taken in adjusting the discriminator secondary control, as even a very slight misadjustment will result in distortion in the frequency-modulated signals.

(9) After the transformer is tuned, apply glyptal to the slug adjustment screws to keep them in place.

d. B.F.O. ADJUSTMENT.

(1) Connect the signal generator as for i-f alignment (paragraph 5*b* (1)), set it to 5.25 megacycles, and turn off the 400-cycle modulation.

(2) Turn the receiver's "B.F.O." switch to "ON," and back off the "A.F. GAIN" control slightly.

(3) Adjust the slug on top of transformer T15 until a 1000-cycle note is obtained in the headset. (The headset should replace the output meter from this operation.) Note that the 1000-cycle note appears at two different settings of this screw: when the oscillator is set 1000 cycles above the i-f frequency, and when it is set 1000 cycles below the i-f frequency.

e. R-F ALIGNMENT.—See figure 5-2 for location of alignment controls.

(1) Connect the signal generator to the antenna connector, and wire the dummy-antenna resistor (50-ohm noninductive resistor) across the generator terminals. Connect the output meter to the jeck marked "PHONES."

(2) Set the controls on the receiver as for i-f amplifier alignment. (Refer to paragraph 5*b*(2), this section.)

(3) Turn on 400-cycle tone modulation on signal generator.

(4) Align the three hands as follows:

(a) BAND "1."

1. Set the signal generator and receiver to 45 megacycles.

2. Adjust trimmer capacitor C_{19} for maximum output. Note that the frequency at which the receiver's oscillator operates on this band is higher than the signal frequency.

3. Adjust trimmer capacitors C_9 and C_{76} for maximum output.

4. Set signal generator and receiver to 30 megarycles.

5. Set padder capacitor C_{19}, whlle rocking the tuning control, to obtain maximum output.

6. Repeat operations 1 through 5, above, to recheck alignment of the high-frequency end of the hand.

(b) BAND "2."

1. Set signal generator and receiver at 80 megacycles.

2. Adjust trimmer capacitor C_{20} for maximum output. Note that the frequency at whlch the receiver's oscillator operates on this hand is lower than the signal frequency.

3. Adjust trimmer capacitors C_{10} and C_{74} for maximum output.

4. No padder-capacitor adjustment is provided for the low-frequency end of this band.

5. Check the 60-megacycle check point for alignment.

(c) BAND "3."

1. Set signal generator and receiver at 135 megacycles.

2. Adjust trimmer capacitors C_{11} and C_{75}, while rocking the tuning control, to obtain maximum output.

3. It is not recommended that the frequency of the oscillator in this hand be adjusted except at the factory or at a depot. Should it be impracticahle to return the receiver to a depot or factory for adjustment, make the following adjustments.

a. Remove the top cover of the r-f unit, and locate the high-frequency oscillator coil, T_9.

b. Set the signal generator and receiver at 135 megacycles.

c. Locate the white Celanese wire on the coil form of transformer T_6, and carefully shift its position for maximum output. Note that the frequency at which the receiver's oscillator oparates on this band is lower than the signal frequency.

d. Set the signal generator and receiver at 90 megacycles.

e. Locate the heavy tinned wire on the coil form of transformer T_9, and carefully spread or compress the turns until maximum signal output is obtained. Note that this transformer does not have a padding capacitor.

f. Recheck the high-frequency end of the band, and then cement the windings in place with "Q-Max" or equivalent low-loss cement.

g. Set the signal generator and receiver at 135 megacycles.

h. Reset trimmer capacitors C_{11} and C_{75} for maximum output.

6. MAINTENANCE OF GEAR DRIVE ASSEMBLY.

a. The hrushes in the scanning motor should be checked once a month and replaced when worn short. Access to the brushes is had by removing the plate of the motor housing.

b. The gears should he inspacted for dust and foreign particles once a month, and cleaned and oiled when necessary.

SECTION VI

SUPPLEMENTARY DATA

1. TYPICAL PERFORMANCE DATA.

a. The input to Rectifier Power Unit PP-32/AR is as follows:

115 volts a.c., 400 to 2600 cps...
1.3 amps. with 1 receiver.
2.0 amps. with 2 receivers.
2.7 amps. with 3 receivers.

80 volts a.c., 400 to 2600 cps....
1.85 amps. with 1 receiver.
2.85 amps. with 2 receivers.
3.85 amps. with 3 receivers.

24 volts d.c., running current....
0.25 amp. with 1 receiver.
0.50 amp. with 2 receivers.
0.75 amp. with 3 receivers.

b. The output of Rectifier Power Unit PP-32/AR and input to Receiver R-44/ARR-5 is as follows:

270 volts a.c. at 135 milliamperes for each receiver.

24 volts d.c. at .25 ampere (motor running) for each receiver.

6.3 volts a.c. at 4.5 amperes, frequency of 400 to 2600 cps for each receiver.

c. The sensitivity of Radio Receiver R-44 ARR-5 is as follows: with a 400-cps modulated r-f signal input to the receiver of 10 microvolts on the first band, 10 microvolts on the second band, and 10 microvolts on the third band, the audio output of the receiver should be at least 15 milliwatts into a 8000-ohm load or 11 volts across an 8000-ohm load.

2. TUBE COMPLEMENT.

a. The tube complement of Radio Receiver R-44 ARR-5 consists of:

Quantity	*Type Designation*	*Function*
1	Tube JAN-956 (V1)	Re-radiation suppressor
1	Tube JAN-956 (V2)	R-F amplifier
1	Tube JAN 954 (V3)	Mixer
1	Tube JAN 955 (V4)	High frequency oscillator
1	Tube JAN-6AC7 (V5)	First r-f amplifier
1	Tube JAN-6AB7 (V6)	Second r-f amplifier
1	Tube JAN-6SK7 (V9)	Third r-f amplifier
1	Tube JAN 6H6 (V10)	A-M detector and automatic noise limiter
1	Tube JAN-6AC7 (V7)	F-M limiter
1	Tube JAN-6H6 (V8)	F-M discriminator
1	Tube JAN-6SQ7 (V11)	Audio amplifier
1	Tube JAN-6J5 (V13)	Beat frequency oscillator
1	Tube JAN-6V6 (V12)	Power amplifier
1	Tube JAN-OD3 VR-150, (V14)	Voltage regulator

b. The tube complement of the Rectifier Power Unit PP-32/AR consists of:

Quantity	*Type Designation*	*Function*
3	Tube JAN-5T 4G (recommend JAN-5R 4GY when available)	Rectifier

3. FUSE COMPLEMENT.

Type No	*Stock No*	*Current Rating*	*Location*	
			Fuse Fuse	*Spare Fuse*
4AG, (FU-35)	3Z1935.5	5 amps.	Front panel (rectifier power unit)	Inside rectifier power unit
4AG, (FU-35)	3Z1935.5	5 amps.	Front panel (rectifier power unit)	Inside rectifier power unit

4. PILOT LIGHT COMPLEMENT.

Type Designation	*Stock No*	*Location*
Mazda 44 (LM-27)	2Z5927	Dial illumination and pilot light (receiver)
Mazda 47 (LM-52)	2Z5952	A-C on-off indicator
Mazda 49 (LM-49)	2Z5949	D-C on-off indicator

5. TYPICAL CHARACTERISTIC CURVES.

Figures 6-1 to 6-6, which follow, show typical characteristic curves of Radio Receiving Set AN ARR-5.

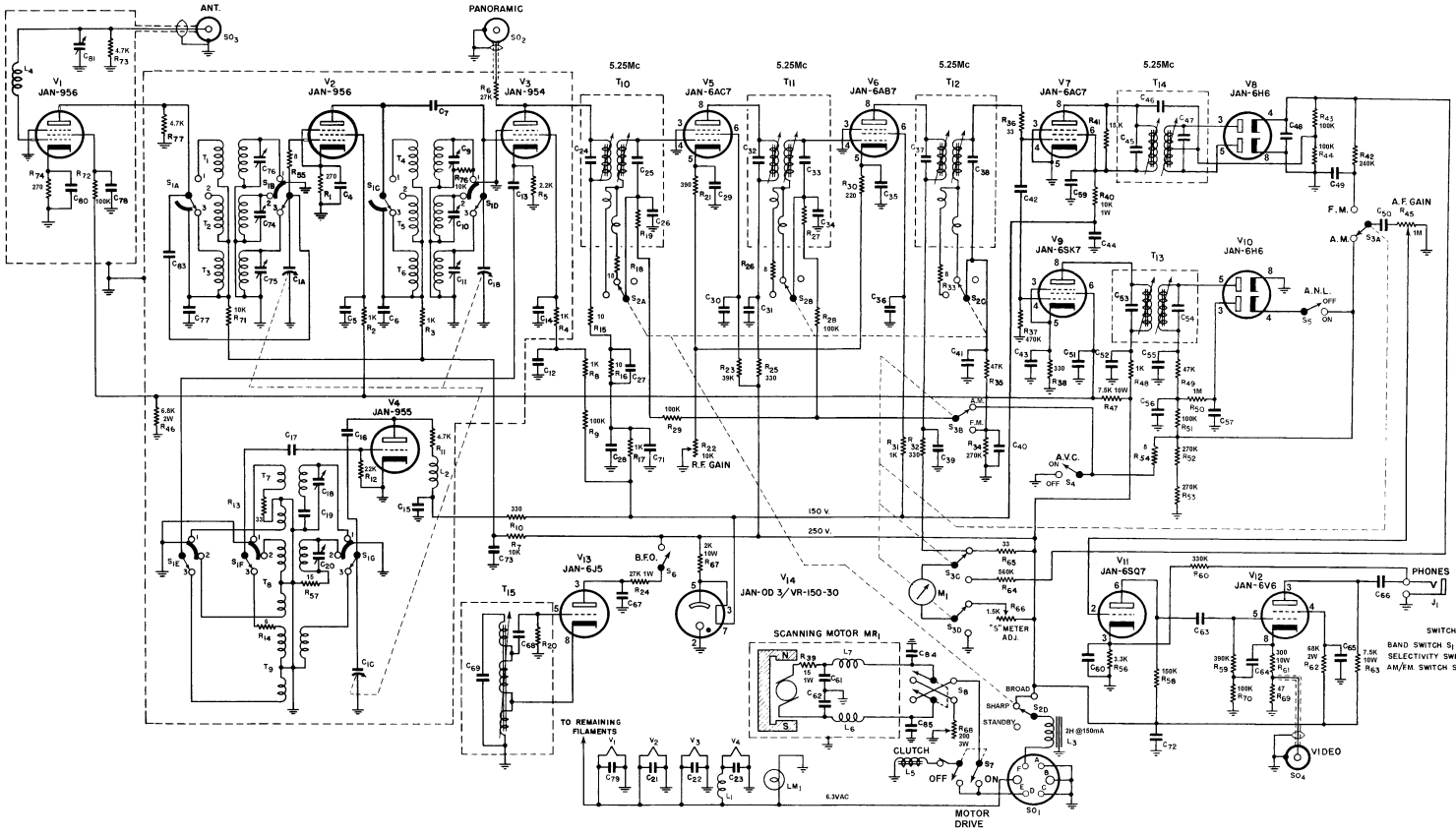

Figure 8-6—Radio Receiver R-44/ARR-5—Schematic Diagram