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Handbook  
Overhaul Instructions

RADIO RECEIVING SET  
AN/ARR-41

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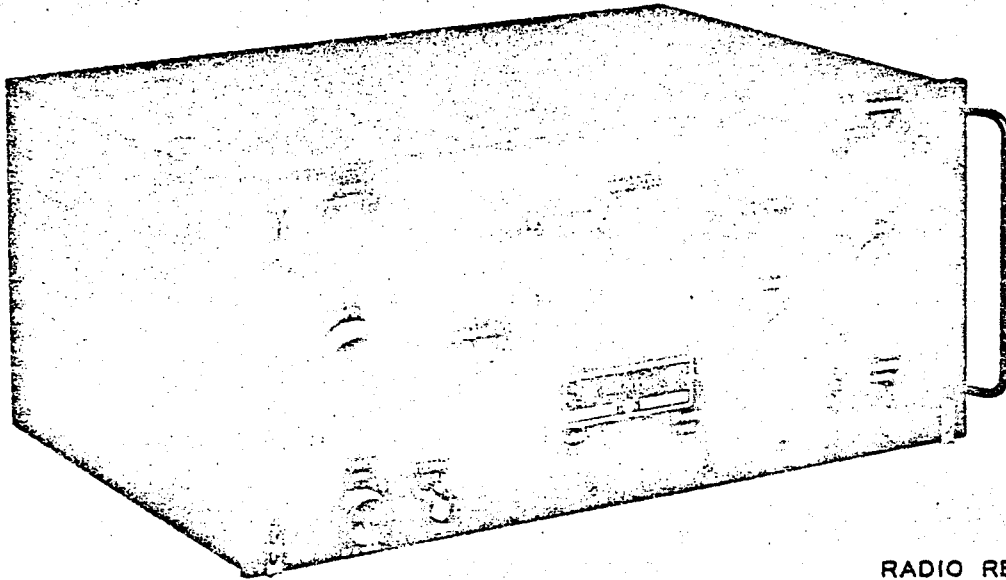
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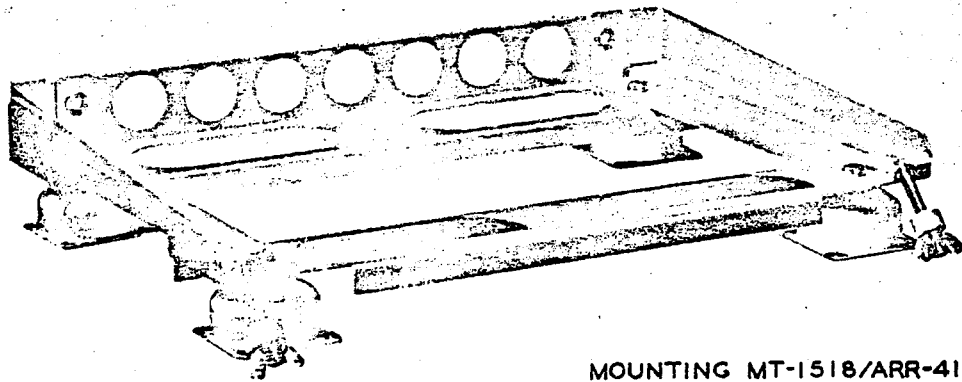
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RADIO RECEIVING SET AN/ARR-41



RADIO RECEIVER R-648/ARR-41



MOUNTING MT-1518/ARR-41

Figure 1-1. Radio Receiving Set AN/ARR-41, Equipment Supplied.



## INTRODUCTION

This overhaul handbook is prepared for use by Overhaul and Repair Departments (Bureau of Aeronautics) and Depots (Department of the Air Force) as an aid in understanding and performing service and maintenance procedures for Radio Receiving Set AN/ARR-41. Repair, replacements, adjustments, and recalibration data for the electronic equipment is limited to that which is beyond the capabilities of organizational and field maintenance personnel. Reference is made to publication NavAer 16-30ARR41-502, Handbook of Service Instructions, Radio Receiving Set AN/ARR-41, for all installation, maintenance, and service procedures not found in this handbook. For information concerning any detail part in this equipment, refer

to publication NavAer 16-30ARR41-504, Illustrated Parts Breakdown, Radio Receiving Set AN/ARR-41. This handbook is compiled and printed in accordance with Specifications MIL-H-6814A (ASG) and MIL-H-5474A, and conforms to applicable portions of the following specifications:

JAN-STD-15	Electrical and Electronic Symbols
MIL-STD-16	Electrical and Electronic Reference Designations
MIL-STD-122	Color Code for Chassis Wiring for Electronic Equipment
ANA 261	Abbreviations and Contractions; Approved List of

## SECTION I DESCRIPTION AND LEADING PARTICULARS

### 1-1. SCOPE OF HANDBOOK.

1-2. This publication comprises overhaul instructions for Radio Receiving Set AN/ARR-41, manufactured and supplied by the Collins Radio Company, Cedar Rapids, Iowa, under Contract NOas 55-821r, NOas 57-438. Sections I through XI of this handbook apply to Radio Receiving Set AN/ARR-41. Additional models will be covered in section XII by the use of difference data sheets.

### 1-3. PURPOSE AND APPLICATION OF EQUIPMENT.

1-4. Radio Receiving Set AN/ARR-41, consisting of equipment illustrated in figure 1-1, is a general purpose receiving equipment designed for mounting in larger types of aircraft and capable of receiving

amplitude-modulated radiotelephony (A-3), unmodulated cw radiotelegraphy (A-1), and frequency-shift-keyed radioteletype (A-2) when an external converter is employed for operation of the printer. Frequency coverage is in the ranges of 190 to 550 kilocycles and 2 to 25 megacycles, which are covered in five bands.

### NOTE

A complete general description of Radio Receiving Set AN/ARR-41 will be found in section I of NavAer 16-30ARR41-502, Handbook of Service Instructions. This information will not be repeated here.

## SECTION II TEST EQUIPMENT AND SPECIAL TOOLS

### 2-1. SPECIAL TEST EQUIPMENT.

2-2. No special test equipment is required to perform overhaul procedures outlined in this instruction manual. All test equipment required for service and maintenance of Radio Receiving Set AN/ARR-41 is listed in section II of the Handbook of Service Instructions. All test equipment used normally is supplied to overhaul activities.

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### 2-3. SPECIAL TOOLS.

2-4. There are no special tools, fixtures, or jigs required for the overhaul procedures described in this handbook which are not listed in section II of Publication NavAer 16-30ARR41-502, Handbook of Service Instructions, Radio Receiving Set AN/ARR-41.



## SECTION III

### MAINTENANCE BEYOND CAPABILITIES OF FIELD

#### 3-1. INTRODUCTION.

3-2. This section contains service data to enable Overhaul and Repair Departments (Navy) and Depot (Air Force) facilities to perform specialized maintenance and to repair electronic and electromechanical components of the equipment which are beyond the capabilities of field facilities. The section provides instructions for the dismantling and reassembly of the r-f and i-f tuner assembly and the r-f oscillator assembly which normally are not dismantled during regular overhaul procedures.

3-3. Trouble isolation in this section supplements or makes reference to data found in the Handbook of Service Instructions. When performing maintenance work on the r-f and i-f tuner assembly or the r-f oscillator assembly, reference should be made to section IV of the Handbook of Service Instructions for a detailed explanation of the theory of operation. Before starting any of the specialized maintenance procedures in this section, the detailed performance tests and trouble isolation procedures, section VI of the Handbook of Service Instructions should be performed. Refer to paragraphs 6-7 through 6-12 and

table XIII for the r-f and i-f tuner assembly and to paragraph 6-35 and table XVI for the r-f oscillator assembly.

#### 3-4. R-F AND I-F TUNER ASSEMBLY.

#### 3-5. DISASSEMBLY OF R-F AND I-F TUNER ASSEMBLY.

#### NOTE

Considerable time should be spent in trouble shooting and adjustment procedures before attempting to disassemble the r-f and i-f tuner assembly. Reference is made to the Handbook of Service Instructions, paragraph 6-32 and table XIII. In most cases, trouble can be corrected by adjustment procedures and intelligent application of operational theory. If trouble has been isolated to a detail part or group of detail parts which are not readily accessible, the following disassembly procedures are supplied as a step-by-step guide to completely dismantle the r-f and i-f tuner assembly. The r-f and i-f tuner assembly

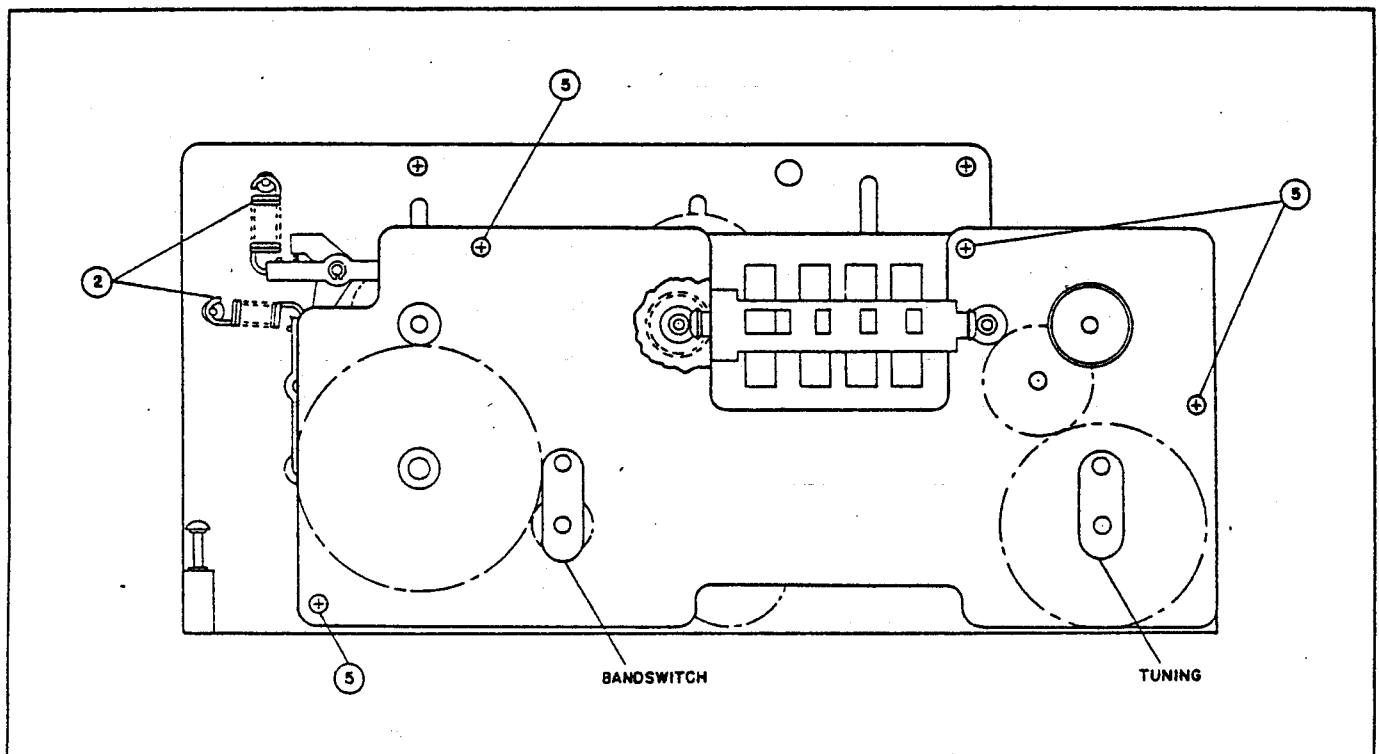


Figure 3-1. R-F and I-F Tuner Assembly, Front View

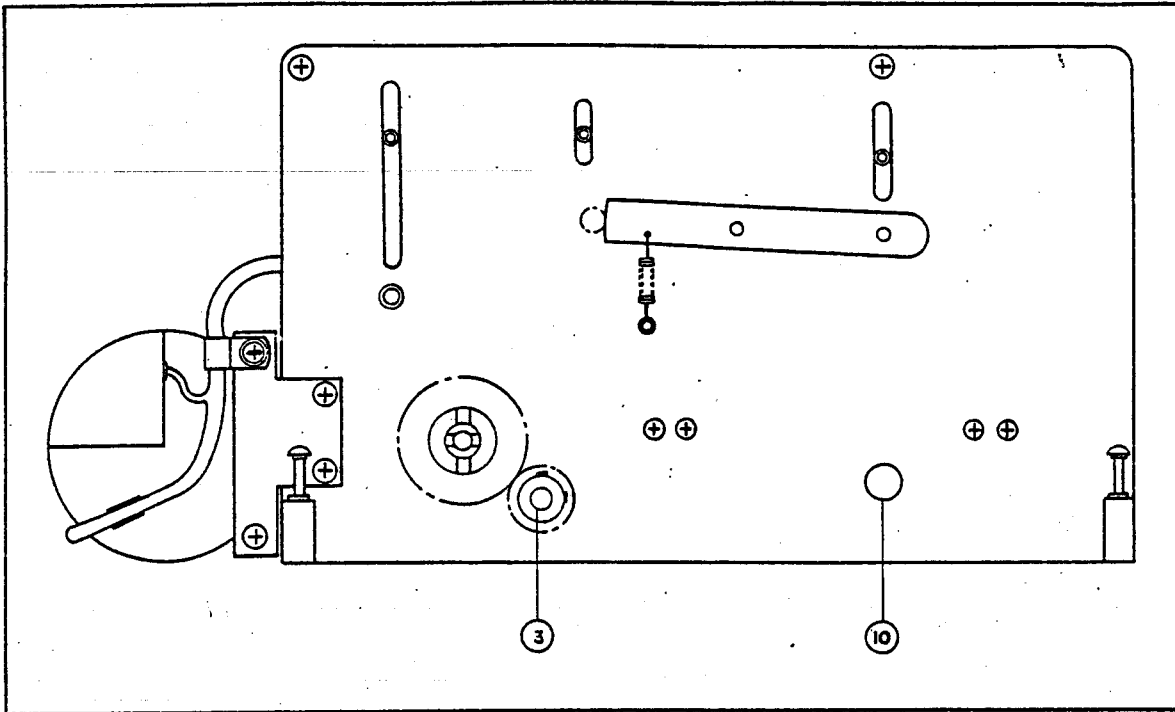


Figure 3-2. R-F and I-F Tuner Assembly, Rear View

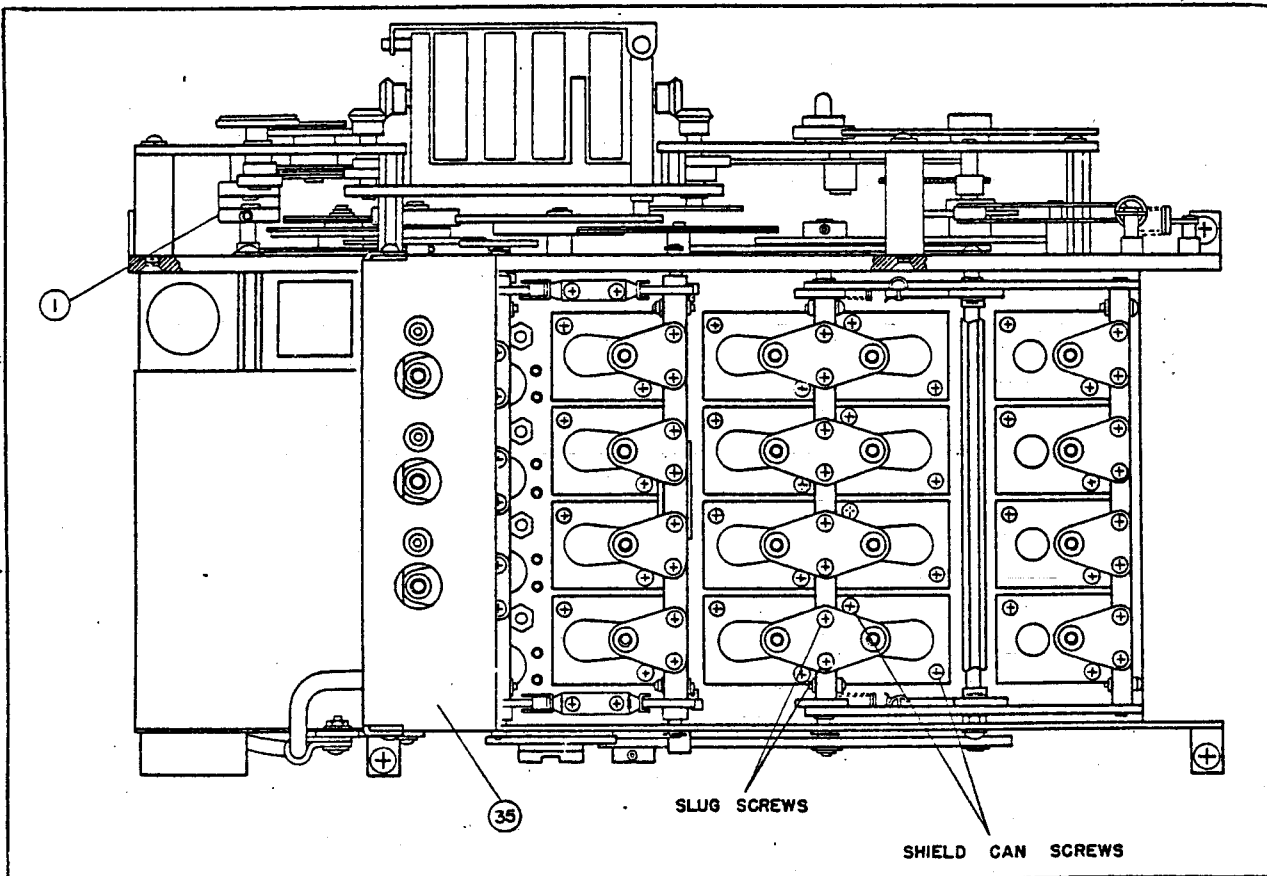


Figure 3-3. R-F and I-F Tuner Assembly, Top View

should be dismantled only as far as necessary to replace the defective detail part. These instructions are not to infer that a unit should be regularly disassembled, since the operation will disturb factory aligned adjustments and reassembly procedures must be strictly observed.

### 3-6. REMOVAL OF R-F AND I-F TUNER ASSEMBLY FROM RADIO RECEIVER R-648/ARR-41.

- a. Set the BANDSWITCH and TUNING controls for a reading of 0.190 on the MEGACYCLES frequency indicator.
- b. Loosen the two thumb nuts (labeled LOCK) on the upper right and left-hand corners of the front panel.
- c. Swing the front panel out and down on its hinges. This action disengages the BANDSWITCH and TUNING coupler and plug P304 from jack J201.
- d. Loosen the four redheaded captive screws at the corners of the r-f and i-f tuner assembly.
- e. Grasp the r-f and i-f tuner assembly by the end-plate spacers and pull up, disengaging the assembly from jacks J207 and J208.

### 3-7. REMOVAL OF VARIABLE FREQUENCY OSCILLATOR-CONVERTER SUBASSEMBLY FROM R-F AND I-F TUNER ASSEMBLY.

- a. Set the frequency of Radio Receiver R-648/ARR-41 to 0.500 megacycles as read on the MEGACYCLES frequency indicator.
- b. Loosen the two setscrews of coupler (item 1, figure 3-4) located nearest the r-f and i-f tuner assembly middle plate and mounted on the variable frequency oscillator shaft.
- c. Disengage plug P15001 from jack J401.
- d. Remove the two flathead screws in the middle plate securing the variable frequency oscillator-converter subassembly.
- e. Remove two flathead screws securing the variable frequency oscillator-converter subassembly to the rear plate.
- f. Remove the cable of plug P15001 from the cable clamp, located on the rear r-f and i-f tuner assembly plate.
- g. The variable frequency oscillator-converter subassembly may now be pulled straight back from the r-f and i-f tuner assembly.

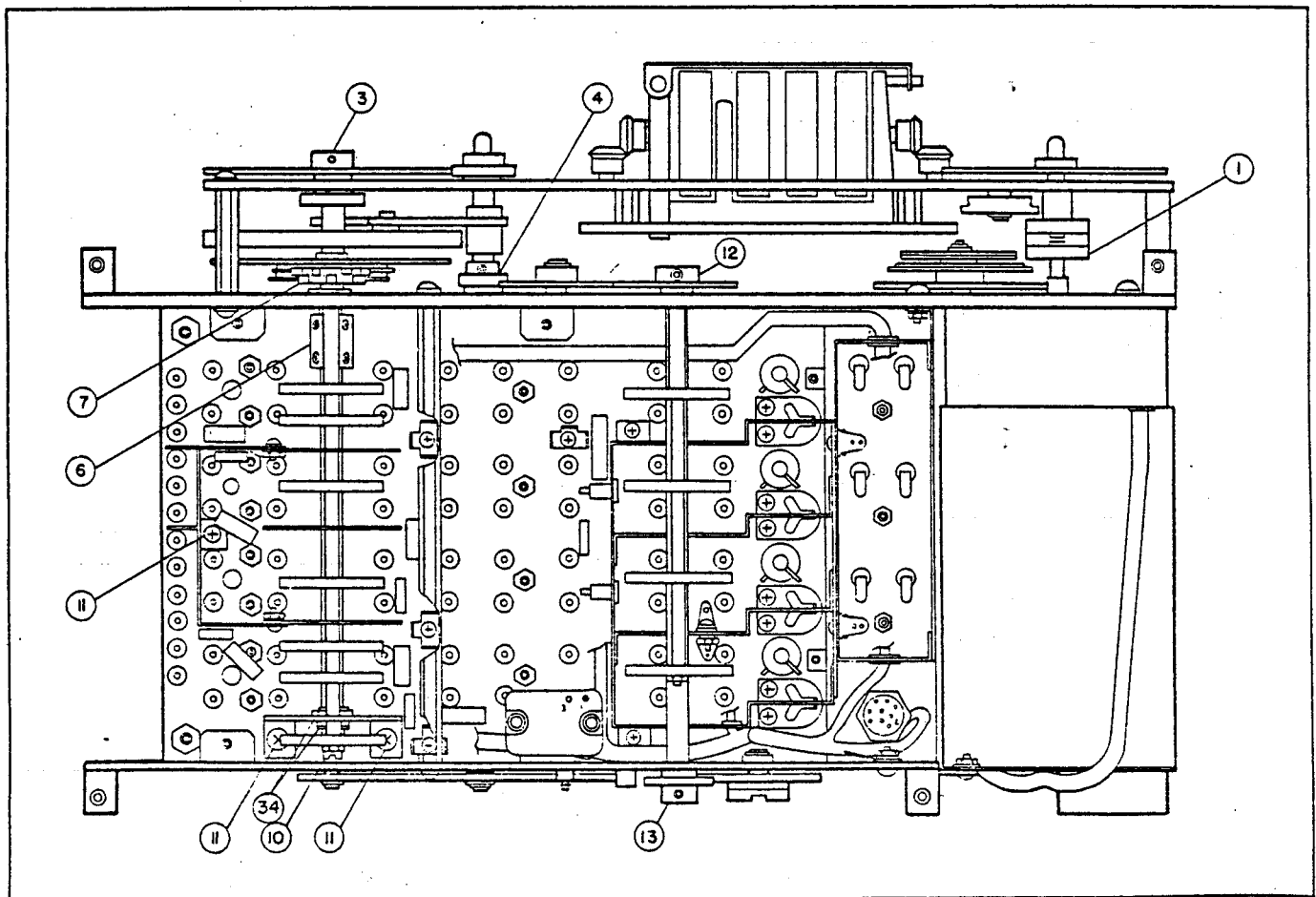


Figure 3-4. R-F and I-F Tuner Assembly, Bottom View

NOTE

The bottom cover of the variable frequency oscillator-converter subassembly may be removed for replacement of detail parts, however, the temperature control oven is sealed at the factory and should not be dismantled. The variable frequency oscillator-converter subassembly should be replaced as a unit if the trouble is within this oven.

3-8. REMOVAL OF R-F AMPLIFIER SUBASSEMBLY FROM R-F AND I-F TUNER ASSEMBLY.

- a. Disengage plug P703 from r-f oscillator assembly jack J601.
- b. Loosen the two captive screws holding the r-f amplifier subassembly to the r-f and i-f tuner assembly.
- c. Pull the r-f amplifier subassembly straight up, disengaging plug P702 from jack J402.

3-9. REMOVAL OF FRONT PLATE.

- a. Rotate the BANDSWITCH and TUNING drives for a reading of 0.500 on the MEGACYCLES frequency indicator.
- b. Remove pin from gear (item 3, figure 3-4). Remove gear (item 3, figure 3-4).
- c. Remove four screws (item 5, figure 3-1).
- d. Carefully remove the front plate from r-f and i-f tuner assembly. This allows access to the various gears and mechanical parts between the front and middle plates. If any of the gears are replaced, make

certain they are replaced in the exact positions from which removed, as shown in figures 3-1 through 3-5.

3-10. REMOVAL OF R-F SWITCH, S401.

- a. Unsolder all leads to the r-f switch wafers. Identify leads in some manner for replacement.
- b. Loosen four setscrews in the r-f switch coupler (item 6, figure 3-4).
- c. Remove gear (item 7) and cam assembly (item 8, figure 3-5).
- d. Remove two screws (item 9, figure 3-5).
- e. Remove retaining rings (item 34, figure 3-4) and slide the r-f switch shaft (item 10, figure 3-4) out the rear of the r-f and i-f tuner assembly.
- f. Remove three screws (item 11, figure 3-4) securing the r-f switch to the bottom plate.
- g. Lift the r-f switch out of the r-f and i-f tuner assembly chassis.

3-11. REMOVAL OF I-F SWITCH, S402.

- a. Unsolder all leads to the r-f switch wafers. Identify leads in some manner for replacement.
- b. Loosen setscrews (item 12, figure 3-4) and remove gear.
- c. Remove the i-f switch shaft (item 13, figure 3-4) from the rear of the r-f and i-f tuner assembly.
- d. Remove the two screws securing the i-f switch to the middle plate. (See item 14, figure 3-5.)
- e. Lift the i-f switch out of the r-f and i-f tuner assembly.

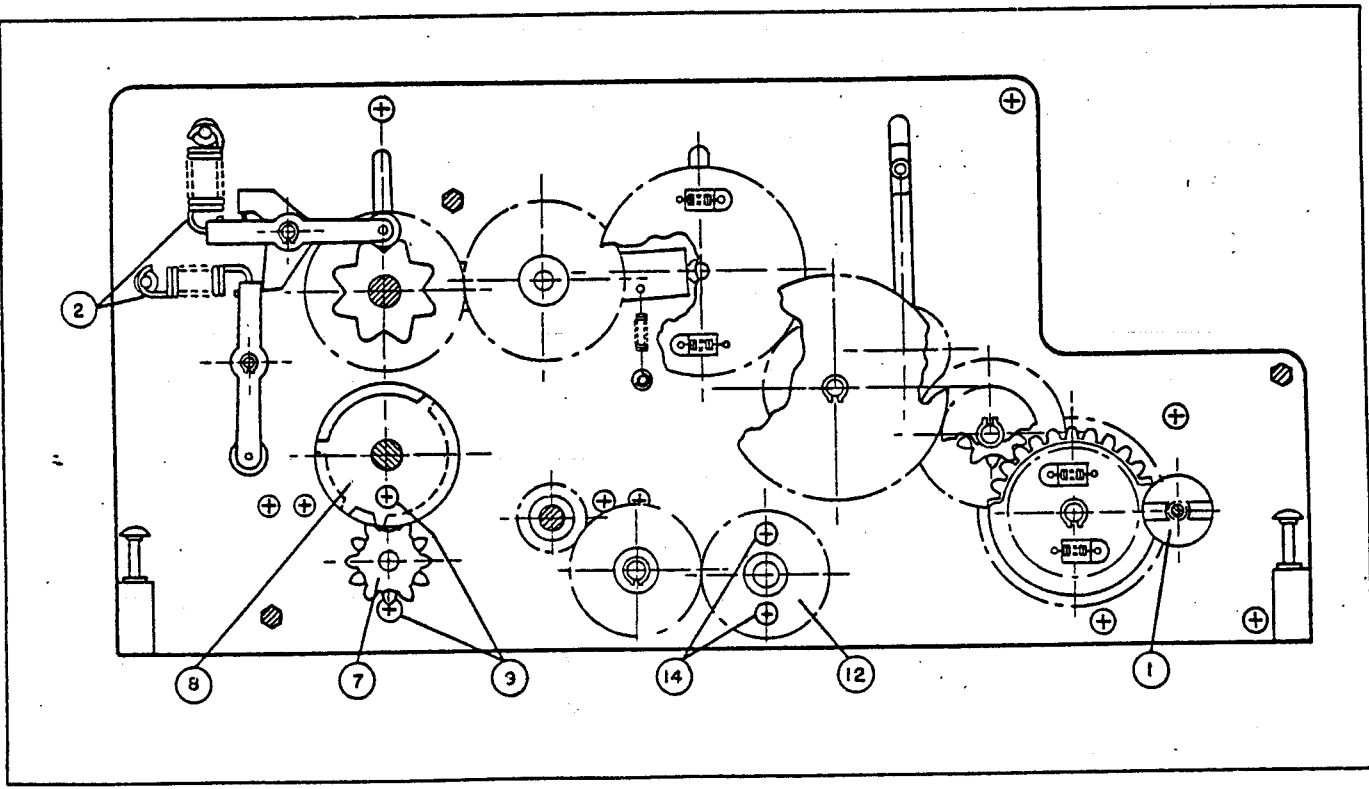


Figure 3-5. R-F and I-F Tuner Assembly, Middle Plate, Front View

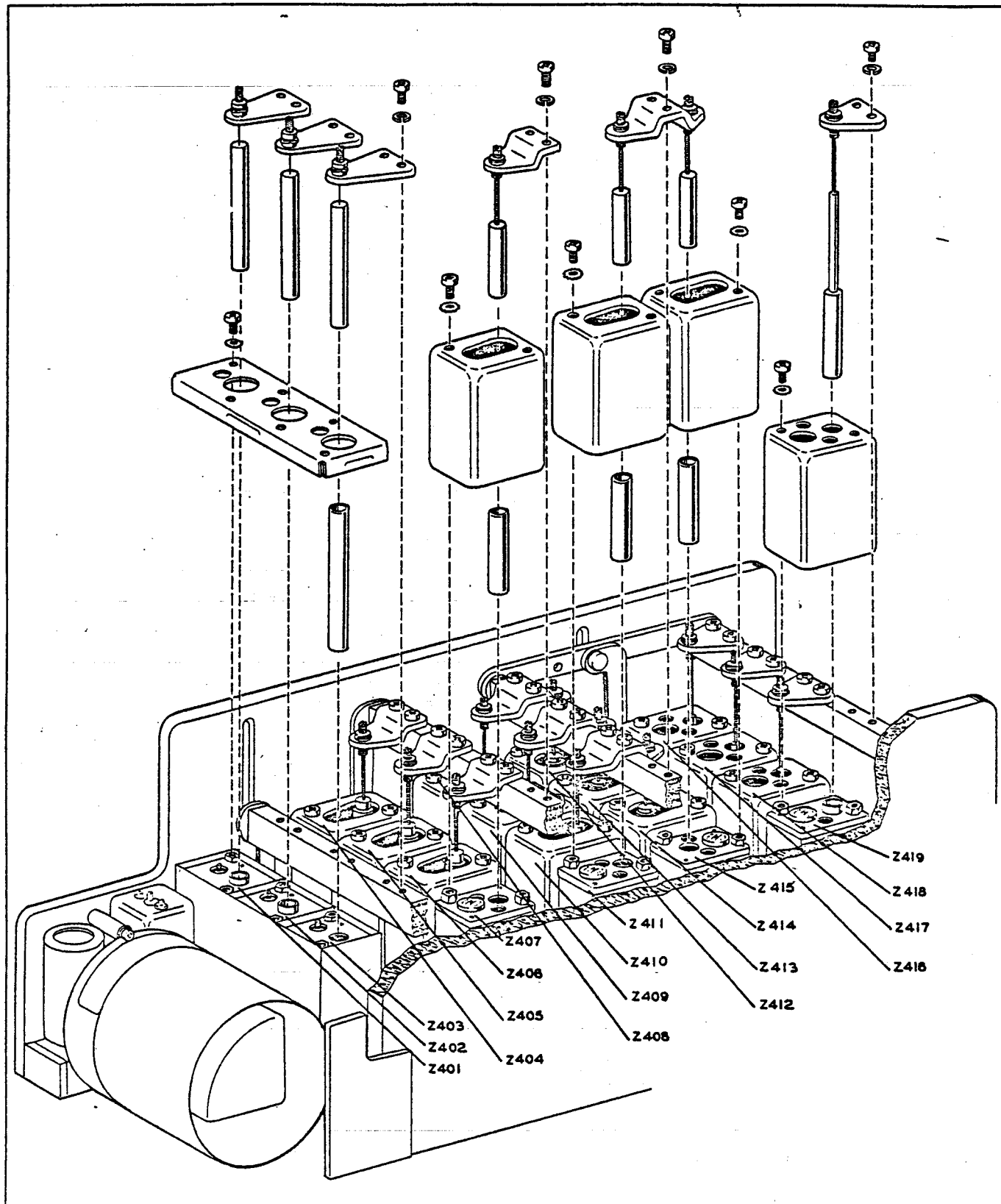


Figure 3-6. R-F and I-F Tuner Assembly, Tuned Circuits, Exploded View

**3-12. REMOVAL OF TUNED CIRCUITS.** Refer to figure 3-6.

- a. Unsolder all leads to the tuned circuit to be removed. Identify in some manner for replacement.
- b. Remove two Phillips head screws securing the slug of the tuned circuit being removed. If a low-band tuned circuit (Z401 through Z403) is to be removed, all slugs must be removed, requiring the removal of cover (item 35, figure 3-3) and six Phillips head screws.
- c. Remove the slug and identify position from which removed so that it may be replaced in the same position.
- d. Remove two hex nuts (six Phillips head screws for low band) securing shield can.
- e. Remove shield can from tuned circuit being removed. If a low-band tuned circuit is being removed, the lid of the shield can must be removed.
- f. Remove one Phillips head screw located in the hole from which the slug was removed. If a band 4 tuned circuit (Z416, Z417, Z418, or Z419) is being removed, two Phillips head screws, located on opposite sides of the tuned circuit, must be removed.
- g. The tuned circuit may now be lifted out of the r-f and i-f tuner assembly.

**3-13. REMOVAL OF MEGACYCLES FREQUENCY INDICATOR.**

- a. Loosen six setscrews (item 15, figure 3-7).
- b. Remove shaft (item 16, figure 3-7).
- c. Loosen six setscrews (item 17, figure 3-7).
- d. Remove shaft of cam (item 18, figure 3-7 and 3-9).
- e. Remove the eight screws securing the MEGACYCLES frequency indicator to the front plate (item 19, figure 3-8).
- f. The MEGACYCLES frequency indicator and its mounting plate are now removable.

**3-14. DISASSEMBLY OF MEGACYCLES FREQUENCY INDICATOR.** Refer to figures 3-10 and 3-11.

- a. Remove the MEGACYCLES frequency indicator as per instructions given in paragraph 3-13.
- b. Remove retaining rings (item 22).
- c. Remove shaft and counter gears (items 23 and 24).
- d. Remove screws and washers securing mask actuating pin (item 25).
- e. Remove sliding mask and spring (items 26 and 27).
- f. Loosen setscrews of the fourth counter wheel (item 28).
- g. Remove retaining ring (item 29).
- h. Remove shaft (item 30), allowing the three right-hand counter wheels and associated hardware to be removed. (See figure 3-11.)
- i. Loosen setscrews of left-hand counter wheel (item 31) and remove retaining ring (item 32).
- j. Remove shaft (item 33).
- k. Remove left-hand counter wheel (item 31) and associated hardware.

**3-15. REASSEMBLY OF R-F AND I-F TUNER ASSEMBLY.**

**3-16. REASSEMBLY OF MEGACYCLES FREQUENCY INDICATOR.** Refer to figures 3-10, 3-11, and 3-12.

- a. Install counter wheel (item 31) in left-hand position and slide shaft (item 33) into position.
- b. Install retaining ring (item 32) on shaft (item 33) and orient setscrews of left-hand counter wheel (item 31) with the flat edges of shaft (item 33).
- c. Adjust position of counter wheel (item 31) for minimum end play of shaft (item 33) and tighten setscrews. Counter wheel (item 31) should now rotate freely.

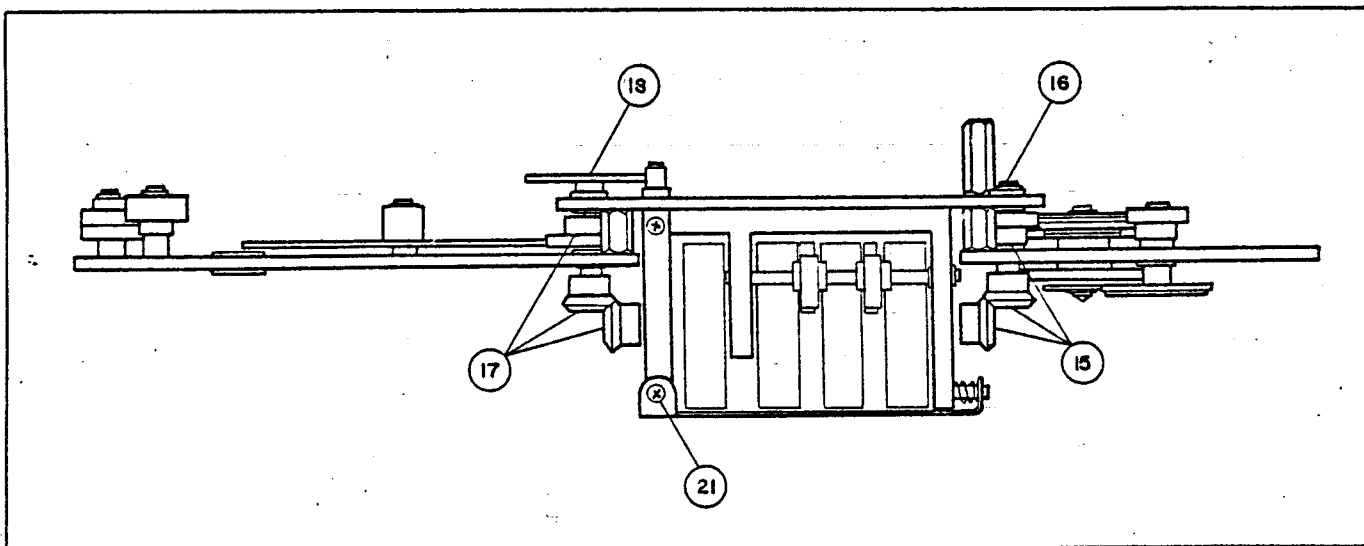


Figure 3-7. R-F and I-F Tuner Assembly, Front Plate, Top View



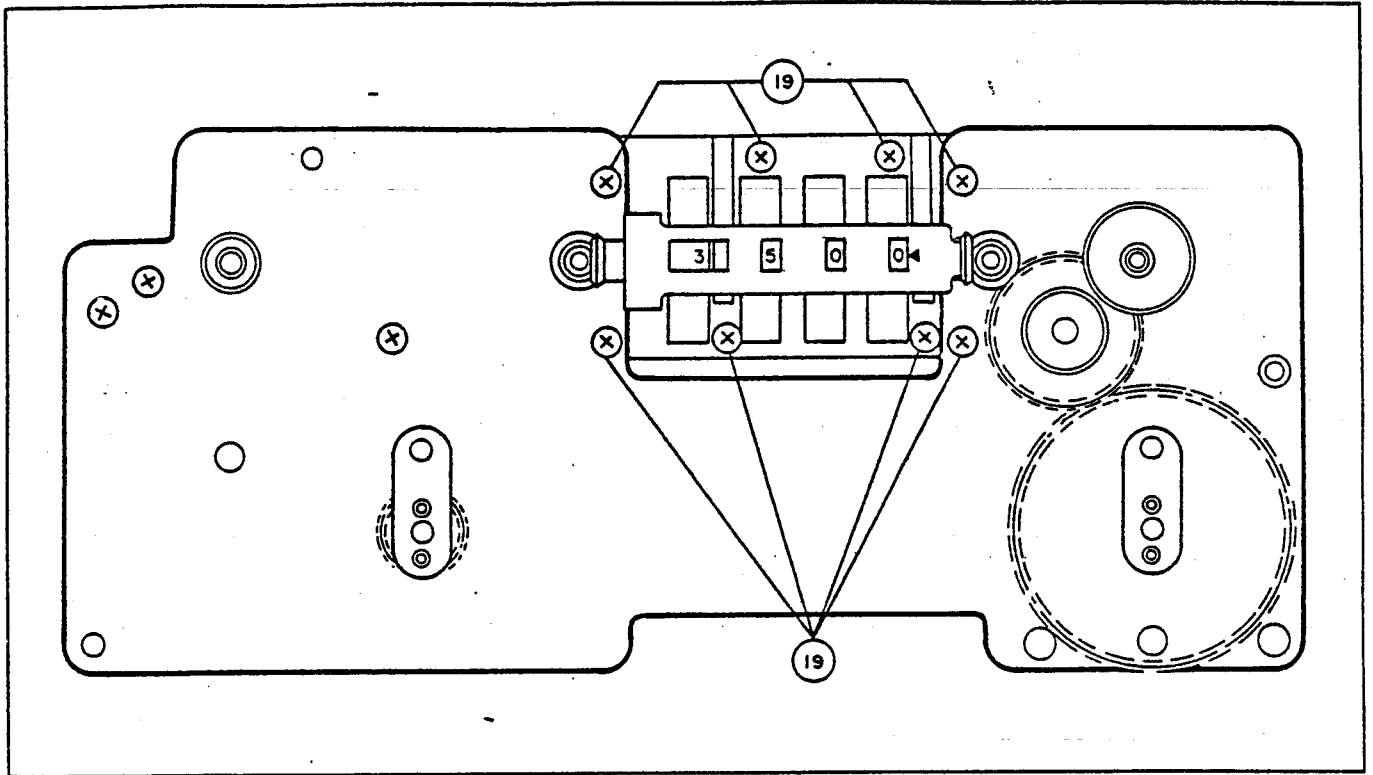


Figure 3-8. R-F and I-F Tuner Assembly, Front Plate, Front View

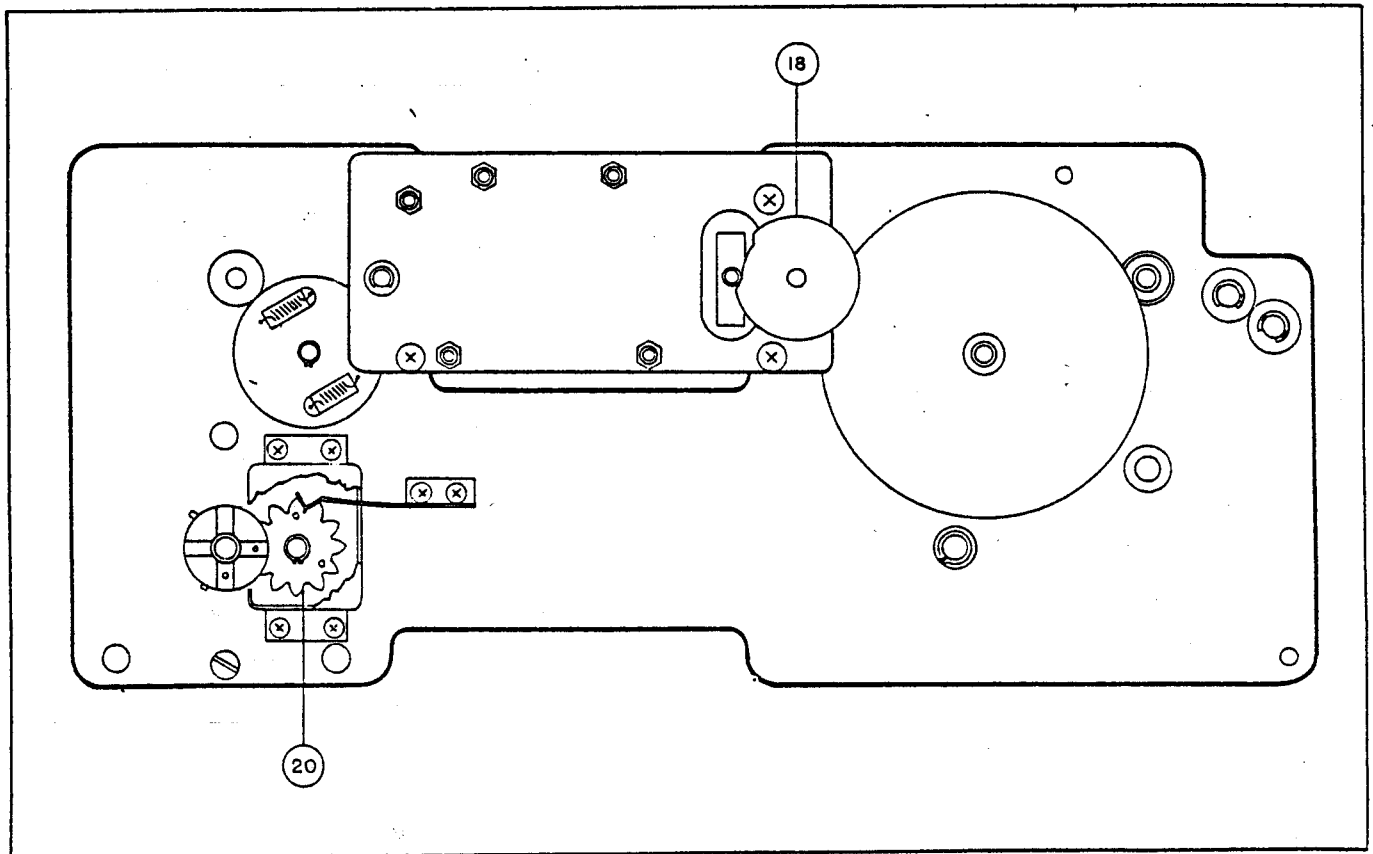


Figure 3-9. R-F and I-F Tuner Assembly, Front Plate, Rear View

- l. Install the three right-hand counter wheels and associated hardware and slide shaft (item 30) into position.
- m. Install retaining ring (item 29) on shaft (item 30) and orient setscrews of right-hand counter wheel (item 28) with the flat edges of shaft (item 30).
- n. Adjust position of right-hand counter wheel (item 28) for minimum end play of shaft (item 30) and tighten setscrews. The two middle counter wheels should now rotate freely and shaft (item 30) should rotate freely in the end bearings.
- o. Install sliding mask (item 26) and spring (item 27) with pin (item 25). Install screws and washers of pin (item 25). Sliding mask (item 26) should slide horizontally without seizing or binding after installation.
- p. With the three right-hand counter wheels set for a reading of 00-00-00 from the front and 27-27-55 from the top, install counter gears (item 24) and shaft (item 23) as illustrated in figures 3-10 and 3-11.
- q. Secure shaft (item 24) with retaining rings (item 22) as illustrated in figure 3-10. Make certain the

retaining rings (item 22) are installed with the burr side away from the bearing.

- j. The counter gears (item 24) should rotate freely on shaft (item 23) after completion of steps a through i.

### 3-17. REPLACEMENT OF MEGACYCLES FREQUENCY INDICATOR. Refer to figures 3-7, 3-8, and 3-9.

- a. Rotate MEGACYCLES frequency indicator for a reading of 3.500 megacycles.
- b. Mount the MEGACYCLES frequency indicator on its plate and on the r-f and i-f tuner assembly front plate with 8 screws. (See figure 3-8, item 19.)
- c. Install cam and shaft (item 18) as illustrated in figure 3-9.
- d. With cam (item 18) in the position indicated in figure 3-9, set the shaft and gears (item 17) for minimum end play and backlash and tighten the six setscrews.
- e. Install shaft (item 16) and gears (item 15) and set for minimum end play and backlash.

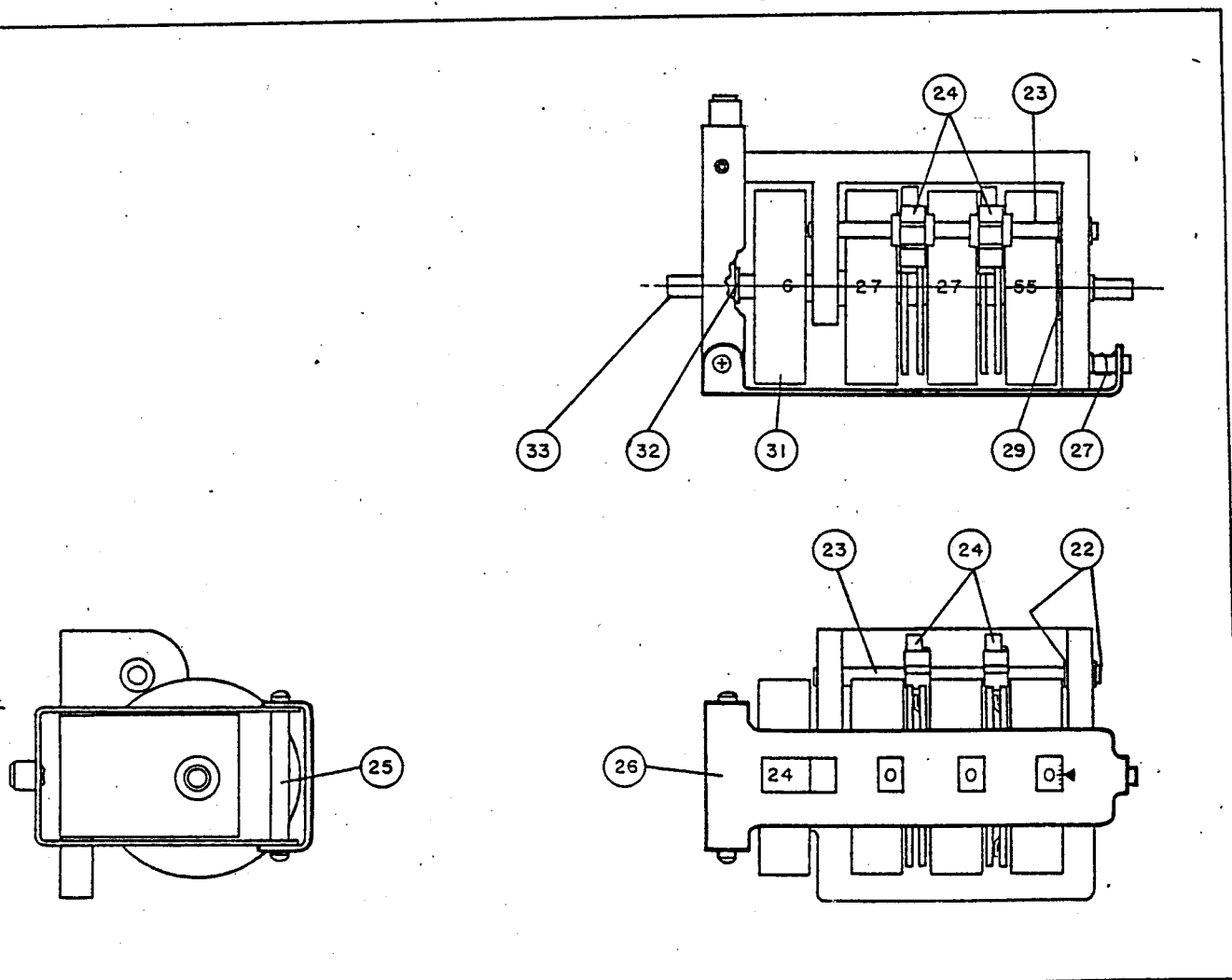


Figure 3-10. MEGACYCLES Frequency Indicator; Top, Front, and Side Views

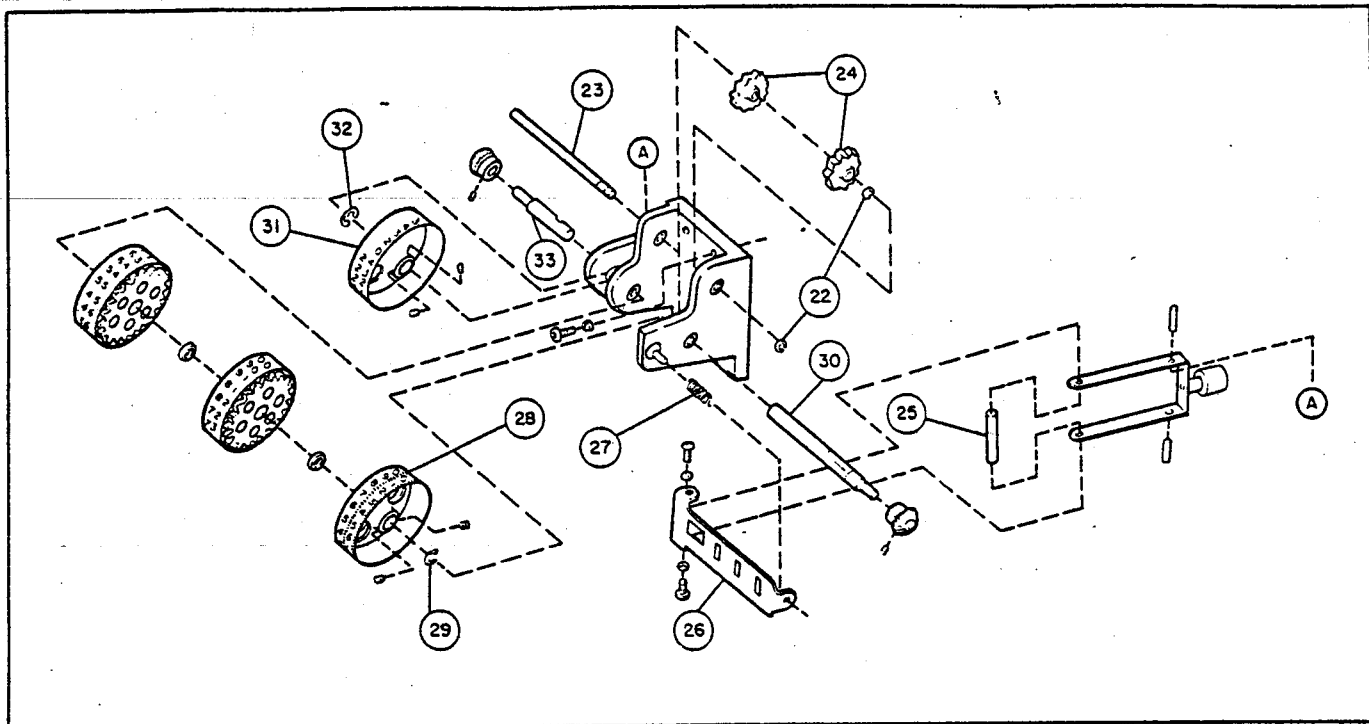


Figure 3-11. MEGACYCLES Frequency Indicator, Exploded View

f. Install retaining ring of shaft (item 16) and tighten setscrews of gears (item 15).

g. Test operation of sliding mask by rotating megacycle counter for a reading of 4.500 megacycles. The mask should change positions. If not, loosen the setscrews of the camshaft (item 18) and set cam as indicated in figure 3-9.

h. Both positions of the sliding mask should reveal the vernier markings of the right-hand counter wheel. If not, loosen the two screws (item 21) and reset the sliding mask correctly.

i. Run the three right-hand counter wheels throughout their range. There should be an overlap of approximately 10 kilocycles at either end. If the overlap is more at one end than the other, loosen the two setscrews of any one of three gears (item 15) and reset the right-hand counter wheel.

### 3-18. REPLACEMENT OF TUNED CIRCUITS. Refer to figure 3-6.

a. Replace tuned circuit in position from which removed and secure with either one or two Phillips head screws, depending upon tuned circuit being replaced.

b. Replace shield can and secure with two hex nuts. For low band, replace lid of shield can and secure with six Phillips head screws.

c. Install the slugs in the tuned circuits being replaced. Make certain slugs are replaced in the same position from which removed.

d. Secure the slugs with Phillips head screws.

e. Resolder all connections. Refer to figure 3-13.

### 3-19. REPLACEMENT OF I-F SWITCH, S402.

a. Align i-f switch wafers as illustrated in figure 3-14, viewed from the front.

b. Replace the i-f switch in the position from which removed and secure to the middle plate with two screws (item 14, figure 3-5).

c. Replace the i-f switch shaft from the rear of the r-f and i-f tuner assembly, mating the coupler gear as illustrated in figure 3-4, item 13.

d. Replace gear (item 12, figures 3-4 and 3-5) and tighten setscrews.

e. Resolder all leads previously removed. Refer to figure 3-13.

### 3-20. REPLACEMENT OF R-F SWITCH, S401.

a. Align r-f switch wafers as illustrated in figure 3-14, viewed from the front.

b. Replace the r-f switch in the position from which removed and secure to the bottom plate with three Phillips head screws (item 11, figure 3-4).

c. Secure the r-f switch to the middle plate with two Phillips head screws (item 9, figure 3-5).

d. Replace the r-f switch shaft from the rear of the r-f and i-f tuner assembly (item 10, figures 3-2 and 3-4), and replace retaining rings (item 34, figure 3-4).

e. Replace gear (item 7) and cam assembly (item 8) as illustrated in figure 3-5.

f. Tighten the four setscrews of the r-f switch coupler (item 6, figure 3-4).

g. Resolder all leads previously removed. Refer to figure 3-13.

### 3-21. REPLACEMENT OF FRONT PLATE.

a. Set the MEGACYCLES frequency indicator for a reading of 0.500 megacycles.

b. Place the front plate in position, carefully meshing all gears.

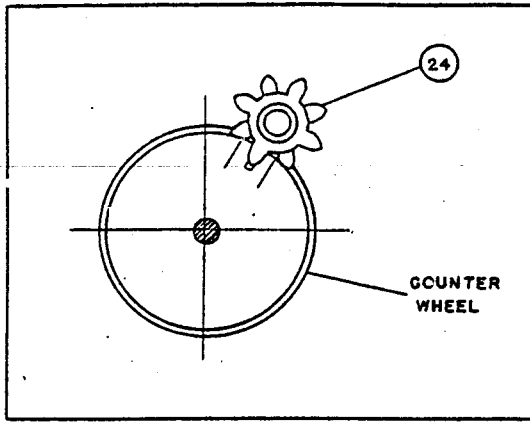


Figure 3-12. MEGACYCLES Frequency Indicator, Counter Gear Setting

e. Rotate the BANDSWITCH and TUNING controls (figure 3-1) and check for binding or excessive backlash. The torque required to operate the BANDSWITCH should not exceed 12 inch-pounds at any point. The TUNING control torque will be described in step h of paragraph 3-23.

3-22. REPLACEMENT OF R-F AMPLIFIER SUBASSEMBLY.

a. Place the r-f amplifier subassembly in position in the r-f and i-f tuner assembly, carefully engaging plug P702 with jack J402.

b. Tighten the two captive screws which secure the r-f amplifier subassembly to the r-f and i-f tuner assembly. Tighten the screws intermittently to avoid binding.

3-23. REPLACEMENT OF VARIABLE FREQUENCY OSCILLATOR-CONVERTER SUBASSEMBLY.

NOTE

When the shaft of the variable frequency oscillator converter-subassembly has been turned, or when a new subassembly is to be replaced,

- c. Secure the front plate with the four screws (item 5, figure 3-1).
- d. Replace and mesh gear (item 3, figure 3-4). Secure with pin.

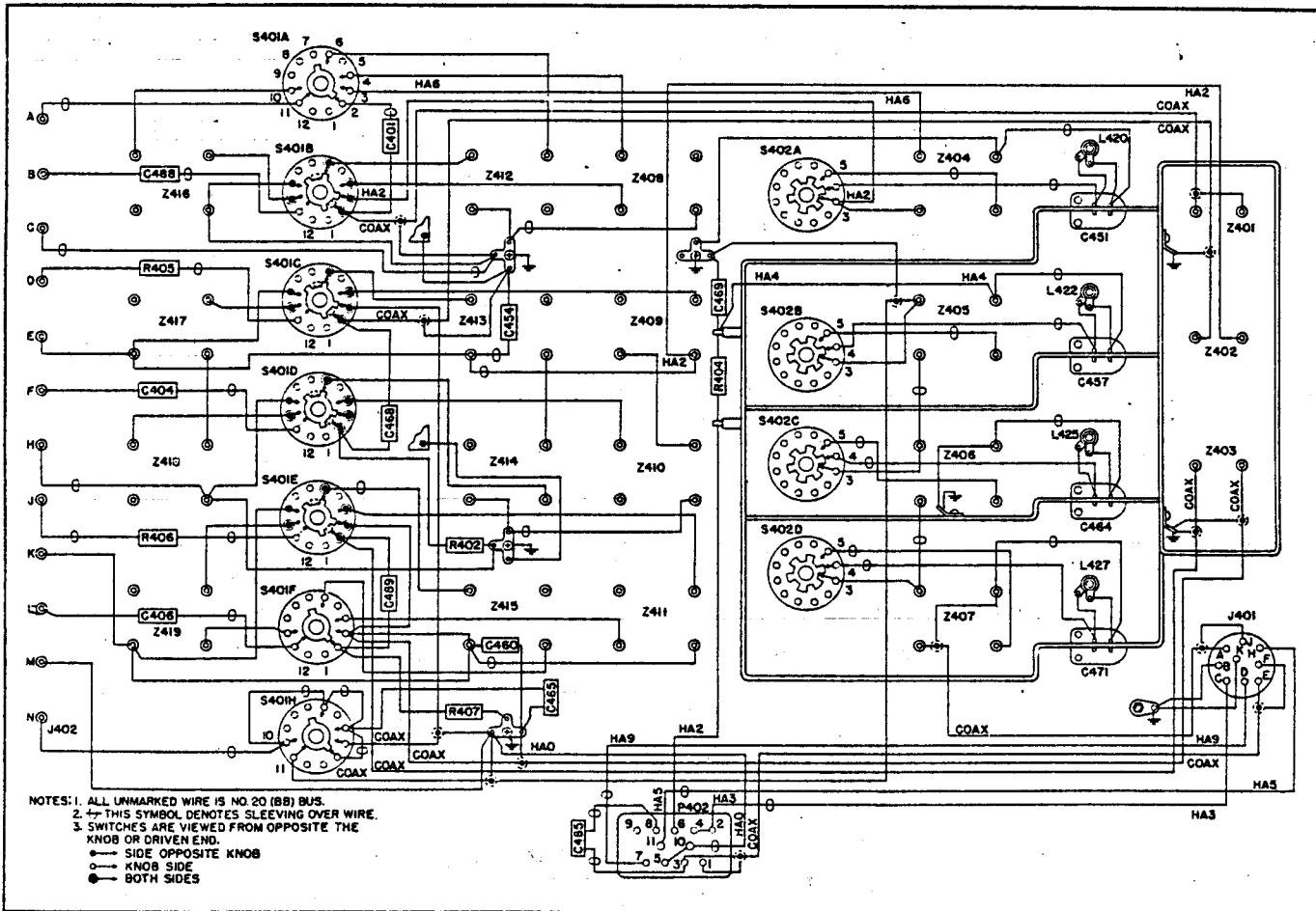


Figure 3-13. R-F and I-F Tuner Assembly, Wiring Diagram

the frequency should be set as follows before installing in the r-f and i-f tuner assembly: Install the r-f and i-f tuner assembly in Radio Receiver R-648/ARR-41 -as per paragraph 3-24. Engage P15001 with J401, set the frequency to 0.500 megacycles, and turn on the equipment and allow sufficient time for warm-up. Connect Frequency Meter AN/USM-26 from the inside of V15001 tube shield to ground and adjust the shaft of the variable frequency oscillator-converter subassembly for a reading of exactly 3.0 megacycles.

- a. Set the BANDSWITCH and TUNING controls for a reading of 0.500 megacycles on the MEGACYCLES frequency indicator.
- b. Observe positions of gears and compare with figure 3-5. The positions should correspond.
- c. Place the variable frequency oscillator-converter subassembly in position and install the pinion gear and couplers as illustrated in figures 3-3 and 3-4, item 1. Make certain the setscrews of the coupler will not strike the grooves of the small pinion gear when tightened.
- d. Tighten the setscrews of coupler (item 1, figures 3-3 and 3-4).

e. Fasten the variable frequency oscillator-converter subassembly to the middle plate by means of one of the flathead screws. Place the flathead screw in the lower left-hand screw hole, as viewed from the front of the r-f and i-f tuner assembly, but do not tighten completely.

f. Using the flathead screw as a pivot axis, rock the variable frequency oscillator-converter subassembly so that the pinion gear on the oscillator shaft meshes with minimum detectable backlash.

g. Replace and tighten all screws in the variable frequency oscillator-converter subassembly and engage plug P15001 in jack J401.

h. Rotate the TUNING control and check for binding and excessive backlash. The torque required to operate the TUNING control should not exceed 3 inch-pounds at any point.

i. Operate the TUNING control throughout its range. The low-band tuning cores should start to rise at approximately 0.170 megacycles. Approximately 10 kc overtravel should be indicated at each extreme end of rotation.

### 3-24. REPLACEMENT OF R-F AND I-F TUNER ASSEMBLY.

- a. Set the BANDSWITCH and TUNING controls for a reading of 0.190 megacycles on the MEGACYCLES frequency indicator.

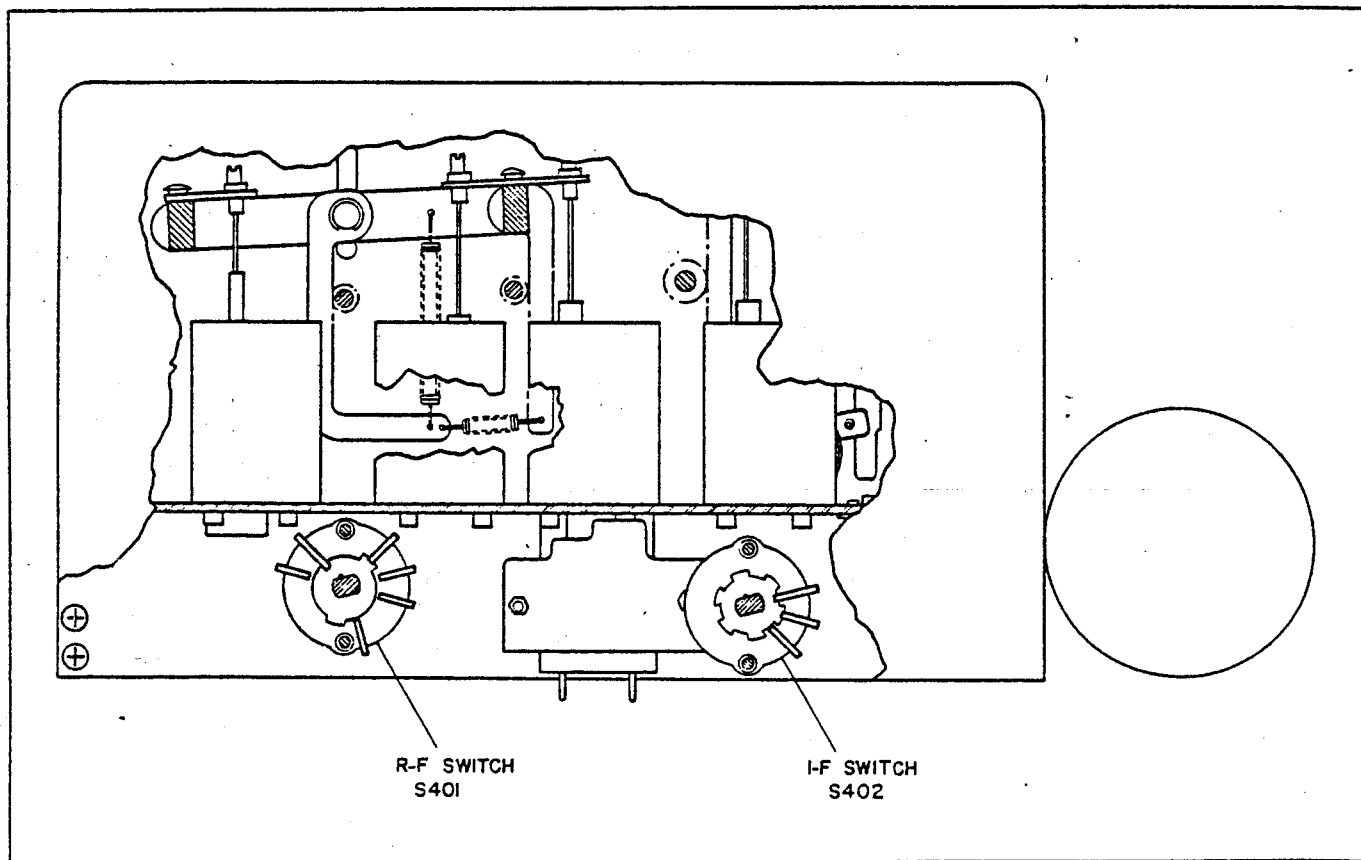


Figure 3-14. R-F and I-F Tuner Assembly, Switch Alignment

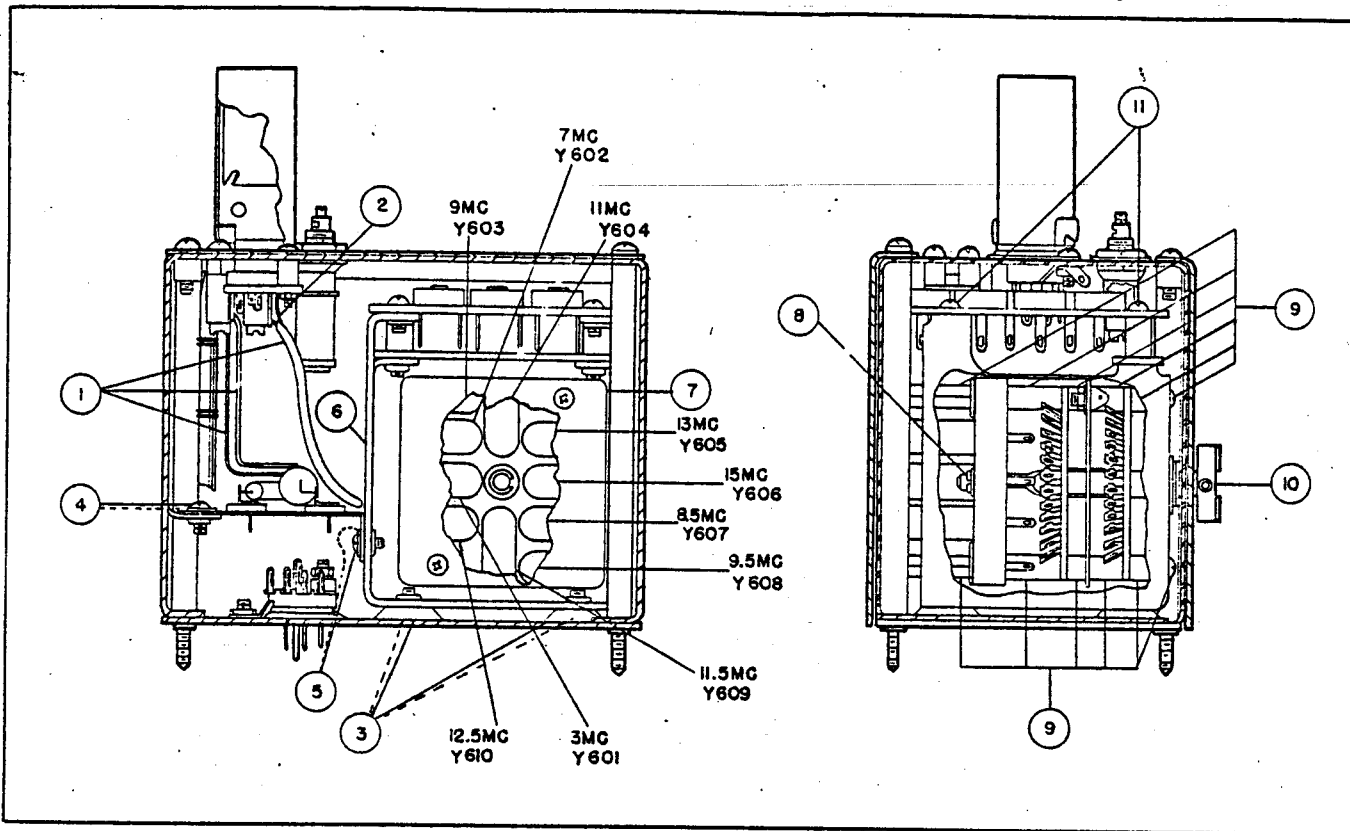


Figure 3-15. R-F Oscillator Assembly, Front and Side View

b. Place the r-f and i-f tuner assembly in position in the R-648/ARR-41 chassis, carefully engaging plugs P402 and P701 with jacks J207 and J208 respectively.

c. Tighten the four red headed captive screws intermittently, securing the r-f and i-f tuner assembly to the R-648/ARR-41 chassis.

d. Swing the front panel into position, carefully meshing the BANDSWITCH and TUNING couplers and plug P304 with jack J201.

e. Tighten the two thumb nuts (labeled LOCK) on the upper right and left-hand corners of the front panel.

f. Engage plug P703 with jack J601.

g. After the r-f and i-f tuner assembly has been reassembled and installed in the R-648/ARR-41 chassis, the MEGACYCLES frequency indicator should be checked. Turn the equipment on and allow at least 15 minutes for warmup. Perform a calibration check on any of the 100-kilocycle check points and calibrate the counters by depressing and rotating the DIAL ZERO control. Following calibration, zero beat should correspond with zero reading on the right-hand counter wheel. After zero beat has been established at zero reading, rotate the TUNING control both directions and observe the point where the calibration signal drops out. The calibration signal should drop out at approximately the same point for both directions of TUNING control rotation, as read on the right-hand counter wheel. If not reset the right-hand counter wheel as per step i of paragraph 3-17.

**NOTE**

After completion of the maintenance operations upon the r-f and i-f tuner assembly and after the reassembly procedures have been completed; the performance tests, paragraphs 6-7 through 6-12 of the Handbook of Service Instructions, should be performed. It may be found, as a result of these tests, that realignment is necessary. If so, the alignment procedure, paragraphs 6-59 through 6-64 of the Handbook of Service Instructions, should be performed. A complete realignment may not be necessary, depending upon the maintenance operations performed.

**3-25. R-F OSCILLATOR ASSEMBLY.**

**3-26. DISASSEMBLY OF R-F OSCILLATOR ASSEMBLY.**

**NOTE**

Considerable time should be spent in trouble shooting and adjustment procedures before attempting to disassemble the r-f oscillator assembly. Reference is made to the Handbook of Service Instructions, paragraph 6-35 and table XVI. Note especially all instructions in

table XVI to replace the entire r-f oscillator assembly, in which case the necessary corrective maintenance is beyond the capabilities of field maintenance and should be performed as per instructions given in the following paragraphs. In most cases, trouble can be corrected by adjustment procedures and intelligent application of operational theory. If trouble has been isolated to a detail part or group of detail parts which are not readily accessible, the following disassembly procedures are supplied as a step-by-step guide to dismantle completely the r-f oscillator assembly. The r-f oscillator assembly should be dismantled only as far as necessary to replace the defective detail part. These instructions are not to infer that a unit should be regularly disassembled, since the operation will disturb factory-aligned adjustments and reassembly procedures must be strictly observed.

**3-27. REMOVAL OF R-F OSCILLATOR ASSEMBLY FROM RADIO RECEIVER R-648/ARR-41.**

- a. Set the BANDSWITCH and TUNING controls for a reading of 0.190 megacycles on the MEGACYCLES frequency indicator.
- b. Remove plug P703 from jack J601 on the top of the r-f oscillator assembly chassis.
- c. Loosen the two redheaded captive screws at diagonal corners of the r-f oscillator assembly.
- d. Lift the r-f oscillator assembly vertically to disengage plug P601 from jack J204.

**3-28. REMOVAL OF SWITCHES AND TRIMMER CAPACITORS.** Refer to figure 3-15.

- a. Unsolder three switch leads (item 1). Identify for replacement.
- b. Remove grounded coax lead (item 2) by removing screw in V601 tube socket.
- c. Remove four screws from the bottom of the chassis (item 3).

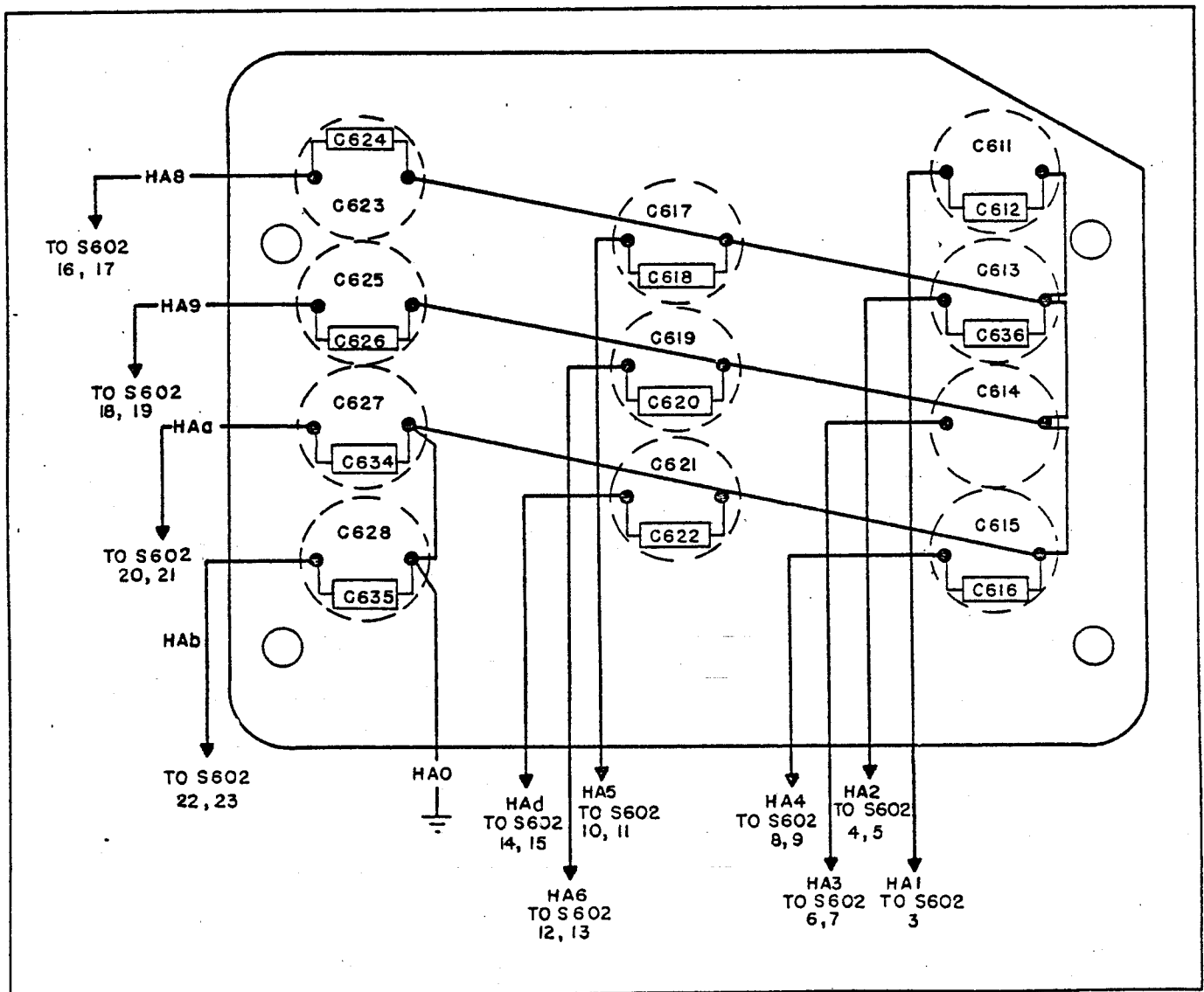


Figure 3-16. R-F Oscillator Assembly, Trimmer Capacitors, Wiring Diagram

- d. Remove two screws (item 4), thereby allowing access to screws (item 5).
- e. Remove two screws (item 5).
- f. Withdraw the small chassis (item 6) containing the switches and trimmers from inside the r-f oscillator assembly chassis.
- g. Remove crystal cover (item 7) by removing two attached screws. Pull all crystals from sockets.
- h. Remove retaining ring and washer (item 8).
- i. Remove screws, spacers, and posts (item 9).
- j. Remove switch shaft (item 10).
- k. Remove four screws and two spacers (item 11), allowing the switches and terminal boards to be removed.
- l. Switch S601 is mounted to the crystal terminal board and switch S602 is mounted at the rear. Either switch wafer may now be replaced by unsoldering the terminals.
- m. The fixed capacitors and variable trimmer capacitors, connected to switch S602, are now replaceable without further disassembly. The fixed capacitors are removable by unsoldering and the variable capacitors are removable by sliding the capacitor mounting clamps up and back with long-nose pliers. Refer to figure 3-16 for trimmer capacitor location.

3-29. REASSEMBLY OF R-F OSCILLATOR ASSEMBLY.

3-30. REASSEMBLY AND SWITCH ALIGNMENT.  
 Refer to figures 3-16 through 3-18.

- a. Resolder all switch and trimmer capacitor leads.
- b. Locate the "S" stamped on switch wafers S601 and S602, located nearest the trimmer capacitor terminal board and on the solder terminal side of the switch wafers. Center the common wiper of switch wafer S602 on the tab to the left of the "S". Center the common wiper of switch wafer S601 on tab 16, counting clockwise starting with the tab to the right of the "S".
- c. Replace the switches and terminal boards in the small chassis (item 6) in the same position as removed.
- d. Replace four screws and two spacers (item 11).
- e. Replace switch shaft (item 10) as illustrated, in figure 3-15, being careful not to move any of the switch positions.
- f. Replace screws, spacers, and posts (item 9).
- g. Replace retaining ring and washer (item 8).
- h. Replace crystals in the correct sockets. Refer to figure 3-15.

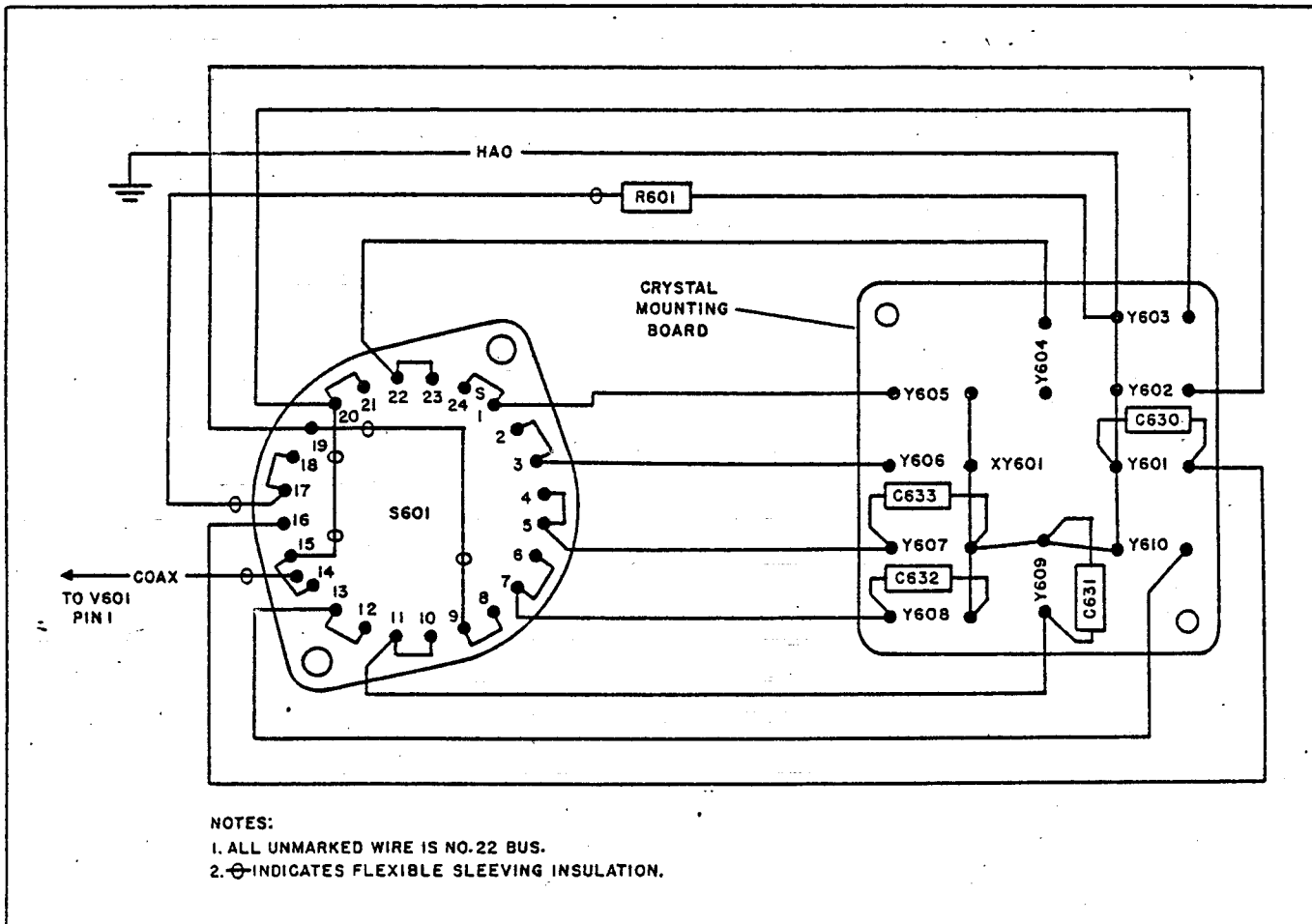


Figure 3-17. R-F Oscillator Assembly, Switch S601 Wiring Diagram



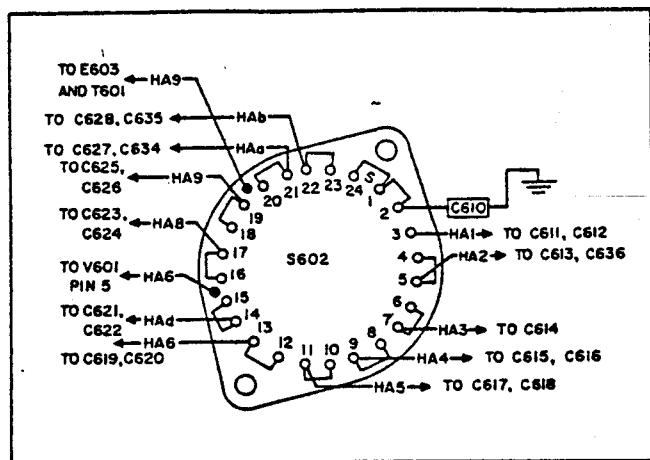


Figure 3-18. R-F Oscillator Assembly  
Switch S602 Wiring Diagram

The blue wire connects to V601 terminal 5 and the white wire connects to standoff connector E603.

### 3-31. REPLACEMENT OF R-F OSCILLATOR ASSEMBLY.

a. Observe the coupler located on the front of the r-f oscillator assembly. The key portion of this coupler should be oriented vertically to mate properly the r-f and i-f tuner assembly coupler. This condition will be so if the reassembly procedures, paragraph 3-29, have been followed correctly.

b. With the MEGACYCLES frequency indicator set for a reading of 0.19 megacycle, place the r-f oscillator assembly in position, engaging plug P601 with jack J204.

c. Tighten the two redheaded captive screws alternately.

d. Replace plug P703 in jack J601 on the top of the r-f oscillator assembly.

#### NOTE

- i. Replace crystal cover (item 7) and secure with two screws.
- j. Replace the small chassis (item 6) within the r-f oscillator assembly chassis.
- k. Replace two screws (item 5).
- l. Replace two screws (item 4).
- m. Replace four screws (item 3).
- n. Replace coax lead (item 2) to ground and secure with screw in V601 tube socket.
- o. Resolder three wires (item 1) previously removed. The coax inner conductor connects to the common point between capacitor C602 and V601 terminal 1.

After completion of the maintenance operations upon the r-f oscillator assembly and after the reassembly procedures have been completed; the performance test, paragraph 6-35 of the Handbook of Service Instructions, should be performed. It may be found, as a result of this test, that a realignment is necessary. If so, the alignment procedure, paragraphs 6-53 through 6-55 of the Handbook of Service Instructions, should be performed. A complete realignment may not be necessary, depending upon the maintenance operations performed.



## SECTION IV

# DISMANTLING AND DISASSEMBLY

### 4-1. INTRODUCTION.

4-2. This section describes the procedures preparatory to overhaul, including dismantling of the equipment into its assemblies and disassembly into parts. The extent to which the dismantling processes are carried will be determined by the authority in charge of overhaul, according to the condition of the equipment. In most instances, it will probably not be necessary to dismantle the equipment to the extent covered by these instructions. Disassembly is limited to the removal of mechanical items, such as bearings, shafts, armatures, and brushes. Internal wiring, resistors, capacitors, or other electrical parts are not removed unless such action is necessary for access to a part requiring overhaul.

4-3. Where tables containing disassembly instructions appear in this section, the sequence of index numbers listed in the first column of each table corresponds to

the sequence of procedural steps, thus indicating the order in which the parts are loosened, removed, or otherwise affected.

### 4-4. DISMANTLING.

4-5. REMOVAL OF ASSEMBLIES. To remove the assemblies of Radio Receiver R-648/ARR-41 refer to figure 4-1 and proceed with the following steps.

#### NOTE

Set the reading on the MEGACYCLES frequency indicator to 0.19 megacycle before proceeding with the dismantling procedures.

a. Remove Radio Receiver R-648/ARR-41 from Mounting MT-1518/ARR-41 by loosening the two forward locking mechanisms and pulling the entire chassis out with the two handles.

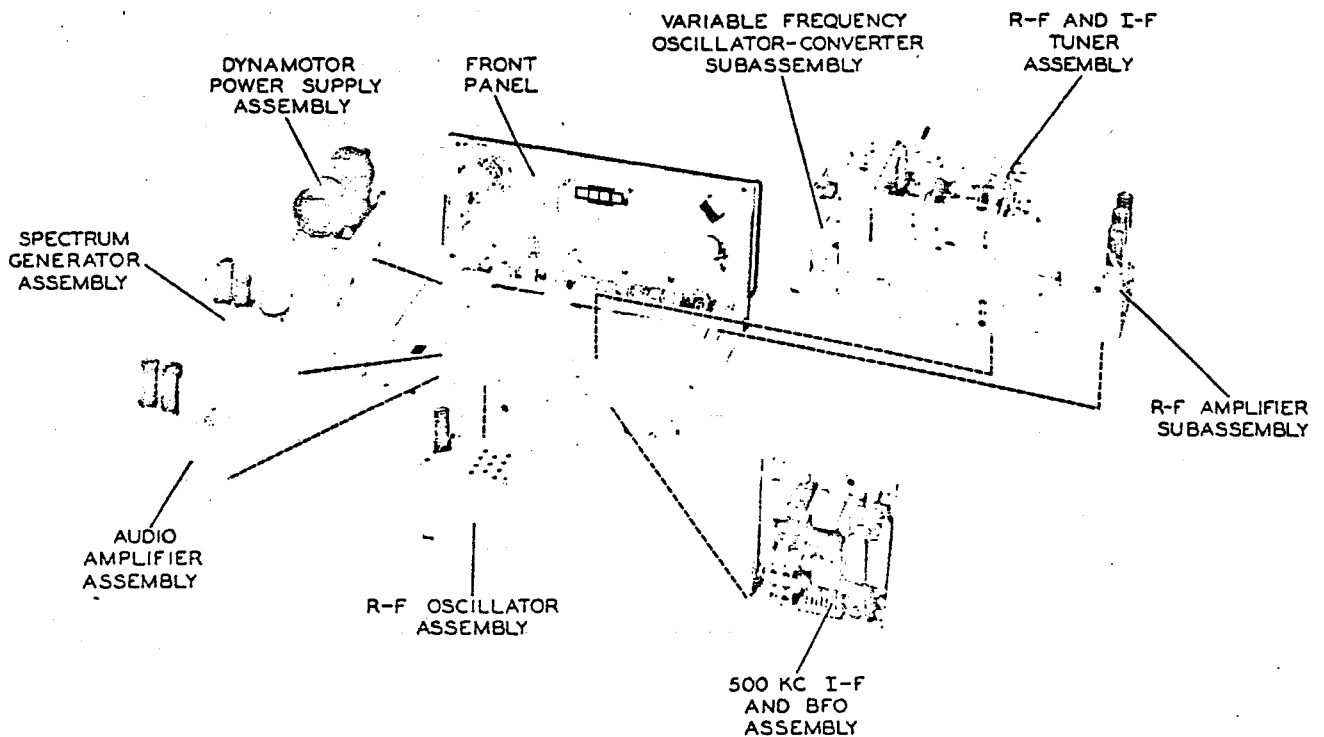


Figure 4-1. Radio Receiver R-648/ARR-41, Exploded View

- b. Remove the radio receiver cover by turning the two Dzus fasteners located at the rear and pulling the chassis out.
- c. Disengage plug P703 from jack J601.
- d. Loosen the two setscrews labeled LOCK on the front panel and remove the two pins securing the bottom of the front panel to the chassis. The front panel is now removable as a unit.
- e. Remove each assembly by pulling up with a slight rocking motion to disengage the plugs from the jacks.
- f. Loosen the redheaded captive screws securing the assemblies to the chassis. Loosen the captive screws alternately until they turn freely to avoid possible damage to the connectors.
- g. Remove the covers from each assembly by removing the Phillips head screws on the top of each assembly chassis.

**4-6. DISASSEMBLY.**

4-7. DYNAMOTOR. Unsolder all leads from the dynamotor and remove the dynamotor from its chassis. Refer to figure 4-2 and proceed as directed in table I.

**NOTE**

Further dismantling or disassembly other than is described in paragraphs 4-4 through 4-7 should not be performed during routine overhaul procedures. The gears, bearings, and other mechanical parts of the r-f and i-f tuner assembly are available for cleaning and inspection without further disassembly.

**TABLE I. DISASSEMBLY OF DYNAMOTOR**

INDEX NO.	ITEM	PROCEDURE
1	Phillips head screws	Remove the screws (1) and end covers (2). Loosen setscrew (3) and remove impeller (4). Remove low-voltage brush caps (5) and brushes (6). Remove high-voltage brush caps (7) and brushes (8). Remove screws (9) and low-voltage end plate (10). Remove screws (11) and high-voltage end plate (12). Remove capacitors (13 and 14). Remove two frame bolts (15). Remove the front and rear end-spider assemblies and pull out armature (16). Remove press bearing and washers (17). Remove press bearing and washers (18).
2	End covers	
3	Setscrew	
4	Impeller	
5	Low-voltage caps	
6	Low-voltage brushes	
7	High-voltage caps	
8	High-voltage brushes	
9	Phillips head screws	
10	Low-voltage end plate	
11	Phillips head screws	
12	High-voltage end plate	
13	Low-voltage capacitor	
14	High-voltage capacitor	
15	Frame bolts	
16	Armature	
17	Low-voltage bearing and washers	
18	High-voltage bearing and washers	

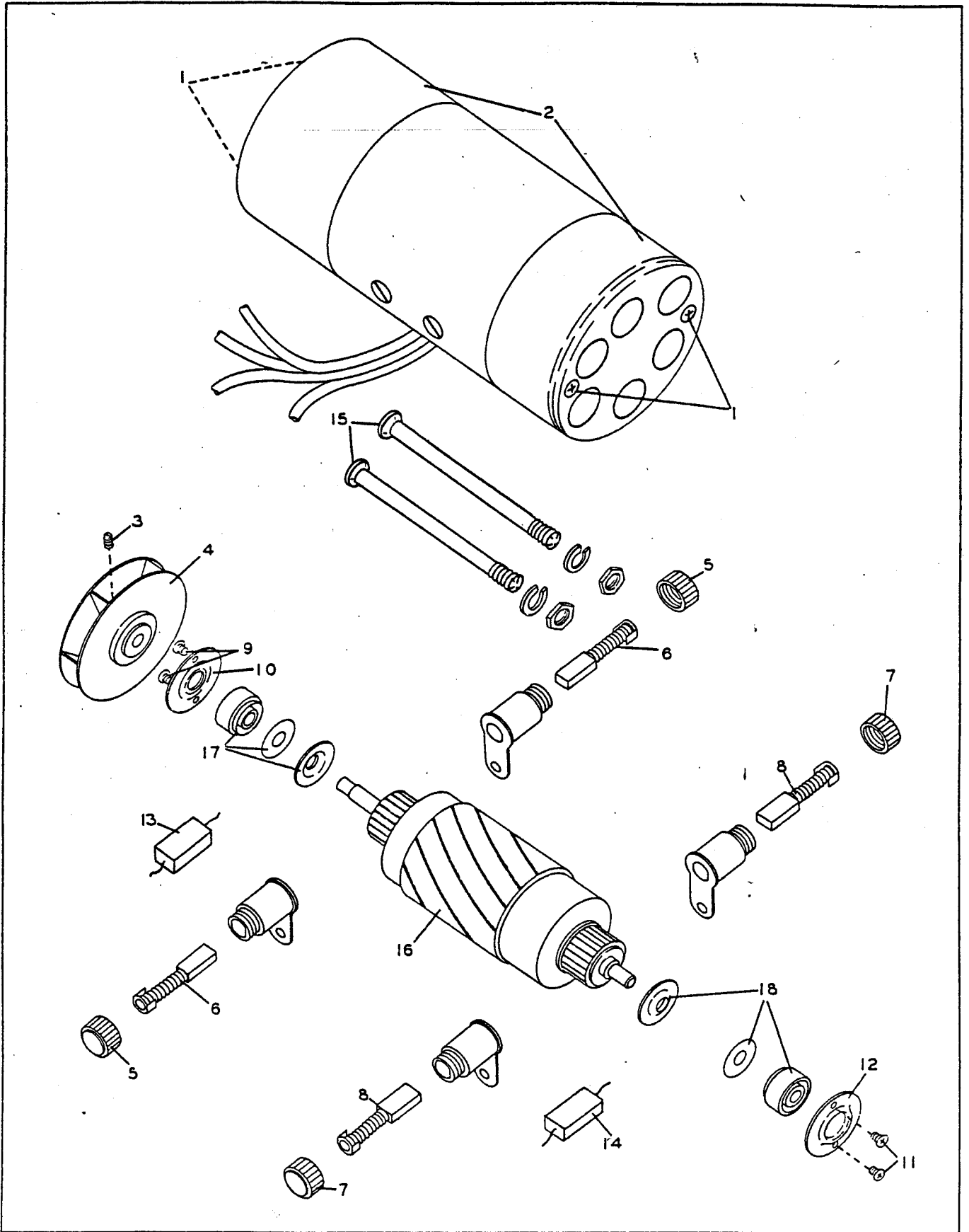


Figure 4-2. Dynamotor D901, Exploded View



## SECTION V CLEANING

### 5-1. INTRODUCTION.

5-2. This section contains instructions and procedures for cleaning the dismantled and disassembled assemblies and parts of Radio Receiving Set AN/ARR-41.

5-3. Component cleaning instructions and procedures are alphabetically arranged in paragraph 5-7. Whenever feasible instructions are in tabular form, arranged to facilitate reference by paragraph to the procedure for cleaning the various parts and assemblies.

5-4. All parts requiring particular methods of cleaning are considered separately, and parts which are of such similar nature as to permit identical cleaning procedures are grouped wherever possible in paragraph 5-12. Instructions are given for cleaning finished surfaces, in order to permit immediate repairs to minor finish damage by brush touch-up after the surface has been cleaned.

5-5. Reference to the word solvent shall be understood as indicating a mixture comprising methylene chloride, 25 percent; perchlorethylene, 5 percent; and dry cleaning solvent, Federal Spec P-S-661a, 70 percent, by volume. All reference cleaning materials and protective agents are listed and identified in table II.

#### WARNING

Perform operations involving cleaning solvent under a ventilated hood. Avoid breathing solvent vapor; wear a suitable mask when necessary. Avoid continuous contact with a solvent. Use goggles, gloves, and apron to prevent irritation due to prolonged contact. Change clothing that has become saturated with solvents.

5-6. References to air jet, frequently made in section V, signify a hand-operated air nozzle supplied with clean, dry, compressed air at a pressure of 25 to 28 psi maximum.

#### WARNING

Goggles should be worn when using air jet to blow dust and dirt from equipment parts. Other persons should be warned away from hazardous area or working enclosure.

TABLE II. CLEANING MATERIALS AND PROTECTIVE AGENTS

MATERIAL	SPECIFICATION	ASO STOCK NO.
Solvent; a mixture by volume of: Methylene chloride 25 percent Perchlorethylene 5 percent Solvent, dry cleaning 70 percent	ANA Spec. AN-M-37 Fed. Spec. O-T-236 Fed. Spec. P-S-661a	R51-M-950-20 R51-T-4459-200 R51-C-1326-75
Chamois skin Cloth, cotton; lintless Detergent, powder (Dreft) Oil, lubricating Oil, lubricating: refrigerating machine Grease, lubricating Paper, lens tissue Paper, tissue: fine grade Solvent, dry cleaning Tool, burnishing Trichloroethylene	MIL-L-7870 Fed. Spec. VV-O-581 MIL-G-3278  Fed. Spec. P-S-661a  AN-O-T-631	R14-O-2405-20    R51-C-1326-75 R41-T-3080 R51-T-5780

**5-7. COMPONENTS.**

5-8. The following paragraphs contain instructions and procedures for cleaning the various parts of the dismantled and disassembled equipment preparatory to the inspection procedures found in section VI. Cleaning instructions are listed for each component and the dynamotor in tabular form, and opposite each part to be cleaned reference is made by paragraph to the proper procedure. These procedures are found in paragraph 5-12 or immediately following the table of instructions for each component.

5-9. RADIO RECEIVER R-648/ARR-41. Clean the dismantled and disassembled Radio Receiver R-648/ARR-41 as directed in table III.

**TABLE III. CLEANING RADIO RECEIVER  
R-648/ARR-41**

ITEM	PARAGRAPH
Bearings	5-14, 5-16
Covered cable	5-18
Castings	5-19
Wired chassis	5-21
Connectors	5-23
Covers and shields	5-24
Dials and knobs	5-26
Gaskets and seals	5-29
Metallic or fabric gears	5-31
Ceramic or mycalex insulators	5-33
Jacks	5-35
Machined metal parts	5-40
Mechanical metal parts	5-42
Molded plastic parts	5-44
Receptacles	5-48
Tube sockets	5-50
Sensitive and toggle switches	5-52
Rotary switches	5-53
Electron tubes	5-55

5-10. DYNAMOTOR. Clean the disassembled dynamotor as directed in table IV.

**TABLE IV. CLEANING DYNAMOTOR**

ITEM	PARAGRAPH
Armature	5-13
Bearings	5-14
End-spider assemblies	5-19
Connector	5-23
Dust covers	5-24
Frame and field assembly	5-28

**TABLE IV. CLEANING DYNAMOTOR (Cont)**

ITEM	PARAGRAPH
Paper gaskets and fiber shim washers	5-30
Brush-holder caps	5-42
Fan	5-42
Frame bolts	5-42
Retainer plate and retainer-plate brackets	5-42
Mechanical metal parts	5-42

5-11. MOUNTING MT-1518/ARR-41. Clean the Mounting MT-1518/ARR-41 as directed in table V.

**TABLE V. CLEANING MOUNTING  
MT-1518/ARR-41**

ITEM	PARAGRAPH
Mechanical metal parts	5-42
Vibration isolators	5-46

**5-12. SIMILAR PARTS.**

**5-13. ARMATURES.**



To prevent damage, armatures should not be rolled, or permitted to rest on their coils or commutators. They should be handled by the armature shafts whenever possible.

a. With air jet, blow dust and dirt from all surfaces and crevices.

**WARNING**

When using flammable materials for cleaning purposes, observe all fire precautions. These materials should only be used outside, or in a ventilated booth provided with explosion-proof electrical equipment and an exhaust fan having spark-proof blades.

b. Observing WARNING, remove any lubricants and remaining dirt by immersing armature in a washing bath of an approved solution, and wash clean with soft-bristled brush having no metallic parts. Remove from bath at once when clean, and drain.



**CAUTION**

Carbon tetrachloride, trichlorethylene, solvent or other cleaning agents with chlorine content should not be used for cleaning armatures, since poor commutation and excessive brush wear may result.

- c. Immerse in rinse bath of an approved solution; rinse, remove from bath, and drain.
- d. Rest on suitable metal screen in ventilated oven, and dry at approximately 105 degrees C (221 degrees F) for four hours.
- e. Remove from oven, and lightly coat shaft with MIL-L-7870 oil.
- f. Rest on shaft, and protect from dust and moisture pending inspection.

**5-14. BEARINGS, BALL.**

5-15. These bearings may be cleaned for inspection in a bearing cleaning machine such as ASO Stock No. V40C969, using the cleaning agents and procedures recommended by its manufacturer. Otherwise, clean these bearings according to the following hand washing procedures.

- a. Perform cleaning work in an air-conditioned or air-filtered area. All tools, equipment, fixtures, and the area in general must be maintained at a very high level of cleanliness. For air jets used in the area, compressed air from a source outside the area should be again filtered and dehydrated, even though the source has those facilities. All cloth used in these procedures must be lint-free and clean. Dry cleaning solvent Federal Spec P-S-661a must be filtered through clean chamois skin or filter paper before use, and periodically thereafter.

**CAUTION**

Permanent damage may result from forcibly spinning a bearing before it is thoroughly cleansed of all foreign matter. Bearings must not be handled with bare hands during and after cleaning and preservation. Operators must wear rubber gloves or finger stalls to avoid contamination of bearings by fingerprints. Handling should be kept to a minimum.

- b. Insert a bearing holder into bore securely, and immerse bearing in a cleaning bath of dry cleaning solvent Federal Spec P-S-661a. Move bearing up and down several times to circulate the dry cleaning solvent.
- c. Remove from bath, and direct air jet at side of bearing opposite from holder until dry; take care not to allow flow from air jet to spin the bearing.

- d. Again wash and dry bearing as directed in steps b and c.

e. Repeat wash as directed under step b, and while doing so, gently rotate outer race with gloved fingers to dislodge any foreign particles from balls, retainer, and races; then dry as directed in step c.

f. Demagnetize the bearing by passing it through the throat of a suitable demagnetizer, once in a forward direction, then in the reverse direction; and, while doing so, slightly rotate the bearing in order that the balls within it will be rotated one or two revolutions.

g. Using a second bath of freshly filtered dry cleaning solvent, repeat washing and drying operations of step e. Repeat this operation until bearing is completely free of all foreign matter as ascertained by step h following.

h. Gently rotate outer race with gloved finger, and observe whether the action is smooth all the way around, without resistance or grinding. Smooth action of a dry bearing is accepted as an indication that it is clean.

i. Bake bearing for approximately one-half hour in suitable electric or infrared ventilated oven at approximately 43 degrees C (110 degrees F) until all remaining dry cleaning solvent is evaporated.

j. Remove from oven, place in clean, dry, suitable container for protection from dust, moisture, and handling while in transit to inspector. Attach to the container a slip identifying the contents, and forward immediately to inspection department.

**CAUTION**

Some inspection procedures require the cleaned bearings to be dry; that is, without lubrication. Because the dry bearings are unprotected from corrosion due to moisture, it is necessary that they be inspected immediately after cleaning.

**5-16. BEARINGS, BRONZE: OILITE.**

5-17. The bronze oilite bearings are located in the r-f and i-f tuner assembly and in the r-f oscillator assembly. Since these assemblies normally are not disassembled during routine overhaul procedures and since the oilite bearings are initially impregnated with oil at the factory, it is only necessary to apply a small amount of MIL-L-7870 oil with a dropper to these bearings. Reference is made to paragraph 5-32 and figures 5-5 through 5-8 of the Handbook of Service Instructions for the location of these bearings.

**5-18. CABLE, COVERED.**

- a. Clean outer surface of flexible vinylite conduit, by wiping dirt from surfaces with solvent-moistened, lintless cloth.
- b. Wipe dry, using dry, clean, lintless cloth.

c. Treat any connector terminations as directed in paragraph 5-23; wipe clean any lug terminations with solvent-moistened, lintless cloth, and dry with dry, clean, lintless cloth.

#### 5-19. CASTINGS.

5-20. Castings; unfinished, finished, or partly finished, are cleaned as follows:

- a. Remove bulk of any surface grease with rags.
- b. Blow dust from surfaces, holes, and recesses with air jet.
- c. Immerse casting in washing bath of solvent, and scrub until clean, working over all surfaces and into all holes and recesses with suitable nonmetallic brushes. Flat, wood-backed brushes with soft fiber bristles are recommended for surfaces; round brushes similar to those used for washing bottles and test tubes are recommended for holes and recesses.
- d. Raise from bath, and permit solvent to drain into bath.
- e. Immerse in rinsing bath of clean solvent, rinse, and raise from bath. Position to drain dry, i.e., so that solvent is not trapped in holes or recesses. Where practical positioning will not permit complete drainage, use air jet to remove any trapped solvent.
- f. When thoroughly dry, touch up minor damage to finish. Extensive damage to finish may require complete refinishing.
- g. Protect from dust and moisture, pending inspection.

#### 5-21. CHASSIS, WIRED.

5-22. The following cleaning procedure is used for wired chassis containing terminal boards, resistor and capacitor assemblies and subassemblies, r-f coils, switches, tube sockets, inductors, transformers, or other wired parts.

- a. Remove dust and dirt from all surfaces, including parts and wiring, using soft-bristled brushes in conjunction with an air jet.

#### CAUTION

Avoid air-blasting small coils, leads, and other delicate parts by too close an approach with air jet nozzle. Use caution in use of brushes on delicate parts.

#### NOTE

When necessary to disturb the dress of wiring and cables, dressing should be noted, and upon completion of cleaning operations, wiring and cables should be restored to their proper positions or dress.

- b. Clean jacks as instructed in paragraph 5-35.
- c. Clean lamp holders as directed in paragraph 5-36.
- d. With minimum possible disturbance of wiring, clean connectors as prescribed in paragraph 5-23.
- e. Disturbing wiring as little as possible, clean tube sockets as directed in paragraph 5-50.
- f. Clean toggle and sensitive switches as directed in paragraph 5-52 and rotary switches as instructed in paragraph 5-53. Disturb wiring dress as little as possible.
- g. Clean ceramic or mycalex insulators by method prescribed in paragraph 5-33.
- h. Complete chassis cleaning by wiping down all finished surfaces with solvent-moistened, lintless cloth.
- i. Dry and polish these surfaces, using dry, clean, lintless cloth.
- j. Protect from dust, moisture, and physical damage, pending inspection.

#### 5-23. CONNECTORS.

#### NOTE

Connectors received for overhaul which contain Dow-Corning #4 sealing and insulating compound require steam cleaning in equipment designed for this purpose.

- a. Wipe dust and dirt from bodies, shells, and cable clamps, using solvent-moistened, lintless cloth. Wipe dry with clean, dry, lintless cloth.
- b. Remove dust from inserts, using small, soft-bristled brush in conjunction with air jet.
- c. Wash dirt and any traces of lubricant from insert, insulation, and contacts with solvent applied sparingly with small camel's hair brush.

#### CAUTION

Do not allow solvent to run into sleeves (or conduit) covering any wires or cables connected to contact terminals of the insert.

- d. Dry the insert with air jet.

#### 5-24. COVERS AND SHIELDS.

5-25. Clean all unfinished, partly finished, and finished sheet metal covers and shields such as dust covers, inspection covers, chassis covers, and housings according to applicable steps of procedure used for cleaning castings. Refer to paragraph 5-19.

**5-26. DIALS AND KNOBS.**

5-27. Clean all dials and knobs by gently wiping their surfaces with clean, soft, lintless cloth which has been slightly moistened with solvent. When clean, polish with tissue paper.

**5-28. FIELD ASSEMBLIES.**

Do not allow field assembly to rest on its coils. Injury to windings or insulation may result.

a. Blow dust and dirt from all surfaces and crevices with air jet. Do not raise or tear loose any insulation with air jet.



When using flammable materials for cleaning purposes, observe all fire precautions. These materials should only be used outside, or in a ventilated booth provided with explosion-proof electrical equipment and an exhaust fan having spark-proof blades.

b. If assembly is not very dirty, and there is no oil or grease present, finish cleaning by wiping over all surfaces, using lintless cloth moistened with an approved solution.

c. If assembly is very dirty, or with oil or grease present, immerse in washing bath of an approved solution, and wash clean, using soft-bristled brush having no metallic parts; then remove and drain.

d. Immerse field assembly in rinse bath of an approved solution, rinse gently, remove immediately, and drain.

e. Rest on suitable metal screen in ventilated oven, and dry at 105 degrees C (221 degrees F) for four hours to evaporate solution and remove moisture.

f. Protect from dust and moisture, and rest field assembly on its side pending inspection.

**5-29. GASKETS AND SEALS, NEOPRENE OR RUBBER.**

a. Remove any grease from surfaces with dry, lintless cloth.

b. Make up a washing bath of two ounces of detergent powder (Dreft) per gallon of warm water.

c. Immerse gaskets and seals in bath, and wash clean with lintless cloth.

d. Rinse well in clean warm water, dry with air jet, and protect from dust, lubricants, and high temperatures, pending inspection.

**5-30. GASKETS AND SHIM WASHERS, PAPER OR FIBER.**

a. Remove any grease from surfaces with dry, lintless cloth.

b. Quickly but thoroughly wipe all surfaces until clean with clean, lintless cloth moistened with solvent.

c. Immediately dry all surfaces using clean, dry, lintless cloth.

d. Protect from dust and lubricants pending inspection.

**5-31. GEARS, METAL OR FABRIC.**

5-32. Gears within the r-f and i-f tuner assembly are not normally removed during routine overhaul procedures. Under normal circumstances, it is sufficient to apply a small amount of MIL-G-3278 grease to all gear teeth with a brush. Reference is made to the Handbook of Service Instructions, paragraph 5-32 and figures 5-5 through 5-8 for gear location. If the r-f and i-f tuner assembly has been disassembled for replacement of a particular gear, the gears removed should be cleaned as directed in steps a, c, d, and e of paragraph 5-20 and step b of paragraph 5-41 before applying the MIL-G-3278 grease.

**5-33. INSULATORS, CERAMIC OR MYCALEX.**

5-34. Clean all terminal mounting insulators of glazed porcelain, ceramic insulators, or mycalex insulators as follows:

a. Wipe clean with solvent-moistened, clean, lintless cloth.

b. Dry and polish, using dry, clean, lintless cloth.

**5-35. JACKS.**

a. Remove dust from exteriors with camel's hair brush and air jet.

b. Blow dust from interior of single female contact with air jet.

**5-36. LAMP HOLDERS.**

a. Clean exteriors with soft-bristled brush and air jet.

b. Clean interiors of socket types with air jet.

**5-37. LAMPS.**

5-38. Clean all dial lamps by wiping with solvent-moistened, lintless cloth; then dry and polish with clean, dry, lintless cloth.

**5-39. LENS, LAMP-HOLDER.**

a. Wipe all surfaces clean with solvent-moistened, lintless cloth.

b. Wipe all surfaces dry with dry, clean, lintless cloth.

c. Polish glass lens with clean, fine, tissue paper or lens tissue paper.

**5-40. MACHINED METAL PARTS.**

5-41. Detached shafts, keys, pins, collars, worms, springs, and similar machined parts, should be cleaned in a suitable machine, if available; otherwise proceed as follows:

a. Clean as directed in steps a, c, d, and e of paragraph 5-20, and in steps b, c, and d of this paragraph.

**NOTE**

Split-gear assemblies of spring-loaded type require cleaning between the twin gears. Accomplish this while washing, by moving gears with fingers.

**CAUTION**

To prevent corrosion, avoid touching any machined or unfinished surfaces with bare hands after cleaning.

b. Dry in dust-free, dry area or suitable enclosure. The use of radiant heat in a ventilated enclosure is recommended for drying, particularly wherever atmospheric humidity is high.

c. When dry, immediately apply light coat of MIL-L-7870 lubricating oil to any bare steel surfaces.

d. Protect from dust and moisture pending inspection.

**5-42. MECHANICAL METAL PARTS.**

5-43. The detached miscellaneous mechanical parts include ventilating grilles, mounting plates, mounting clamps and brackets, nuts, bolts, screws, washers, handles, fasteners, and hardware. These are handled in a suitable cleaning machine, or according to applicable steps of procedure used for castings. Refer to paragraph 5-19.

**5-44. MOLDED PLASTIC PARTS.**

5-45. Plastic parts in this equipment include insulating members, terminal boards, and mounting blocks. These are cleaned in the following manner:

a. With air jet, blow loose dust and dirt from surfaces, holes, and crevices, including any attached metal parts.

b. Wipe clean, using solvent-moistened, lintless cloth.

c. Dry and polish, using clean, dry, lintless cloth.

**5-46. MOUNTS, VIBRATION: HOLDER TYPE.**

5-47. Clean detached mounts as follows:

a. Blow dust from surfaces with air jet.

b. Wipe clean of any grease or remaining dirt, using solvent-moistened, lintless cloth.

c. Make up washing bath by dissolving two ounces of detergent powder (Dreft) per gallon of warm water, immerse mounts, and agitate them in bath a few minutes. Raise and drain.

d. Rinse mounts in warm-water bath, drain, and dry with air jet.

**5-48. RECEPTACLES.**

5-49. Clean all receptacles according to applicable steps of procedure used for connectors. Refer to paragraph 5-23.

**5-50. SOCKETS, TUBE.**

5-51. Mica-filled bakelite sockets are cleaned as follows:

a. Remove any rosin adhering to silver-plated contacts, using orange sticks dressed to wedge ends.

**CAUTION**

Do not use metal tools to remove foreign matter from these contacts, as damage to contact plating invites corrosion which may ultimately result in equipment failure. Existing corrosion on contacts should not be disturbed. Its presence will indicate positive damage of plating to inspection, and necessity for socket replacement.

b. Wash contacts with solvent lightly applied with small soft-bristled brush.

c. Using solvent-moistened, lintless cloth, remove any foreign matter adhering to socket body or wafer.

d. Dry all parts with air jet.

**5-52. SWITCHES, SENSITIVE OR TOGGLE.**

a. Using air jet, blow dust from surfaces and crevices of switch bodies, and any attached activating mechanisms.

b. Wipe all surfaces with solvent-moistened, lintless cloth, and dry with air jet.

**5-53. SWITCHES, ROTARY.**

5-54. Clean all special switches with button contacts and switches of the phenolic-wafer type as follows:

a. Remove all dust with air jet, turning switch rotor back and forth several times while blowing.

b. Wash all contacts and insulation with solvent lightly applied with small camel's hair brush.

c. Dry with air jet, then repeat wash, using clean solvent, and rotating switch rotor several times during this wash.

d. Dry gently but thoroughly with air jet.

## 5-55. TUBES. ELECTRON.

a. Remove dust and dirt from surface of glass or metal envelope and side of tube base with solvent-moistened, lintless cloth lightly applied to avoid obliterating type markings or loosening tube-cap terminals.

b. Dry and polish these surfaces by gently wiping them with dry, clean, lintless cloth.

c. Clean bottom of base and all tube contacts with soft-bristled brush.

## NOTE

Abrasives or metal tools should not be used to remove corrosion deposits occasionally present on tube contacts. These deposits are indicative of damage to contact plating, and inspection will probably order tube replacement.

d. Protect from dust and breakage pending inspection.



## SECTION VI INSPECTION

### 6-1. INTRODUCTION.

6-2. This section presents instructions and directive procedures designed to determine, by inspection, the condition of the dismantled, disassembled, and cleaned components, assemblies, and parts of Radio Receiving Set AN/ARR-41. Defects resulting from wear, physical damage, deterioration, or other such causes are brought to light by these inspection procedures.

6-3. To facilitate inspection, detailed inspection procedures are alphabetically arranged under paragraph 6-9 or 6-29, depending upon whether the nature of the part involved is mechanical or electrical. Wherever feasible inspection procedures are listed in tabular form.

### 6-4. COMPONENTS.

6-5. The following paragraphs contain instructions for inspecting the various parts of this equipment. Inspection instructions are listed for each component and the dynamotor in tabular form, and opposite each part to be inspected, reference is made to the proper procedure.

6-6. RADIO RECEIVER R-648/ARR-41. Inspect the dismantled and disassembled Radio Receiver R-648/ARR-41 as directed in table VI.

TABLE VI. INSPECTING RADIO RECEIVER  
R-648/ARR-41

ITEM	PARAGRAPH
<b>MECHANICAL PARTS</b>	
Castings	6-14
Covers and shields	6-16
Dials and knobs	6-18
Neoprene or rubber gaskets and seals	6-20
Metal or fiber gears	6-24
Machined metal parts	6-25
Mechanical metal parts	6-26
<b>ELECTRICAL PARTS</b>	
Covered cable	6-32
Fixed capacitors	6-35
R-f coils	6-37
Connectors	6-39

TABLE VI. INSPECTING RADIO RECEIVER  
R-648/ARR-41 (Cont)

ITEM	PARAGRAPH
<b>ELECTRICAL PARTS (Cont)</b>	
Ceramic or mycalex insulators	6-42
Jacks	6-44
Molded plastic parts	6-52
Receptacles	6-54
Fixed composition resistors	6-56
Fixed wire-wound resistors	6-58
Variable resistors	6-60
Tube sockets	6-62
Soldered terminal connections	6-64
Rotary switches	6-65
Sensitive switches	6-66
Toggle switches	6-67
Transformers and reactors	6-69
Electron tubes	6-71
Wiring	6-72

6-7. DYNAMOTOR. Inspect the disassembled dynamotor as directed in table VII.

TABLE VII. INSPECTING DYNAMOTOR

ITEM	PARAGRAPH
<b>MECHANICAL PARTS</b>	
Bearings	6-10
Castings	6-14
Covers	6-16
Gaskets and shim washers	6-22
Mechanical metal parts	6-26
<b>ELECTRICAL PARTS</b>	
Armature	6-30
Capacitors	6-35
Field assembly	6-40
Receptacle	6-54
Soldered terminal connections	6-64
Wiring	6-72

6-8. MOUNTING MT-1518/ARR-41. Inspect Mounting MT-1518/ARR-41 as directed in table VIII.

TABLE VIII. INSPECTING MOUNTING  
MT-1518/ARR-41

ITEM	PARAGRAPH
<b>MECHANICAL PARTS</b>	
Mechanical metal parts	6-26
Vibration isolators	6-28

**6-9. MECHANICAL PARTS.**

**6-10. BEARINGS, BALL.**

6-11. GENERAL. The following inspection procedures apply to all ball bearings found in this equipment. After each bearing has been cleaned, it is inspected to determine whether it is serviceable, or is to be rejected because of a defect. It is recommended that defective bearings in this equipment be replaced with new bearings rather than to recondition or replace defective parts. If determined serviceable, the bearing is again cleaned. After final cleaning it is either properly lubricated for installation or treated with preservative for storage, as required; depending upon its destination, it is then suitably wrapped and packaged. Whether the bearing is to be used immediately or stored, its packaging must be clearly marked on the outside with proper nomenclature to fully identify contained bearing and its lubrication or preservative material.



All inspection work must be performed under conditions of extreme cleanliness. Operators must wear rubber gloves or fingerstalls to prevent corrosion due to fingerprint contamination when handling bearings.

6-12. INSPECTION. Inspect all bearings as directed in the following steps.

- a. Check for blue or purple discoloration of any part of bearing due to burning.
- b. Check for tarnished external surfaces. This is indicated by a light discoloration of the highly finished surfaces.
- c. Check for rust.
- d. With emphasis on bearing balls and races, check for pitted, scarred, scuffed, or galled surfaces.

e. Check for flat bearing balls, broken ball separators, flaking or spalling of load carrying surfaces, and all other abnormal conditions.

6-13. In addition to the above inspection, check for undersize OD caused by creepage of outer race in its housing. Also check for oversize or defective bore caused by the inner race having turned on its shaft, and for excessive radial play. Use a suitable radial gauge equipped with a dial indicator calibrated in ten-thousandths of an inch when checking radial play of each bearing, which must previously have been cleaned and dried. A noise inspection can be accomplished by manual or mechanical rotation. If motor driven, the bearing should be lightly lubricated with oil only, such as Federal Spec VV-O-581, and rotated at 500 to 1000 rpm. A dental lathe can be used to drive the inner race while the outer race is held in gloved fingers. A used but serviceable bearing will develop a certain amount of noise. A slight, uniform noise is to be expected, but loud noise, nonuniform noises such as clicks or buzzes, and vibration originating in the bearing indicate that it is unfit for service. If manually rotated, the bearing must be clean and dry (unlubricated), and outer race spun with the gloved finger while the bearing is held by means of a bearing holder inserted in its bore. Hold the bearing in several positions while making the check, and listen for any vibration or intermittent resistance.

**6-14. CASTINGS.**

6-15. Unfinished, finished, or partly finished castings are inspected as follows: Inspect for cracks or breaks and marred or damaged machined surfaces, holes, counterbores, or threads. Also determine whether finish is damaged beyond practical touch-up repairs, requiring work in finishing department.

**6-16. COVERS AND SHIELDS.**

6-17. Inspect covers and shields for deformation, punctures, deep dents, and badly worn surfaces. Also check for damaged fastener devices or handles. Examine for corrosion and damage to finish requiring work in finishing department.

**6-18. DIALS AND KNOBS.**

6-19. Inspect all dials and knobs for physical damage and deformation, marred surfaces, and impairment of markings.

**6-20. GASKETS AND SEALS, NEOPRENE OR RUBBER.**

6-21. Inspect these gaskets and seals for deformation, and for damage such as tears, creases, folds or elongation, rough surfaces, and imbedded foreign matter. Check for loss of resiliency by stretching or compressing moderately and noting any failure to spring back to shape.



**6-22. GASKETS AND SHIM WASHERS, PAPER OR FIBER.**

6-23. Inspect these gaskets and shim washers for deformation, and for damage such as tears, rough surfaces, imbedded foreign matter, and other abnormal conditions.

**6-24. GEARS, METAL OR FIBER.**

- a. Inspect all gears for broken, chipped or badly worn teeth.
- b. Inspect gear bodies for cracks and deformation.
- c. Inspect bore of gear for excessive wear. Presence of a sharp burr on one side of gear at edges of teeth is an indication of wear of teeth.
- d. Inspect surfaces for corrosion or other abnormal condition.
- e. Inspect for proper lubrication of all gear teeth.

**6-25. MACHINED METAL PARTS.**

- a. Make over-all check for physical damage to surfaces, corners, and edges.
- b. Inspect closely all machined plane surfaces, holes, bores, counterbores, slots, grooves, shoulders, flanges, keyways, teeth, tapped holes and all threaded members, both male and female, for physical damage of any sort, including roughness of surface, corrosion, or presence of foreign matter.

c. Inspect plated or finished areas for damage requiring replating or refinishing beyond touch-up repair.

**6-26. MECHANICAL METAL PARTS.**

6-27. Inspect the unmachined mechanical metal parts including ventilating grilles, mounting plates, chassis, mounting clamps and brackets, nuts, bolts, screws, washers, handles, fasteners, and hardware for physical damage and deformation. Also check for corrosion and any damage which would require replating or refinishing beyond practical touch-up.

**6-28. MOUNTS, VIBRATION: HOLDER TYPE.**

- a. Inspect metal parts for corrosion, damaged surface, and deformation.
- b. Inspect the elastic members for deep cracks or other physical damage.
- c. Inspect elastic members for loss of resiliency by distorting manually and noting return to normal position upon release. Sluggish return or failure to return completely to normal position indicates a defective mount.

**6-29. ELECTRICAL AND ELECTRONIC PARTS.****6-30. ARMATURES.**

6-31. Inspect armatures for defects listed in table IX.

TABLE IX. INSPECTION OF DYNAMOTOR ARMATURE

DEFECT	SHAFT	LAMINATIONS	BANDS	WINDINGS	INSULATION	COMMUTATOR	NOTES
Corrosion (rust)	X	X	X				1. With Dynamotor centered in lathe, measure cut required. If cut will leave less than minimum diameter indicated in table XII, replace armature.
Corrosion (verdigris)				X		X	
Roughness, grooving or pitting						X	
Out of round (note 1)						X	
Burning						X	
Loss of solder						X	
High mica						X	
Worn to minimum diameter (note 2)						X	2. Cause for replacement. Refer to table XII. 3. Determine by growler test, or by continuity test. 4. Megger test.

TABLE IX. INSPECTION OF DYNAMOTOR ARMATURE (Cont)

DEFECT	SHAFT	LAMINATIONS	BANDS	WINDINGS	INSULATION	COMMUTATOR	NOTES
Physical damage	X	X	X	X	X	X	5. Burning on commutator is an indication. Check by performing a growler test.
Looseness			X	X	X	X	
Open coils (note 3)				X			6. Use the baking Megger test. Condition is usually due to moisture, but is sometimes due to charred insulation under coils.
Grounded coils (note 4)				X			
Shorted coils (note 5)				X			
Low insulation resistance (note 6)					X		

6-32. CABLE, COVERED.

6-33. Inspect flexible vinylite conduit as follows:

- a. Inspect for physical damage throughout entire length of conduit.
- b. Inspect conduit at ends to make certain that it is not pulled loose from connectors.

c. Inspect cable for other abnormal conditions. Treat any connector terminations as directed under paragraph 6-38.

6-34. CAPACITORS, FIXED.

6-35. Inspect fixed capacitors for defects listed in table X.

TABLE X. INSPECTION OF FIXED CAPACITORS

DEFECT	METAL CASE	MOLDED TYPE	CERAMIC TYPE
Oil leakage (at case seams or around terminal insulation)	X		
Cracked, broken, or charred terminal insulation	X		
Case damage (dents or holes)	X		
Case damage (cracks or breakage)		X	
Body damage (cracks or breakage)			X
Loose, broken, or corroded terminal studs, lugs, or leads	X	X	X
Loose, broken, or poorly soldered terminal connections	X	X	X
Loose mountings	X	X	X

6-36. COILS, R-F.

6-37. Inspect r-f coils for broken leads, loose, poorly soldered, or broken terminal connections, and loose mountings. Also check for crushed, scratched, cut, bruised, or charred windings, for corrosion on windings, leads, terminals, and connections, and for physical damage to forms and tuning-slug adjustment screws.

6-38. CONNECTORS.

a. Inspect connector body for broken parts, deformed shell, clamp, and other abnormal conditions, depending upon its type.

b. Inspect connector for cracked, broken insulation, and for contacts which are broken, deformed, or out of alignment. Check also for corroded or damaged plating on contacts, and for loose, poorly soldered, broken, or corroded terminal connections.

6-39. FIELD ASSEMBLIES.

6-40. Inspect field assemblies for defects noted in table XI.

6-41. INSULATORS, CERAMIC OR MYCALEX.

6-42 Inspect these insulators for cracked, chipped, or broken ceramic or mycalex. Also check for signs of burning, looseness, and other abnormal conditions.

6-43. JACKS.

6-44. Inspect all jacks for corrosion, rust, loose, or broken parts, cracked insulation, poor contacts, and other abnormal conditions.

6-45. LAMPS.

6-46. Inspect lamps for loose, cracked, or broken glass envelope. Also check for internal darkening, corrosion of base, and damage to insulation or base.

6-47. LAMP HOLDERS.

6-48. Inspect the lamp holders for corrosion, weak contacts, damaged insulation, and loose or broken parts. Also check for other conditions which are not normal.

6-49. LENS, LAMP-HOLDER.

6-50. Inspect the lamp-holder lenses for cracks, looseness, or deformation.

6-51. MOLDED PLASTIC PARTS.

6-52. Inspect these plastic parts, such as terminal boards, mounting blocks, and insulating members for signs of corrosion, cracked, broken or charred insulation, and for loose or missing mounting hardware. Also check for other abnormal indications which might be a source of future breakdown.

6-53. RECEPTACLES.

6-54. Inspect receptacles for cracked, broken, or charred insulation. Also check for physical damage to all parts, loose or bent contacts, damage to contact plating, corrosion, and other abnormal conditions.

TABLE XI. INSPECTION OF FIELD ASSEMBLIES

DEFECT	FRAME	LAMINATIONS	WINDINGS	INSULATION	LEADS	NOTES
Corrosion (rust)	X	X				1. Use conventional continuity test to detect.
Corrosion (verdigris)			X		X	
Looseness		X	X	X	X	2. Use Megger test.
Burnt, charred, worn, or brittle condition				X		3. Use oven baking Megger test (if time element is vital, a high-pot test of 500 volts d-c, applied for one minute, may be used.
Physical damage	X	X	X	X	X	
Open coils (note 1)			X			
Grounded coils (note 2)			X			
Low insulation resistance (note 3)			X			

6-55. RESISTORS, FIXED COMPOSITION.

6-56. Inspect these resistors for cracked, broken, blistered, or charred bodies, and loose, broken, poorly soldered, or corroded terminal connections.

6-57. RESISTORS, FIXED: WIRE-WOUND.

6-58. Inspect these resistors for signs of heating, cracked, broken, or charred insulation, loose, poorly soldered, broken, or corroded terminal connections, and loose mountings.

6-59. RESISTORS, VARIABLE.

6-60. Inspect variable resistors for corrosion of shafts, cases, and other visible parts, loose mountings, and physical damage. Rotate the shaft to determine whether action is too rough, too loose, or too tight.

6-61. SOCKETS, TUBE.

6-62. Mica-filled bakelite sockets are inspected as follows:

- a. Inspect for loose, broken, missing, or improperly seated mounting rings. Also check for cracked, broken, or charred insulation.
- b. Inspect for broken, deformed, or corroded contacts, and loose, poorly soldered, broken, or corroded terminal connections.

6-63. SOLDERED TERMINAL CONNECTIONS.

- a. Inspect for cold-soldered or "rosin" joints. These joints present a porous or dull, rough appearance. Check for strength of bond with the point of a tool.
- b. Examine for excess solder, protrusions from the joint, pieces adhering to adjacent insulation, and particles lodged between joints, conductors, or other parts.
- c. Inspect for insufficient solder and unsoldered strands of wire protruding from conductor at joint. Also look for insulation that is stripped back too far from joint, or badly frayed at joint.
- d. Inspect for corrosion (verdigris) on copper conductor at joint.

6-64. SWITCHES, ROTARY.

- a. Inspect insulation for cracks or breakage and for charring.

b. Check movable and stationary contacts for deformation, breakage, and wear, and for burning, pitting, and corrosion.

c. Inspect terminals for loose, poorly soldered, broken, or corroded connections.

d. Examine mechanical parts for damage or corrosion, and for irregular or rough action.

e. If applicable, examine switch for proper detent action.

6-65. SWITCHES, SENSITIVE.

a. Inspect for cracked, broken, or charred body, and loose, poorly soldered, broken, or corroded terminal connections.

b. Inspect for damaged operating mechanisms. Check by operating plunger, and listening for typical on-and-off click of internal mechanism.

6-66. SWITCHES, TOGGLE.

6-67. Inspect these switches for rough or loose action, cracked, broken, or charred body, loose, poorly soldered, broken, or corroded terminal connections, and loose or missing mounting nuts, bolts, and other parts.

6-68. TRANSFORMERS AND REACTORS.

6-69. Check these parts for signs of excessive heating, physical damage to case, cracked or broken ceramic insulators, and other abnormal conditions. Also check for corroded, poorly soldered, or loose terminals, and loose, broken, or missing mounting hardware.

6-70. TUBES, ELECTRON.

- a. Inspect envelope for cracked glass or dented metal, separation from base, and obliterated markings.
- b. Check base for cracked, chipped, or broken body or key, and for charring of base between contacts.
- c. Inspect for loose tube caps, and deformed, broken, or misaligned base contacts. Also check for corrosion or other damage to contact plating, and for loose or missing solder at tips of tubular-type contacts.

6-71. WIRING.

6-72. Inspect open and laced wiring of chassis, terminal boards, and parts of equipment by checking insulation for physical damage and charring, and check wires for breakage and for improper dress in relation to adjacent wiring or chassis.

## SECTION VII

### REPAIR AND REPLACEMENT

#### 7-1. INTRODUCTION.

7-2. This section contains essential instructions for the repair or replacement of worn, damaged, or defective parts. Repair instructions include resurfacing of commutators and repairs to finish damage of pole surfaces on rotating machinery. Replacement instructions include replacing brushes.

7-3. Faulty parts are usually detected by inspection in section VI, by tests performed during reassembly in sections VIII and IX, or by tests given in section XI. When the faulty part is repaired or replaced, the new part should be inspected and tested as described in section VI, VIII, IX, or XI. Instructions for testing the insulation resistance of cables and capacitors and for seating brushes are included in this section.

7-4. Repair instructions are not given for such items as are replaced as a unit, since they cannot be economically repaired or overhauled. Replacement instructions are not given where the method is obvious, nor are dismantling or disassembly instructions given in section III and section IV repeated in this section. Instructions for replacing special parts on assembled equipments are contained in section III of this manual and in section VI of the Handbook of Service Instructions.

7-5. Most of the repair or replacement instructions contained in this section apply to disassembled equipment. For dismantling and disassembling instructions refer to section IV.

7-6. A wiring diagram should be drawn before removal of any part requiring unsoldering of several wires. This diagram should show any color coding or markings of the wires, and the approximate location and identity of the terminal to which they are connected. In cases where lacing is to be removed, or where the lead dress is important, this should also be shown.

7-7. The repair of the dynamotor consists mainly of replacing the field, armature, or bearings. Brushes are replaced and seated as described under paragraph 7-8. Commutators are resurfaced, if necessary, as described in paragraph 7-10. Field or armature pole surface damage is repaired as described in paragraph 7-13.

#### 7-8. REPLACING BRUSHES.

7-9. Brush replacement data is found in paragraph 5-12 of the Handbook of Service Instructions. Replacement of brushes for the dynamotor disassembled in section IV is performed during reassembly in section VIII. Brushes should be replaced in their brush holders with the curved facing of the brush fitting the curved surface of the commutator. When

brush caps are replaced, the springs must not be distorted. Brushes should be seated on 100 percent of the arc, and at least 75 percent of the area of the brush. To obtain this brush seating, connect the dynamotor to a 27.5-volt d-c supply and allow it to run with no load until the proper seating has been obtained. Run-in time should be from 3 to 5 hours. When satisfactory seating is attained, remove the brushes from their holders, and remove all carbon dust from the dynamotor by careful and thorough use of an air jet supplied with dry, clean air at approximately 25 psi. Replace all brushes in their respective holders.

#### 7-10. RESURFACING COMMUTATORS.

7-11. If a commutator is out of round, or is deeply grooved or pitted, turning in a lathe is required to restore it to a true round, or to remove defects noted. Refer to table XII for pertinent data on the commutator of the dynamotor used in this equipment.

#### NOTE

Commutators cannot be resurfaced if their diameters after resurfacing will be less than the minimum allowable diameters listed in table XII. The lathe must have a dial indicator mounted on the lathe bed for determining concentricity of the commutators. The dial-indicator reading should not exceed a total of 0.001 inch from true round for all cases.

7-12. After the commutator has been turned down, undercut the insulation with a mica-cutting saw that will give a cut 0.020 to 0.025 inch less than the exact width of the insulation thickness. Carefully remove any slivers of insulation remaining in the slots against the sides of the commutator bars. A piece of hacksaw blade having all but one tooth ground off, and dressed to fit the commutator slots, will serve as a tool for this purpose. Apply friction tape to part of the blade to form a handle. Carefully remove any burrs from edges of the bars, taking care not to scratch their faces. Polish the commutator by gentle applications of No. 0000 or finer sandpaper to its surface, while rotating in the lathe at moderate speed commensurate with its size. Blow all dust and particles from slots, windings, and surfaces of entire armature with clean, dry, compressed air at approximately 25 psi.

**CAUTION**

Do not use emery cloth to polish commutator.

TABLE XII. COMMUTATOR RESURFACING LIMITS AND UNDERCUTTING DIMENSIONS

MANUFACTURER	COMMUTATOR IDENTIFICATION	MINIMUM ALLOWABLE DIAMETER (Inch)	DEPTH OF UNDERCUT* (Inch)
Eicor	Input; 27.5 volts d-c	.7185	.03125
	Output; 250 volts d-c	.7185	.03125

\*Width of undercut should be 0.020 to 0.025 inch less than slot width.

**7-13. RELACQUERING POLE SURFACES.**

7-14. If the pole surfaces of the armature or field are corroded, or if the lacquer finish is damaged, proceed as follows:

- a. Remove all defective finish from pole surfaces, using clean, lintless cloth dampened with lacquer thinner.
- b. Remove spots of corrosion from pole surfaces, using a fine grade of crocus cloth.



Do not contact pole surfaces with bare hands. Wear rubber gloves or fingerstalls.

- c. Carefully remove dirt with clean, dry, compressed air at approximately 25 psi.
- d. Using clean lintless cloth dampened with lacquer thinner, carefully wipe cleaned pole surfaces only.
- e. Mask all surfaces not to be treated, then heat to approximately 15 degrees C (27 degrees F) above room temperature.
- f. Spray while warm with thin coat of air-drying varnish mixed with enough lacquer thinner to prevent cobwebbing of sprayed surfaces.
- g. Bake in ventilated oven at approximately 121 degrees C (250 degrees F) for one hour.

**NOTE**

When oven is not available, drying may be done at room temperature.

- h. Remove armature from oven, allow it to cool to room temperature. Remove all masking material carefully.



Protect the lacquered surface from damage. Scratching this surface exposes the metal to corrosion.

**7-15. CABLES.**

7-16. Paragraph 6-32 describes inspection of cables for physical damage and shorted, open, or grounded pins. For cable information when repairing or replacing defective cables, refer to the cable fabrication data, paragraph 3-3 and figures 3-1 and 3-2 of the Handbook of Service Instructions. New cable, and those newly repaired, should be tested for continuity between corresponding terminals. The insulation resistance between each terminal and its connector shell, and between each terminal and every other terminal of that connector, should be measured with an insulation tester, such as a Biddle Midget Megger or Interstate type G. The insulation resistance should be at least 100 megohms.

**7-17. CAPACITOR INSULATION RESISTANCE.**

**7-18. GENERAL.**

7-19. Capacitors which are suspected of being faulty, or new capacitors which are to be installed in the equipment, should be checked according to the following procedures, as applicable. New capacitors drawn from stock are apt to have low insulation resistance, particularly paper-dielectric capacitors which have been stored under tropical conditions for a long period of time.

**7-20. MICA OR CERAMIC-DIELECTRIC CAPACITORS.**

7-21. Measure the insulation resistance between terminals, using a megohm bridge such as the Biddle 628-TA. The d-c potential used for this test should be at least 100 volts but not more than the rated voltage, and the electrification time should not exceed two minutes. The insulation resistance, measured at a temperature between 20 degrees C (68 degrees F) and 25 degrees C (77 degrees F) and a relative humidity between 0 and 80 percent, should be greater than 7500 megohms. (Any condensed moisture on the case of the capacitor should be removed with an air jet before making the test.)

**7-22. PAPER-DIELECTRIC CAPACITORS.**

7-23. Measure the insulation resistance by following the procedure given in paragraph 7-21. In addition, for capacitors which are sealed in metallic cases (and in which the case is not a terminal), insulation resistance should be measured between each terminal and the case. This resistance should be greater than 3000 megohms.

## SECTION VIII

# ASSEMBLY AND TESTING OF ASSEMBLIES AND SUBASSEMBLIES

### 8-1. INTRODUCTION.

8-2. This section contains instructions for the re-assembly of parts into subassemblies and assemblies, and specifies tests to be made prior to reassembly into components.

8-3. Reference is made to exploded views in section IV for aid in reassembly. The referenced figure and index numbers correspond to those used during the disassembly.

8-4. Only those subassemblies disassembled in section IV will be considered in this section. Re-assembly and testing procedures for assemblies and subassemblies disassembled in section III will be found in section III.

### 8-5. REASSEMBLY AND TESTING OF DYNAMOTOR.

8-6. REASSEMBLY OF DYNAMOTOR. (Refer to figure 4-2.) To reassemble the dynamotor, proceed as directed in the following steps:

- a. Wearing rubber gloves or fingerstalls, remove prelubricated bearings from their packages and press bearings and washers (17 and 18) onto the armature shaft.
- b. Replace the armature (16) into the field assembly and replace the end-spider assemblies.
- c. Replace and tighten two frame bolts (15).
- d. Replace capacitors (13 and 14) and tighten screws.
- e. Replace high-voltage end plate (10) and screws (11).
- f. Replace low-voltage end plate (10) and screws (9).
- g. Replace high-voltage brushes (8) and caps (7).
- h. Replace low-voltage brushes (6) and caps (5).
- i. Replace impeller (4) and tighten setscrew (3).
- j. Replace end covers (2) and Phillips head screws (1).

#### NOTE

Before replacing the dynamotor on its chassis, the test procedure, paragraph 8-7, should be performed to determine if the dynamotor is in proper operating condition.

8-7. TESTING OF DYNAMOTOR. The following tests should be performed prior to installing the dynamotor in its chassis:

a. Connect the positive terminal of the 27.5-volt d-c power source to the white lead of the dynamotor and connect the negative terminal to both the black and blue dynamotor leads.

b. With Multimeter TS-352/U adjusted to the 500-volt d-c range, connect between the red dynamotor lead and the common point formed by the blue and black leads. Multimeter TS-352/U should read between 280 and 300 volts d-c.

c. Adjust Multimeter TS-352/U to the 10-volt a-c range. Ripple voltage should be less than 1% of voltage determined in step b.

d. Shunt a one-microfarad capacitor across the TS-352/U leads. Adjust Multimeter TS-352/U to the 2.5-volt a-c range. Ripple voltage should be less than 0.5% of voltage determined in step b.

e. If the dynamotor satisfies the above tests, replace the dynamotor on its chassis and secure with the nuts and bolts supplied. Resolder leads previously removed.

### 8-8. MINIMUM PERFORMANCE STANDARDS.

8-9. Since each assembly of Radio Receiver R-648/ARR-41 is an integral part of the complete unit, an individual test for each assembly cannot be given with the R-648/ARR-41 in its disassembled state. Therefore, in order to test a single assembly, it is necessary to reassemble Radio Receiver R-648/ARR-41 in accordance with instructions given in paragraph 9-4, and then proceed with the required tests.

8-10. With the use of the Test Bench Cable Set AN/ARM-21, it is possible to perform tests upon all assemblies except the r-f and i-f tuner assembly and the r-f oscillator assembly with the assembly under test removed from the chassis. In this case, all other assemblies must be replaced, and the correct test cable interconnected with Radio Receiver R-648/ARR-41 and the assembly under test. Reference is made to table VII of the Handbook of Service Instructions for selection of the proper test cable for each removable assembly. The stage gain or other applicable tests, paragraphs 6-6 through 6-22 and 6-35 through 6-37 of the Handbook of Service Instructions, then may be performed upon each assembly.

### 8-11. LUBRICATION.

8-12. Reference is made to the Handbook of Service Instructions, paragraph 5-32 and figures 5-5 through 5-8, for instructions on lubrication.





## SECTION IX

# REASSEMBLY AND TESTING OF COMPONENTS

### 9-1. INTRODUCTION.

9-2. This section contains instructions for reassembling the Radio Receiver R-648/ARR-41 assemblies into components, and for testing the reassembled components. Since reassembly procedures are approximately the reverse of those for dismantling and disassembly, references are made to figures in section IV.

### 9-3. REASSEMBLY.

#### 9-4. REPLACEMENT OF ASSEMBLIES.

(Refer to figure 4-1.)

- a. Operate the BANDSWITCH and TUNING controls for a reading of 0.19 megacycle on the MEGACYCLES frequency indicator.
- b. Replace and secure the covers on each assembly chassis.
- c. Replace the front panel on the Radio Receiver R-648/ARR-41 chassis and secure with the two pins previously removed. Do not tighten the setscrews labeled LOCK on the front panel, as this would complicate replacement of the r-f and i-f tuner assembly.
- d. Replace each assembly in the positions from which removed, carefully engaging the plugs with the jacks.
- e. Tighten the redheaded captive screws alternately.

f. Swing the front panel upward on its hinges, engaging the BANDSWITCH and TUNING couplers and plug P304 with jack J201.

g. Tighten the LOCK setscrews on the upper right- and left-hand corners of the front panel.

h. Engage and tighten plug P703 with jack J601.

### 9-5. TESTING.

9-6. After the assemblies have been replaced in Radio Receiver R-648/ARR-41, the entire component should be tested for sensitivity, selectivity, calibration, etc. Paragraphs 5-14 through 5-17 of the Handbook of Service Instructions contain all procedural steps necessary to satisfy these requirements.

9-7. After the test procedures listed in paragraph 9-6 have been completed, and Radio Receiver R-648/ARR-41 is found to be in proper operating condition, the radio receiver cover should be replaced and secured with the two Dzus fasteners. If trouble is encountered, and Radio Receiver R-648/ARR-41 does not satisfy the requirements of these tests, the trouble isolation procedures, table VI and tables XIII through XVIII, and paragraphs 6-32 through 6-37 of the Handbook of Service Instructions, should be performed. It may be found that a complete or partial realignment is necessary. If so, refer to the Handbook of Service Instructions, paragraphs 6-44 through 6-64, and perform applicable portions of the alignment procedures.

## SECTION X

# FINAL REASSEMBLY

### 10-1. INTRODUCTION.

10-2. This section contains instructions for the reassembly of components into a complete equipment, ready for inspection and final test. Since the AN/ARR-41 equipment is comprised of only two components, instructions in this section pertain only to the replacement of Radio Receiver R-648/ARR-41 into Mounting MT-1518/ARR-41.

### 10-3. REPLACEMENT OF RADIO RECEIVER R-648/ARR-41.

10-4. To replace Radio Receiver R-648/ARR-41 on Mounting MT-1518/ARR-41, proceed as directed in the following steps:

a. Loosen the two forward locking mechanisms on Mounting MT-1518/ARR-41 by rotating the wing nuts as far as possible in a counterclockwise direction.

b. Place Radio Receiver R-648/ARR-41 on the mounting chassis and push to the rear, making sure the two pins at the rear of Radio Receiver R-648/ARR-41 enter the mating holes of the mounting chassis.

c. Place the two locking mechanisms over the right-angle brackets on the front panel and tighten the wing nuts until they are firmly secured.

### 10-5. TESTING.

10-6. Final testing of Radio Receiving Set AN/ARR-41 will be covered in section XI. No additional tests or adjustments are necessary within this section.



## SECTION XI

# INSPECTION, TESTING, AND PACKAGING

### 11-1. INTRODUCTION.

11-2. This section contains instructions for the inspection and testing of newly overhauled Radio Receiving Set AN/ARR-41. Appropriate reference is made to procedures and tests in section V of the Handbook of Service Instructions.

### 11-3. INSPECTION.

11-4. The reassembled equipment is visually inspected as follows:

- a. Check each component for scratches, dents, and other damage which might have occurred during reassembly.
- b. Check all connectors for bent terminals, corrosion, and other damage.
- c. Check to see that equipment is properly secured with all necessary screws and Dzus fasteners.
- d. Make certain that all fasteners work properly.
- e. Be sure that equipment is complete.
- f. Check for completion of all repairs and replacements made during overhaul.

#### NOTE

Marking of equipments required by government technical orders or other instructions, to indicate overhaul, or the incorporation of changes, shall be applied during inspection and test (if not previously applied to sub-assemblies, assemblies, or components during overhaul and assembly).

### 11-5. ALIGNMENT AND ADJUSTMENTS.

11-6. All alignment and adjustments are made prior to the complete reassembly, as directed in paragraph 9-7. No further adjustments are necessary.

### 11-7. PERFORMANCE CHECKS.

11-8. CALIBRATION AND DAILY INSPECTION. These are checks of the over-all performance of Radio Receiving Set AN/ARR-41, performed after all visual checks in paragraph 11-3 have been completed. If Radio Receiver R-648/ARR-41 has satisfactorily passed the minimum performance standards test outlined in paragraph 8-8, the daily inspection and test, paragraph 5-7, and the calibration test, paragraph 5-17 of the Handbook of Service Instructions, will satisfy the final testing requirements for standards of performance.

11-9. TWO-HOUR OPERATING TEST. Following the calibration and daily inspection and tests, the equipment should be operated for a period of not less than two hours. A new two-hour test must be made if any part is repaired or replaced before the original two-hour test is completed.

11-10. During the two-hour test, the equipment is checked for intermittent, erratic, or unstable operation, or any other condition indicating faulty operation. Lightly jar the chassis to check for loose connections, intermittent shorts, microphonic tubes, and similar faults by tapping it from several directions with a rubber mallet, observing output for indications of intermittent or unstable operation.



## SECTION XII

# DIFFERENCE DATA SHEETS

### 12-1. INTRODUCTION.

12-2. Overhaul instructions for the models included in this section are the same as the procedures for Radio Receiving Set AN/ARR-41 except for specific

differences noted by the applicable difference data sheet. Sections I through XI contain complete overhaul instruction information for Radio Receiving Set AN/ARR-41, manufactured and supplied under Contract NOas 55-821r, and NOas 57-438.

## APPENDIX A

## INDEX

TITLE	ILLUS	ADJUST- MENT	CLEAN- ING	DISMAN- TLING	DIS- ASSY	INSP	RE- ASSY	RE- MOVAL	RE- PAIR	REPLACE- MENT	TESTS
Audio Amplifier Assembly	19	--	24	19	--	31	41	19	--	41	41
Dynamotor	21	--	24	20	20	31	39	20	37	41	39
Dynamotor Power Supply Assembly	19	--	24	19	--	31	41	19	--	41	41
500-Kc I-F and BFO Assembly	19	43	24	19	--	31	41	19	--	41	41
Front Panel	19	43	24	19	--	31	41	19	--	41	41
Mounting MT-1518/ARR-41	vi	--	24	--	--	32	--	19	--	41	--
R-F Amplifier Subassembly	19	43	24	6	--	31	41	6	--	12	41
R-F and I-F Tuner Assembly	19	14	24	5	3	31	8	5	3	13	14
R-F Oscillator Assembly	19	17	24	15	14	31	16	15	14	17	17
Radio Receiver R-648/ARR-41	vi	43	24	19	--	31	41	19	--	41	43
Spectrum Generator Assembly	19	43	24	19	--	31	41	19	--	41	41
Variable Frequency Oscillator- Converter Subassembly	19	12	24	5	--	31	41	5	--	12	41

TABLE VIII. R-F OSCILLATOR STATISTICS

BANDSWITCH POSITION (MC COUNTER READING)	R-648/ARR-41 FREQUENCY, MC	SELECTED CRYSTAL, MC	SELECTED TRIMMER	SELECTED HARMONIC	OSCILLATOR OUTPUT, MC
0	0.190-0.550	3.0	C610	FIRST	3.0
2, 3	2-4	NONE	NONE	NONE	NONE
4	4-5	7.0	C611	FIRST	7.0
5, 6	5-7	9.0	C613	FIRST	9.0
7, 8	7-9	11.0	C614	FIRST	11.0
9, 10	9-11	13.0	C615	FIRST	13.0
11, 12	11-13	15.0	C617	FIRST	15.0
13, 14	13-15	8.5	C619	SECOND	17.0
15, 16	15-17	9.5	C621	SECOND	19.0
17, 18	17-19	7.0	C623	THIRD	21.0
19, 20	19-21	11.5	C625	SECOND	23.0
21, 22	21-23	12.5	C627	SECOND	25.0
23, 24	23-25	9.0	C628	THIRD	27.0

TABLE IX. CONVERSION STATISTICS FOR ALL FREQUENCIES

MEGACYCLE COUNTER POSITION	R-648/ARR-41 FREQUENCY, MC	R-F TUNER BAND (S401 POSITION)	R-F OSC FREQUENCY MC	VARIABLE I-F FRE- QUENCY MC	VARIABLE FREQUENCY OSC, MC	FIXED I-F FREQUENCY KC
0	0.190-0.550	1	3	3.19-3.55	2.69-3.05	500
2	2-3	2	NONE	2-3	2.5-3.5	500
3	3-4		NONE	3-4	2.5-3.5	500
4	4-5	3	7	3-2	3.5-2.5	500
5	5-6		9	4-3	3.5-2.5	500
6	6-7		9	3-2	3.5-2.5	500
7	7-8		11	4-3	3.5-2.5	500
8	8-9	4	11	3-2	3.5-2.5	500
9	9-10		13	4-3	3.5-2.5	500
10	10-11		13	3-2	3.5-2.5	500
11	11-12		15	4-3	3.5-2.5	500
12	12-13		15	3-2	3.5-2.5	500
13	13-14		2 x 8.5	4-3	3.5-2.5	500
14	14-15		2 x 8.5	3-2	3.5-2.5	500
15	15-16		2 x 9.5	4-3	3.5-2.5	500
16	16-17	5	2 x 9.5	3-2	3.5-2.5	500
17	17-18		3 x 7	4-3	3.5-2.5	500
18	18-19		3 x 7	3-2	3.5-2.5	500
19	19-20		2 x 11.5	4-3	3.5-2.5	500
20	20-21		2 x 11.5	3-2	3.5-2.5	500
21	21-22		2 x 12.5	4-3	3.5-2.5	500
22	22-23		2 x 12.5	3-2	3.5-2.5	500
23	23-24		3 x 9	4-3	3.5-2.5	500
24	24-25		3 x 9	3-2	3.5-2.5	500



TABLE X. R-F TUNING, BANDSWITCH FUNCTION

CYCLE	FREQUENCY (MC)	BAND	SHAFT A ROTATION (DIRECTION)	R-F TUNING CORE ELEVATOR (DIRECTION)
1	0 to 4	(See note)	Counterclockwise	Downward
2	4 to 8	3	Clockwise	Upward
3	8 to 16	4	Counterclockwise	Downward
4	16 to 24	5	Clockwise	Upward

NOTE:  
 All frequencies within the range of cycle 1 (0 to 4 megacycles) are tuned by operation of the TUNING control. The downward movement of the r-f tuning core elevator is only a mechanical action, as the r-f coils are switched out of the circuit during cycle 1. The BANDSWITCH functions of r-f and variable i-f switching and operation of the frequency indicator are still employed.