

★

AN 08-30ARC3-2

HANDBOOK OF
OPERATING INSTRUCTIONS

for

RADIO SET
AN/ARC-3

RESTRICTED
(For Official Use Only)

★

Approved 20 DECEMBER 1944

**RESTRICTED
AN 08-30ARC3-2**

Published under joint authority of the United States War and Navy
Departments and the Air Council of the United Kingdom.

SECURITY NOTICE

FOR U. S. PERSONNEL: This document contains information affecting the national defense of the United States within the meaning of the Espionage Act, 50 U.S.C., 31 and 32, as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law. (AR 380-5) (ARTS 75½ & 76, U.S.N. REGS-1920.)

The information contained in restricted documents and the essential characteristics of restricted material will not be communicated to the public or to the press, but may be given

to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work.

FOR BRITISH PERSONNEL: For Official Use Only—Not to be communicated to anyone outside His Majesty's Service. Not to be published. The information given in this document is not to be communicated, either directly or indirectly, to the press or to any person not holding an official position in His Majesty's Service.

LIST OF REVISED PAGES ISSUED

NOTE: A heavy black vertical line, to the left of the text on revised pages, indicates the extent of the revision. This line is omitted where more than 50 percent of the page is revised.

ADDITIONAL COPIES OF THIS PUBLICATION MAY BE OBTAINED AS FOLLOWS:

AAF ACTIVITIES—Submit requisitions to the Commanding General, Fairfield Air Service Command, Patterson Field, Fairfield, Ohio, Attention: Publications Distribution Branch, in accordance with AAF Regulation No. 5-9. Also, for details of Technical Order distribution, see T. O. No. 00-25-3.
NAVY ACTIVITIES—Submit requests to the Chief, Bureau of Aeronautics, Navy Department, Washington, D. C.
BRITISH ACTIVITIES—Submit requirements on Form 294A, in duplicate, to the Air Publications and Forms Store, New College, Leadhall Lane, Harrogate, Yorkshire, England.

TABLE OF CONTENTS

<i>Section</i>	<i>Page</i>	<i>Section</i>	<i>Page</i>
Destruction of Abandoned Materiel in the Combat Zone.....	iii	III. OPERATION	16-17
Unsatisfactory Report	iii	1. Function	16
 		2. Starting and Stopping the Equipment.....	16
I. GENERAL DESCRIPTION	1-2	<i>a.</i> Starting the Equipment.....	16
1. General	1	<i>b.</i> Stopping the Equipment.....	16
2. Equipment Supplied	1	3. Operation	16
3. Equipment Required but Not Supplied.....	2	<i>a.</i> Warm-Up	16
 		<i>b.</i> Receiver Operation	16
II. INSTALLATION AND ADJUSTMENT....	2-16	<i>c.</i> Transmitter Operation	17
1. Installation	2	<i>d.</i> Changing Frequencies	17
<i>a.</i> General Installation	2	<i>e.</i> MCW Operation	17
<i>b.</i> Unpacking of Equipment.....	2	 	
<i>c.</i> Bench Test	2	IV. EMERGENCY OPERATION AND REPAIR, 17-20	
<i>d.</i> Installation Positions	4	1. Emergency Operation	17
<i>e.</i> Mounting	4	<i>a.</i> General	17
<i>f.</i> Cable Construction	6	<i>b.</i> Use of Alternate Channel.....	17
<i>g.</i> Interconnection of Units.....	11	2. Repair	17
<i>b.</i> Installation Inspection	12	<i>a.</i> Transmitter Trouble Chart.....	17
2. Adjustment	12	<i>b.</i> Receiver Trouble Chart.....	18
<i>a.</i> Selecting the Proper Crystals.....	12	<i>c.</i> Crystal Replacement	19
<i>b.</i> Setting Up Channels.....	14	<i>d.</i> Brush Replacement	19
<i>c.</i> Starting and Stopping the Equipment....	14	<i>e.</i> Tube Replacement	19
<i>d.</i> Operational Performance Test.....	15	<i>f.</i> Cleaning Relays	19
<i>e.</i> Setting the Squelch Control.....	16	<i>g.</i> Alignment Check of the Transmitter, After Replacing Vacuum Tube JAN-832A	19
		V. SUPPLEMENTARY DATA	20-31



LIST OF TABLES

<i>Table</i>	<i>Page</i>
I. Equipment Supplied	1
II. Equipment Required but Not Supplied.....	2
III. Transmitter Trouble Chart.....	18
IV. Receiver Trouble Chart.....	18
V. Crystal vs. Carrier Frequencies.....	20
VI. Transmitter Tube Connectors.....	23
VII. Receiver Tube Connections.....	23

LIST OF ILLUSTRATIONS

<i>Figure</i>	<i>Page</i>	<i>Figure</i>	<i>Page</i>
1. Radio Set AN/ARC-3, Equipment Supplied....	iv	13. Control Box-to-Power Junction Box, for Fighter Installations.....	10
2. Transmitter Mount MT-238/ARC-3.....	4	14. Power Junction Box to Circuit Breaker Cable...	11
3. Receiver Mount MT-237/ARC-3.....	5	15. Transmitter-to-Antenna and Transmitter- to-Receiver Cables	11
4. Power Junction Box J-68/ARC-3, Top View, with Dynamotor Unit DY-22/ARC-3 Removed	5	16. Transmitter T-67/ARC-3, with Crystal Compartment Door Open.....	12
5. Power Junction Box Mount MT-236/ARC-3...	6	17. Receiver R-77/ARC-3, with Crystal Compartment Door Open.....	13
6. Control Box Mount FT-240-A.....	6	18. Power Junction Box J-68/ARC-3.....	14
7. Transmitter-to-Power Junction Box, Low Impedance Systems.....	7	19. Control Box C-118/ARC-3.....	15
8. Transmitter-to-Power Junction Box, High Impedance System or Low Impedance Headset	7	20. Control Box C-118/ARC-3, Bottom View.....	15
9. Receiver-to-Power Junction Box, Low Impedance System	8	21. Radio Set AN/ARC-3, Cording Diagram.....	24
10. Receiver-to-Power Junction Box, High Impedance System	8	22. Transmitter T-67/ARC-3, Installation Diagram	25
11. Receiver-to-Power Junction Box-Cable Connections for Auxiliary Equipment.....	9	23. Receiver R-77/ARC-3, Installation Diagram....	26
12. Control Box-to-Power Junction Box, No Volume Control Used.....	10	24. Power Junction Box J-68/ARC-3, Installation Diagram	27
		25. Control Box C-118/ARC-3, Installation Diagram	28
		26. Power Junction Box J-68/ARC-3, Wiring Diagram	29
		27. Radio Set AN/ARC-3, Wiring Diagram	31

Destruction of Abandoned Materiel in the Combat Zone

In case it should become necessary to prevent the capture of this equipment and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED, OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:—

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper, or wood.
4. Grenades and shots from available arms.
5. Burying all debris or disposing of it in streams or other bodies of water, where possible and when time permits.

Procedure:—

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch- and instrument-boards.
3. Destroy all controls, switches, relays, connections, and meters.
4. Rip out all wiring and cut interconnections of electrical equipment. Smash gas, oil, and water-cooling systems in gas-engine generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving, or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.
8. Bury or scatter all debris.

DESTROY EVERYTHING!



Unsatisfactory Report

For U. S. Army Air Force Personnel:

In the event of malfunctioning, unsatisfactory design, or unsatisfactory installation of any of the component units of this equipment, or if the material contained in this book is considered inadequate or erroneous, an Unsatisfactory Report, AAF Form No. 54, or a report in similar form, shall be submitted in accordance with the provisions of Army Air Force Regulation No. 15-54, listing:

1. Station and organization.
2. Nameplate data (type number or complete nomenclature if nameplate is not attached to the equipment).
3. Date and nature of failure.
4. **Radio model and serial number.**
5. Remedy used or proposed to prevent recurrence.
6. Handbook errors or inadequacies, if applicable.

For U. S. Navy Personnel:

Report of failure of any part of this equipment during its guaranteed life shall be made on Form N. Aer. 4112, "Report of Unsatisfactory or Defective Material," or a report in similar form, and forwarded in accordance with the latest instructions of the Bureau of Aeronautics. In addition to other distribution required, one copy shall be furnished to the inspector of Naval Materiel (location to be specified) and the Bureau of Ships. Such reports of failure shall include:

1. Reporting activity.
2. Nameplate data.
3. Date placed in service.
4. Part which failed.
5. Nature and cause of failure.
6. Replacement needed (yes-no).
7. Remedy used or proposed to prevent recurrence.

For British Personnel:

Form 1022 procedure shall be used when reporting failure of radio equipment.

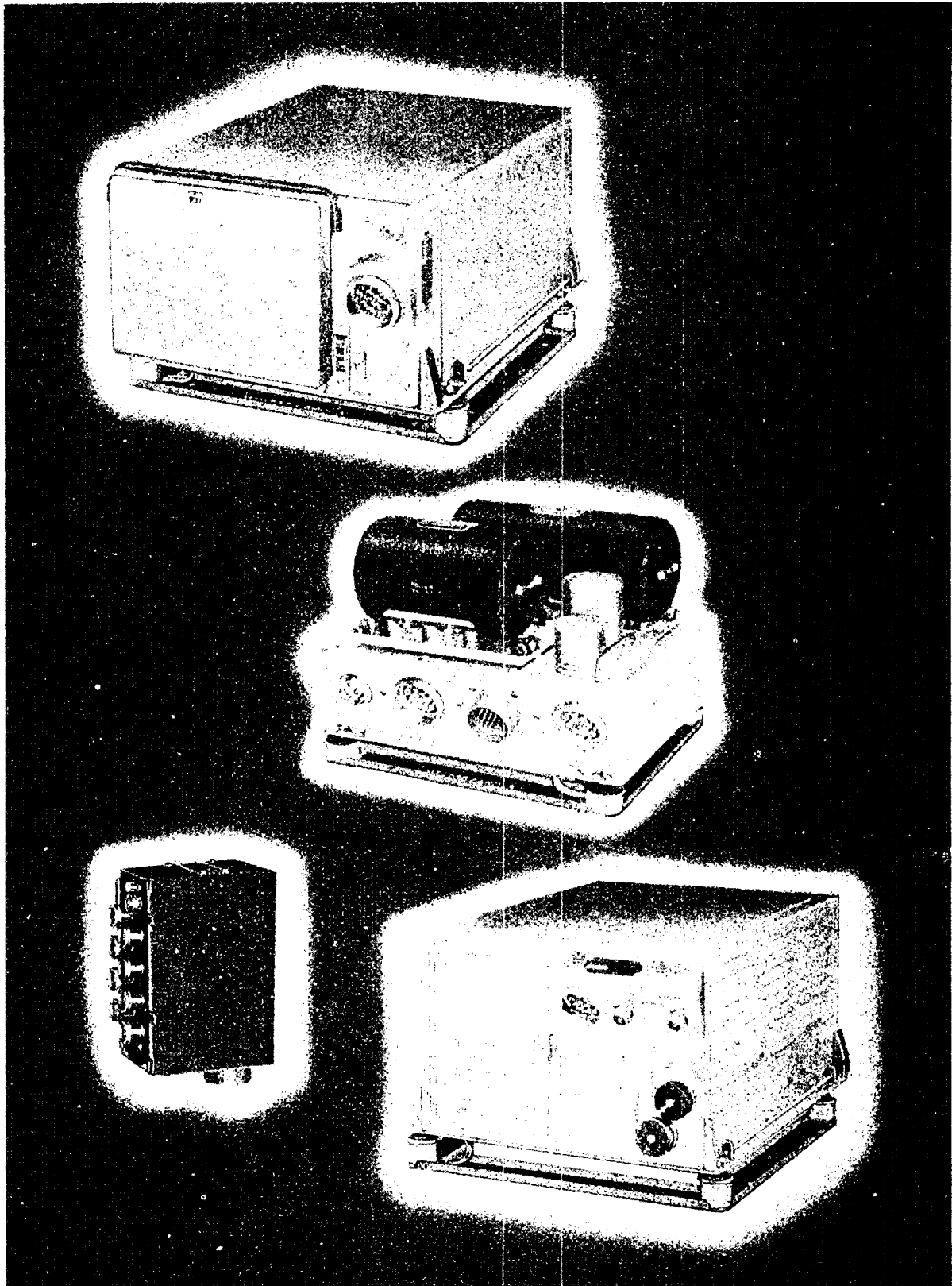


Figure 1. Radio Set AN/ARC-3—Equipment Supplied

SAFETY NOTICE

Operation of this equipment involves the use of high voltages which are dangerous to life. Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustments inside the equipment with high voltage supply on.

Do not depend upon door switches or interlocks for protection but always shut down motor generators or other equipment. Under certain conditions dangerous potentials may exist in circuits with power controls in the off-position due to charges retained by capacitors, etc.

To avoid casualties always discharge and ground circuits prior to touching them.

SECTION I

GENERAL DESCRIPTION

1. GENERAL.

a. Radio Set AN/ARC-3 is an airborne receiving and transmitting equipment designed to provide communication from plane to plane, or from plane to ground. (See Fig. 1.)

b. The equipment has a provision for remote operation on eight frequency channels, available to the operator by pushing any one of the eight channel-selector buttons located on the front panel of the control box. The transmitter is coordinated with the control box and the receiver in such a manner that they both operate on preset frequency channels in combination with other equipment, similarly preset.

c. The equipment operates over a "line of sight" distance range, on an all-frequency range of 100 to 156

megacycles and is provided with eight crystal-controlled channels for transmission and reception. It will work well at temperatures ranging from -55°C (-67°F) to $+50^{\circ}\text{C}$ ($+122^{\circ}\text{F}$) and can withstand long periods of high humidity.

d. The normal operating voltage is 28 volts direct current. However, the set will give emergency operation on voltages between 22 and 32 volts direct current. Approximately 6 amperes are drawn when receiving, 13.5 amperes when transmitting.

e. The power output of the transmitter is approximately 8 watts.

2. EQUIPMENT SUPPLIED.

The following table lists the equipment supplied:

TABLE I. EQUIPMENT SUPPLIED

Quantity	Name of Unit	AN Type Designation	Overall Dimensions	Weight Max. Lbs.	Numerical Series of Ref. Symbols
1	RADIO TRANSMITTER without mount, plugs or crystals, but including 1 set of vacuum tubes.	T-67/ARC-3	$7\frac{1}{2}$ " h x $12\frac{1}{8}$ " wd x $15\frac{1}{4}$ " lg	21.0	100-199
1	TRANSMITTER MOUNTING	MT-238/ARC-3	$15\frac{1}{16}$ " h x $12\frac{3}{4}$ " wd x $11\frac{13}{16}$ " lg	1.1	
1	RADIO RECEIVER without mount, plugs or crystals, but including 1 set of vacuum tubes	R-77/ARC-3	6" h x 11" wd x $14\frac{5}{16}$ " lg	20.5	201-399
1	Receiver Mounting	MT-237/ARC-3	$11\frac{1}{32}$ " h x $11\frac{5}{8}$ " wd x $10\frac{23}{32}$ " lg	1.1	
1	POWER JUNCTION BOX without mount, plugs or Dynamotors	J-68/ARC-3	$5\frac{3}{16}$ " h x $8\frac{3}{8}$ " wd x $10\frac{11}{32}$ " lg	6.7	401-499
1	Transmitter Dynamotor Unit	DY-21/ARC-3	4" h x $3\frac{7}{16}$ " wd x $7\frac{1}{2}$ " lg	8.4	
1	Receiver Dynamotor Unit	DY-22/ARC-3	4" h x $3\frac{7}{16}$ " wd x $7\frac{3}{16}$ " lg	4.8	
1	Power Junction Box Mounting	MT-236/ARC-3	$11\frac{1}{16}$ " h x $8\frac{7}{8}$ " wd x $10\frac{3}{16}$ " lg	0.8	
1	CONTROL BOX without mount or plugs	C-118/ARC-3	6" h x $2\frac{5}{8}$ " wd x $6\frac{7}{8}$ " lg	2.1	501-599
1	Control Box Mounting	FT-240-A	$\frac{5}{16}$ " thk x $5\frac{1}{2}$ " wd x $6\frac{3}{8}$ " lg	0.3	
1	HANDBOOK OF OPERATING INSTRUCTIONS			1.0	

3. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

The following table lists the equipment required but not supplied:

TABLE II. EQUIPMENT REQUIRED BUT NOT SUPPLIED

<i>Quantity</i>	<i>Name of Unit</i>	<i>Required Characteristics</i>
8	Crystals (Transmitters)	CR-1/AR, DC-11A, DC-16A or DC-26A, 5555.5 to 8666.6 Kc.
8	Crystals (Receiver)	CR-1/AR, DC-11A, DC-16A or DC-26A, 8000.0 to 8727.0 Kc.
1	Antenna	AN-104A or AN-104B
1	Microphone	T-17 or T-30-P
1 to 12	Head Sets	HS-23 or HS-33 or equivalents
2	Plugs	U-15/U (16 contact)
4	Plugs	PL-259 (For r-f cable RG-8/U)
1	Plug	PL-151-A (6 contact)
2	Plugs	PL-153A (18 contact)
1	Plug	PL-148A (3 contact)
2	Plugs	U-16/U (24 contact)
	RG-8/U Coaxial Cable	50 ohm
	Wire	AWG, No. 20
	Wire	AWG, No. 16
	Wire	AWG, No. 14
1	Phantom Transmitter Antenna TS-78/U	
1	Radio Test Set AN/ARM-1	

Note

Cable lengths may vary with each particular airplane installation. Usually all cable wiring will be installed at the airplane factory by the airplane contractor.

SECTION II**INSTALLATION AND ADJUSTMENT****1. INSTALLATION.**

a. GENERAL INSTALLATION.—Radio Equipment AN/ARC-3 is designed for maximum flexibility in various installations. Transmitter T-67/ARC-3 is mounted on a specially designed, shockproof Mounting MT-238/ARC-3, which is permanently attached to the aircraft structure at the time the equipment is first installed. Receiver R-77/ARC-3 is mounted on a similar Mounting MT-237/ARC-3. Power Junction Box J-68/ARC-3 is mounted on Mounting MT-236/ARC-3. Control Box C-118/ARC-3 is mounted on Mounting FT-240-A. All units are easily removed from their mountings for repair or adjustment.

b. UNPACKING OF EQUIPMENT.—Remove all the components of Radio Set AN/ARC-3 from their respective cartons. Check with table I, section I, to make certain that all the necessary units have been provided.

c. BENCH TEST.—Before installing the equipment in the plane, assemble all the units on the bench and interconnect as described in paragraph 1g, in this section. Connect the equipment to a 28-volt power source. Use cords which have been made up according to instructions given in paragraph 1f, (Figs. 7, 9, 12 and 14) in this section, and cords provided with Radio Test Set AN/ARN-1.

(1) RADIO TRANSMITTER T-67/ARC-3.

(a) Proceed to test the transmitter as outlined below.

Note

When the lid of the transmitter is removed, motor control switches S-102 must be depressed while selecting channels to insure proper operation.

1. Connect Phantom Transmitter Antenna TS-78/U to the receptacle marked "ANTENNA" on front of the transmitter.

2. Connect Microphone T-17 to the jack marked "MIC" on Control Box C-118/ARC-3.

3. Connect Test Unit TS-178/ARM-1 to the receptacle marked "PL-152" on the front of the transmitter. The cable between the junction box (dynamotor unit) and receiver is not needed for this test.

4. Insert crystal units of the following frequencies in Channels A, B and C. Other crystal units, preferably of the frequencies to be used in the aircraft, should be inserted in the other five channels.

Channel	Frequency
A	5555.5 Kc.
B	6944.0 Kc.
C	8458.0 Kc.

5. Depress channel "A" push button of Control Box C-118/ARC-3. If the tuning motor does not stop after one minute, turn the switch of Test Unit TS-178/ARM-1 to the "B" position. If no voltage is indicated, check the transmitter H. V. fuse on Power Junction Box J-68/ARC-3. If the motor stops but no power output is obtained, as shown in the lamps of Phantom Antenna TS-78/U, it will be necessary to check the crystal unit and vacuum tubes. All tubes except JAN-832-A may be replaced without realignment. Instructions for a check of the alignment after replacing a JAN-832-A tube are printed in the lid of the transmitter.

6. Check the modulation of the transmitter by noting an increase in the brightness of the lamps in the Phantom Antenna TS-78/U when the microphone is spoken into.

7. The readings as observed on Test Unit TS-178/ARM-1 should be within the following limits when the push-to-talk button is depressed.

Position	Limits
Osc.	More than 20
1	More than 25
2	More than 25
3	More than 25
4 Trans.	40 to 85

If the readings on Position 1, 2, 3 and 4 Trans. are not within these limits, a change of tubes or realignment is indicated. Check to see that the power source is between 27 and 29 volts before replacing tubes or attempting to realign the set. A reading of 54 to 58 on the A+ scale

of Test Unit TS-178/ARM-1 indicates a satisfactory voltage.

8. Check channels "B" and "C." Check the meter readings in the positions indicated preceding paragraph. Check for power output on the remaining five channels. The antenna loading is adjusted at the factory for an average value that will give the best results irrespective of the frequency used. This antenna loading adjustment should not be changed.

(b) Absence of power output on one or two channels is usually caused by defective crystal units or dirty relay contacts. The Phantom Antenna TS-78/U indicates only relative power output at a particular frequency. More or less light, as indicated by the lamps of this phantom antenna, on another frequency does not necessarily mean a change in power output.

(2) RADIO RECEIVER R-77/ARC-3.

(a) Proceed to test the receiver as outlined below.

Note

When the lid of the receiver is removed, switch S-203 must be depressed while selecting channels to secure proper operation. Hold switch until tuning motor stops running.

1. Connect Test Unit TS-178/ARM-1 to Socket PL-152 which is located under the cover on the right side of the receiver.

2. Insert crystal units and set the receiver thumb-wheels on the channels listed below.

Channel	Crystal Frequency	Thumb-Wheel
A	8727 Kc.	116.7
B	8000 Kc.	100.0
C	8100 Kc.	137.7
D	(See (8) page 4)	156.0

3. Set channels E, F, G and H on the frequencies that will be used in the aircraft.

4. Depress channel "A" pushbutton of Control Box C-118/ARC-3. If the motor does not stop in about one minute, turn the switch of Test Unit TS-178/ARM-1 to the "B" position. If no voltage is indicated, check the transmitter high voltage fuse on Power Junction Box J-68/ARC-3. The frequency indicating dial at the extreme right of the receiver should stop at 116.7 megacycles plus or minus 1 percent. If the word "end" appears, push button "B" and immediately repush button "A." Switch S-203 must be depressed during shifting operations. If the word "end" appears this time, the crystal unit and tubes should be checked. It is not necessary to make any alignment adjustments after replacing any of the receiver tubes.

5. The meter reading in switch position "1" of Test Unit TS-178/ARM-1 on channel "A" should be between 40 and 60.

Section II
Paragraph 1

RESTRICTED
AN 08-30ARC3-2

6. Depress channel "B" pushbutton. Meter position "1" should read more than 8 and position "3" more than 25.

7. Depress channel "C" pushbutton. Meter position "1" should read more than 8 and position "2" more than 5.

8. Change the 8000 kilocycle crystal from channel "B" to channel "D." Depress channel "D" pushbutton. Meter position "3" should read more than 30.

9. Remove Test Unit TS-178/ARM-1 and replace the receiver cover. Check to see that the squelch is off.

10. Check the intermediate frequency and audio stages by listening in the phones for a hiss, which indicates that the receiver is operating. The antenna connection may be tapped gently with a metallic object. A click should be heard in the headset, indicating proper operation of the receiver.

11. Check the remaining four channels to see that the receiver tunes to the frequency determined by the crystal unit and the proper setting of the thumbwheel.

(b) If Signal Generator I-130A (part of Test Equipment IE-19A) is available, it can be used to compare a questionable receiver with one known to be in good operating condition. Crystal control of this signal generator using a transmitter crystal should be used. Entirely acceptable receivers may have a variation in sensitivity for a given frequency of 3 to 1, from receiver to receiver. This fact should be kept in mind to avoid rejecting usable receivers.

(c) When questionable, relay contacts should be burnished with the tool provided in Radio Test Set AN/ARM-1. Never burnish relay contacts with abrasive material such as a file.

WARNING

Always turn off all power before attempting to burnish relay contacts. The high voltage can cause serious injury to personnel.

See Table IV for emergency repair hints, including relays to be checked for various symptoms of improper operation.

(3) **POWER JUNCTION BOX J-68/ARC-3 (DYNAMOTOR UNITS DY-21/ARC-3 AND DY-22/ARC-3) AND CONTROL BOX C-118/ARC-3.**—Bench tests for the power junction box, dynamotors and control box may be adequately accomplished by substituting the proper items of Radio Test Set AN/ARM-1, one at a time, for those parts. Use a radio receiver and transmitter known to be in good operating condition. Check the hum level and continuity of all circuits using a headset and microphone. Maintenance work is limited to repair of obvious damage, check and readjustment of relay contacts.

(4) **CONTROL UNIT C-197/ARC-3.**—The bench test is unnecessary. If for any reason faulty operation is suspected, it may be checked using an ohmmeter with reference to the schematic diagram for this item.

(5) **ANTENNA MAST AN-104-B.**—The bench test is unnecessary. Continuity of the inner conductor on the antenna sheath may be checked with an ohmmeter.

d. INSTALLATION POSITIONS.

(1) Install the control box (See fig. 19) in the pilot's compartment, in a position where he can easily reach it from his usual operating position. For an aircraft with dual controls it should be installed between the pilots so that it will be easily accessible to both. (For mounting dimensions see fig. 25.)

(2) Install the transmitter (See fig. 16), receiver (See fig. 17) and power junction box (See fig. 18) in suitable positions in the airplane, allowing adequate clearance to easily permit their removal and replacement. Adequate clearance must also be allowed for the equipment's associated cords and plugs, for replacement of crystals and to permit a free movement on the shock absorber mountings. (For mounting dimensions see figs. 22 and 23.)

(3) Determine the exact locations of the forenamed units according to information furnished by the proper authorities.

(4) The units should be installed in a position approximately horizontal during the level flight of the aircraft.

(5) All units should be installed so that only minimum lengths of cording are required, to insure against excessive voltage drop.

e. MOUNTING.

Note

Check the name plates to make sure that the proper mounts are provided. These mounts are identical in dimensions and appearance to the mounts of Radio Set SCR-274. However, SCR-274 mounts do not have shock absorption qualities adequate to support the Transmitter T-67/ARC-3, Receiver R-77/ARC-3 and Power Junction Box J-68/ARC-3. If the correct mounts are not in place, they should be installed. No 10 screws should be used for all mountings on this equipment.

(1) **TRANSMITTER.**—Align the four holes in the base of Transmitter T-67/ARC-3, with the four studs on Mount MT-238/ARC-3. (See fig. 2.) Each side of the transmitter base contains two snap-slide fasteners

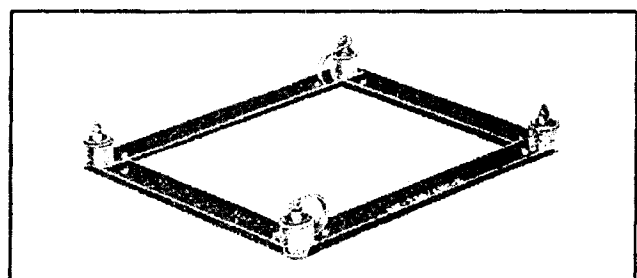


Figure 2. Transmitter Mount MT-238/ARC-3

which are connected by a rod and can be locked from either end. Lower the transmitter onto the mount and snap the snap slides.

(2) RECEIVER.—Align the four holes in the base of the Receiver R-77/ARC-3, with the four studs on Mount MT-237/ARC-3. (See fig. 3.) Each side of the Receiver base contains two snap-slide fasteners which are connected by a rod and can be locked from either end. Lower the Receiver onto the Mount and snap the snap slides.

(3) DYNAMOTORS.

(See fig. 4.)

(a) Transmitter Dynamotor DY-21/ARC-3 is mounted to Power Junction Box J-68/ARC-3 with one

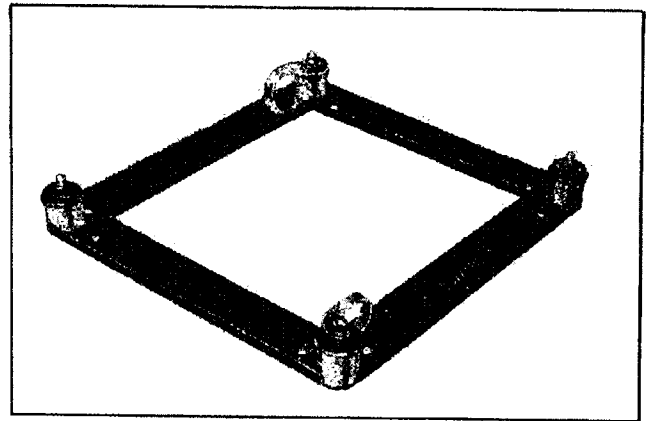


Figure 3. Receiver Mount MT-237/ARC-3

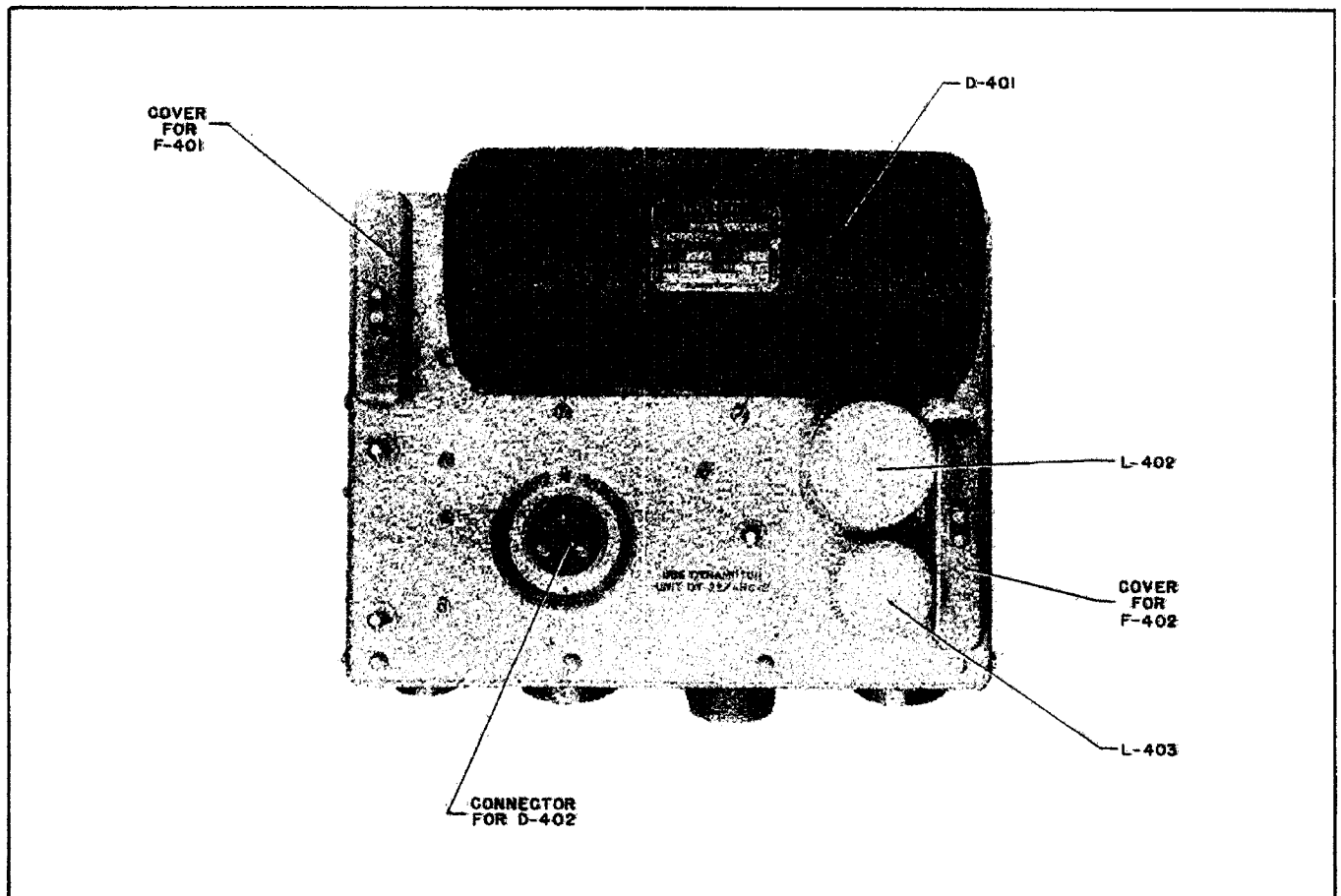


Figure 4. Power Junction Box J-68/ARC-3—Top View with Dynamotor Unit DY-22/ARC-3 Removed

plug and snap-slide fasteners. Two extra holes in the base of the dynamotor slip over guide pins on the box to prevent mounting in a reversed position. Align the four holes in its base with the four studs on the power junction box. This will align the pin plug. Lower the dynamotor over the four studs and snap the four snap-slide fasteners.

(b) Receiver Dynamotor DY-22/ARC-3 is mounted with one plug and three snap-slide fasteners.

Align the three holes in its base with the three studs on the power junction box. The plug will then be aligned. Lower the dynamotor onto the three studs and snap the three snap-slide fasteners.

(4) POWER JUNCTION BOX.—Power Junction Box J-68/ARC-3 is mounted with four snap-slide fasteners. Align the four holes in the base of the power junction box with the four studs on the Mount MT-236/ARC-3. (See fig. 5.) Lower onto the mount and snap

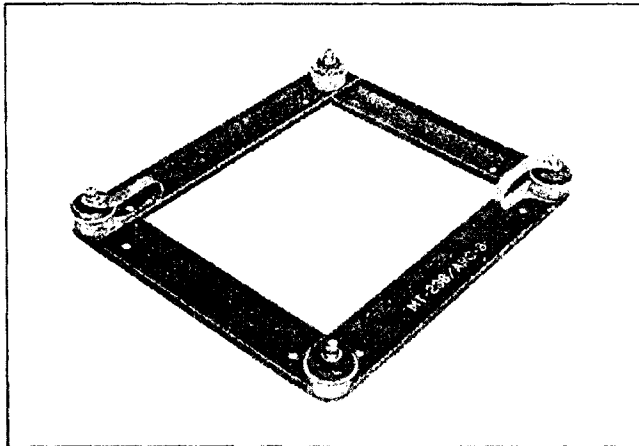


Figure 5. Power Junction Box Mount MT-236/ARC-3

the four snap-slide fasteners. (See fig. 25 for mounting dimensions.)

(5) CONTROL BOX.—Slide Control Box C-118/ARC-3 under the flange on one side of the Mount FT-240-A. (See fig. 6.) Align the two holes in the

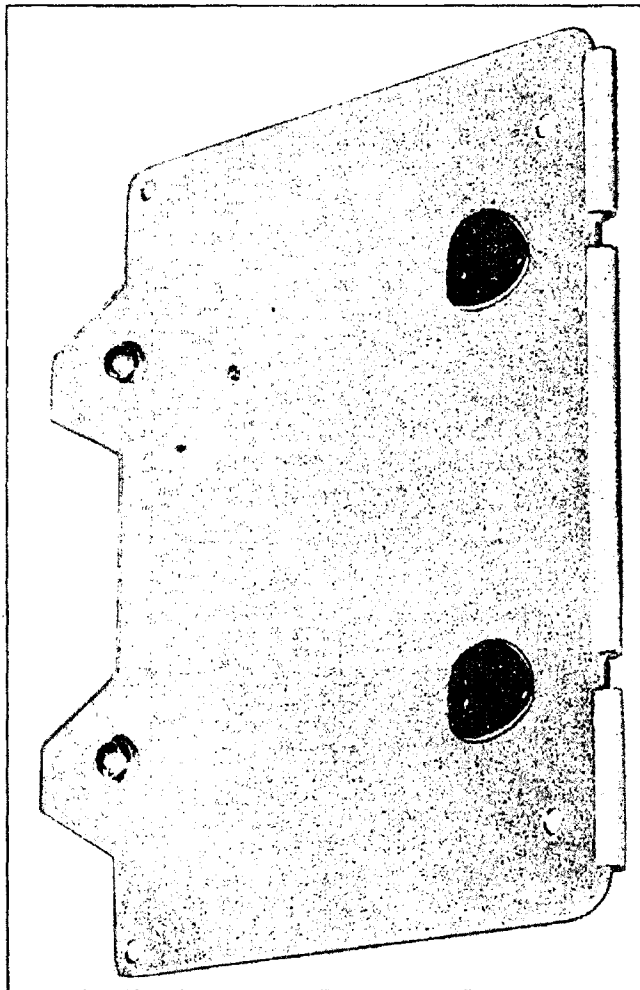


Figure 6. Control Box Mount FT-240-A

bracket, on the edge of the control box, with the two studs at the rear of the mount. Push into position and snap the snap-slide fasteners. It may be necessary to change the bracket, containing the snap-slides, to the opposite edge of the control box, due to the position of the mount. Three extra screw holes are provided in the control box for this purpose. (See fig. 25 for mounting dimensions.)

f. CABLE CONSTRUCTION.

(1) Many wires used in the cables are alike, so make certain that each wire connects the correct pins in both plugs. All connections must be electrically tested for correct continuity. Study the requirements of the installation with regard to the type of headsets and auxiliary equipment to be used. The construction and lengths of the cables vary according to these requirements.

CAUTION

Clean connections thoroughly before soldering. Do not allow excess solder to run into the small sockets. Test the strength of the connections by means of a vigorous straight pull on each wire. Care must be taken not to burn the bakelite portions of the plugs or the insulation on the wires.

(2) TOOLS REQUIRED.—Tools required for making the cables include: (a) long-nosed pliers; (b) Phillips screw driver No. 2; (c) small soldering iron; (d) $1\frac{1}{16}$ inch spanner wrench; and (e) solder.

(3) TRANSMITTER-TO-POWER JUNCTION BOX CABLE.—This cable consists of 15 wires. Each end terminates in Plug U-15/U (16 pin). To disassemble this plug, remove the setscrew with a Phillips screw driver and take the plug body out of the shell. The wiring connections vary according to the requirements of the installation, as follows:

(a) FOR LOW IMPEDANCE SYSTEMS.—Connect each of the pins in one plug with the pin of a similar number in the other plug, except that no connection should be made to pin 15 in either plug. Use No. 20 gauge stranded wire on all connections except pins 5 and 13 which require No. 16 gauge wire. (See fig. 7.) For single-place aircraft where more audio power is required, a single low impedance headset may be used on the high impedance tap.

(b) FOR HIGH IMPEDANCE SYSTEMS.—The sequence of the wires is identical with the above, except that pin 14 on the power junction box plug is wired to pin 15 on the transmitter plug with No. 20 gauge stranded wire. (See fig. 8.) Place a spot of paint, or a mark of some kind, on the power junction box plug to identify it when interconnecting the units. To assemble cable, thread the wires through the properly numbered holes in the base of the shell. Solder each wire end to its numbered receptacle cup in the plug body. Slip the shell over the plug body, aligning the tapped hole in the body with the hole in the shell, and replace the setscrew.

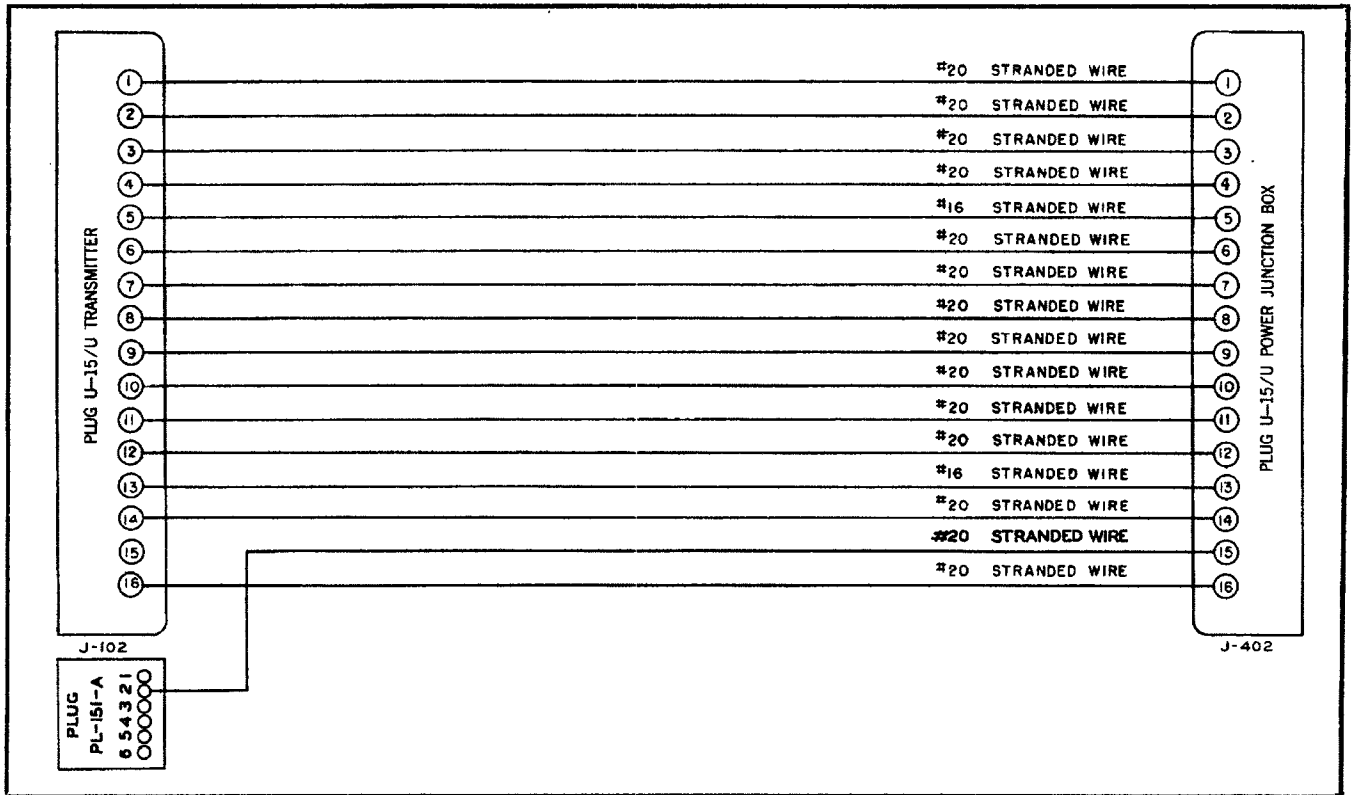


Figure 7. Transmitter-to-Power Junction Box—Low Impedance Systems

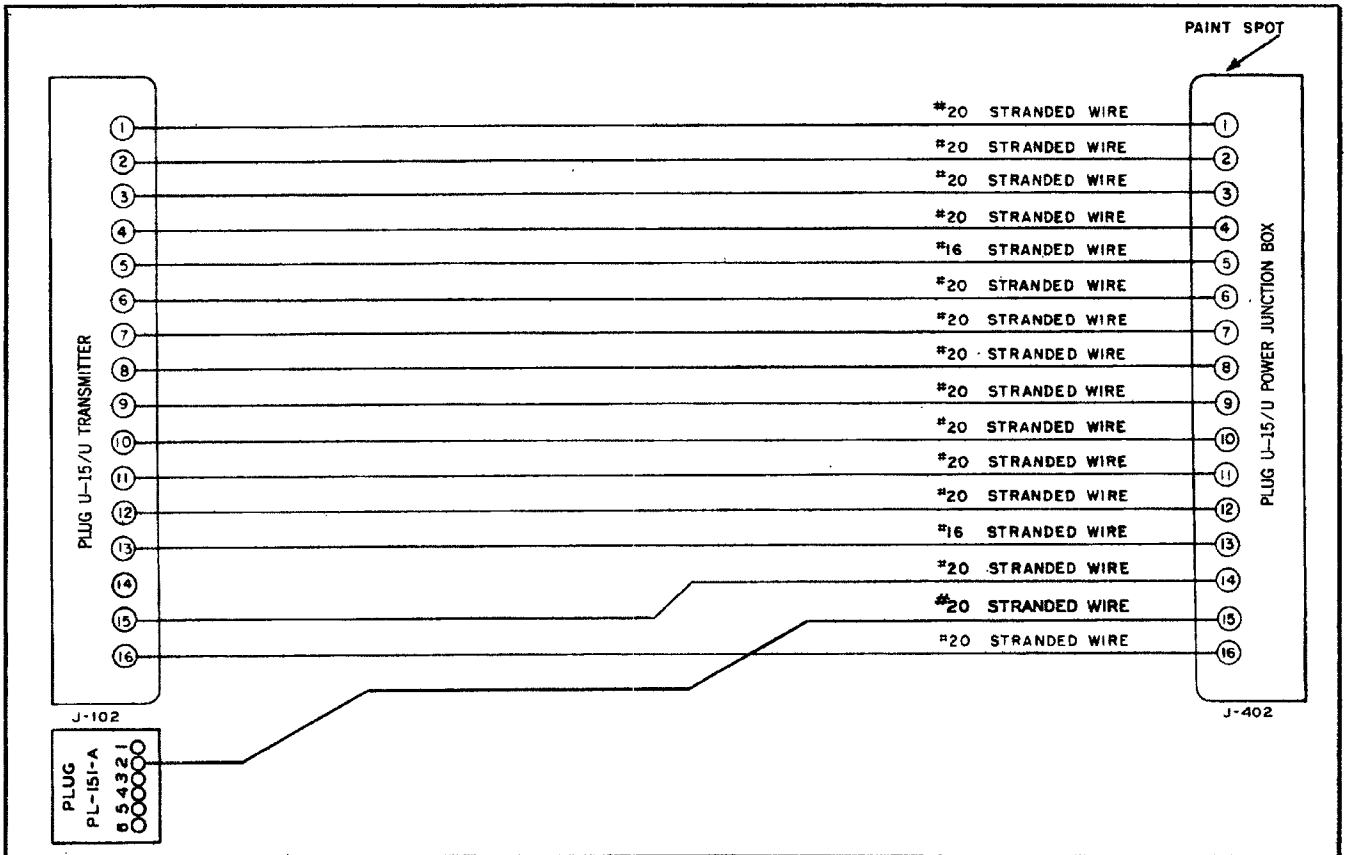


Figure 8. Transmitter-to-Power Junction Box—High Impedance System or Low Impedance Headset

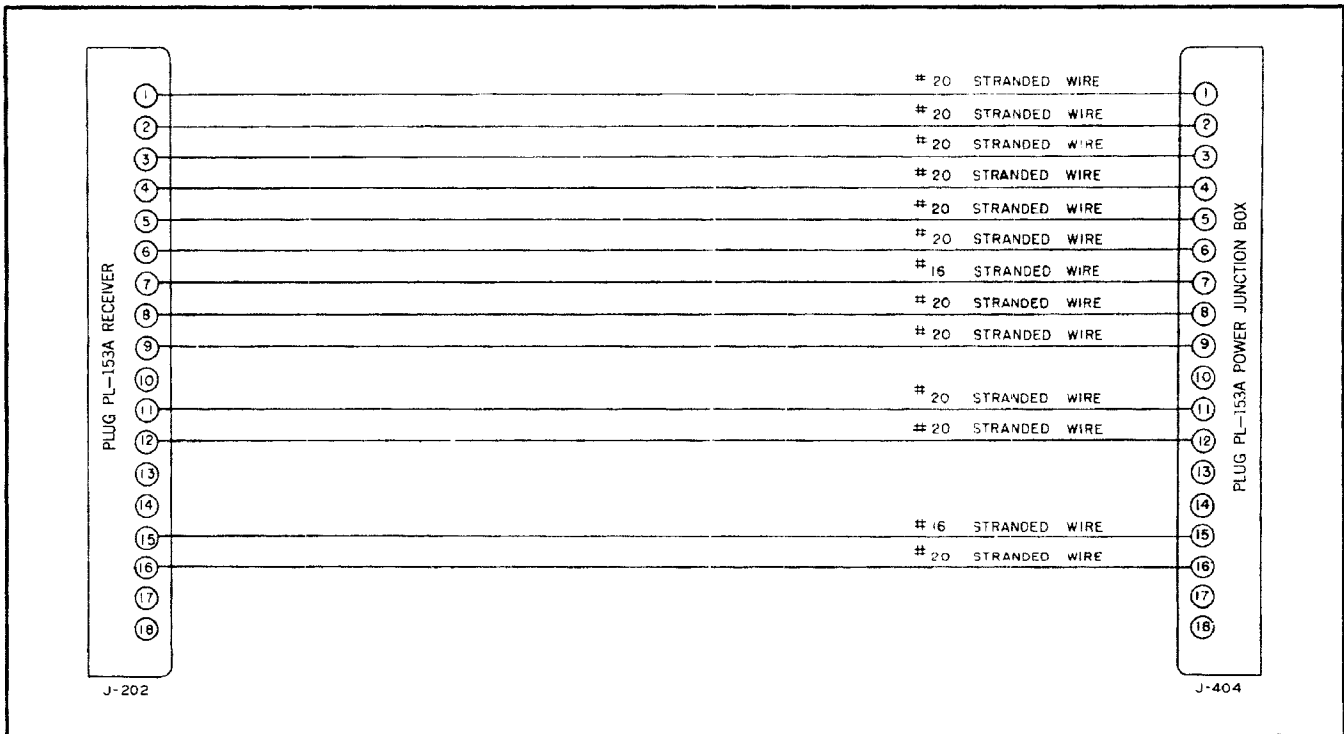


Figure 9. Receiver-to-Power Junction Box—Low Impedance System

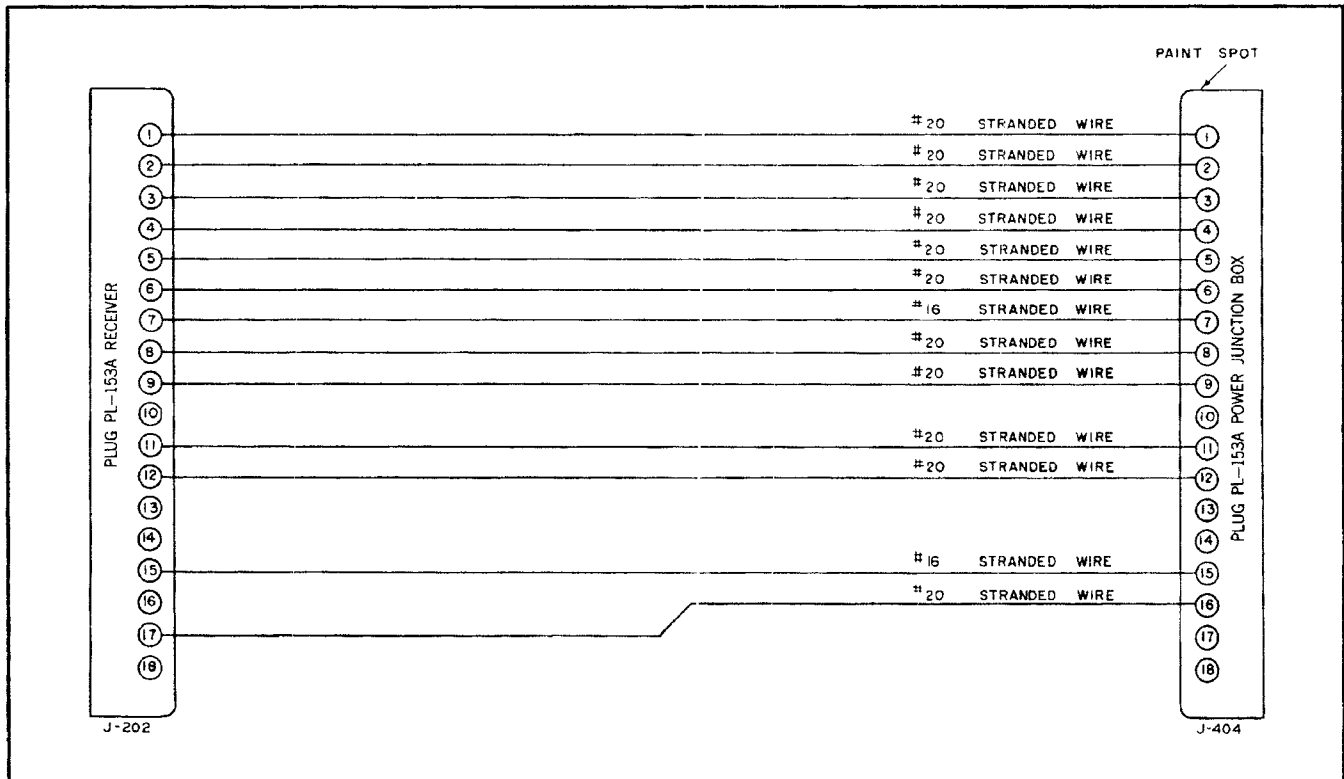


Figure 10. Receiver-to-Power Junction Box—High Impedance System

(4) RECEIVER-TO-POWER JUNCTION BOX CABLE.—This cable consists of 13 to 23 wires, depending on the installation. Each end terminates in Plug PL-153A (18-pin). To disassemble this plug, remove the setscrew with a Phillips screw driver and take the plug body out of the shell. Be careful that the fiber ring inside the shell is not lost. The wiring connections vary according to the requirements of the installation as follows:

(a) FOR LOW IMPEDANCE SYSTEMS.—Connect each of the pins in one plug with the pin of similar number in the other plug. No connection should be made to pins 10, 13, 14, 17 and 18 on either plug. Use No. 20 gauge stranded wire on all connections except pin 7 and 15. These require No. 16 gauge stranded wire. (See fig. 9.) For single-place aircraft where more audio power is required, a single low impedance headset may be used on the high impedance tap.

(b) FOR HIGH IMPEDANCE SYSTEM.—The sequence of the wires is identical with that of the low impedance systems, except that pin 16 on the power junction box plug is wired to pin 17 on the receiver

plug. (See fig. 10.) Place a spot of paint, or a mark of some kind on the Power Junction Box plug to identify it when interconnecting the units.

(c) FOR PARALLEL OPERATION OF MEDIUM FREQUENCY RECEIVER.—If it is necessary to feed the output of the receiver and the output of a medium frequency receiver or the SCR-274 series into the headsets simultaneously, connect a 20-gauge stranded wire to pin 14 on the receiver plug. This may be done on either of the above cables as the requirements indicate. (See fig. 11.) This wire should be brought out of the cable and connected to the audio output of the m-f receiver. A spot of paint, or similar mark, on the Power Junction Box plug will identify it when interconnecting the units.

(d) FOR INTERPHONE SYSTEM CONNECTIONS.—If the equipment is to be operated from interphone positions, wire should be connected to pins 10, 13, 14 and 17 of the power junction box plug on any one of the above cables. (See fig. 11.) Use No. 20 gauge stranded wire on all connections. These wires should

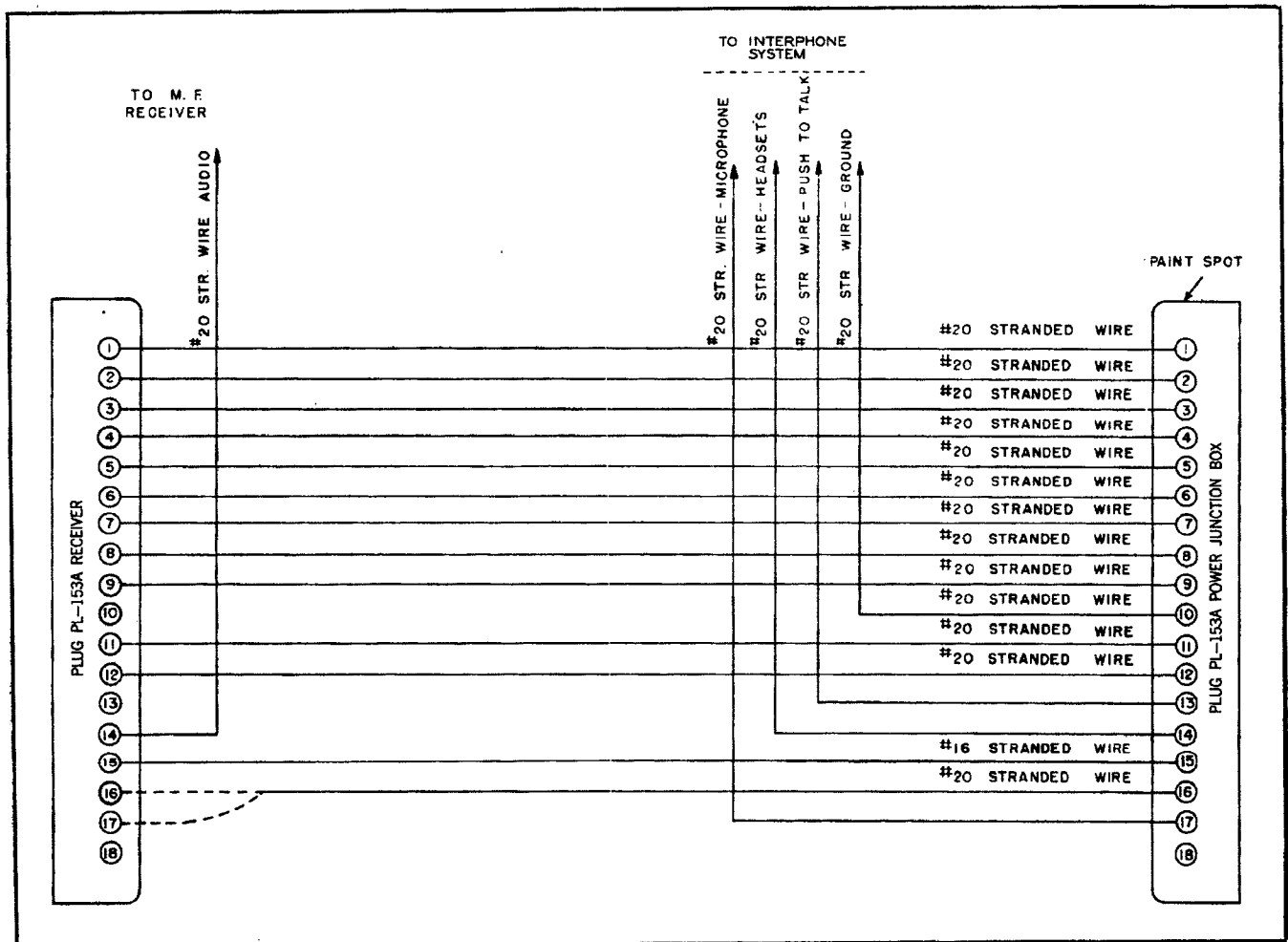


Figure 11. Receiver-to-Power Junction Box—Cable Connections For Auxillary Equipment

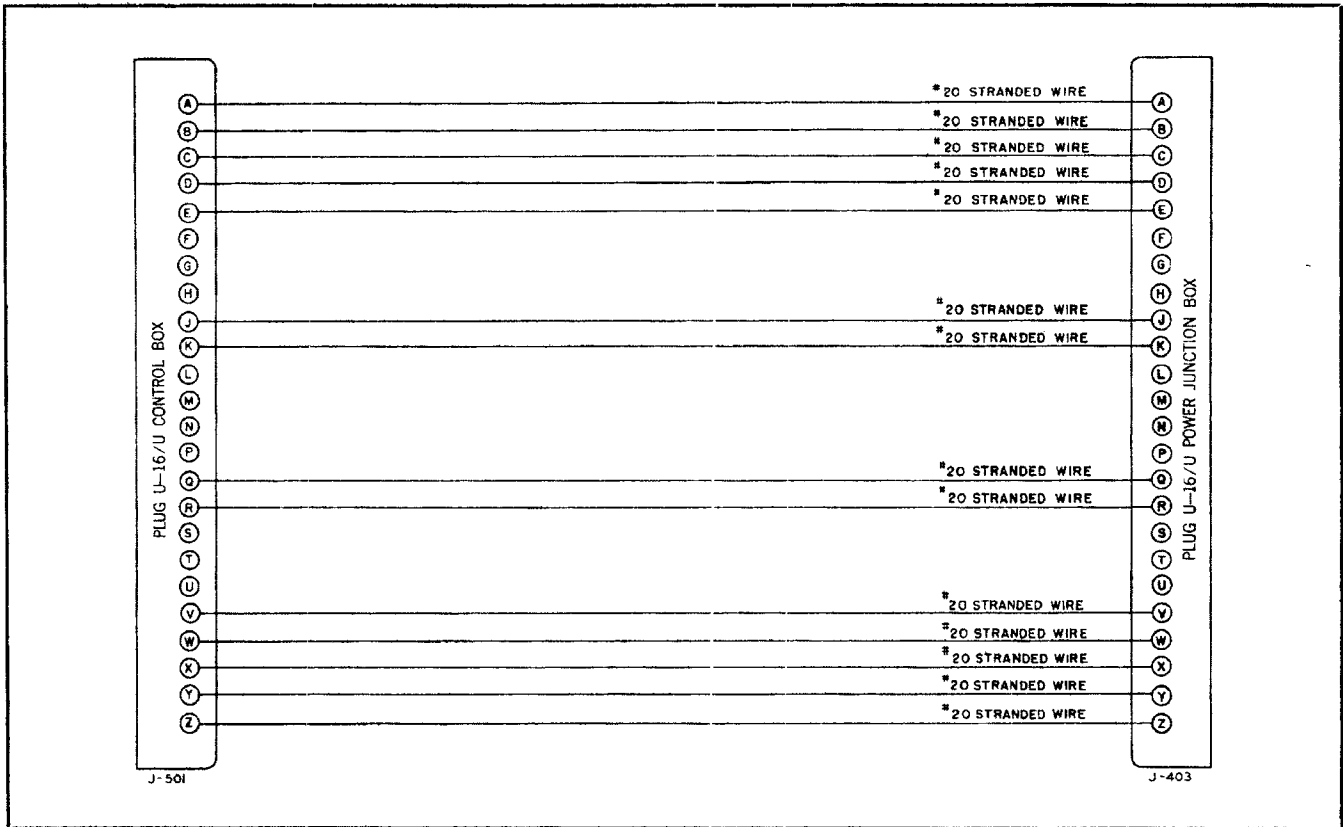


Figure 12. Control Box-to-Power Junction Box—No Volume Control Used

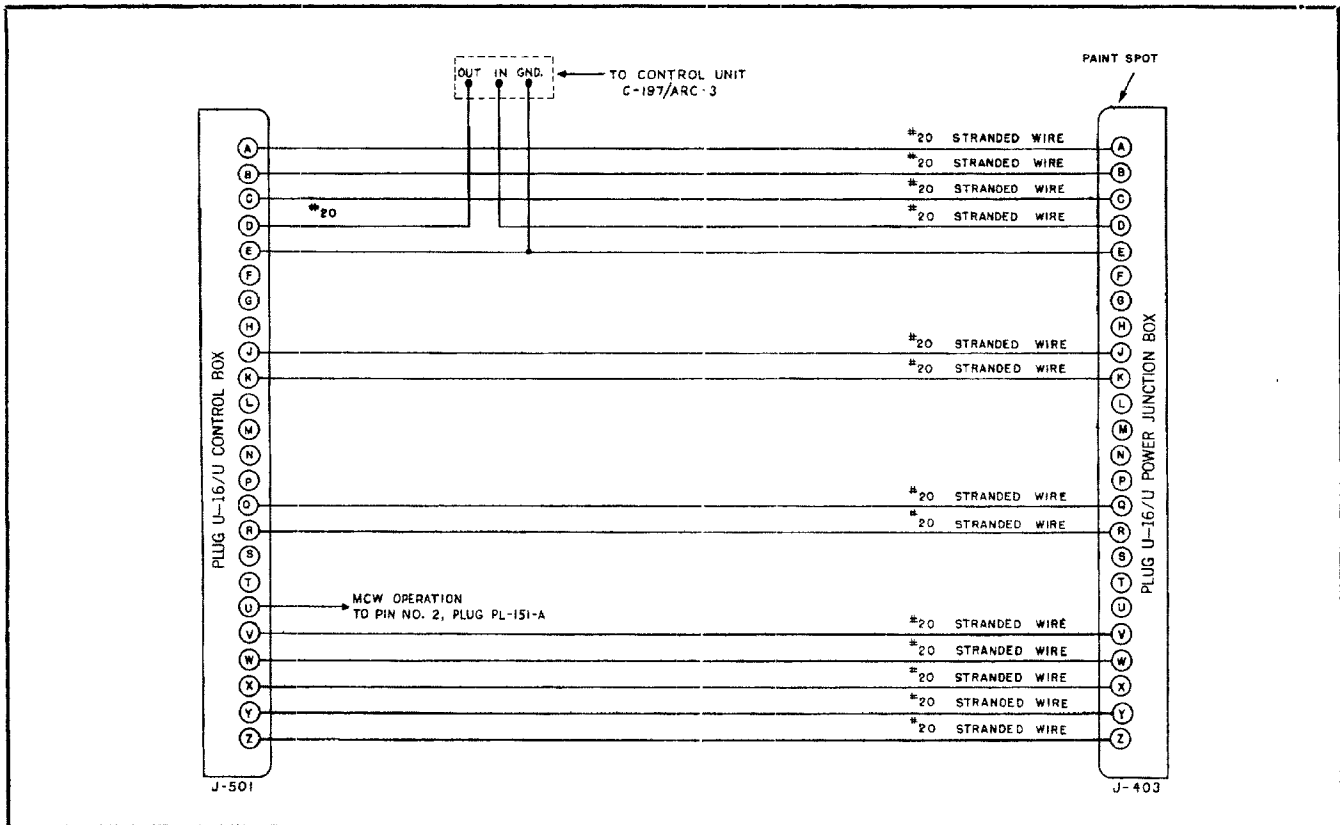


Figure 13. Control Box-to-Power Junction Box Cable—For Fighter Installations

be long enough to come out of the cable and attach to the interphone system. The connections are as follows:

- Pin 10..... Ground
- Pin 13..... Push-to-Talk
- Pin 14..... Headsets
- Pin 17..... Microphones

Place a spot of paint on the power junction box plug to identify it when interconnecting the units.

(5) CONTROL BOX TO POWER JUNCTION BOX CABLE.—This cable consists of 14 to 16 wires, depending on installation. Each end terminates in Plug U-16/U (24-pin). To disassemble this plug, insert it in its proper receptacle or hold it firmly with a suitable tool. Using a large spanner wrench, unscrew the slotted inner shell at the base of the plug by turning it counter-clockwise. This permits the bakelite insulator to be easily removed. Unscrew the knurled ring and remove the plug from the receptacle. Continue to unscrew the knurled ring until it is separated from the plug body. The wiring connections vary according to the requirements of the installation, as follows:

(a) FOR OPERATION WITHOUT VOLUME CONTROL.—Connect each of the pins in the plug with the pins of a similar switch letter in the other plug. No connection should be made to pins F, G, H, L, M, N, P, S, or T. (See fig. 12.) Use 20-gauge stranded wire on all connections.

(b) FOR OPERATION WITH VOLUME CONTROL.—For operation with Control Unit C-197/ARC-3 the sequence of wires is identical with the above except that wire D is broken so as to include the control unit and a wire is extended from the ground lug on the control unit to wire E. It should be noted that Control Unit C-197/ARC-3 is only used in fighter installations as the interphone boxes provide audio attenuation in bombardment aircraft.

(6) POWER JUNCTION BOX-TO-CIRCUIT BREAKER CABLE.—This cable consists of two 14-gauge stranded wires. One end of the cable terminates in Plug PL-148A (3-pin). The other end should be fastened to circuit breaker provided for this set. (See fig. 14.)

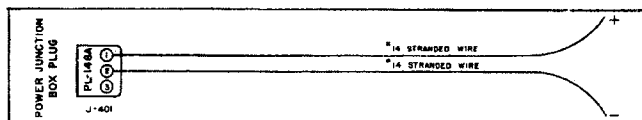


Figure 14. Power Junction Box-to-Circuit Breaker Cable

To disassemble this plug, remove the setscrew with a Phillips screw driver and take the plug body out of the shell. Be careful that the fiber ring inside the shell is not lost. The two wires are fastened to pins 1 and 2. This cable should be as short as possible since it carries the A current for the entire equipment. To assemble cable, thread the wires through the proper, numbered holes in the base of the shell. Solder each wire end to its numbered receptacle cup in the plug body. Slip the

shell over the plug body, aligning the tapped hole in the body with the hole in the shell, and replace the setscrew.

(7) TRANSMITTER-TO-ANTENNA CABLE.—This cable is made up of a suitable length of 50-ohm, coaxial cable RG-8/U. Each end of this cable terminates in Plug PL-259. (See fig. 15.) To disassemble this

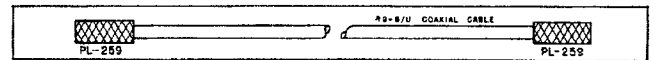


Figure 15. Transmitter-to-Antenna & Transmitter-to-Receiver Cables

plug, unscrew the outer shell by turning it counter-clockwise. To assemble the cable, slide the outer shell onto the cable. Cut back the outer Vinylite covering $1\frac{7}{16}$ inches. The shielding and insulation should be cut back $1\frac{1}{16}$ of an inch. Insert the cable into the plug body far enough that the shielding may be seen through the four soldering holes, with the single wire of the cable extending through the hollow pin. Solder the wire firmly to the end of the pin and solder the braid to the shell, through the four soldering holes. Slide the outer shell back over the plug body and tighten securely.

(8) TRANSMITTER-TO-RECEIVER CABLE.—This cable is assembled in exactly the same manner as the Transmitter-to-Antenna cable described above. The only difference is in the length of cable required. (See fig. 15.) If MCW operation is required, an additional wire is necessary. A No. 20 gauge stranded wire should be run from pin 2 of Plug PL-151-A to pin 15 of Plug J-402. MCW transmission is then provided by pressing the button marked "TONE" on Control Box C-118/ARC-3.

g. INTERCONNECTION OF UNITS.

(See figure 21.)

(1) Connect the Transmitter-to-Antenna cable (refer to par. 1f(7) in this section) from the socket at the base of the antenna mast to the receptacle marked "ANTENNA" on the front panel of the transmitter.

(2) Connect the Transmitter-to-Receiver cable (refer to par. 1f(8) in this section) from the socket marked "RECEIVER" on the transmitter to the socket marked "PL-259" on the receiver.

(3) Connect the Receiver-to-Power junction box cable (refer to par. 1f(4) in this section) from the socket marked "PL-153A" on the receiver to the socket marked "PL-153A" on the power junction box. If special cable for auxiliary equipment is used, be careful to insert the end with the identification mark in the power junction box socket.

(a) To make connections to auxiliary equipment, refer to par. 1f(4)(c), (4)(e) and (5)(c), in this section.

(b) When an auxiliary m-f receiver is used (refer to par. 1f(4)(c) in this section), it should be wired for high impedance headsets.

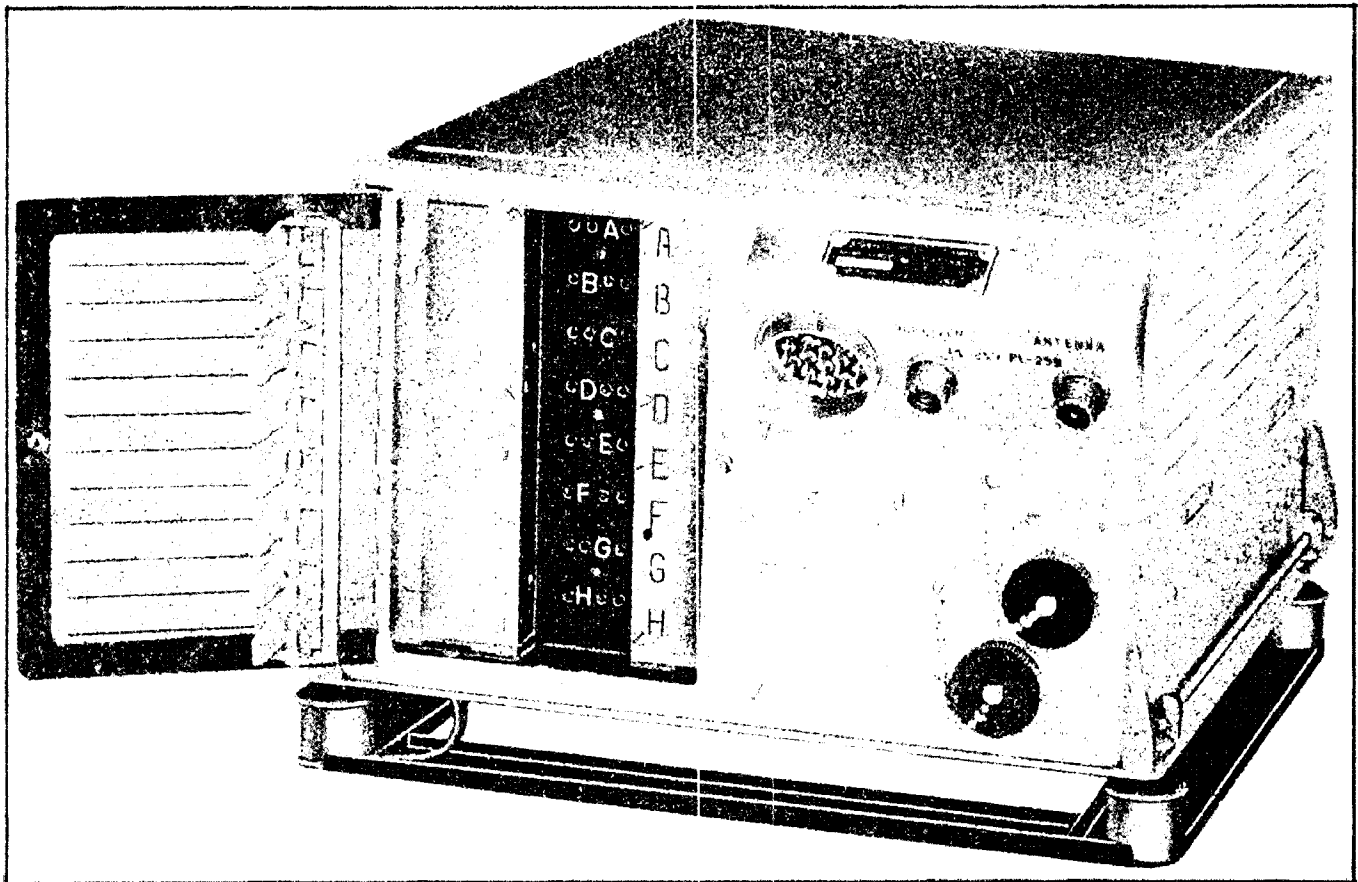


Figure 16. Transmitter T-67/ARC-3—with Crystal Compartment Door Open

(4) Connect the Control Box-to-Junction Box cable (refer to par. 1f(5) in this section) from the socket marked "U-16/U" on the Control Box to the socket marked "U-16/U" on the power junction box. If the special cable for Control Unit C-197/ARC-3 is used, be careful to insert the cord with the identification mark in the power junction box socket.

(5) Connect the Transmitter-to-Power Junction Box cable (refer to par. 1g(3) in this section) from the socket marked "U-15/U" on the transmitter to the socket marked "U-15/U" on the power junction box. If cable for high impedance system is used, be careful to insert the end with the identification mark in the power junction box socket.

(6) If the equipment is to be wired for MCW operation, unscrew the black cover on the receptacle marked "PL-151A," on the front panel of the transmitter and plug in the MCW cable (refer to par. 1f(9) in this section).

(7) Make sure the "OFF" button on the Control Box is depressed. Connect the power junction box-to-circuit breaker cable (refer to par. 1f(6) in this section) to the socket marked "PL-148A," on the power junction box to the circuit breaker.

CAUTION

Pin 1 connects to the POSITIVE terminal.
Pin 2 connects to the NEGATIVE terminal (ground).

b. INSTALLATION INSPECTION.—Make an inspection of the entire equipment after installation.

- (1) Check the antenna connections.
- (2) Check all soldered connections in plugs for weak joints. Using the cabling diagrams (See figs. 7 through 15), check to see that wiring sequence is correct.
- (3) Be sure that the cable ends with the identifying marks are plugged into the power junction box.
- (4) Tighten knurled ring on plugs. Make certain that plugs are secure in their proper receptacles. (See cording diagram, fig. 21.)
- (5) Check the fuses in the power junction box.

2. ADJUSTMENT.

a. SELECTING THE PROPER CRYSTALS.

(1) TRANSMITTER.—To select the proper transmitter crystal for a particular channel, divide the desired operating frequency by 18 or refer to Table No. V, Section V. The crystal frequency, kc., is stamped on each crystal name plate.

$$fc = \frac{fo}{18}$$

where fc = crystal frequency and fo = desired operating frequency.

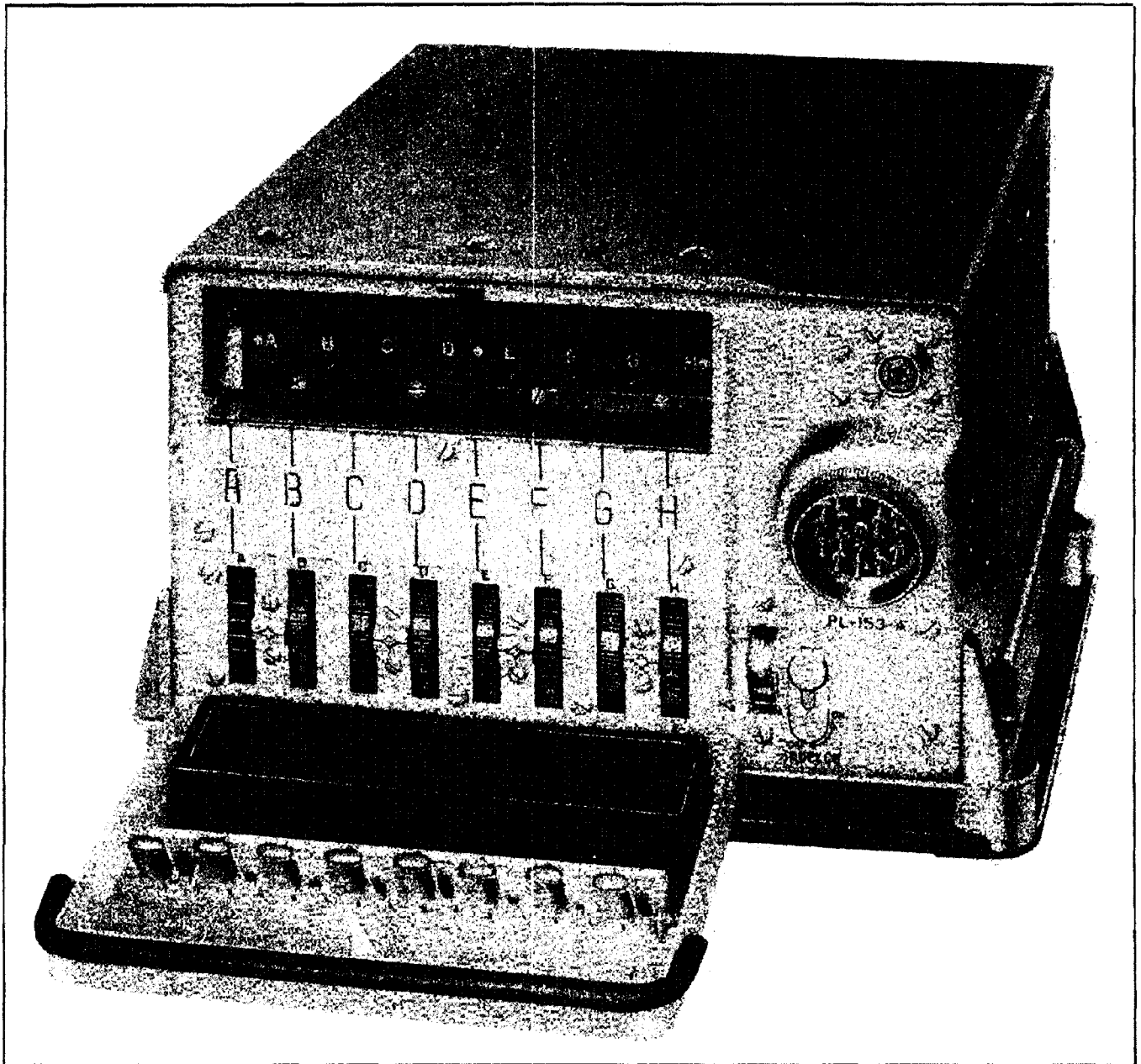


Figure 17. Receiver R-77/ARC-3—with Crystal Compartment Door Open

Note

To set up a 100-megacycle operating frequency

$$f_c = \frac{100}{18} = 5555.5 \text{ kc.}$$

Select crystal with 5555.555 kc. stamped on its name plate.

(2) RECEIVER.—The frequency of the correct receiver crystal to be used can be found in Table No. V, Section V, or in the following manner.

$$f_c = \frac{f_o - 12}{H}$$

where f_c —crystal frequency and f_o —frequency to which the receiver is to be tuned and H —harmonic.

The correct value of H will be indicated in the table following.

Frequency (f_o)	Receiver Crystal Harmonic (H)
100-108	11
108-116	12
116-124	13
124-132	14
132-140	15
140-148	16
148-156	17
156	18

No crystals below 8000.000 kc. or above 8727.000 should be used.

Note

To select proper crystal for a 100 megacycle channel

$$f_c = \frac{100 - 12}{11} = 8000.000 \text{ kc.}$$

Select crystal with 8000.000 kc stamped on its name plate.

b. SETTING UP CHANNELS.

(1) TRANSMITTER.

(a) Turn winged Dzus fastener and open the hinged crystal cover door, located at the left of the front panel. The eight crystal sockets are designated with letters from "A" to "H." (See fig. 16.) These sockets are designed to accommodate Crystal Units DC-11, DC-16, DC-26, or CR-1 crystals.

(b) Insert the selected crystals into the properly lettered sockets.

(c) Close and fasten the crystal compartment door, to hold the crystals firmly in place.

(d) No other adjustment is necessary.

(2) RECEIVER.

(a) Open the crystal compartment by pressing the release button at the top of the hinged crystal cover which is located on the front panel. The eight crystal

sockets are inside this compartment and are designated with letters from "A" to "H." (See fig. 17.) These sockets are designed to accommodate Crystal Units DC-11, DC-16, DC-26 or CR-1.

(b) Insert the selected crystals into the properly lettered sockets.

(c) Figure 17 also shows eight calibrated thumbwheels, also designated from "A" to "H," which are located directly beneath the eight crystal sockets. Set each thumbwheel to the designated operating frequency for that particular channel.

(d) Close the crystal compartment door, to hold the crystals firmly in place.

c. STARTING AND STOPPING THE EQUIPMENT.

(1) STARTING THE EQUIPMENT.—Push any one of the eight red channel-selector buttons designated from "A" to "H," located on the front panel of the Control Box. (See fig. 19.) This automatically releases the "OFF" button and applies power to the equipment.

(2) STOPPING THE EQUIPMENT.—Push the black "OFF" button and the small metal lock button *at the same time*. Both of these buttons are located on the front panel of the control box.

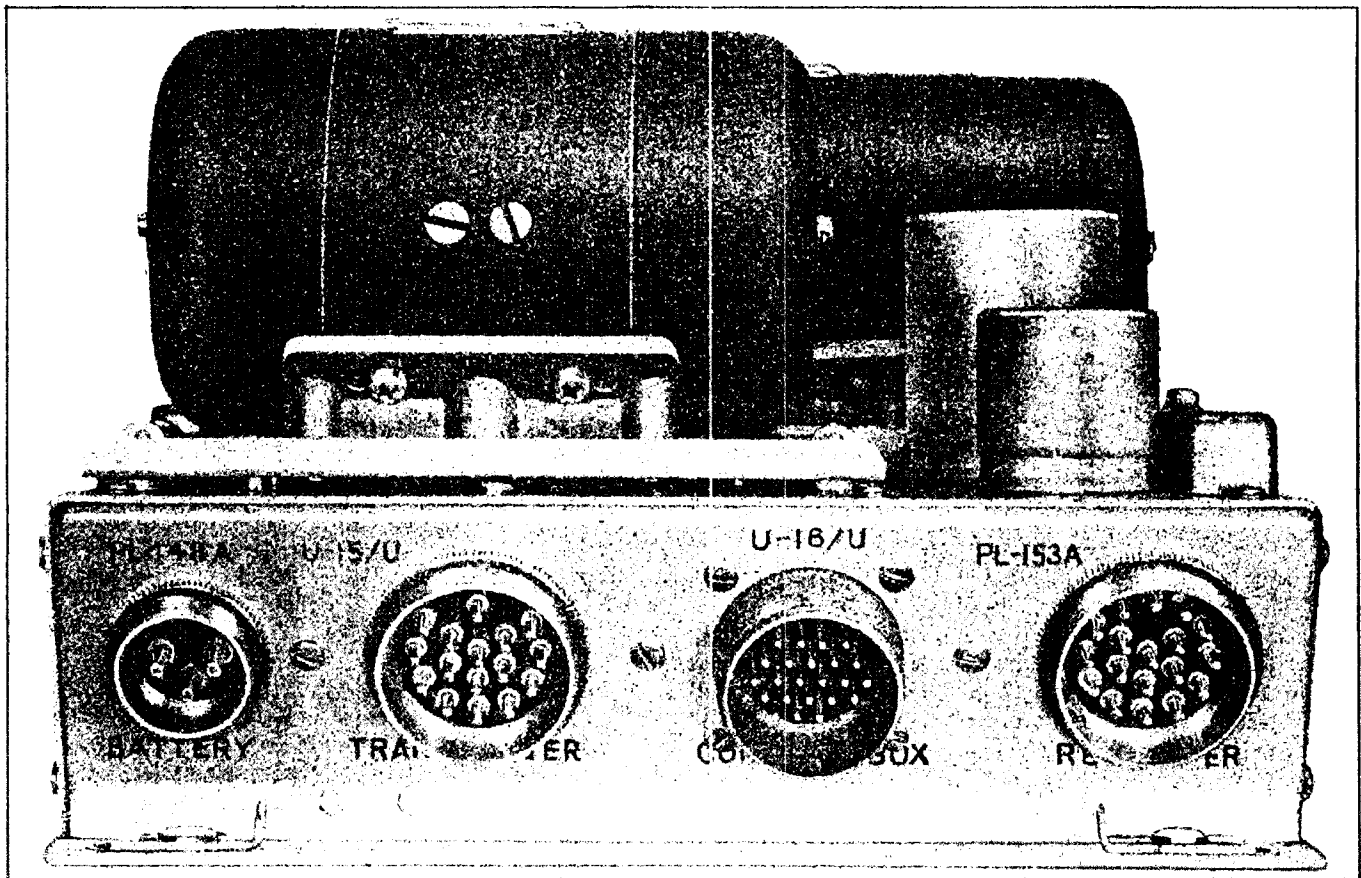


Figure 18. Power Junction Box J-68/ARC-3

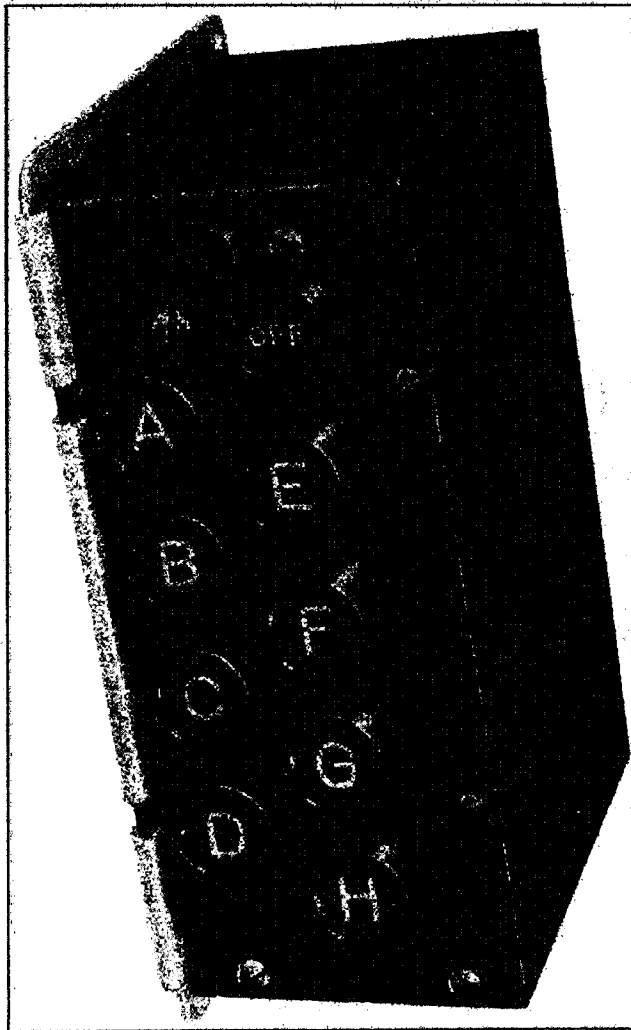


Figure 19. Control Box C-118/ARC-3

d. OPERATIONAL PERFORMANCE TEST.

(1) Plug the headsets into the jacks marked "TEL," on the bottom of the control box. Plug the microphone into the jack marked "MIC," also located on the bottom of the control box. (See fig. 20.)

(2) Start the equipment, as described above. Allow a warm-up period of approximately 30 seconds. During the last part of this period an audio tone will be heard in the headsets. When this tone stops, the Receiver and Transmitter have been tuned to the selected channel and the equipment is ready for operation.

(3) The dial, located behind a window on the front panel of the Receiver, indicates the frequency to which the Receiver has tuned. (See fig. 17.) This should be the operating frequency which has been set up for the selected channel, if the Receiver has tuned properly.

(4) Press the push-to-talk button and speak into the microphone. If the Transmitter is properly tuned, the sidetone will be heard in the headsets. However, lack of sidetone does not necessarily indicate a defect in the equipment, since no sidetone will be heard if

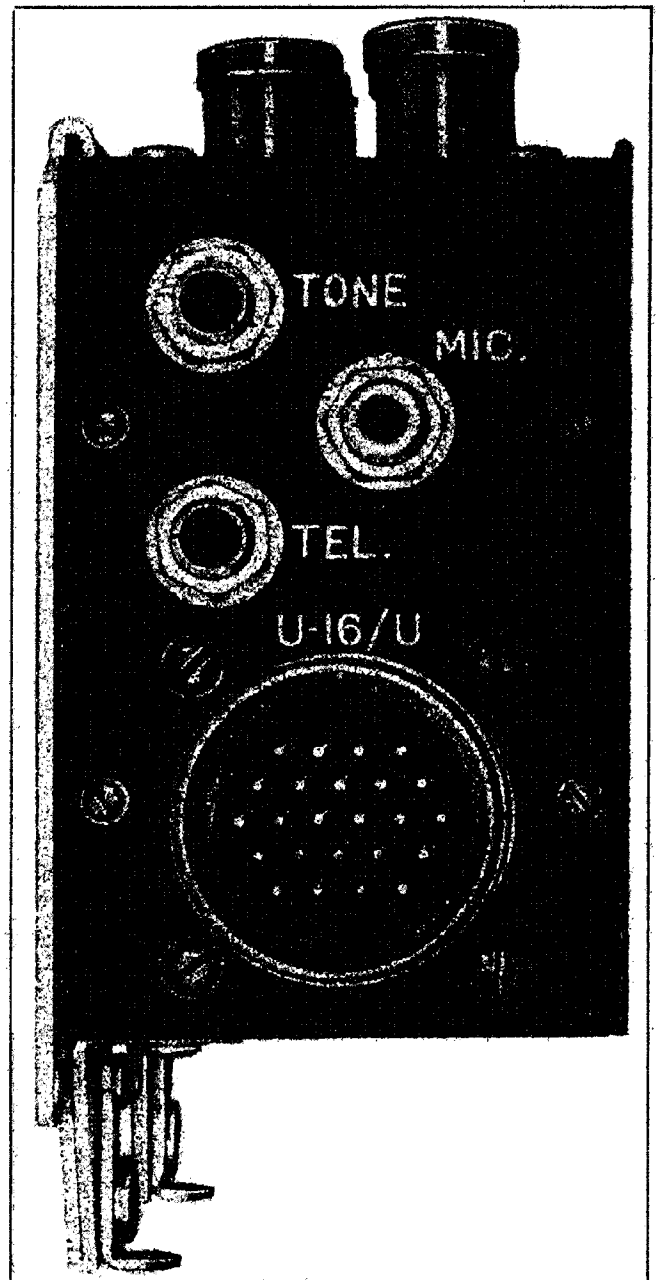


Figure 20. Control Box C-118/ARC-3
Bottom View

there is no crystal installed in the Transmitter channel selected.

Note

If either the Receiver or the Transmitter have tuned incorrectly, push any other channel-selector button, and then push the desired channel button again. Repeated mistuning indicates either a defective crystal, incorrect setting of the thumbwheel, or a defect in the equipment.

(5) Select each of the other set-up channels in turn and check the operation of each, as described in paragraph 2d(3) and 2d(4). The Transmitter and Receiver

will tune simultaneously. Approximately two seconds are required to change frequencies. An audio tone will be heard in the headsets while the equipment is tuning.

(6) The Receiver continuously monitors the channel indicated by the Control Box until the push-to-talk button is operated. Pushing this button is the only operation required to change from Receive to Transmit. This button operates a system of relays which perform the following functions:

(a) Starts the transmitter dynamotor, and applies B voltage to the Transmitter.

(b) Switches the antenna from the receiver input to the transmitter output circuit.

(c) Transfers the headsets from the Receiver output to the transmitter sidetone output, to monitor the transmitted message.

(7) If the installation includes provision for tone transmission, check the operation of the tone oscillator switch or whatever other device is provided to short

the wires of the tone oscillator cable. The shorting of these wires should automatically switch the equipment to the transmitting position and provide continuous tone modulation.

(8) If a volume control has been included in the installation, check its operation. The volume should noticeably increase in strength as the control is rotated clockwise.

e. SETTING THE SQUELCH CONTROL.

(1) Background noise in the Receiver may be reduced by the audio squelch, which is adjustable by a control located on the front of the Receiver under a sliding cover, marked "SQUELCH." (See fig. 17.) Counterclockwise rotation increases the squelch, so that a stronger signal is necessary for reception. *Set the control no farther counterclockwise than is necessary to reduce the noise interferences to a tolerable level, as the squelch also prevents weak signals from being received.*

SECTION III OPERATION

1. FUNCTION.

a. Radio Set AN/ARC-3 is an airborne receiving and transmitting equipment designed to provide communication from plane to plane, or from plane to ground.

b. The equipment has provision for remote operation on eight frequency channels, available to the operator by pushing any one of the eight channel-selector buttons located on the front panel of the Control Box. The transmitter is coordinated with the Control Box and the Receiver in such a manner that they both operate on preset frequency-channels in combination with other equipment, similarly preset.

c. The equipment operates over a "line of sight" distance range, on a frequency range of 100 to 156 megacycles and reception is practically free of natural disturbances such as static. Eight crystal-controlled channels are provided for transmission and reception.

d. Normal operation is by voice but provision may be made for a continuous tone transmission. C-W operation at a maximum of 15 words per minute may be obtained if desired.

2. STARTING AND STOPPING THE EQUIPMENT.

a. **STARTING THE EQUIPMENT.**—Push any one of the eight red channel-selector buttons designated "A" to "H," located on the front panel of the Control Box. (See fig. 19.) This automatically releases the "OFF" button and applies power to the equipment.

b. **STOPPING THE EQUIPMENT.**—Push the black "OFF" button and the small metal lock button at the same time. Both of these buttons are located on the front

panel of the Control Box. (See fig. 19.) The small interlocking black button is provided to prevent the equipment from being accidentally turned off.

3. OPERATION.

a. WARM-UP.

(1) Plug the headsets into the jack marked "TEL" and microphone into the jack marked "MIC" on the bottom of the Control Box. (See fig. 20.)

(2) Push any one of the eight red channel-selector buttons designated "A" to "H," located on the front panel of the Control Box. (See fig. 19.) Allow a warm-up period of approximately 30 seconds. Toward the end of this period an audio tone will be heard in the headsets. When this tone stops, the Receiver and the Transmitter have been tuned to the selected channel and reception should now be possible.

b. RECEIVER OPERATION.

(1) The Receiver will continuously monitor the channel indicated by the depressed button on the Control Box except during periods of transmission, which silence the Receiver.

(2) In fighter installations a volume control (Control Unit C-197/ARC-3) is provided to adjust the volume in the pilot's headset. In multiple installations, volume control is provided by the interphone volume control through which this equipment is wired.

(3) One to twelve headsets may be used with the equipment. No volume adjustment is necessary when the number of headsets is changed. The power output of the receiver is automatically increased as the output load is

increased, maintaining a constant audio level in each headset.

c. TRANSMITTER OPERATION.

(1) Press the push-to-talk button and speak into the microphone. If the Transmitter is properly tuned the sidetone will be heard in the headset. The push-to-talk button switches the equipment from the receive to the transmit position and also shifts the headsets to monitor the transmitted message.

(2) Lack of sidetone does not necessarily indicate a defect in the equipment. No sidetone will be heard if the Receiver is being used on a standby channel with no crystal installed in the corresponding Transmitter channel.

(3) The microphone circuit is automatically adjusted to compensate for the decrease in microphone voltage due to less dense air at higher altitudes, permitting the operator to use his normal tone of voice at all times.

Note

If either the Receiver or the Transmitter have

tuned incorrectly, push any other channel-selector button and then push the desired channel button again. Repeated mistuning indicates either a defective crystal or a defect in the equipment.

d. CHANGING FREQUENCIES.

(1) To change the frequency, push the button marked with a letter corresponding to the frequency desired. The Transmitter and Receiver will tune simultaneously.

(2) Approximately 2 seconds are required to change frequencies. An audio tone will be heard in the headsets while the equipment is tuning.

e. MCW OPERATION.

(1) Continuous tone modulation of the Transmitter may be obtained by depressing the button marked "TONE" on Control Box C-118/ARC-3.

(2) This operation automatically switches the equipment from the receive to the transmit position.

SECTION IV

EMERGENCY OPERATION AND REPAIR

1. EMERGENCY OPERATION.

a. GENERAL.—Trouble in many parts of the equipment will result in the set failing to tune properly when a channel is selected. Such mistuning may generally be recognized by lack of reception on the Receiver and by lack of sidetone on power output on the Transmitter. The small dial on the front panel of the Receiver indicates the frequency to which the Receiver has tuned. The small dial, located beneath the top cover of the Transmitter, indicates the frequency to which the Transmitter has tuned.

b. USE OF ALTERNATE CHANNEL.—Before attempting to make any repairs, in case of mistuning, first push any other channel button and immediately push the button again for the desired operating channel. If the equipment mistunes repeatedly, check the operation of the other seven channels. If any channel is found to be operative it may be used for more than one frequency by performing the following setup whenever it is desired to change.

(1) TRANSMITTER.—Move the crystal corresponding to the frequency desired, into the operative channel that has been found.

(2) RECEIVER.—Move the crystal for the frequency desired, into the same operative channel. Set the thumbwheel of this operative channel to the desired frequency.

(3) CHANNEL SELECTION.—If the operative channel button is depressed, push any other channel button and then push the operative channel button again

to make the equipment tune to the new frequency. If the operative channel becomes inoperative when the new frequency is set up, a defective crystal is indicated.

2. REPAIR.

If unsatisfactory operation of either the receiver or transmitter occurs, the defective unit should be replaced with a spare that is known to be in good operating condition, if one is available. If the good unit fails to operate properly, check the cables carefully for open or shorted leads. Use of the following trouble charts will aid in quickly locating defective components.

a. TRANSMITTER TROUBLE CHART.—Check position at which the tuning system stops if transmission is not available on any selected channel. An audio tone is usually heard in the headsets when the motor is running on the Transmitter. If the motor stops at the cam position on the high frequency end of the band, no sidetone will be heard in the headsets when an attempt is made to operate the Transmitter. A small dial located inside the top cover on the variable capacitor nearest the front, provides a further check. Possible repairs for the various troubles are listed below.

WARNING

Operation of this equipment involves the use of high voltages which are dangerous to life. Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustments inside the equipment with high voltage supply on.

TABLE III

<i>Trouble</i>	<i>Remedy</i>
Transmission but no sidetone; tuning system stops at proper frequency	1. Clean contacts of relay K406 (in Power Junction Box)
No modulation or sidetone; tuning system stops at proper frequency	1. Replace tube V106 or V109. 2. Clean contacts of relay K106.
No transmission or sidetone; tuning system stops at high frequency end of band	1. Replace crystal. 2. Replace tube V101, V102, V103, V104, V107, or V108. 3. Clean contacts of crystal relay for inoperative channel.
No transmission; motor does not stop	1. If dynamotor runs when channel button is pushed, perform the following steps: a. Replace Transmitter fuse of Power Junction Box. If fuse continues to blow, battery polarity may be reversed. b. Replace tube V105. c. Clean contacts of relay K102. d. Clean contacts of relays K403 and K404 in Power Junction Box. e. Replace plug in relay K103. f. Clean contacts on relay K104. 2. If dynamotor does not run: a. Clean contacts of relay K106. b. Clean contacts of relay K-104. c. Clean contacts of relay K402 in Power Junction Box.
No transmission; motor does not start. (If top cover is removed, button S102, located at top of case at the front, must be pushed to make motor run)	1. Check circuit breakers in plane wiring. 2. Check circuit breaker connections. 3. Clean all crystal relay contacts. 4. Clean contacts of relays K107 and K108. 5. Clean contacts of relay K104.

b. RECEIVER TROUBLE CHART.—Check position at which the tuning system stops if reception is not available on any selected channel. This is indicated by the small dial at the lower right-hand corner of the front panel on the receiver. Possible repairs for the various troubles are listed below.

WARNING

Operation of this equipment involves the use of high voltages which are dangerous to life. Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustments inside the equipment with high voltage supply on.

TABLE IV

<i>Trouble</i>	<i>Remedy</i>
No reception; tuning system stops at proper frequency	1. Replace tube V-211, V-212, V-213, V-214, V-215, V-216 or V-217. 2. Replace tube V-208, V-209, or V-210. 3. Clean contacts of relay K-406 in Power Junction Box.
No reception; tuning system stops at high frequency end of band	1. Replace crystal. 2. Replace tube V-201, V-202, V-203, V-204, V-205, V-206, V-208 or V-209. 3. Clean contacts of crystal relay for inoperative channel. 4. Clean contacts of relay K-204, K-205 and all crystal relays.
No reception; tuning system stops at wrong frequency	1. Check setting of thumbwheel for inoperative channel. 2. Clean contacts of crystal relay for inoperative channel. 3. Clean contacts of relays K-204, K-205 and all crystal relays.
No reception; motor will not stop	1. Replace Receiver fuse (on Power Junction Box). 2. Replace tube V-207 or V-210. 3. Clean contacts of relays K-404 and K-405 (in Power Junction Box). 4. Replace plug-in relay K-201. 5. Replace dynamotor brushes.

c. **CRYSTAL REPLACEMENT.**—Turn the winged Dzus fastener and open the hinged crystal cover door, located at the left of the front panel. Remove defective crystal and insert new crystal of the same frequency. Recycle by pushing any channel button and immediately pushing the desired channel button.

d. **BRUSH REPLACEMENT.**—Low or erratic B voltage, or excessive noise in the headsets, usually indicates defective dynamotor brushes.

WARNING

Always turn off power before attempting to replace dynamotor brushes, or any tubes.

Remove the end covers on the dynamotor, unscrew the bakelite brush holder caps and examine the brushes. If they are badly worn, replace them with new brushes. A complete set of new brushes will be found in the small metal can, mounted on a bracket under the high voltage end cover, on both dynamotors.

e. **TUBE REPLACEMENT.**—If the possibility of a defective tube is indicated, remove the unit from its mount and take off the top cover. This will provide access to all tubes except the V-103 tube in the transmitter. To replace this tube, it is necessary to remove the small metal plate on the bottom of the transmitter.

(1) The best check on a receiving or transmitting tube is by direct comparison in its own socket, with a new tube of known quality, under actual operating conditions.

(2) A visual check of individual tubes may be made as follows:

(*a*) In metal tubes, look for failure to heat. In glass tubes, look for failure to light. This indicates a burned-out filament and the tube should be replaced. The filaments of some tubes are wired in series. In order to find which tube may have a defective filament, it is necessary to replace the tubes in the group, one at a time. The groups in series are as follows:

1. TRANSMITTER.

- a. Two 832-A tubes, V-103 and V-104.
- b. Two 6L6 tubes, V-107 and V-108, and two 6V6 tubes, V-101 and V-102.
- c. One 6V6 tube, V-109 and one 6J5 tube, V-106.

2. RECEIVER.

- a. Three 6AK5 tubes, V-205, V-206 and V-208, and one 9001 tube V-209.
- b. Three 6AK5 tubes, V-202, V-203 and V-204, and one 9002 tube V-201.
- c. One 12SH7 tube, V-207, and one 12SG7 tube, V-210.
- d. Two 12SG7 tubes, V-211 and V-212.
- e. Two 12SN7 tubes, V-214 and V-216.
- f. One 12SL7 tube V-215 and one 12A6 tube, V-217.

(*b*) Inspect glass tubes for abnormal blue haze on surfaces of tube. Inspect for blue haze or white glowing spots between the elements, or for red spots on plates or tubes. These conditions will indicate either a defective tube, abnormal circuit conditions, or overloading.

(*c*) If all tubes light and still the set does not function properly, replace all tubes, one at a time, as indicated in Trouble Charts 3 and 4.

(*d*) Replacement of the 832A tubes in the transmitter may in some cases necessitate a partial realignment. If Radio Test Set AN/ARM-1 is available, this operation may be performed as described in paragraph 2*b*, in this section.

(*e*) Negative grid current as observed on the test unit is usually an indication of an internal tube short.

g. CLEANING RELAYS.

WARNING

Do not burnish relay contacts with the power on.

(1) Relay contact failure may be due to dirt or burned points. Turn off equipment before servicing.

(2) Two narrow metal plates, one on each side of the transmitter crystal compartment, may be removed by loosening two Dzus fasteners in each plate. Remove these plates for access to the points of the crystal relays.

(3) On the receiver, a metal cover located directly below the crystal compartment, may be taken off by removing three screws. This reveals the points of the crystal relays.

(4) Relay points may be cleaned with a burnishing tool (part of Radio Test Set AN/ARM-1). Restore from high-resistance contact with a burnishing tool, rubbed flat on point contact surfaces.

b. ALIGNMENT CHECK OF THE TRANSMITTER, AFTER REPLACING VACUUM TUBE JAN-832A.

Note

Because of the differences in internal capacitances of tube JAN-832A it is sometimes necessary to realign the transmitter after replacing JAN-832-A.

(1) Use Radio Test Unit AN/ARM-1 with a 28-volt supply. Make sure "OFF" button on control box is depressed. Remove the top cover and the small plate on the bottom of the Transmitter, and connect the 16-pin plug to the Transmitter receptacle marked U-15/U. Install Phantom Antenna TS-78/U (A-85-A), and connect Test Unit TS-178/ARM-1 to receptacle marked PL-152. Insert the 8458 kc. crystal in channel "A."

(2) Push button "A" and hold down motor control button S-102 until motor stops. If the dial does not stop at 152 megacycles but goes to "C," refer to the maintenance handbook for complete alignment instructions. Warm up at least five minutes before proceeding with step (3).

(3) Turn to position 1 on the Test Unit. Push button "B" and immediately push button "A" again. Tune the Transmitter for the maximum obtainable reading on the Test Meter, by turning knurled knob on the motor shaft.

(4) Turn to position 2 on the Test Unit and depress the push-to-talk button, if necessary, to secure B+ voltage. Slowly insert each end of tuning wand MX-173/ARM-1 into the tank coil mounted on the top front variable capacitor. If the meter reading increases more than 5 divisions, adjust green screw marked "2" for the maximum obtainable reading, using the Insulated Screwdriver MX-174/ARM-1.

(5) Turn to position 3 on Test Unit. Depress the push-to-talk button and adjust the green screw marked "3" for the maximum obtainable reading.

(6) Push button "B" and immediately push button "A" again. Hold down motor control button S-102 until motor stops. Turn to position 4T on the test unit and remove Phantom Antenna TS-78/U (A-85-A). Hold down push-to-talk button and slowly insert each end of tuning wand MX-173/ARM-1 into the tank coil mounted on the top rear variable capacitor. If the meter reading does not decrease more than two scale divisions, no further

adjustment is necessary. This reading should be approximately 50. If a pronounced dip is not observed, the tuned circuit may be far off resonance. The green screw marked "4T" should be adjusted for a minimum reading on test position "4T."

CAUTION

Do not disturb either the position of the load adjustment screw, located between the power amplifier tube and the top rear variable capacitor, or the setting of capacitor C-130, located on the top rear variable capacitor.

(7) If the meter reading decreases more than four divisions, adjust green screw marked "4T" for the *minimum* meter reading (with screw driver removed) as observed when the tuning wand was used.

(8) Reattach Phantom Antenna TS-78/U (A-85-A). Push button "B" and immediately push button "A." Hold down motor control button S-102 until motor stops. Then remove the phantom antenna again and check the reading on position 4T of the Test Unit, holding down the push-to-talk button. If the reading is more than 3 divisions higher than that obtained in step (6), repeat steps (7) and (8).

SECTION V
SUPPLEMENTARY DATA

TABLE No. V—CRYSTAL VS. CARRIER FREQUENCIES

<i>Carrier MC</i>	<i>Receiver KC</i>	<i>Transmit KC</i>	<i>Carrier MC</i>	<i>Receiver KC</i>	<i>Transmit KC</i>
100.08	8007.27	5560.0	104.94	8449.09	5830.0
100.26	8023.64	5570.0	105.12	8465.45	5840.0
100.44	8040.00	5580.0	105.30	8481.82	5850.0
100.62	8056.36	5590.0	105.48	8498.18	5860.0
100.80	8072.73	5600.0	105.66	8514.55	5870.0
100.98	8089.09	5610.0	105.84	8530.91	5880.0
101.16	8105.45	5620.0	106.02	8547.27	5890.0
101.34	8121.82	5630.0	106.20	8563.64	5900.0
101.52	8138.18	5640.0	106.38	8580.00	5910.0
101.70	8154.55	5650.0	106.56	8596.36	5920.0
101.88	8170.91	5660.0	106.74	8612.73	5930.0
102.06	8187.27	5670.0	106.92	8629.09	5940.0
102.24	8203.64	5680.0	107.10	8645.45	5950.0
102.42	8220.00	5690.0	107.28	8661.82	5960.0
102.60	8236.36	5700.0	107.46	8678.18	5970.0
102.78	8252.73	5710.0	107.64	8694.55	5980.0
102.96	8269.09	5720.0	107.82	8710.91	5990.0
103.14	8285.45	5730.0	108.00	8000.00	6000.0
103.32	8301.82	5740.0	108.18	8015.00	6010.0
103.50	8318.18	5750.0	108.36	8030.00	6020.0
103.68	8334.55	5760.0	108.54	8045.00	6030.0
103.86	8350.91	5770.0	108.72	8060.00	6040.0
104.04	8367.27	5780.0	108.90	8075.00	6050.0
104.22	8383.64	5790.0	109.08	8090.00	6060.0
104.40	8400.00	5800.0	109.26	8105.00	6070.0
104.58	8416.36	5810.0	109.44	8120.00	6080.0
104.76	8432.73	5820.0	109.62	8135.00	6090.0

**RESTRICTED
AN 08-30ARC3-2**

Section V

<i>Carrier MC</i>	<i>Receiver KC</i>	<i>Transmit KC</i>	<i>Carrier MC</i>	<i>Receiver KC</i>	<i>Transmit KC</i>
109.80	8150.00	6100.0	122.40	8492.31	6800.0
109.98	8165.00	6110.0	122.58	8506.15	6810.0
110.16	8180.00	6120.0	122.76	8520.00	6820.0
110.34	8195.00	6130.0	122.94	8533.85	6830.0
110.52	8210.00	6140.0	123.12	8547.69	6840.0
110.70	8225.00	6150.0	123.30	8561.54	6850.0
110.88	8240.00	6160.0	123.48	8575.38	6860.0
111.06	8255.00	6170.0	123.66	8589.23	6870.0
111.24	8270.00	6180.0	123.84	8603.08	6880.0
111.42	8285.00	6190.0	124.02	8001.43	6890.0
111.60	8300.00	6200.0	124.20	8014.29	6900.0
111.78	8315.00	6210.0	124.38	8027.14	6910.0
111.96	8330.00	6220.0	124.56	8040.00	6920.0
112.14	8345.00	6230.0	124.74	8052.86	6930.0
112.32	8360.00	6240.0	124.92	8065.71	6940.0
112.50	8375.00	6250.0	125.10	8078.57	6950.0
112.68	8390.00	6260.0	125.28	8091.43	6960.0
112.86	8405.00	6270.0	125.46	8104.29	6970.0
113.04	8420.00	6280.0	125.64	8117.14	6980.0
113.22	8435.00	6290.0	125.82	8130.00	6990.0
113.40	8450.00	6300.0	126.00	8142.86	7000.0
113.58	8465.00	6310.0	126.18	8155.71	7010.0
113.76	8480.00	6320.0	126.36	8168.57	7020.0
113.94	8495.00	6330.0	126.54	8181.43	7030.0
114.12	8510.00	6340.0	126.72	8194.29	7040.0
114.30	8525.00	6350.0	126.90	8207.14	7050.0
114.48	8540.00	6360.0	127.08	8220.00	7060.0
114.66	8555.00	6370.0	127.26	8232.86	7070.0
114.84	8570.00	6380.0	127.44	8245.71	7080.0
115.02	8585.00	6390.0	127.62	8258.57	7090.0
115.20	8600.00	6400.0	127.80	8271.43	7100.0
115.38	8615.00	6410.0	127.98	8284.29	7110.0
115.56	8630.00	6420.0	128.16	8297.14	7120.0
115.74	8645.00	6430.0	128.34	8310.00	7130.0
115.92	8660.00	6440.0	128.52	8322.86	7140.0
116.10	8007.69	6450.0	128.70	8335.71	7150.0
116.28	8021.54	6460.0	128.88	8348.57	7160.0
116.46	8035.38	6470.0	129.06	8361.43	7170.0
116.64	8049.23	6480.0	129.24	8374.29	7180.0
116.82	8063.08	6490.0	129.42	8387.14	7190.0
117.00	8076.92	6500.0	129.60	8400.00	7200.0
117.18	8090.77	6510.0	129.78	8412.86	7210.0
117.36	8104.62	6520.0	129.96	8425.71	7220.0
117.54	8118.46	6530.0	130.14	8438.57	7230.0
117.72	8132.31	6540.0	130.32	8451.43	7240.0
117.90	8146.15	6550.0	130.50	8464.29	7250.0
118.08	8160.00	6560.0	130.68	8477.14	7260.0
118.26	8173.85	6570.0	130.86	8490.00	7270.0
118.44	8187.69	6580.0	131.04	8502.86	7280.0
118.62	8201.54	6590.0	131.22	8515.71	7290.0
118.80	8215.38	6600.0	131.40	8528.57	7300.0
118.98	8229.23	6610.0	131.58	8541.43	7310.0
119.16	8243.08	6620.0	131.76	8554.29	7320.0
119.34	8256.92	6630.0	131.94	8567.14	7330.0
119.52	8270.77	6640.0	132.12	8008.00	7340.0
119.70	8284.62	6650.0	132.30	8020.00	7350.0
119.88	8298.46	6660.0	132.48	8032.00	7360.0
120.06	8312.31	6670.0	132.66	8044.00	7370.0
120.24	8326.15	6680.0	132.84	8056.00	7380.0
120.42	8340.00	6690.0	133.02	8068.00	7390.0
120.60	8353.85	6700.0	133.20	8080.00	7400.0
120.78	8367.69	6710.0	133.38	8092.00	7410.0
120.96	8381.54	6720.0	133.56	8104.00	7420.0
121.14	8395.38	6730.0	133.74	8116.00	7430.0
121.32	8409.23	6740.0	133.92	8128.00	7440.0
121.50	8423.08	6750.0	134.10	8140.00	7450.0
121.68	8436.92	6760.0	134.28	8152.00	7460.0
121.86	8450.77	6770.0	134.46	8164.00	7470.0
122.04	8464.62	6780.0	134.64	8176.00	7480.0
122.22	8478.46	6790.0	134.82	8188.00	7490.0

Section V

RESTRICTED
AN 08-30ARC3-2

<i>Carrier MC</i>	<i>Receiver KC</i>	<i>Transmit KC</i>	<i>Carrier MC</i>	<i>Receiver KC</i>	<i>Transmit KC</i>
135.00	8200.00	7500.0	145.62	8351.25	8090.0
135.18	8212.00	7510.0	145.80	8362.50	8100.0
135.36	8224.00	7520.0	145.98	8373.75	8110.0
135.54	8236.00	7530.0	146.16	8385.00	8120.0
135.72	8248.00	7540.0	146.34	8396.25	8130.0
135.90	8260.00	7550.0	146.52	8407.50	8140.0
136.08	8272.00	7560.0	146.70	8418.75	8150.0
136.26	8284.00	7570.0	146.88	8430.00	8160.0
136.44	8296.00	7580.0	147.06	8441.25	8170.0
136.62	8308.00	7590.0	147.24	8452.50	8180.0
136.80	8320.00	7600.0	147.42	8463.75	8190.0
136.98	8332.00	7610.0	147.60	8475.00	8200.0
137.16	8344.00	7620.0	147.78	8486.25	8210.0
137.34	8356.00	7630.0	147.96	8497.50	8220.0
137.52	8368.00	7640.0	148.14	8008.24	8230.0
137.70	8380.00	7650.0	148.32	8018.82	8240.0
137.88	8392.00	7660.0	148.50	8029.41	8250.0
138.06	8404.00	7670.0	148.68	8040.00	8260.0
138.24	8416.00	7680.0	148.86	8050.59	8270.0
138.42	8428.00	7690.0	149.04	8061.18	8280.0
138.60	8440.00	7700.0	149.22	8071.76	8290.0
138.78	8452.00	7710.0	149.40	8082.35	8300.0
138.96	8464.00	7720.0	149.58	8092.94	8310.0
139.14	8476.00	7730.0	149.76	8103.53	8320.0
139.32	8488.00	7740.0	149.94	8114.12	8330.0
139.50	8500.00	7750.0	150.12	8124.71	8340.0
139.68	8512.00	7760.0	150.30	8135.29	8350.0
139.86	8524.00	7770.0	150.48	8145.88	8360.0
140.04	8002.50	7780.0	150.66	8156.47	8370.0
140.22	8013.75	7790.0	150.84	8167.06	8380.0
140.40	8025.00	7800.0	151.02	8177.65	8390.0
140.58	8036.25	7810.0	151.20	8188.24	8400.0
140.76	8047.50	7820.0	151.38	8198.82	8410.0
140.94	8058.75	7830.0	151.56	8209.41	8420.0
141.12	8070.00	7840.0	151.74	8220.00	8430.0
141.30	8081.25	7850.0	151.92	8230.59	8440.0
141.48	8092.50	7860.0	152.10	8241.18	8450.0
141.66	8103.75	7870.0	152.28	8251.76	8460.0
141.84	8115.00	7880.0	152.46	8262.35	8470.0
142.02	8126.25	7890.0	152.64	8272.94	8480.0
142.20	8137.50	7900.0	152.82	8283.53	8490.0
142.38	8148.75	7910.0	153.00	8294.12	8500.0
142.56	8160.00	7920.0	153.18	8304.71	8510.0
142.74	8171.25	7930.0	153.36	8315.29	8520.0
142.92	8182.50	7940.0	153.54	8325.88	8530.0
143.10	8193.75	7950.0	153.72	8336.47	8540.0
143.28	8205.00	7960.0	153.90	8347.06	8550.0
143.46	8216.25	7970.0	154.08	8357.65	8560.0
143.64	8227.50	7980.0	154.26	8368.24	8570.0
143.82	8238.75	7990.0	154.44	8378.82	8580.0
144.00	8250.00	8000.0	154.62	8389.41	8590.0
144.18	8261.25	8010.0	154.80	8400.00	8600.0
144.36	8272.50	8020.0	154.98	8410.59	8610.0
144.54	8283.75	8030.0	155.16	8421.18	8620.0
144.72	8295.00	8040.0	155.34	8431.76	8630.0
144.90	8306.25	8050.0	155.52	8442.35	8640.0
145.08	8317.50	8060.0	155.70	8452.94	8650.0
145.26	8328.75	8070.0	155.88	8463.53	8660.0
145.44	8340.00	8080.0			

TABLE No. VI—TRANSMITTER TUBE CONNECTIONS

<i>Tube</i>	<i>Function</i>	<i>Cathode</i>	<i>Grid</i>	<i>Plate</i>	<i>Screen</i>	<i>Heater +</i>	<i>Heater -</i>	<i>Shield</i>
V-101	Osc.....	8	5	3	4	2	7	1
V-102	1st H G.....	8	5	3	4	2	7	1
V-103	2nd H G.....	4	2	top	3	7	1	.....
V-104	Power Amplifier.....	4	2	top	3	1	7	.....
V-105	Tuning Control.....	3-5	4	8	6	7	2	1
V-106	Speech Amplifier.....	8	5	3	.....	7	2	1
V-107	Modulator.....	8	5	3	4	7	2	1
V-108	Modulator.....	8	5	3	4	7	2	1
V-109	Sidetone.....	8	5	3	4	7	2	1

TABLE No. VII—RECEIVER TUBE CONNECTIONS

<i>Tube</i>	<i>Function</i>	<i>Cathode</i>	<i>Grid</i>	<i>Plate</i>	<i>Screen</i>	<i>Heater +</i>	<i>Heater -</i>	<i>Shield</i>
V-201	Oscillator.....	2-7	6	1-5	.....	4	3	.....
V-202	Fundamental Amplifier.....	2-7	1	5	6	3	4	.....
V-203	Fundamental Amplifier.....	2-7	1	5	6	3	4	.....
V-204	Harmonic Generator.....	2-7	1	5	6	3	4	.....
V-205	1st Harmonic Amplifier.....	2-7	1	5	6	3	4	.....
V-206	2nd Harmonic Amplifier.....	2-7	1	5	6	3	4	.....
V-207	Tuning Control.....	3-5	4	8	6	2	7	1
V-208	RF Amplifier.....	2-7	1	5	6	4	3	.....
V-209	1st Detector.....	2-7	1	5	6	4	3	.....
V-210	1st IF Amplifier.....	3-5	4	8	6	7	2	1
V-211	2nd IF Amplifier.....	3-5	4	8	6	7	2	1
V-212	3rd IF Amplifier.....	3-5	4	8	6	7	2	1
V-213	2nd Detector.....	8	.....	5	.....	7	2	1
	AVC.....	4	.....	3	.....	7	2	1
V-214	Noise Limiter.....	6	4	5	.....	7	8	.....
	Cathode Follower.....	3	1	2	.....	7	8	.....
V-215	Squelch.....	6	4	5	.....	7	8	.....
	1st Audio Amplifier.....	3	1	2	.....	7	8	.....
V-216	2nd Audio Amplifier.....	6	4	5	.....	8	7	.....
	AVC Delay.....	3	1	2	.....	8	7	.....
V-217	Output.....	8	5	3	4	2	7	1

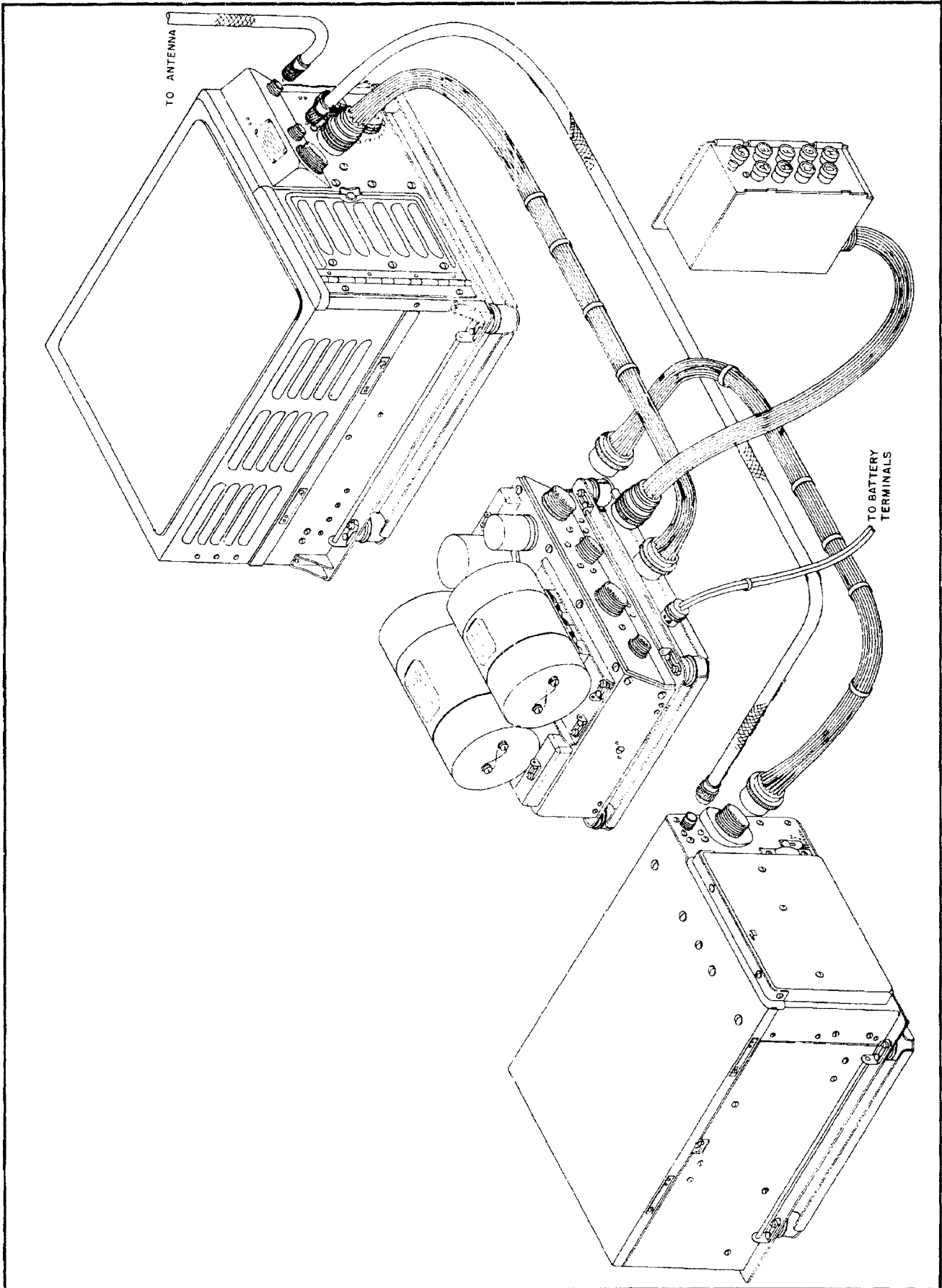


Figure 21. Radio Set AN/ARC-3—Cording Diagram

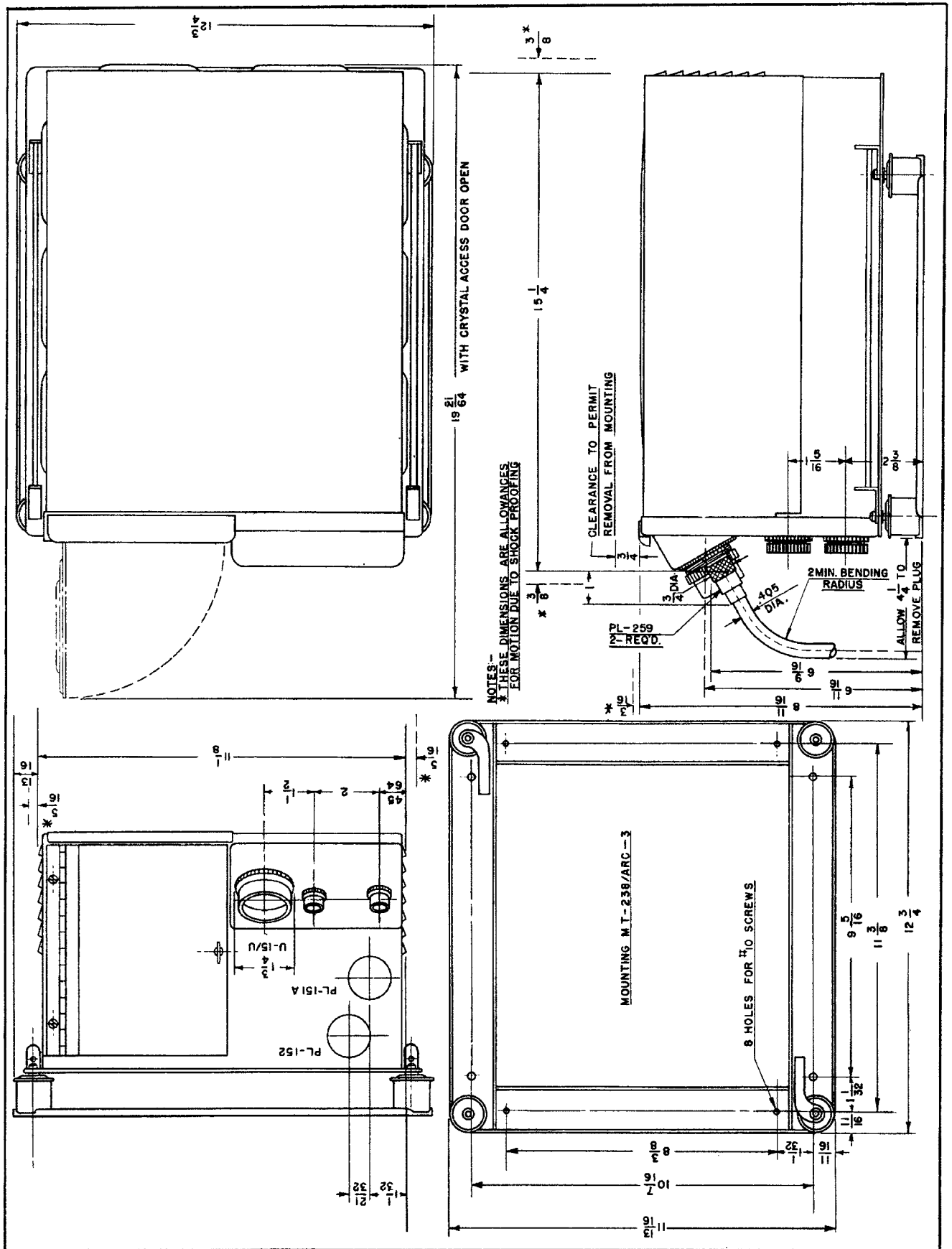


Figure 22. Transmitter T-67/ARC-3—Installation Diagram

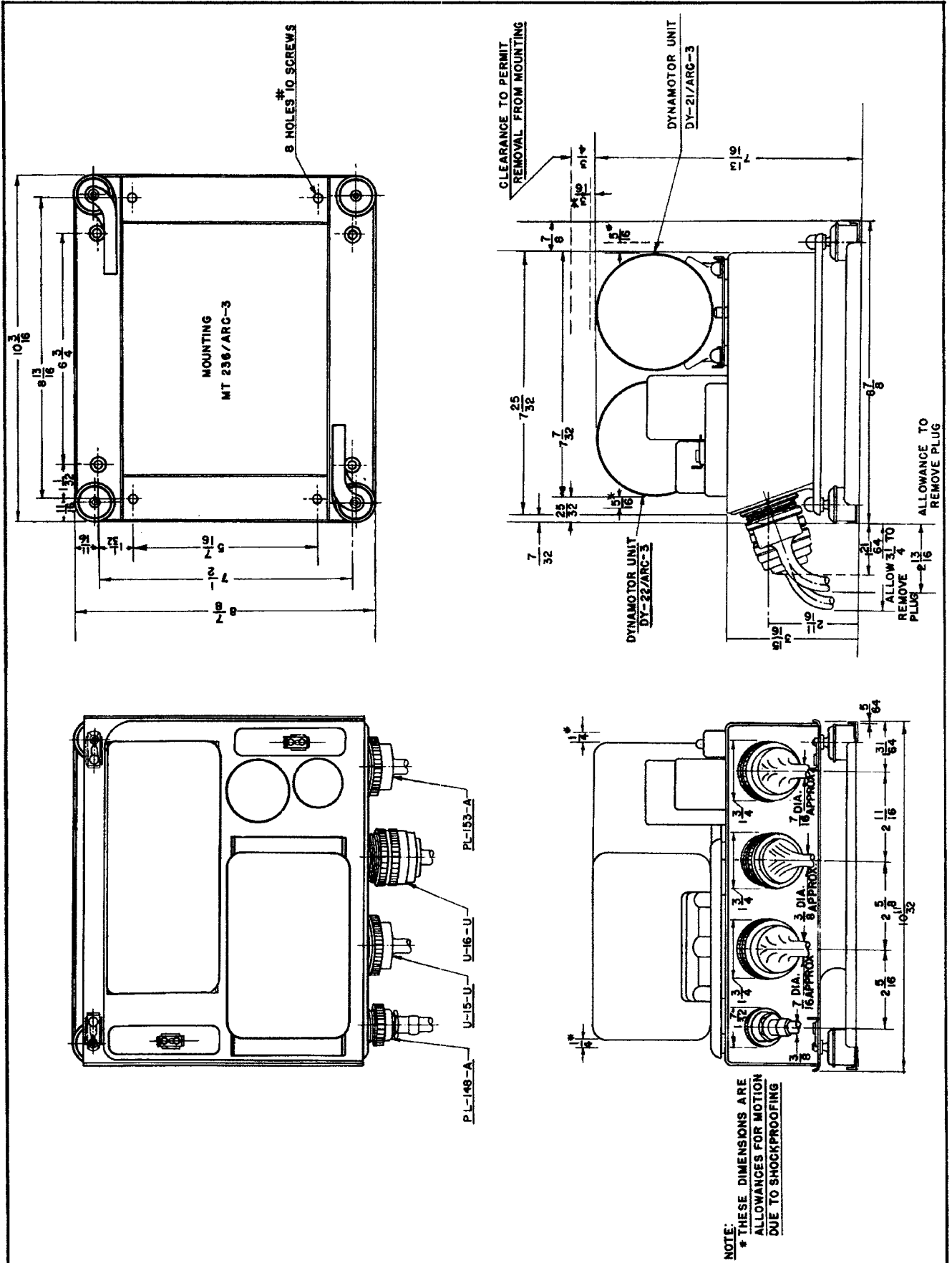


Figure 24. Power Junction Box J-68/ARC-3—Installation Diagram

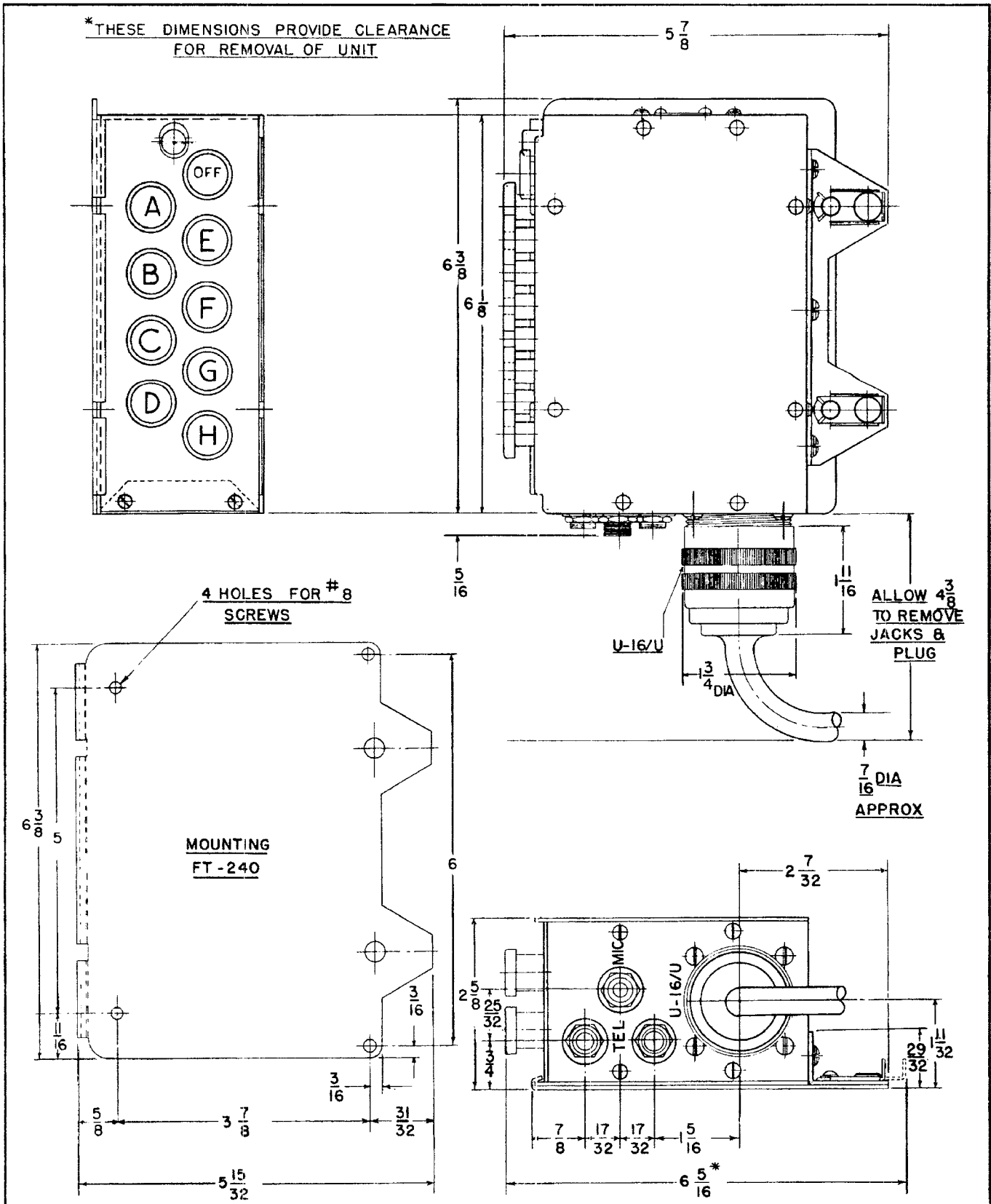


Figure 25. Control Box C-118/AIC-3—Installation Diagram

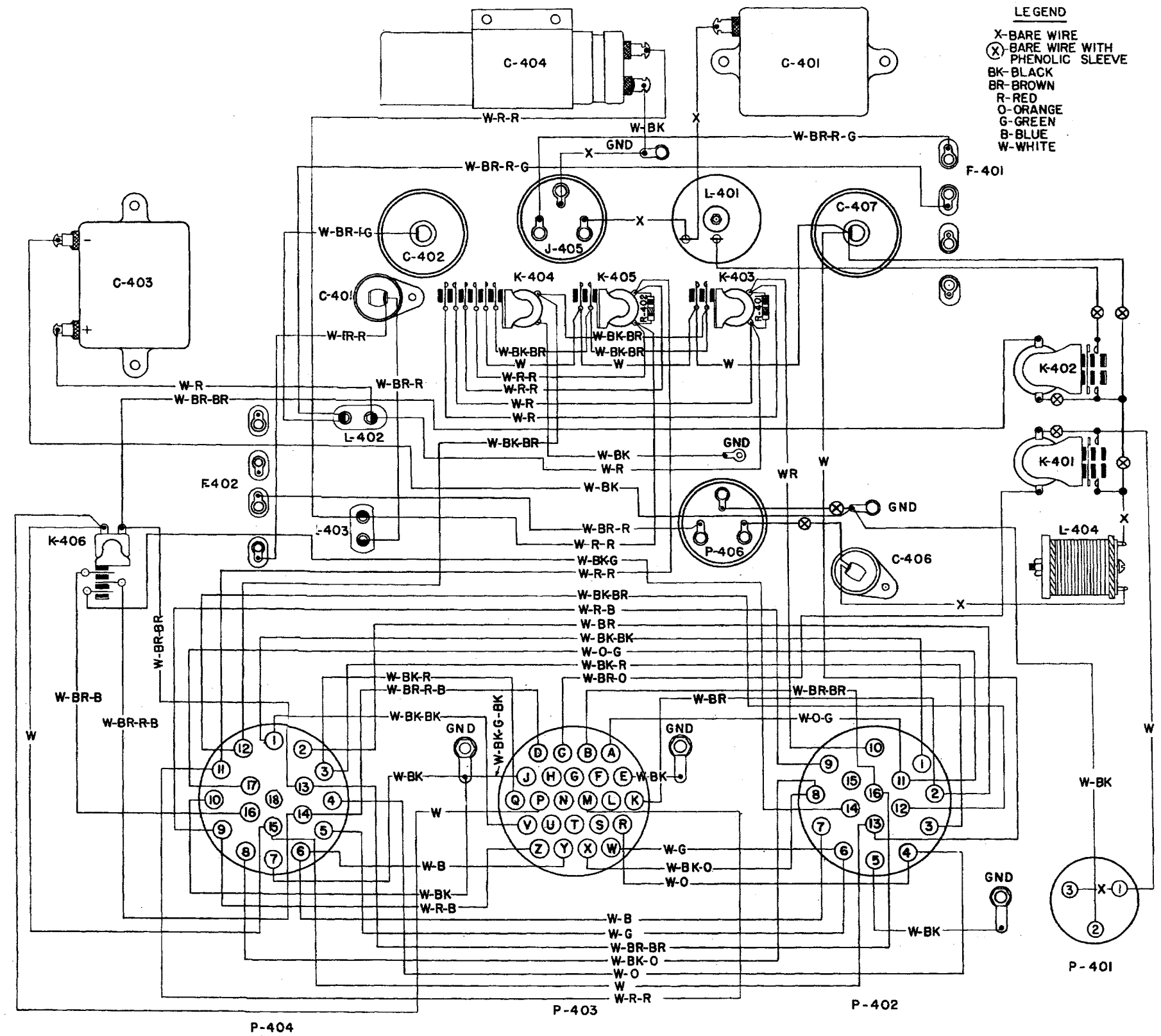


Figure 26. Power Junction Box J-68/ARC-3—Wiring Diagram

CIRCUIT DIAGRAMS SHOWN HERE ARE FOR EQUIPMENTS BEARING MODIFICATION SYMBOLS NEAR APPLICABLE NAMEPLATE AS SHOWN BELOW :

NOMENCLATURE	MODIFIED
RADIO TRANSMITTER T-67/ARC-3	M1
RADIO RECEIVER R-77A/ARC-3	NONE
POWER JUNCTION BOX J-68/ARC-3	M1
CONTROL BOX C-118/ARC-3	NONE

REFER TO HANDBOOK OF OPERATING INSTRUCTIONS T.O. AN08-30ARC3-2 FOR INTERCONNECTING CABLE CONNECTIONS OTHER THAN HERE SHOWN.

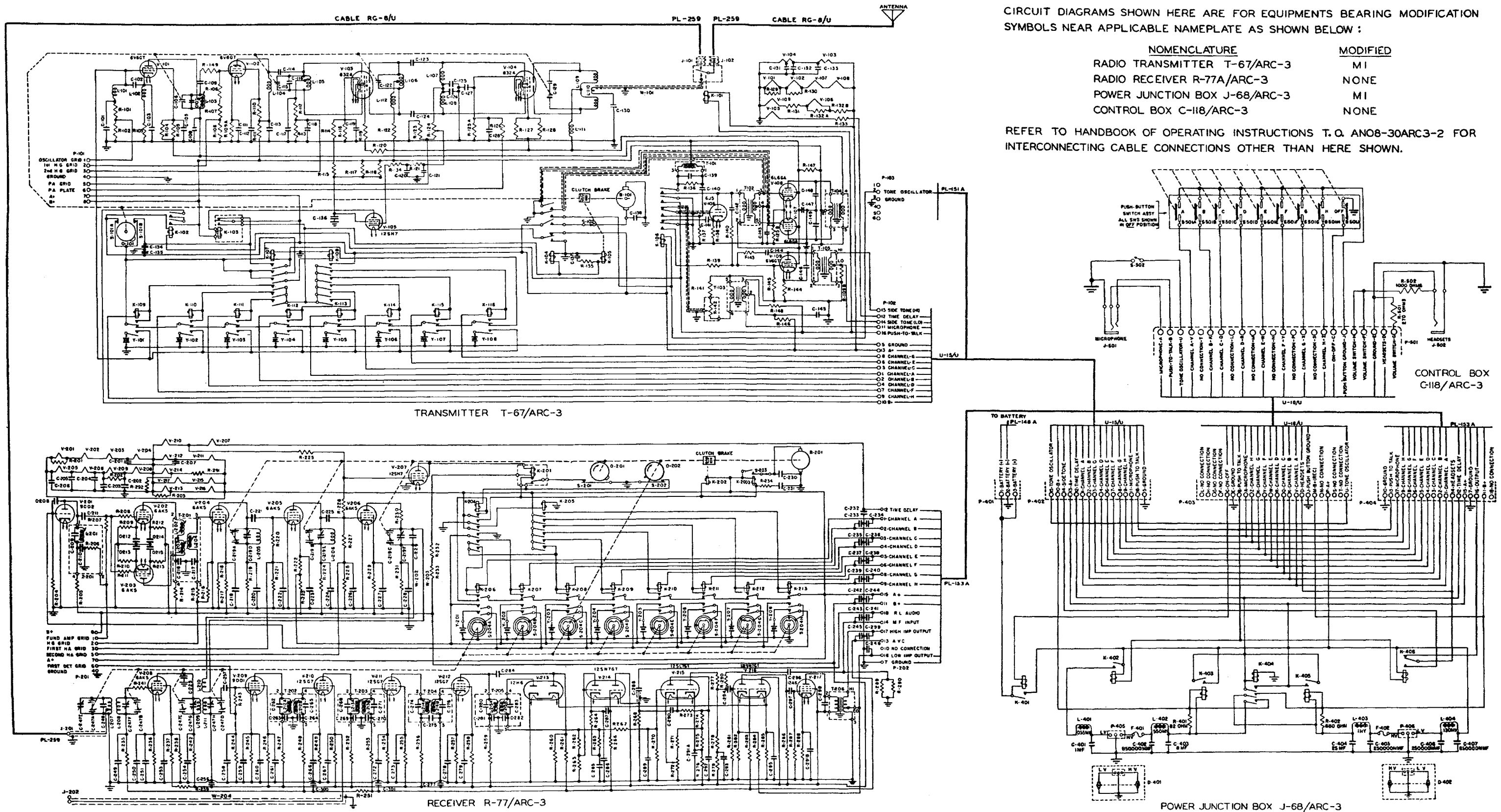


Figure 27. SCHEMATIC DIAGRAM RADIO SET AN/ARC-3