

**Handbook of
OPERATING INSTRUCTIONS**

FOR

AIRCRAFT RADIO RECEIVING EQUIPMENTS

***AN/ARR-2, *AN/ARR-2X, *AN/ARR-2A
*AN/ARR-2AX**

AND

PORTABLE TEST OSCILLATORS

***TS-24/ARR-2, *TS-24A/ARR-2**

RESTRICTED

(FOR OFFICIAL USE ONLY)

1 MAY 1944

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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. Airplane 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 Material (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.

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**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. Burning 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!

GUARANTEE

The equipment, including all parts and spare parts, except vacuum tubes, batteries, rubber, and material normally consumed in operation, is guaranteed for a period of one year from the date of delivery of the equipment to and acceptance by the Government with the understanding that all such items found to be defective as to material, workmanship, or manufacture, will be repaired or replaced f.o.b. any point within the continental limits of the United States designated by the Government, without delay, and at no expense to the Government; provided that such guarantee will not obligate the contractor to make repair or replacement of any such defective items unless the defect appears within a reasonable time and the defect is not the result of normal expected shelf life deterioration.

To the extent the equipment, including all parts and spare parts, as defined above, is of the contractor's design or is a design selected by the contractor, it is also guaranteed, subject to the foregoing conditions, against defects in design with the understanding that if ten per cent (10%) or more of any such said item, but not less than two of any such item, of the total quantity comprising such item furnished under the contract, are found to be defective as to design, such item will be conclusively presumed to be of defective design and subject to one hundred per cent (100%) correction or replacement by a suitably redesigned item.

All such items will be subject to ultimate return to the contractor. In view of the fact that normal activities of the Naval Service may result in the use of equipment in such remote portions of the world or under such conditions as to preclude the return of the defective items for repair or replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service, therefore, may necessitate expeditious repair of such items in order to prevent extended interruption of communications. In such cases the return of the defective items for examination by the contractor prior to repair or replacement will not be mandatory. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable as a basis for affecting expeditious adjustment under the provisions of this contractual guarantee.

The above one year period will not include any portion of time the equipment fails to perform satisfactorily due to any such defects, and any items repaired or replaced by the contractor will be guaranteed anew under this provision.

IMPORTANT

Since Aircraft Radio Receiving Equipments *AN/ARR-2, -2A and *AN/ARR-2X, -2AX are basically the same except for a 28-volt system for the former and a 14-volt system for the latter, the text material is written to apply equally to both groups of equipments. Components are identical except for the following, which are not interchangeable:

Aircraft Radio Receiving Equipment
*AN/ARR-2, -2A
Radio Receiver { *R-4/ARR-2
 * R-4A/ARR-2
Mounting Rack *MT-7/ARR-2
Dynamotor *DY-2/ARR-2
Electric Tuning
Control Adapter *C-37/ARR-2A
(Used with *AN/ARR-2A System only)

Aircraft Radio Receiving Equipment
*AN/ARR-2X, -2AX
Radio Receiver { *R-3/ARR-2X
 * R-3A/ARR-2X
Mounting Rack *MT-6/ARR-2X
Dynamotor *DY-1/ARR-2X
Electric Tuning
Control Adapter *C-36/ARR-2AX
(Used with *AN/ARR-2AX System only)

No reference will be made in either the text or illustrations to the components of Aircraft Radio Receiving Equipments *AN/ARR-2X and *AN/ARR-2AX unless there is a specific difference where the text or illustration will not be applicable.

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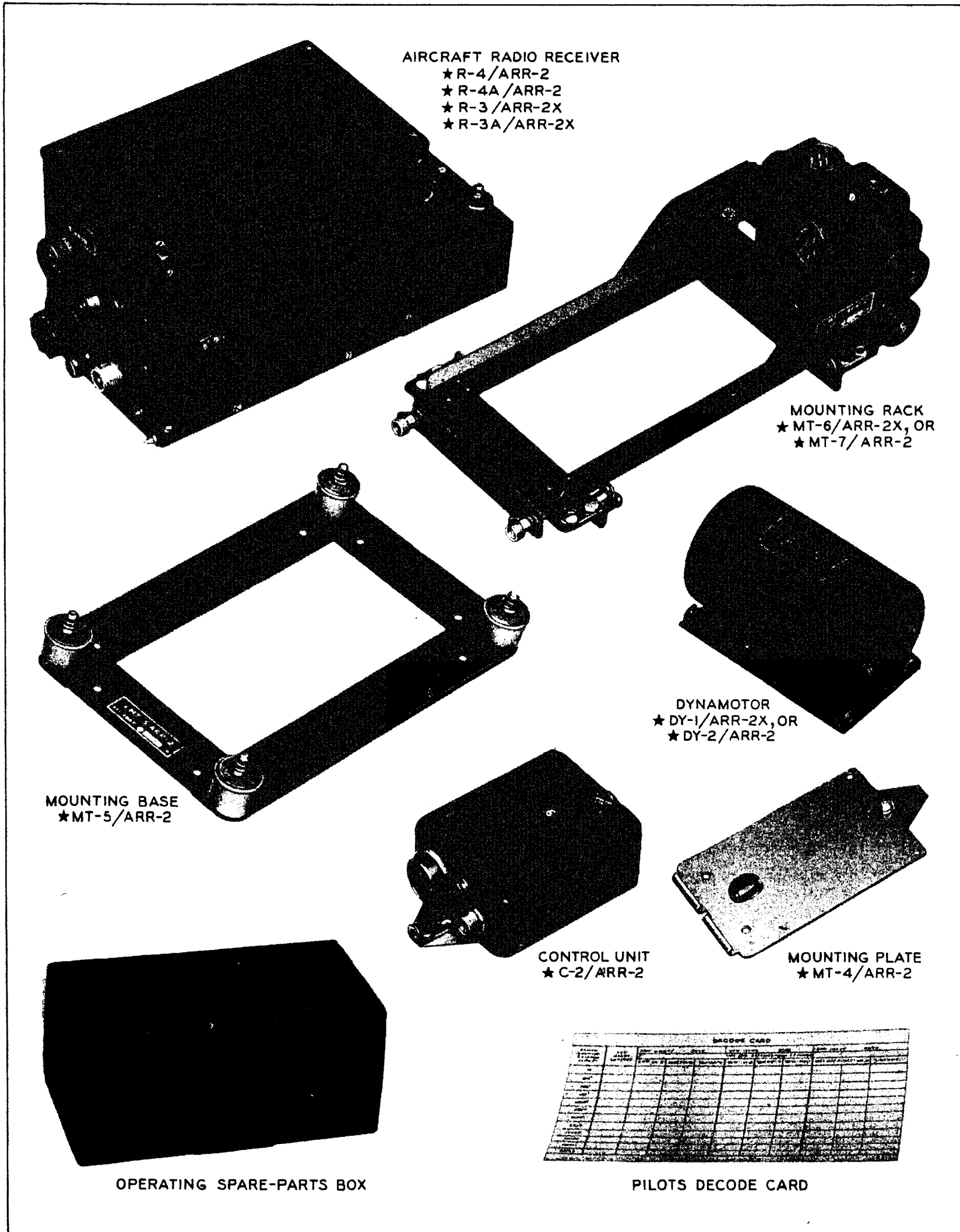


Figure 1—Aircraft Radio Receiving Equipment *AN/ARR-2, -2X

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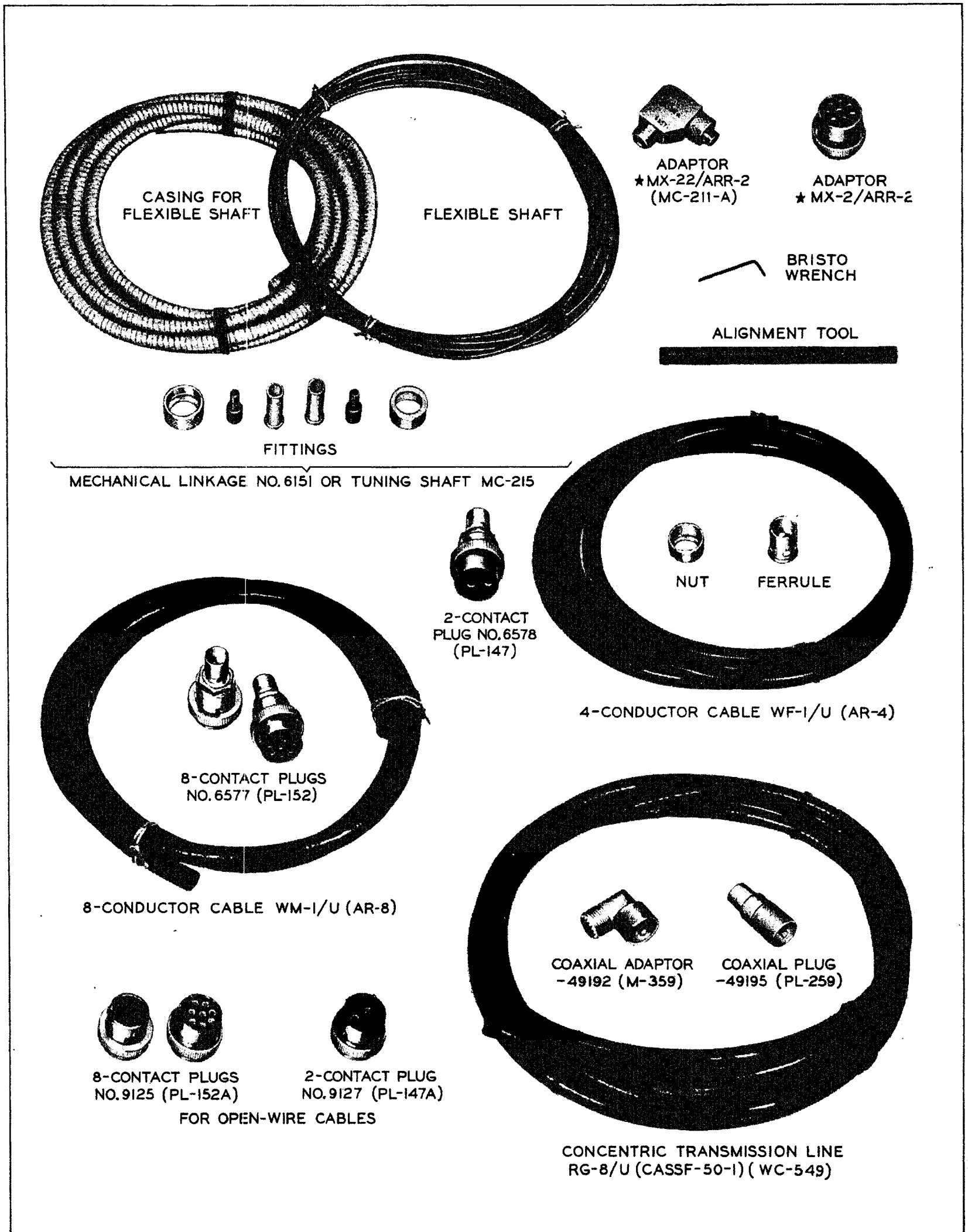


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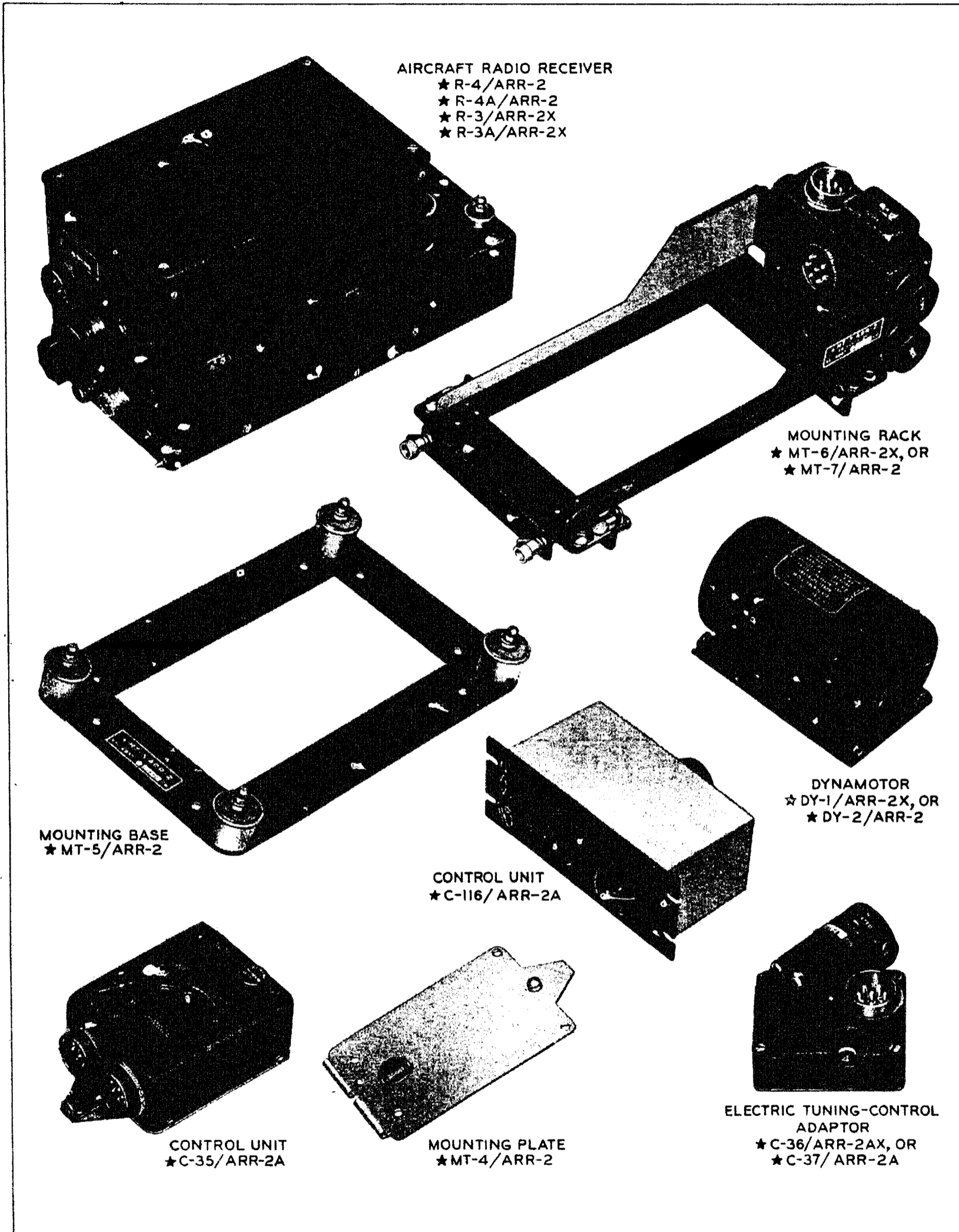


Figure 2—Aircraft Radio Receiving Equipment *AN/ARR-2A, -2AX

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Figure 2—Continued
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SECTION I
GENERAL DESCRIPTION

1. PURPOSE.

The purpose of this handbook is to provide the necessary installation, adjustment, and operating instructions for Aircraft Radio Receiving Equipments *AN/ARR-2, -2X, -2A, -2AX and Portable Test Oscillators *TS-24/ARR-2 and *TS-24A/ARR-2.

This handbook does not attempt to describe the equipment fully nor provide maintenance information.

2. GENERAL.

a. Aircraft Radio Receiving Equipments *AN/ARR-2 and *AN/ARR-2A may be used for navigation or communication. The receiver can be set to any one of six predetermined channels by operation of a remotely controlled Channel Selector mechanism. The equipments are designed for remote control operation only. The

only variable control on the receiver is normally set and locked in position before each flight.

b. Portable Test Oscillators *TS-24/ARR-2 shown in figure 20 and *TS-24A/ARR-2 shown in figure 21 are special oscillators designed to furnish test signals similar to that radiated by the transmitter. In the *TS-24A/ARR-2 Oscillator an additional circuit provides tone modulation. This allows somewhat greater ease in channel alignment. The *TS-24A/ARR-2 Oscillator also has provision for utilizing an external power unit to supply the necessary filament and plate power. This power unit is not supplied as part of the oscillator equipment.

3. EQUIPMENT SUPPLIED.

The major units comprising Aircraft Radio Receiving Equipment *AN/ARR-2, -2A, -2X, -2AX are listed in Table I.

TABLE I
COMPOSITION OF AIRCRAFT RADIO RECEIVING EQUIPMENTS *AN/ARR-2, -2X, -2A, -2AX

Quantity Req'd for Each Installation				Name of Unit	Over-all Dimensions			Weight	Numerical Series of Reference Symbols
*AN/ARR-2	*AN/ARR-2A	*AN-ARR-2X	*AN/ARR-2AX		Long	Wide	High		
—	—	1	1	¹ Radio Receiver *R-3/ARR-2X	12 ¹ / ₁₆ "	4 ²⁷ / ₃₂ "	5 ¹¹ / ₁₆ "	6.5 lbs.	101-199
—	—	1	1	¹ Radio Receiver *R-3A/ARR-2X	12 ¹ / ₁₆ "	4 ²⁷ / ₃₂ "	5 ¹¹ / ₁₆ "	6.5 lbs.	101-199
1	1	—	—	¹ Radio Receiver *R-4/ARR-2	12 ¹ / ₁₆ "	4 ²⁷ / ₃₂ "	5 ¹¹ / ₁₆ "	6.5 lbs.	101-199
1	1	—	—	¹ Radio Receiver *R-4A/ARR-2	12 ¹ / ₁₆ "	4 ²⁷ / ₃₂ "	5 ¹¹ / ₁₆ "	6.5 lbs.	101-199
—	—	1	1	Mounting Rack *MT-6/ARR-2X	13 ¹ / ₄ "	6 ¹ / ₈ "	4 ¹ / ₂ "	1.4 lbs.	601-699
1	1	—	—	Mounting Rack *MT-7/ARR-2	13 ¹ / ₄ "	6 ¹ / ₈ "	4 ¹ / ₂ "	1.4 lbs.	601-699
1	1	1	1	Mounting Base *MT-5/ARR-2	10 ³ / ₄ "	7"	1 ³ / ₄ "	0.9 lb.	701-799
1	1	—	—	Dynamotor *DY-2/ARR-2	4 ¹³ / ₁₆ "	2 ²³ / ₃₂ "	3 ⁹ / ₃₂ "	3.0 lbs.	301-399
—	—	1	1	Dynamotor *DY-1/ARR-2X	4 ¹³ / ₁₆ "	2 ²³ / ₃₂ "	3 ⁹ / ₃₂ "	3.0 lbs.	301-399
1	—	1	—	Control Unit *C-2/ARR-2	5 ¹⁵ / ₃₂ "	3 ³ / ₈ "	3"	1.3 lbs.	201-299
—	1	—	1	² Control Unit *C-35/ARR-2A	5 ¹⁵ / ₃₂ "	3 ³ / ₈ "	2 ¹⁵ / ₃₂ "	0.0 lb.	201-299
—	1	—	1	² Control Unit *C-116/ARR-2A	6"	2 ¹ / ₈ "	6 ⁵ / ₁₆ "	0.75 lb.	201-299
1	1	1	1	³ Control Unit Mounting Plate *MT-4/ARR-2	5 ⁹ / ₁₆ "	3 ⁹ / ₁₆ "	1 ¹ / ₁₆ "	0.2 lb.	
—	1	—	—	Electric Tuning Control Adapter *C-37/ARR-2A	4 ³ / ₁₆ "	3 ¹³ / ₆₄ "	1 ¹⁹ / ₃₂ "	0.94 lb.	901-999
—	—	—	1	Electric Tuning Control Adapter *C-36/ARR-2AX	4 ³ / ₁₆ "	3 ¹³ / ₆₄ "	1 ¹⁹ / ₃₂ "	0.94 lb.	901-999

TABLE 1—Continued

COMPOSITION OF AIRCRAFT RADIO RECEIVING EQUIPMENTS *AN/ARR-2, -2X, -2A, -2AX

Quantity Req'd for Each Installation				Name of Unit	Over-all Dimensions			Weight	Numerical Series of Reference Symbols
*AN/ARR-2	*AN/ARR-2A	*AN-ARR-2X	*AN/ARR-2AX		Long	Wide	High		
1	1	1	1	Adapter *MX-2/ARR-2				0.12 lb.	
1	1	1	1	Coaxial Plug -49195 or PL-259				0.06 lb.	
1	1	1	1	⁴ 2-Contact Plug #6578, PL-147, PL-147A or #9127				0.12 lb.	
2	2	2	2	⁸ 8-Contact Plug #6577, PL-152, PL-152A or #9125				0.12 lb.	
—	2	—	2	⁸ 8-Contact Plug #B-33069 or #B-33069-2				0.12 lb.	
—	1	—	1	¹⁴ 14-Contact Plug AN-3106-20-27S—Position 8				0.18 lb.	
—	1	—	1	Clamp AN-3057-12 for Plug AN-3106-20-27S—Position 8					
1	1	1	1	Right Angle Coaxial Adapter -49192 or M-359				0.1 lb.	
1	—	1	—	Right Angle Adapter for Mechanical Linkage *MX-22/ARR-2, (MC-211-A)	1 ¹⁹ / ₃₂ "	1 ¹¹ / ₃₂ "	5/8"	0.2 lb.	
15'	15'	15'	15'	Concentric Transmission Line RG-8/U (CASSF-50-1, WC-549)				0.11 lb./ft.	
1	—	1	—	Mechanical Linkage #6151 or Tuning Shaft MC-215 (Complete with end fittings)				0.12 lb./ft.	
5'	5'	5'	5'	⁸ 4-Conductor Cable WF-1/U (AR-4)				0.15 lb./ft.	
10'	20'	10'	20'	⁸ 8-Conductor Cable WM-1/U (AR-8)				0.17 lb./ft.	
3	3	3	3	Decode Cards					

NOTES:

¹ Each Radio Receiver is furnished with 1 set of vacuum tubes consisting of:

- 1—JAN 12A6
- 7—JAN 9001
- 3—JAN 6AK5

Only one receiver is furnished with each equipment.

² Either Control Unit *C-35/ARR-2A or *C-116/ARR-2A will be furnished per equipment.

³ Mounting Plate *MT-4/ARR-2 is furnished with Control Units *C-2/ARR-2 and *C-35/ARR-2A only.

⁴ Plug #6578 or PL-147 is furnished where cabling is used. Plug PL-147A or #9127 is furnished for open wire installations.

⁵ Plug #6577 or PL-152 is furnished where cabling is used. Plug PL-152A or #9125 is furnished for open wire installations.

⁶ Plug #B-33069 is furnished where cabling is used. Plug #B-33069-2 is furnished for open wire installations.

⁷ When the 14-Contact Plug AN-3106-20-27S-Position 8 is furnished, only one 8-Contact Plug PL-152A or #9125 and one 8-Contact Plug #B-33069-2 will be furnished.

⁸ These cables will not be furnished for open wire installations.

TABLE II

EQUIPMENT REQUIRED FOR OPERATING SYSTEM BUT NOT FORMING PART OF AIRCRAFT RADIO RECEIVING EQUIPMENTS *AN/ARR-2, -2X, -2A, -2AX

Quantity	Name of Unit	Required Characteristics
1	D-C Supply (28 volts or 14 volts)	Supply primary power
1	Antenna *AT-5/ARR-1 complete with coaxial plug	
1	Headset	8000-ohm impedance (Army) 600-ohm impedance (Navy)
1	LM Series Frequency Measuring Equipment	For alignment purposes
	or	
	Frequency Meter BC-221-()	
1	Test Oscillator *TS-24/ARR-2 with Slip Cover *CW-8/ARR-2	For alignment purposes
	or	
	Test Oscillator *TS-24A/ARR-2 with Slip Cover *CW-8A/ARR-2	For alignment purposes

4. ADDITIONAL EQUIPMENT REQUIRED FOR OPERATING SYSTEM.

The additional items necessary to form an operating system are shown in Table II.

5. RADIO RECEIVERS *R-4/ARR-2 AND *R-4A/ARR-2.

Radio Receivers *R-4/ARR-2 and *R-4A/ARR-2 are identical except for certain improvements provided for in the *R-4A/ARR-2 Receiver. The latter receiver (also the *R-3A/ARR-2X Receiver) contains a circuit modification which prevents overloading throughout the range of field strengths normally encountered in service. Also included in this receiver are two filters designed to reduce the amplitude of signals generated within the receiver itself from interfering with adjacent equipments.

Table III shows the vacuum tubes used in these equipments.

**TABLE III
VACUUM TUBES AND DESIGNATIONS**

<i>Vacuum Tube Designation</i>		<i>Vacuum Tube Designation</i>	
<i>Tube</i>	<i>Type</i>	<i>Tube</i>	<i>Type</i>
V101	JAN-6AK5	V107	JAN-9001
V102	JAN-6AK5	V108	JAN-9001
V103	JAN-6AK5	V109	JAN-9001
V104	JAN-9001	V110	JAN-9001
V105	JAN-9001	V111	JAN-12A6
V106	JAN-9001		

6. CONTROL UNITS *C-2/ARR-2, *C-35/ARR-2A AND *C-116/ARR-2A.

a. Control Unit *C-2/ARR-2, shown in figure 3, is used only with Aircraft Radio Receiving Equipments *AN/ARR-2, -2X. Control Units *C-35/ARR-2A and *C-116/ARR-2A, shown in figures 4 and 5, are used with Aircraft Radio Receiving Equipments *AN/ARR-2A, -2AX. When Control Unit *C-116/ARR-2A is used, it is necessary to provide a jumper between contacts 5 and 8 of Plug P504 (see figure 14H) in order to put the audio signal into Mounting Rack *MT-7/ARR-2. (*MT-6/ARR-2X in the case of 14-volt equipments.) In some aircraft installations, the audio output is taken from the control unit (for Control Units *C-2/ARR-2 and *C-35/ARR-2A only) while in other installations, the the output is taken from an interphone amplifier.

b. All three control units contain a Beat Note control, an Output or Sensitivity control and a Channel selector mechanism. In the case of Control Unit *C-2/ARR-2, the Channel selector control actuates a mechanical linkage which is coupled to a gear train contained in the receiver. When Electric Tuning Control Adapter *C-37/ARR-2A is attached to the receiver, Control Unit *C-35/ARR-2A or *C-116/ARR-2A must be used. In this case the Channel selector control consists of a rotary switch which causes the motor of the tuning control adapter to rotate until the proper channel has been selected.

c. Control Units *C-2/ARR-2 and *C-35/ARR-2A contain an OFF-NAV-VOICE switch. Normally the OFF position is covered by a removable tab. Control Unit *C-116/ARR-2A is constructed with a NAV-VOICE switch and no OFF position is provided.

7. MOUNTING RACK AND BASE.

a. Mounting Rack *MT-6/ARR-2X is identical with Mounting Rack *MT-7/ARR-2 except for the audio circuit relay. The relay in Mounting Rack *MT-7/ARR-2 operates on 28 volts d-c, while the relay in Mounting Rack *MT-6/ARR-2X operates on 14 volts.

b. Both Mounting Racks *MT-6/ARR-2X and *MT-7/ARR-2 are used with Mounting Base *MT-5/ARR-2. The mounting rack and base are used to shock mount the radio receiver. Power is supplied to the receiver through a seven-contact receptacle in the receiver, while the two-contact power plug connects the 14- or 28-volt d-c supply to a receptacle in the left side of the rack. Two clamps on the rack fit over two conical bushings on the receiver to secure the equipment in the rack.

8. DYNAMOTORS.

Dynamotor *DY-2/ARR-2¹ requires a 28-volt power supply, while Dynamotor *DY-1/ARR-2X¹ requires a 14-volt power supply. The dynamotor is provided with a plug-in base and four snapslides for rapid replacement and is mounted on the rear of the receiver.

¹ Dynamotors *DY-2/ARR-2 and *DY-1/ARR-2X are interchangeable with corresponding units of Aircraft Radio Equipment AN/ARC-5 and SCR-274-N. This interchangeability is confined to complete units only.

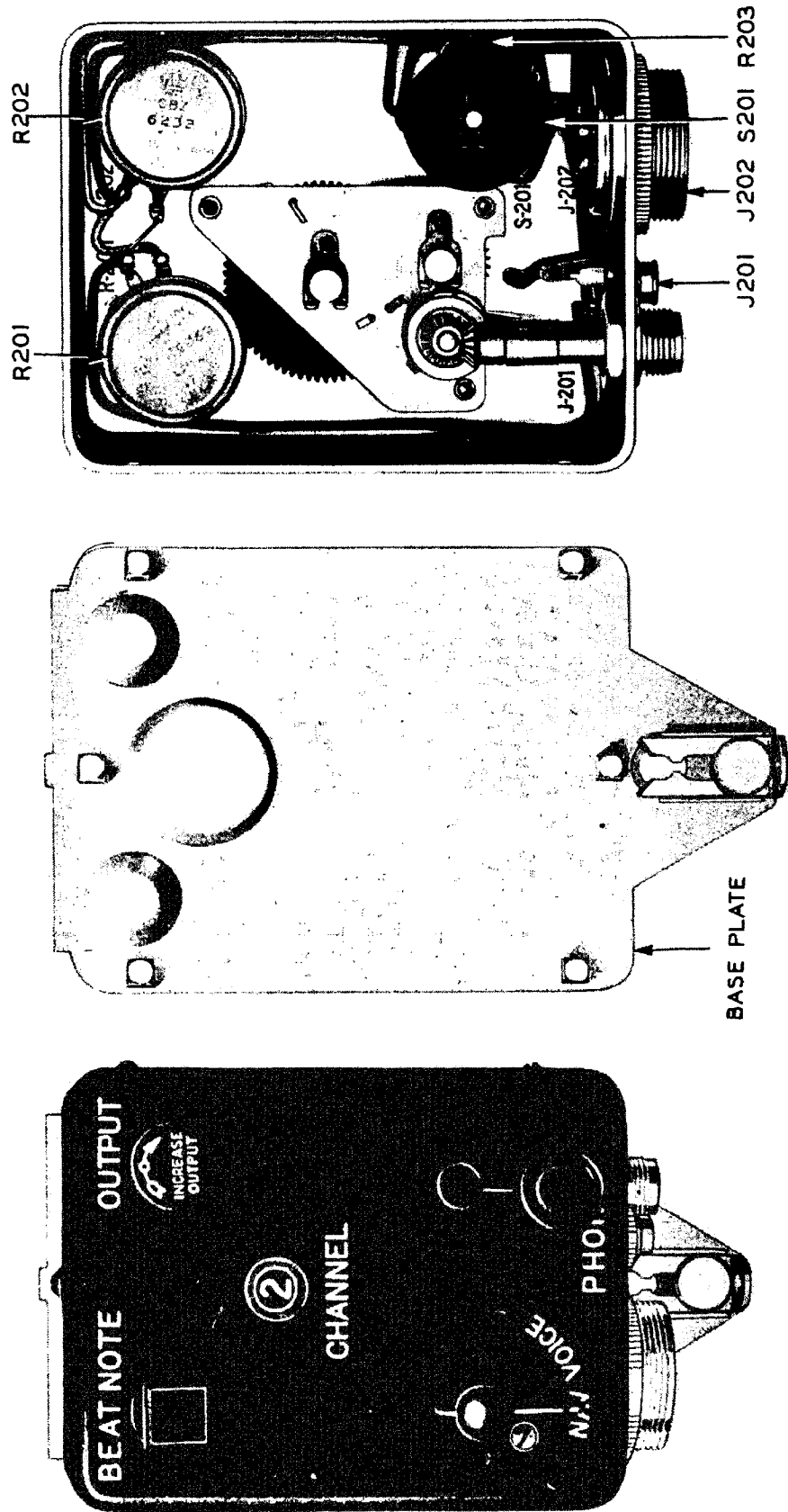


Figure 3—Control Unit *C-2/ARR-2

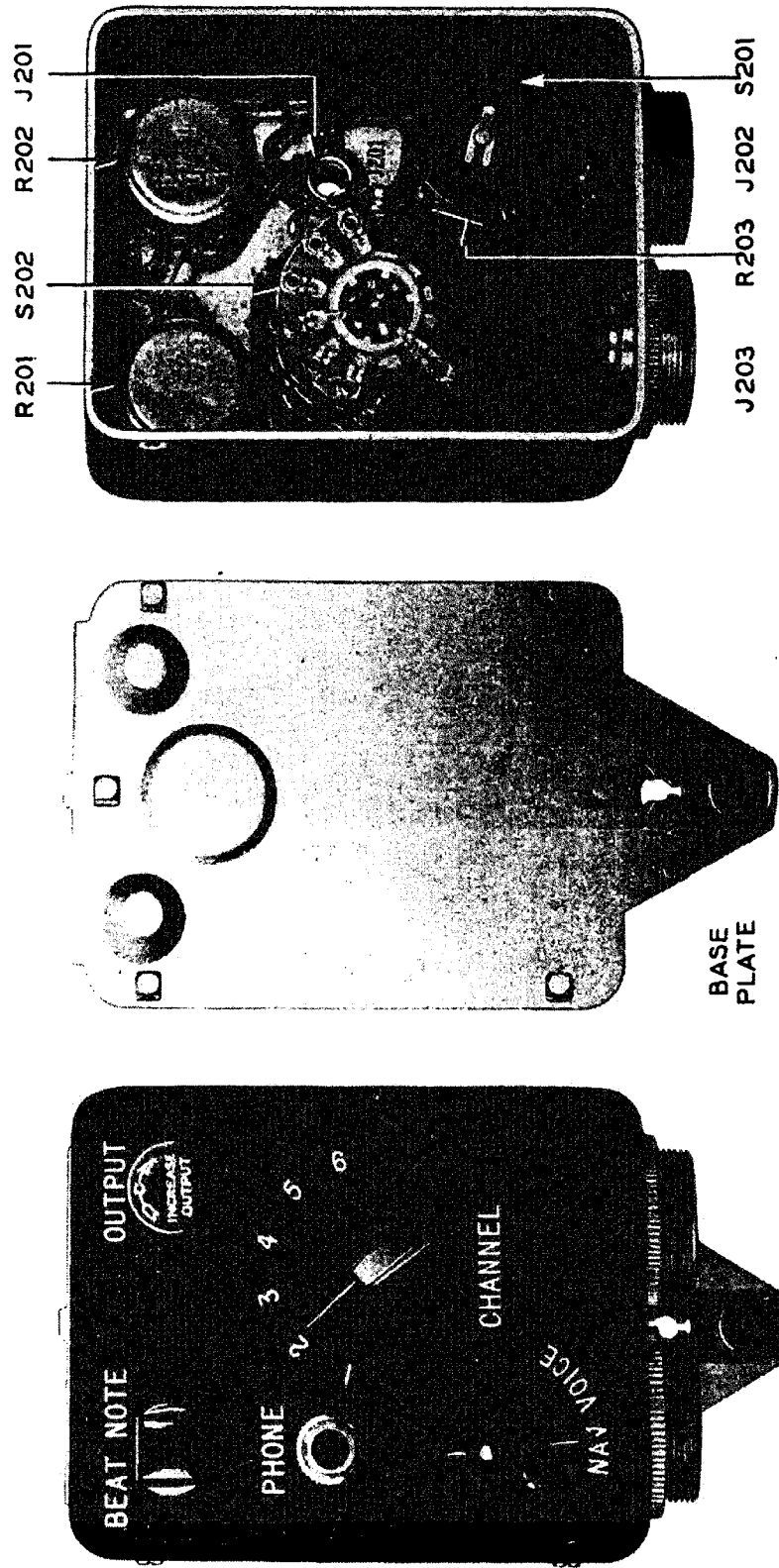


Figure 4—Control Unit *C-35/ARR-2A

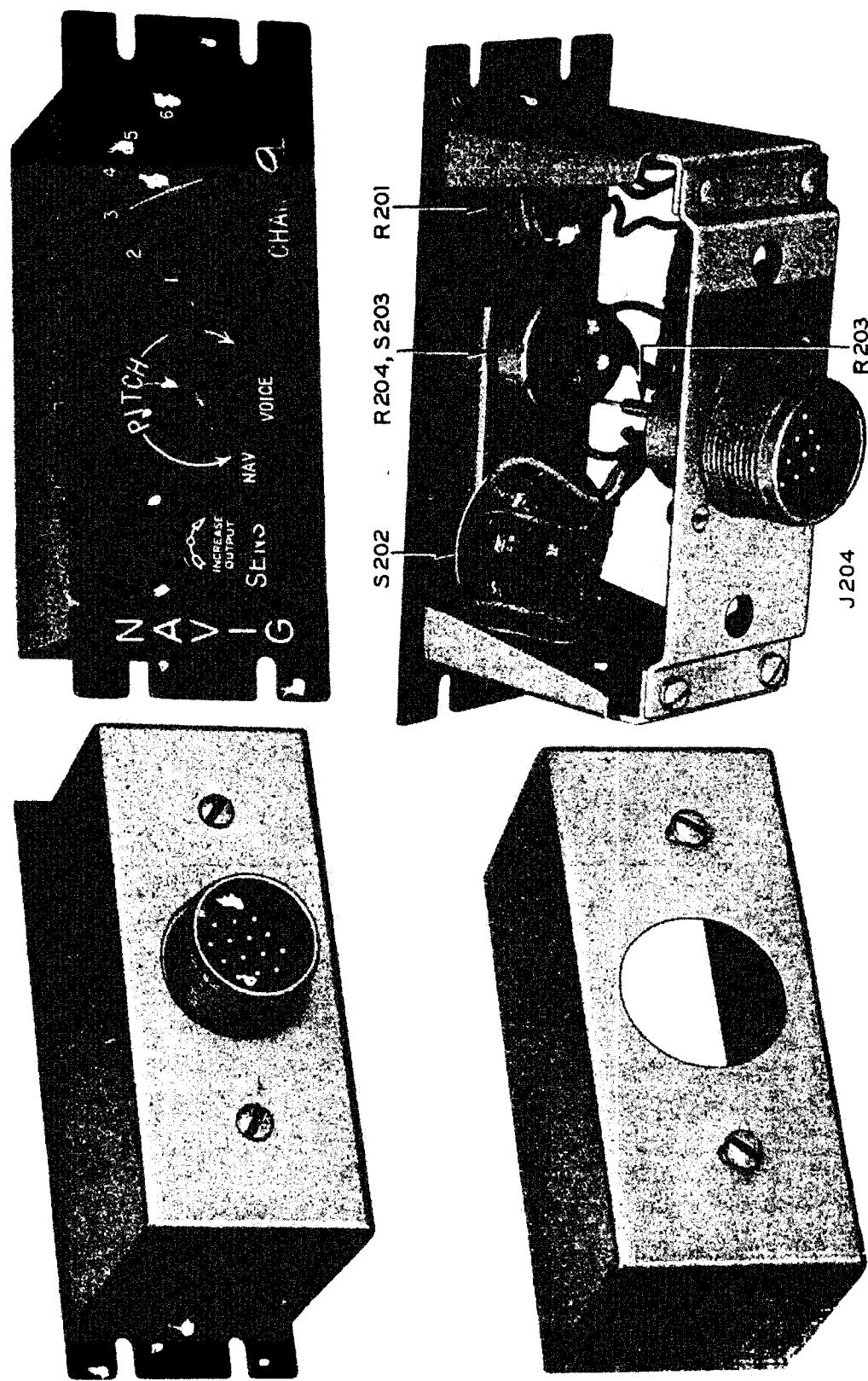


Figure 5—Control Unit *C-116/ARR-2A

SECTION II INSTALLATION AND ADJUSTMENT

I. INSTALLATION OF EQUIPMENT.

a. **GENERAL.**—The installation of this Radio Receiving Equipment is similar to that of Model AN/ARC-5 (Model ARA, Radio Set SCR-274-N) and other radio equipment. The receiver can be operated in any position of the double or triple racks. If Radio Receiver *R-4/ARR-2 or *R-4A/ARR-2 is being installed in a three-unit rack containing units of the AN/ARC-5 system, a space of eight inches may not be available for aligning this receiver if it is installed in the right-hand position. In this case, install the receiver in the left-hand rack (provided proper authority is received) and remove the center receiver to provide alignment space when alignment is necessary. The cables or wiring should be as short as possible to keep the weight of the equipment at a minimum and yet permit easy access to the control unit and receiver.

b. **INSTALLATION OF MOUNTING BASE AND CONTROL UNIT.**—Firmly bolt the receiver mounting base to the structure of the airplane. Figures 9 through 13 show the outline dimensions and information necessary for drilling and mounting the equipment in the aircraft. Place the control unit within easy reach of the operator. When Aircraft Radio Receiving Equipments *AN/ARR-2, -2X are used, the channel selector is driven by a flexible shaft, and therefore it is important that the shaft from the control unit to the receiver be in as straight a line as possible. Avoid sharp bends. (See figure 6.)

c. **PRECAUTIONS.**—Observe the same precautions in installing this equipment as are observed in installing other radio apparatus. The aircraft engine, generator, and accessories must be completely shielded to prevent electrical interference with radio reception. All metal parts of the airplane must be bonded together to prevent electrical interference due to variable or rubbing contacts of metal parts. Noise originating in the airplane due to rubbing or variable ground contacts enters the receiver through the antenna. Therefore, additional shielding of the receiver is worthless and the useful

sensitivity of the receiving equipment will be reduced unless the bonding and shielding is done in a very careful and complete manner.

2. LOCATION OF RECEIVER MOUNTING RACK AND MOUNTING BASE.

a. Firmly bolt the receiver mounting base to the structure of the aircraft in a location that satisfies most of the following considerations:

- (1) Short and direct path from the receiver location to the high-frequency antenna. (Within 15 feet.)
- (2) Direct path from the receiver location to the remote control unit.
- (3) Accessibility for aligning the receiver while in place in the mounting rack.
- (4) Accessibility for removing receiver from the receiver rack.
- (5) Short and direct path from the mounting rack to the power source or junction box.
- (6) Elimination of sharp bends in the transmission line, power cables, and mechanical linkages where used.

b. Since it is important to obtain a good ground contact through the mounting base screws, it is necessary to remove the paint from the mounting base or aircraft structure.

c. When aligning the receiver, adequate space must be provided for inserting the aligning tool in the modulation tuning unit. Figures 9 and 10 show the outline dimensions of the radio receiving equipment. This restricts the positioning of the equipment to at least eight inches between the right side cover of the receiver and any other obstacle.

d. A total of 15 feet of Coaxial Cable RG-8/U (Navy Type CASSF-50-1 or Army Type Cable WC-549) is supplied for connecting the aircraft receiver to the high-frequency antenna. This length is provided for installations where it is impossible to locate the antenna and receiver at a lesser distance. The total length of

cable should not be used if a shorter length will serve. Cut the cable and prepare the ends according to paragraphs 6a and 6b of this section.

3. ANTENNA.

Antenna *AT-5/ARR-1 is connected directly to the 50-ohm concentric transmission line RG-8/U (CASSF-50-1 or Cable WC-549). Select the location of the antenna with care in order to provide a good antenna pattern and also to prevent undesirable modulation by the rotating propellers of the aircraft. In general, the Bureau of Aeronautics approves antenna locations only after satisfactory flight tests have been made. The optimum position for an antenna varies with the type of aircraft and no specific instructions can be given which would apply to all types of installations. It is recommended that antenna radiation patterns be plotted to determine the best antenna location for each specific type of aircraft.

4. CHANNEL SELECTOR GEAR MECHANISM (USED WITH AIRCRAFT RADIO RECEIVING EQUIPMENTS *AN/ARR-2, -2X ONLY).

The gear mechanism used to drive the channel selector switch is included as an integral part of the channel unit. The spline shaft extending into the threaded bushing on the receiver panel engages a mating shaft of the mechanical linkage. To connect the linkage, insert the fitting on the end of the flexible shaft into the bushing and turn slightly to insure correct alignment. Tighten the knurled nut. *DO NOT OVERTIGHTEN.* (See figure 6.) This procedure permits the shaft to leave the receiver in a plane perpendicular to the front panel. If it is necessary to have the mechanical linkage in a plane parallel to the front panel, the right-angle coupling *MX-22/ARR-2 or coupling MC-211-A supplied to the Army should be used. Be sure that the channel number indicated on the receiver and the channel number on the control unit are identical.

5. METHOD OF MOUNTING ELECTRIC TUNING CONTROL ADAPTER TO AIRCRAFT RADIO RECEIVER.

The steps to be followed in order to mount Electric Tuning Control Adapter *C-37/ARR-2A to Aircraft Radio Receiver *R-4/ARR-2 or *R-4A/ARR-2 properly are outlined in figure 19.

When mounting the adapter unit on the receiver according to the instructions contained in Step 4 of figure 19, it should be noted that the spline shaft of the

adapter must fit into its mating section on the receiver without forcing. Before securing the adapter with the four No. 6-32 Sems fasteners, it may be necessary to turn crank No. 6743¹, shown in figure 19, slightly, in order to insure proper meshing of the gears.

6. ASSEMBLY OF CONCENTRIC TRANSMISSION LINES.

NOTE

Do not use acid flux or paste in soldering. Use only resin flux. Avoid excessive application of heat since the dielectric insulating bushing in the plug body can be damaged.

a. ASSEMBLY OF CABLE RG-8/U (CASSF-50-1, WC-549) WITH THREE-PIECE COAXIAL PLUG, NAVY TYPE-49195.—The flexible concentric transmission line is supplied in bulk for the radio receiving equipments. Figures 6, 7, and 8 show the proper installation of this line for the different equipments, while figure 16 shows the method of assembly of Navy Type-49195 Plugs and Cable RG-8/U concentric transmission line. The assembly procedure is as follows:

(1) Cut the cable to the length desired. Allow 1½ inches for length inside each plug. A wire cutter, a pair of pliers, a file, and a soldering iron are required to prepare this cable.

(2) Prepare the cable end as shown in figure 16. Remove the vinyl covering for the length AD, the shielding for the length AC, and the dielectric for the length AB. Then tin the exposed shield over the length CD and the inner conductor, avoiding excessive solder, since the clearance inside the plug is only 1/16 inch over the bare shield.

(3) Take the plug apart by backing out screw H3 and removing parts H2 and H1 in sequence.

(4) Slip shell H2 and clamping nut H1 onto the cable in that order.

(5) Screw plug body E1 onto the cable until the face B seats solidly against the insulated bushing of E1. This should expose the tip of the center conductor at point A.

(6) Solder the shield to plug body E1 through the four holes provided. Solder the center conductor to the plug sleeve at A. After cooling, dress down excess solder with a file to the sleeve diameter.

¹ This crank is not furnished as a part of Aircraft Radio Receiving Equipments *AN/ARR-2, -2A, -2X, -2AX. It is furnished as part of Aircraft Radio Equipment AN/ARC-5 and Radio Set SCR-274-N.

(7) Draw clamping nut H1 up over plug body E1 and push shell H2 up until it is well onto E1 but still allows free rotation of clamping nut H1. This will require considerable force which would be resisted by pushing against the rim of E1, rather than pulling on the cable. A convenient jig can be made for this operation by bench-mounting a dummy jack to which the body and clamping nut can be attached to give firm support for forcing H2 into place.

(8) When shell H2 is in proper position, tighten screw H3 to complete the assembly.

b. ASSEMBLY OF CABLE RG-8/U (CASSF-50-1, WC-549) WITH TWO-PIECE COAXIAL PLUG, PLUG PL-259.—Figure 16 shows the method of assembly of Plug PL-259 and Cable RG-8/U. The assembly procedure is as follows:

(1) Cut the cable to the length desired. Allow $1\frac{1}{2}$ inches for length inside each plug.

(2) Prepare the cable end as shown in figure 16. Remove the vinyl covering for length JM, the shielding for length JL, and the dielectric for length JK. Tin the exposed shield over length LM and the inner conductor, avoiding excessive solder, since the clearance inside the plug is only $\frac{1}{16}$ inch over the bare shield.

(3) Take the plug apart by backing off clamping nut H4.

(4) Slip the clamping nut over the cable with the threaded end facing outward.

(5) Screw the plug body H5 onto the cable until the face K seats solidly against the insulated bushing of H5. This should expose the tip of the center conductor at point J.

(6) Remove the clamping nut H4 and solder the shield to plug body H5 through the holes provided. Solder the center conductor to the plug sleeve at J. After cooling, dress down excessive solder to the sleeve diameter with a file.

(7) Slide clamping nut H4 up until the threads of H4 and H5 are engaged. Screw H4 onto H5 until the threads are no longer engaged. This permits free rotation of the clamping nut when the coaxial plug is connected to the coaxial jack in the receiver. Cut off inner conductor at J.

7. POWER CABLES.

NOTE

DO NOT GRIP PLUGS TO TWIST CABLE AS THIS MAY RESULT IN A

FAILURE AT THE SOLDERED CONNECTION. DO NOT USE ACID FLUX FOR SOLDERING; USE ONLY ROSIN FLUX.

a. GENERAL.

Power cables for Aircraft Radio Receiving Equipments *AN/ARR-2, -2A may be either of the shielded cable type or open wiring. Figure 14 shows the dimensions for trimming the ends of the cables, method of assembling the plugs to fittings, and cable connections to plugs. The procedure which follows for the cable assemblies is applicable to open wiring providing the steps pertaining to the shield are omitted.

The cutting length for the 8-conductor control cables (cable assemblies Nos. 1 and 3) is the nominal length L (*per figures 14A and 14F*) determined at installation, plus $1\frac{3}{16}$ inch; for the battery cable (cable assembly No. 2) it is the nominal length L (*per figure 14C*) determined at installation, plus $11\frac{7}{8}$ inch. A wire cutter, a pair of pliers, a file, and a soldering iron are required to prepare this cable.

b. ASSEMBLY OF CABLE No. 1 (figure 14A).

(1) Remove the cable insulation for a distance AE.

(2) Remove shielding from the insulation covering the grouped conductors for a distance AD.

(3) Remove insulation from insulated conductors for a distance AC.

(4) Remove insulation on individual conductors for a distance AB.

(5) Tin the ends of the conductors and the exposed shielding.

(6) Remove screw H5 and nut H4 from plug.

(7) Parts H4, H3, H1, H6, and H2 shall be passed over the cable in the order mentioned. Seat the cable insulation firmly in part H2.

(8) Solder the tin ends of the conductors into the terminal of E1. No surplus lumps of solder should remain on this terminal or any portion of the bakelite.

(9) Rotate H2 until the locating pin lines up with the threaded hole in terminal 4. Solder H2 to the shield at the four holes. Keep cable firmly seated in H2. Leave no solder on screw thread or sleeve portion of H2.

(10) Pass H1 over H2 and E1 and seat locating pin of H2 in locating slot of H1. Insert screw H5.

(11) Assemble H3 and H4. Seal H4 in place with lacquer.

(12) Lubricate the threaded portion of H1 with an anti-seize compound which consists of 50% petrolatum and 50% zinc dust (200 mesh fineness) or equivalent.

(13) The cable has considerable torsional rigidity, hence appreciable torsional stresses may be set up in the cable during installation if the relative angular position of the plugs is unfavorable. If there is too much stress, twist the cable a short length at a time until proper angular plug relationship results in a negligible torque.

c. ASSEMBLY OF CABLE No. 2 (figure 14C).

(1) Remove the cable insulation for a distance AE and FK.

(2) Remove shielding from the insulation covering the grouped conductors for a distance AB and FJ.

(3) Remove insulation from insulated conductors for a distance AC and FH.

(4) Remove insulation on individual conductors for a distance AB and FG.

(5) Tin the ends of the conductors and the exposed shielding.

(6) Remove screw H11 and H10 from plug.

(7) Parts H10, H9, H7, H12, and H8 shall be passed over the cable in the order mentioned. Seat the cable insulation firmly in part H8.

(8) Solder the tin ends of the conductors into the terminals of E2. No surplus lumps of solder should remain on this terminal or any portion of the bakelite.

(9) Rotate H8 until the locating pin lines up with the threaded hole in terminal 2. Solder H8 to the shield at the four holes. Keep the cable firmly seated in H8. Leave no solder on the screw thread or sleeve portion of H8.

(10) Pass H7 over H8 and E2 and seat locating pin of H8 in locating slot of H7. Insert screw H11.

(11) Assemble H9 and H10. Seal H10 in place with lacquer.

(12) Pass nut H501 and ferrule H502 over the cable and seat the cable insulation firmly in H502. Solder H502 to the shield at the four holes. Be sure no solder is left deposited on the flanged or sleeve portion of ferrule H502.

(13) Lubricate threaded portion of H7 and H501 with an anti-seize compound which consists of 50% petrolatum and 50% zinc dust (200 mesh fineness) or equivalent.

(14) The cable has considerable torsional rigidity,

hence appreciable torsional stresses may be set up in the cable during installation if the relative angular position of the plugs is unfavorable. If there is too much stress, twist the cable a short length at a time until proper angular plug relationship results in a negligible torque.

d. ASSEMBLY OF CABLE No. 3 (figure 14F).

(1) Remove the cable insulation for a distance AE.

(2) Remove shielding from the insulation covering the grouped conductors for a distance AD.

(3) Remove insulation from insulated conductors for a distance AC.

(4) Remove insulation on individual conductors for a distance AB.

(5) Tin the ends of the conductors and the exposed shielding.

(6) Remove screw H17 and nut H16 from plug.

(7) Parts H16, H15, H13, H18, and H14 shall be passed over the cable in the order mentioned. Seat the cable insulation firmly in part H14.

(8) Solder the tin ends of the conductors into the terminals of E3. No surplus lumps of solder should remain on this terminal or any portion of the bakelite.

(9) Rotate H14 until the locating pin lines up with the threaded hole in the insert fitted into E3. Solder H14 to the shield at the four holes. Keep the cable firmly seated in H14. Leave no solder on the screw thread or sleeve portion of H14.

(10) Pass H13 over H14 and E3 and seat locating pin of H14 in locating slot of H13. Insert screw H17.

(11) Assemble H15 and H16. Seal H16 in place with lacquer.

(12) Lubricate threaded portions of H13 with an anti-seize compound which consists of 50% petrolatum and 50% zinc dust (200 mesh fineness) or equivalent.

(13) The cable has considerable torsional rigidity, hence appreciable torsional stresses may be set up in the cable during installation if the relatively angular position of the plugs is unfavorable. If there is too much stress, twist the cable a short length at a time until proper angular plug relationship results in a negligible torque.

e. OPEN WIRE ASSEMBLY No. 4 (figure 14H).

Figure 14H shows the proper connections when control unit #C-116/ARR-2A is installed. It is important that the wires coming from terminals 7 and 3 of the open wire plug No. 9125 or PL-152A be shielded and

the shields grounded to the airplane structure. The open wire plugs are shown in figure 15.

8. ASSEMBLY OF MECHANICAL LINKAGE.

a. RECOMMENDED METHOD OF ASSEMBLY.

(1) REQUIRED TOOLS (Not Supplied with Equipment).

(a) Casing ferrule attaching tool with punch for attaching ferrule 0.380 inch outside diameter complete with arbor suitable to make final inside diameter of casing 0.242 $\begin{matrix} +.005 \text{ inch} \\ -.000 \text{ inch} \end{matrix}$ (see figures 17D and 18A).

(b) Hexagonal shaft swaging tool, dimension across flats 0.133 inch (length of swage $\frac{15}{16}$ inch). (See figures 17B and 18B.)

(c) Hexagonal spline sleeve swaging tool, dimension across flats 0.197 inch (length of swage $\frac{1}{4}$ inch). (See figures 17C and 18C.)

(d) Miscellaneous Tools: Hammer, fine-tooth hacksaw, medium file, pliers, red pencil.

(e) Petrolatum (Specification AN-VV-P-236, or equivalent).

(2) PROCEDURE.

(a) SWAGING AND CUTTING THE SHAFT.

1. Assuming that the free end of the bulk shaft has previously been hexagonally swaged in the recommended shaft swaging tool before cutting, measure along the shaft and accurately mark the cutting point to give the required length. (The minimum bending radius of 6 inches must be considered.)

2. Center the marked cutting point of the shaft in the shaft swaging tool (figure 18B) and strike the plunger with a hammer until seated.

3. Clamp the shaft in a vise and cut it in the center of the swage with a fine-tooth hacksaw. Remove the burrs with a file.

(b) CUTTING THE CASING.

1. With casing stretched out to maximum length, cut the casing $\frac{3}{8}$ inch per foot longer than the shaft. Push back the casing as required to assemble the splines on the shaft.

2. The casing may now be cut by holding it firmly in a vise (without crushing) and cutting off squarely with a fine-tooth hacksaw. Remove all burrs with a file.

(c) ATTACHING FERRULES TO CASING.

1. Slip the two coupling nuts H4 shown on figure 17A back to back over the casing (threaded portions toward ends of casing). Mark the casing at each end for a $\frac{3}{4}$ -inch insertion into casing ferrule (see figure 17D).

2. With a metal mandrel (arbor) inserted in the end of the casing to prevent its collapse, crimp the ferrule (at each end of the casing) by placing in the casing ferrule attaching tool (figure 18A) and striking the plunger a few sharp blows with the hammer until the plunger is firmly seated.

(d) ATTACHING END FITTINGS TO SHAFT.

1. Slip a "spline sleeve" end fitting over one end of the shaft (figure 17C) and place in the shaft sleeve crimping tool (figure 18C). Flats crimped on the hub must be parallel with flats on the shaft. Strike the plunger with a hammer until seated. Make sure that the crimp sleeve will enter and turn freely in the casing ferrule and casing. Burrs may be removed with file.

2. Before similarly attaching the fitting at the opposite end of the shaft, coat the shaft throughout its length with a layer of petrolatum (Specification AN-VV-P-236, or equivalent) and feed the shaft through the casing assembly.

NOTE: To facilitate the final crimping operation, it is possible to shorten the casing temporarily by twisting the ends in opposite directions. Similarly, after the final fitting has been crimped, the casing must be twisted in the reverse direction to adjust for the correct clearance of $\frac{1}{16}$ inch between the shaft ferrule and the shoulder of the splined sleeve at each end.

Swaging of spline fittings to shaft and ferrules to casing is a time-saving process; however, this process is not recommended unless there is an excess supply of end fittings and ferrules on hand to replace those damaged during installation.

b. ALTERNATE METHOD OF ASSEMBLING MECHANICAL LEAKAGE.

(1) REQUIRED TOOLS (Not supplied with equipment).

(a) Shaft Swaging Tool—This may be an ordinary square swaging or crimping tool for 0.150-inch cable as used in the repair of speedometer cables.

(b) 200-watt soldering iron, non-corrosive soldering paste, and resin core solder.

(c) Fine-tooth hacksaw, pliers, red pencil.

(d) Petrolatum (Specification AN-VV-P-236, or equivalent).

(2) PROCEDURE.

(a) SHAFTING.

1. Measure the required length of shafting and mark with red pencil. (The minimum bending radius of 6 inches must be considered.)

2. Apply a small amount of non-corrosive soldering paste about the mark and tin with solder approximately $\frac{15}{32}$ inch each side of the mark using a soldering iron (see figure 17B). DO NOT USE A TORCH.

3. Center tinned area in the swaging tool and strike with a hammer until the punch becomes seated. The shaft may be rotated one position after each blow of the hammer for more uniform swaging.

4. Cut shaft in the center of swage with a fine-tooth hacksaw.

(b) CASING.

1. With casing stretched out to its maximum length cut casing $\frac{3}{8}$ inch per foot longer than the shafting.

2. Place the casing in a vise (do not crush) and cut squarely with a fine-tooth hacksaw. Remove all burrs with a file. Slip the two coupling nuts H4 (see figure 17A) back to back with threads facing outward on the casing. Clean the ends of the casing with sand paper if necessary. Slip a ferrule over one end of the casing as far as it will go (see figure 17B). Solder the ferrule to the casing. DO NOT USE TORCH. Attach another ferrule to the other end of the casing in a similar manner. The casing ends should be inspected and any burrs present should be removed with a file.

3. If the ferrule or casing is made of aluminum, a different method will be required. Slip on the coupling nuts and sleeve as before. Insert a mandrel, arbor, or pilot of the proper size into the casing to prevent crushing. With a metal punch and hammer make indentures in ferrule and casing as indicated in figure 17D.

(c) SHAFT AND FITTINGS.

1. Try pushing the shaft ends into the end fittings to check for proper fit and remove (see figure 17C).

2. Place the end fitting into a vise or suitable jig with the shaft sleeve vertical.

3. With soldering iron held against sleeve, fill up the sleeve with resin core solder; keep in a molten state.

4. Pick up a shaft end with pliers and push it into sleeve while the solder is still molten. Hold in this position until solder is fixed. Remove any excess solder.

5. Grease the entire length of the shaft end with petrolatum (Specification AN-VV-P-236, or equivalent) and feed the shaft through the casing assembly.

6. Attach the second spline in a manner similar to the first one. The casing may be pushed back along the shaft to allow enough room to work. The casing ends may be turned in opposite directions to aid in this adjustment.

7. If the fittings are made of aluminum, soldering is not advised. In this case, some form of swaging is necessary. A speedometer type swaging tool may be used; however, it will be necessary to dress down the shank of the end fitting with a file after swaging in order to permit a satisfactory fit into the casing.

9. ALIGNMENT OF TEST OSCILLATOR AND RECEIVER.

a. ALIGNMENT OF PORTABLE TEST OSCILLATORS *TS-24/ARR-2 AND *TS-24A/ARR-2.— Since part of Portable Test Oscillators *TS-24/ARR-2 and *TS-24A/ARR-2 does not require frequent adjustment, only channel alignment will be given here. The following procedure should be observed in the alignment of test oscillators:

(1) Connect test lead from CAL jack to frequency measuring equipment.

(2) Rotate the time switch beyond the five minute point. If external power supply is used (*TS-24A/ARR-2 only), turn the power switch to EXT POWER SUPPLY.

(3) Set channel selector switch to desired position.

(4) Turn adjusting screws all in.

(5) Set adjustment screws of all six channels to positions determined from the approximate calibration chart on the inside cover of the portable test oscillator. Do this before proceeding with alignment.

(6) Set measuring equipment to proper frequency.

(7) If frequency measuring device has input attenuator, adjust for minimum readable signal indicated in the headphones connected to the frequency measuring equipment.

(8) Tune the desired channel to **ZERO BEAT**. (This should occur ± 2 turns from that indicated on the approximate calibration chart.)

(9) Repeat steps 6, 7, and 8 for each channel to be tuned.

(10) Recheck each channel after all positions have been tuned.

(11) Close doors covering adjusting screws.

b. ALIGNMENT OF RADIO RECEIVER.

(1) Channels in the *AN/ARR-2, -2A equipment are usually set up in the shop and not in the airplane. Adjustments described here will be limited to those adjustments required to install the equipment or check the equipment in the airplane prior to takeoff.

(2) Make certain the test oscillator has been set on all the assigned channels and in the correct order for the receiving equipment.

(3) Set the test oscillator with its antenna in place approximately ten feet from the receiving antenna. Switch the oscillator on and turn the selector switch to one of the required channels. Tone modulation will not be required for the test.

(4) Set **CHANNEL** control on receiving equipment to the corresponding channel of the test oscillator.

(5) Set the **NAV-VOICE** switch on the receiving equipment to the **NAV** position and connect headphones and output meter to the receiver output.

(6) If the receiving equipment works through the interphone system of the airplane, turn the interphone equipment on and set its volume control to maximum.

(7) Advance the **OUTPUT** control on the control unit until noise or signal of moderate level is heard.

(8) Adjust the **BEAT NOTE** control to a position which gives a clear signal.

(9) Loosen the dial lock and adjust the dial on the front of the receiver for maximum signal output. No further adjustment of the dial is required. If a signal is not received, check the wiring and the selector channel settings. Check the test oscillator with the frequency measuring equipment in the shop. If a signal cannot be heard after these checks, remove the receiver from the airplane and send it to the shop for realignment.

(10) Adjust the antenna trimmer screw on the front of the receiver for maximum output. No further adjustment of the trimmer screw will be required.

(11) Check all channels. In the normal case, the test oscillator channels will be the same as the corresponding channels on the receiver. Turn the **CHANNEL** switch on the test oscillator to No. 1 and turn the **CHANNEL** switch in the receiver to No. 1. Adjust the **BEAT NOTE** control for the desired response. In the same manner, check channels 2, 3, 4, 5, and 6. In each instance it may be necessary to readjust the **BEAT NOTE** control for the desired response. If it is not possible to obtain the proper pitch, either the oscillator, the receiver, or both may be out of alignment. The test oscillator should be checked frequently with the frequency measuring equipment to make certain that it is tuned to the assigned channels. Ordinarily, the oscillator will not require checking more often than once each hour. If the test oscillator is found to be in alignment and the receiver out of alignment on any desired channel, the receiver will require a complete channel realignment. The channel alignment should be made in the shop, and it is not recommended that this adjustment be made in the airplane.

SECTION III OPERATION

1. GENERAL.

Aircraft Radio Receiving Equipment *AN/ARR-2, -2A is provided for remote control operation only. All necessary controls for complete OPERATION on any one of the six channels are located on the control unit. The control unit has a combination switch with OFF-NAV-VOICE positions (on Control Unit *C-116/ARR-2A the corresponding switch has only a NAV-VOICE position); an OUTPUT (sensitivity) control; a CHANNEL selector control; a PHONE jack (Control Units *C-2/ARR-2, *C-35/ARR-2A only); and a BEAT NOTE control.

2. USE OF OPERATING CONTROLS.

NOTE

No harm to the equipment or operating personnel can result from any combination of settings of the controls.

a. "OFF-NAV-VOICE" CONTROL.—Power is applied to the receiver when the knob is set to either the NAV or VOICE position. When the control is set to the NAV position, the BEAT NOTE oscillator functions and a navigation signal is heard. The VOICE setting should never be used for navigating service. If VOICE is to be used, instructions will ordinarily be given prior to takeoff. Always be sure this control is set for the kind of reception desired.

b. "OUTPUT" CONTROL (SENSITIVITY CONTROL).—The OUTPUT control varies the gain sensitivity of the receiver and is used as a volume control to limit the audio output to a comfortable level. It is capable of varying the sensitivity over a considerable range. When the output of the receiver is fed into an interphone circuit instead of being taken from the PHONE jack in the control unit, an additional audio control is available at the interphone output. *FOR SATISFACTORY RESULTS WITH RADIO RECEIVING EQUIPMENT *AN/ARR-2, -2A, IT IS IMPORTANT TO SET THE INTERPHONE CON-*

TROL FOR MAXIMUM OR NEAR MAXIMUM OUTPUT AND TO ADJUST THE OUTPUT CONTROL IN THE CONTROL UNIT FOR AS LOW A LEVEL AS CAN BE USED FOR INTELLIGIBLE RECEPTION. This method of reception gives a sharp position indication which cannot otherwise be obtained.

c. "BEAT NOTE" CONTROL.—This control varies the pitch or tone of the observed navigation signal.

d. "PHONE" JACK.—Control Unit *C-2/ARR-2 and *C-35/ARR-2A are provided with a headphone jack marked PHONE. The jack is connected to the output of the receiver at all times. The wiring in many airplane types makes the use of this jack necessary. Control Unit *C-116/ARR-2A does not contain a PHONE jack.

e. "CHANNEL" CONTROL.—In the case of Aircraft Radio Receiving Equipments *AN/ARR-2 and *AN/ARR-2X the CHANNEL selector control consists of a crank driven gear mechanism and functions similarly to the gear box on the Aircraft Radio Receiver. The crank rotates a gear mechanism which in turn rotates the flexible shaft and the selector switch in the receiver. This control can be turned in either direction through 360 degrees. Three complete turns of the crank are required to move the selector switch one position. The channel indicator is observed through a window in the control box case.

In the case of Aircraft Radio Receiving Equipments *AN/ARR-2A and *AN/ARR-2AX, the CHANNEL selector control consists of a rotary six-position switch which causes the motor of the electric tuning control adapter located on the receiver to rotate when a channel position has been selected. The motor rotates until the proper position has been reached.

f. TUNING CONTROL ON FRONT OF RECEIVER.—This control is not considered an operating control. It is usually set to a particular frequency before flight and locked into place.

3. INSTRUCTIONS FOR RECEPTION OF NAVIGATION SIGNALS.

a. The following is a brief outline of tuning procedure in order to receive navigation signals:

(1) Set *CHANNEL* control: Adjust the *CHANNEL* control in accordance with the instructions received prior to takeoff. This amounts to selecting the proper transmitting station.

(2) Set *NAV-VOICE* control: Set this control to *NAV* position.

(3) Set *INTERPHONE VOLUME* control: Turn the *INTERPHONE VOLUME* control to or near the full on position. This volume control is located on the interphone control unit. If too much noise or signal is received from other equipments, their controls may be turned off temporarily in order to properly identify the navigation signals. After the desired operation has been accomplished, return these controls to their former positions. If you happen to have an airplane in which the output of Aircraft Radio Receiving Equipments *AN/ARR-2, -2A does not go through the *INTERPHONE VOLUME* control, step 3 is unnecessary. But if you do not know and want to be on the safe side, **TURN THE INTERPHONE VOLUME CONTROL FULL ON AND LEAVE IT THERE.**

(4) Set the *RECEIVER* output control: Begin

with the control set in the extreme counterclockwise position. Advance it slowly clockwise until either noise or signals of moderate strength are heard. If it is possible to receive signals, you will hear them without advancing the output control any further.

(5) Set *BEAT NOTE* control: Set this control at any position which will give the signals a clear tone or pitch. This control may require resetting occasionally during flight to maintain this pitch.

(6) Readjust *RECEIVER* output control: Turn this control in a counterclockwise direction until only the desired signal is readable. This control will require frequent readjusting, especially when near a transmitter. As you are approaching a transmitter, the required position of the output control should be set further and further counterclockwise.

CAUTION

The most important requirement for tuning is the following: Turn *UP* the *INTERPHONE VOLUME* control; turn *DOWN* the *RECEIVER* output control for minimum readable signal; and readjust it frequently to maintain this condition. Be sure the aircraft is within range of the transmitting equipment. In general, a greater altitude will give a stronger signal.

SECTION IV EMERGENCY OPERATION AND REPAIR

1. GENERAL.

Very little can be accomplished in the way of emergency operation and repair during flight, except in larger aircraft where sufficient personnel and space are available.

2. EQUIPMENT OPERATIVE BUT NO SIGNAL HEARD.

a. Be sure the aircraft is within range of the transmitting equipment. In general, a greater altitude will give a stronger signal.

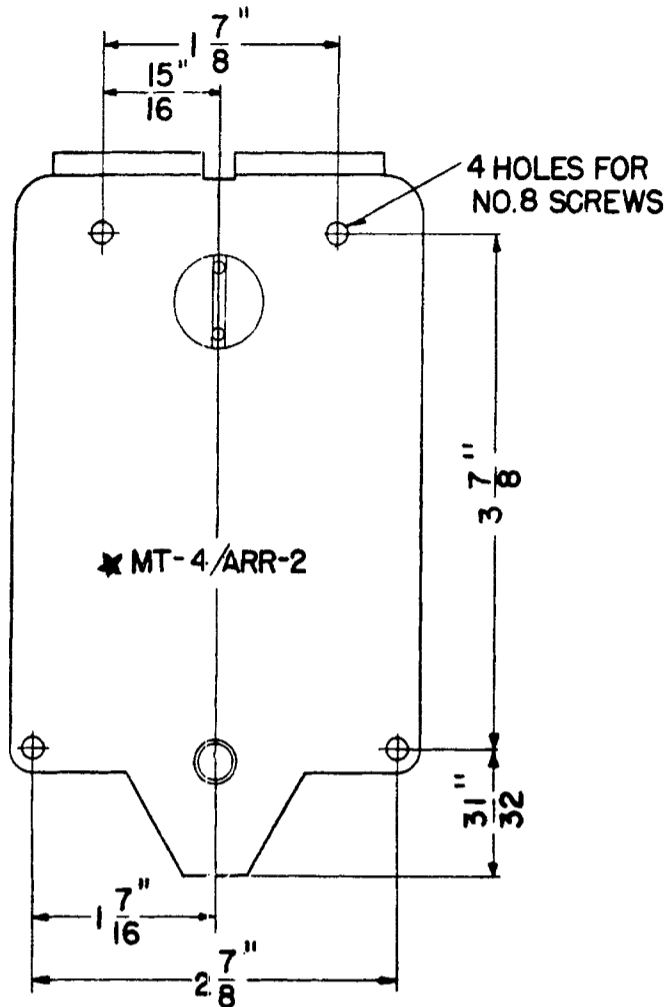
b. Check to see that all controls are in the correct position as outlined in Section III, Paragraph 3.

3. EQUIPMENT INOPERATIVE.

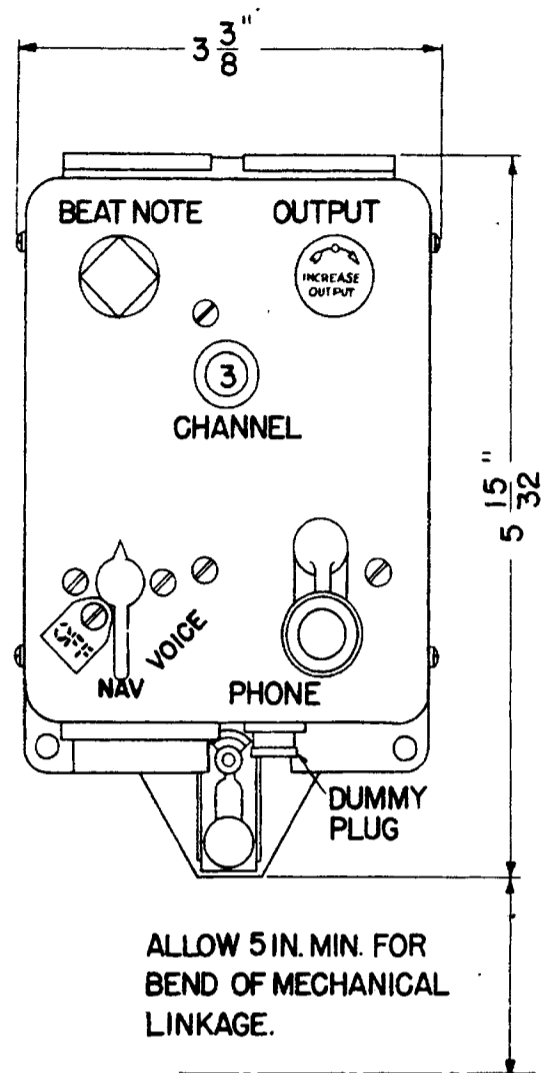
a. Check all cables and plugs for tightness and broken wires.

b. If possible remove the right side cover and check to see if all tubes are in position and lighted.

c. Check fuse on mounting rack. A spare fuse is available in the spare fuse clip.



★ MT-4/ARR-2
MOUNTING PLATE



★ C-2/ARR-2
CONTROL BOX

WEIGHT	(POUNDS)
CONTROL BOX	1.1
MOUNTING PLATE	0.2

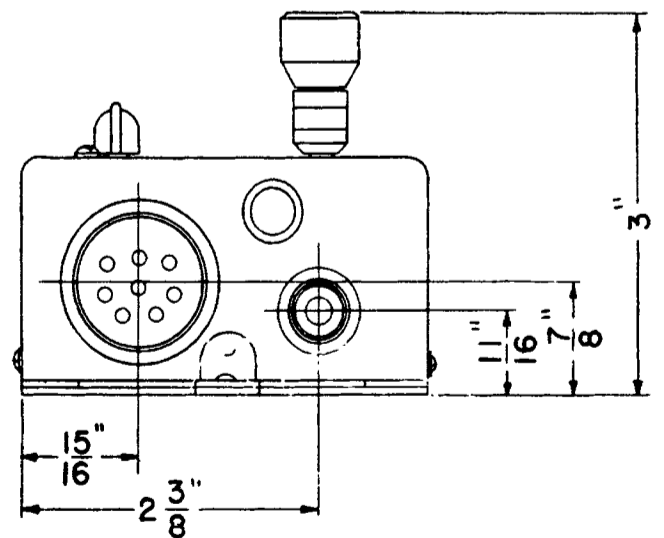


Figure 11—Outline Dimensional Drawing of Control Unit *C-2/ARR-2

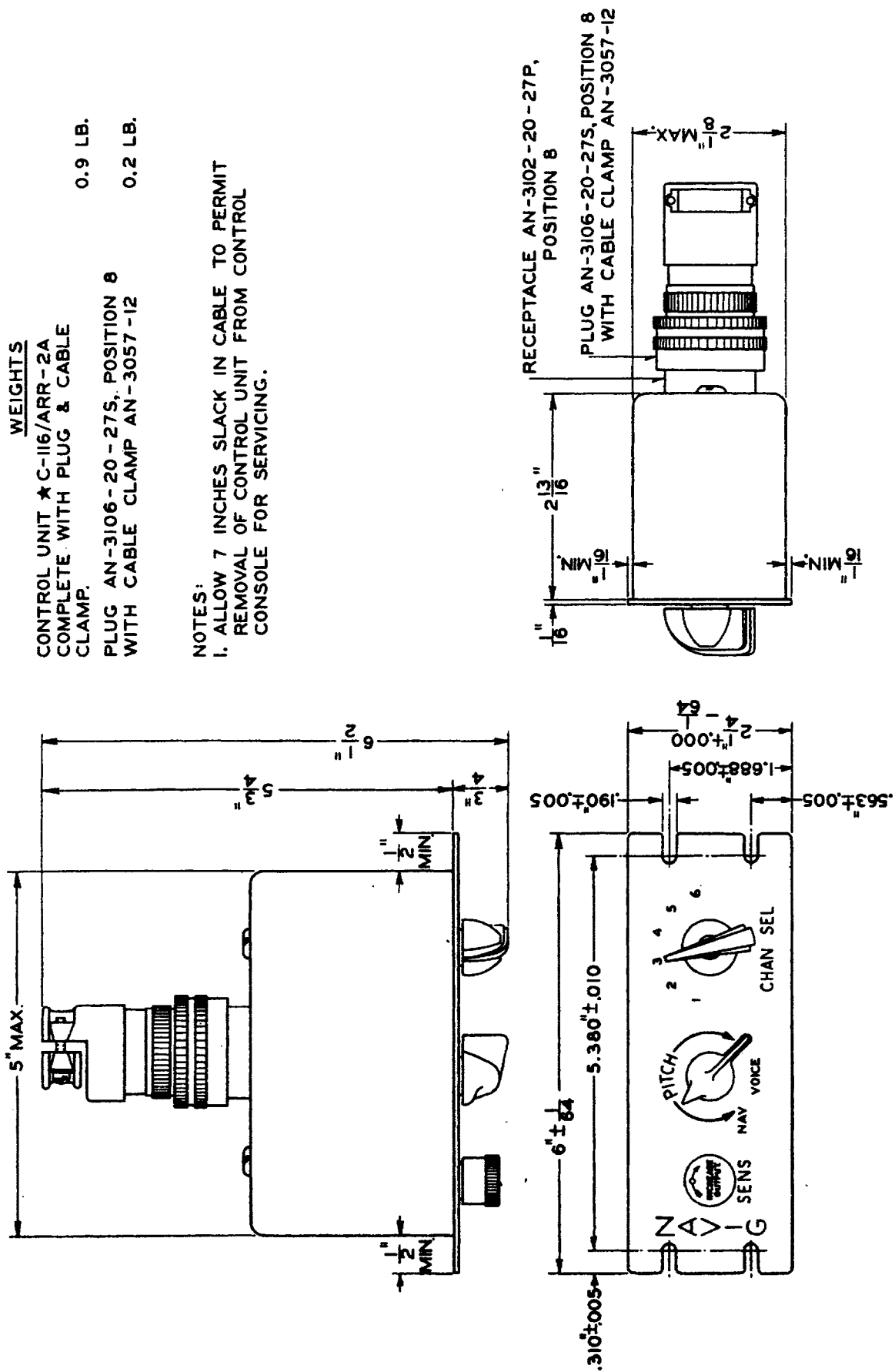
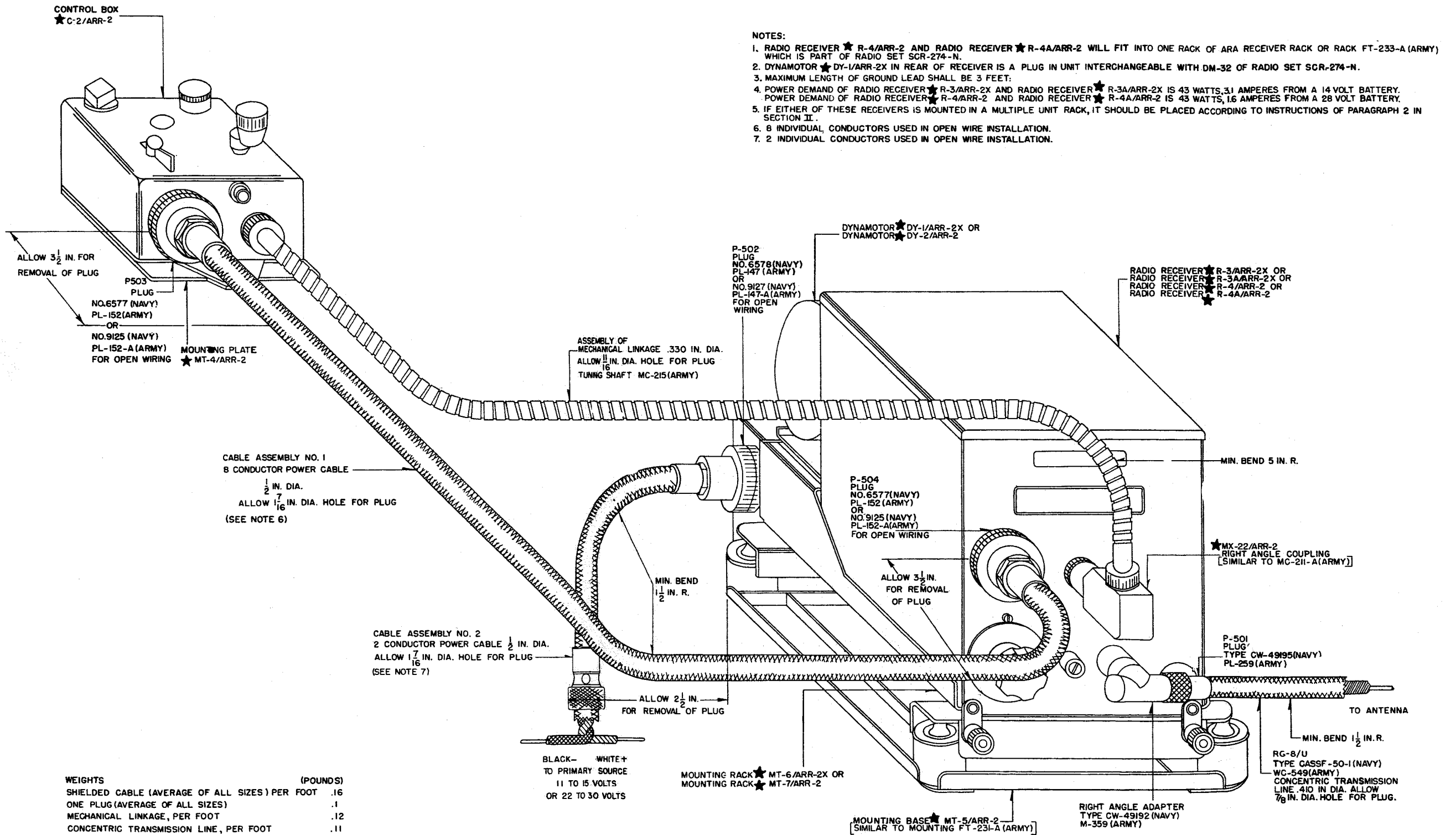


Figure 13—Outline Dimensional Drawing of Control Unit *C-116/ARR-2A

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NOTES:

1. RADIO RECEIVER ★R-4/ARR-2 AND RADIO RECEIVER ★R-4A/ARR-2 WILL FIT INTO ONE RACK OF ARA RECEIVER RACK OR RACK FT-233-A (ARMY) WHICH IS PART OF RADIO SET SCR-274-N.
2. DYNAMOTOR ★DY-1/ARR-2X IN REAR OF RECEIVER IS A PLUG IN UNIT INTERCHANGEABLE WITH DM-32 OF RADIO SET SCR-274-N.
3. MAXIMUM LENGTH OF GROUND LEAD SHALL BE 3 FEET.
4. POWER DEMAND OF RADIO RECEIVER ★R-3/ARR-2X AND RADIO RECEIVER ★R-3A/ARR-2X IS 43 WATTS, 3.1 AMPERES FROM A 14 VOLT BATTERY. POWER DEMAND OF RADIO RECEIVER ★R-4/ARR-2 AND RADIO RECEIVER ★R-4A/ARR-2 IS 43 WATTS, 1.6 AMPERES FROM A 28 VOLT BATTERY.
5. IF EITHER OF THESE RECEIVERS IS MOUNTED IN A MULTIPLE UNIT RACK, IT SHOULD BE PLACED ACCORDING TO INSTRUCTIONS OF PARAGRAPH 2 IN SECTION II.
6. 8 INDIVIDUAL CONDUCTORS USED IN OPEN WIRE INSTALLATION.
7. 2 INDIVIDUAL CONDUCTORS USED IN OPEN WIRE INSTALLATION.

Figure 6—Interconnecting Cable Diagram for Radio Receiving Equipment AN-ARR-2, -2X

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NOTES

1. RADIO RECEIVER ★R-4/ARR-2 AND RADIO RECEIVER ★R4A/ARR-2 WILL FIT INTO ONE RACK OF ARA RECEIVER RACK OR RACK FT-233-A (ARMY) WHICH IS PART OF RADIO SET SCR-274-N.
2. DYNAMOTOR ★DY-1/ARR-2X IN REAR OF RECEIVER IS A PLUG-IN UNIT INTERCHANGEABLE WITH DM-32 OF RADIO SET SCR-274-N.
3. MAXIMUM LENGTH OF GROUND LEAD SHALL BE THREE FEET.
4. POWER DEMAND OF RADIO RECEIVER ★R-3/ARR-2X AND RADIO RECEIVER ★R-3A/ARR-2X IS 43 WATTS, 3.1 AMPERES FROM A 14 VOLT BATTERY. POWER DEMAND OF RADIO RECEIVER ★R-4/ARR-2 AND RADIO RECEIVER ★R-4A/ARR-2 IS 43 WATTS, 1.6 AMPERES FROM A 28 VOLT BATTERY.
5. IF EITHER OF THESE RECEIVERS IS MOUNTED IN A MULTIPLE UNIT RACK, IT SHOULD BE PLACED ACCORDING TO INSTRUCTIONS OF PARAGRAPH 2 IN SECTION II.
6. 8 INDIVIDUAL CONDUCTORS USED IN OPEN WIRE INSTALLATION.
7. 2 INDIVIDUAL CONDUCTORS USED IN OPEN WIRE INSTALLATION.

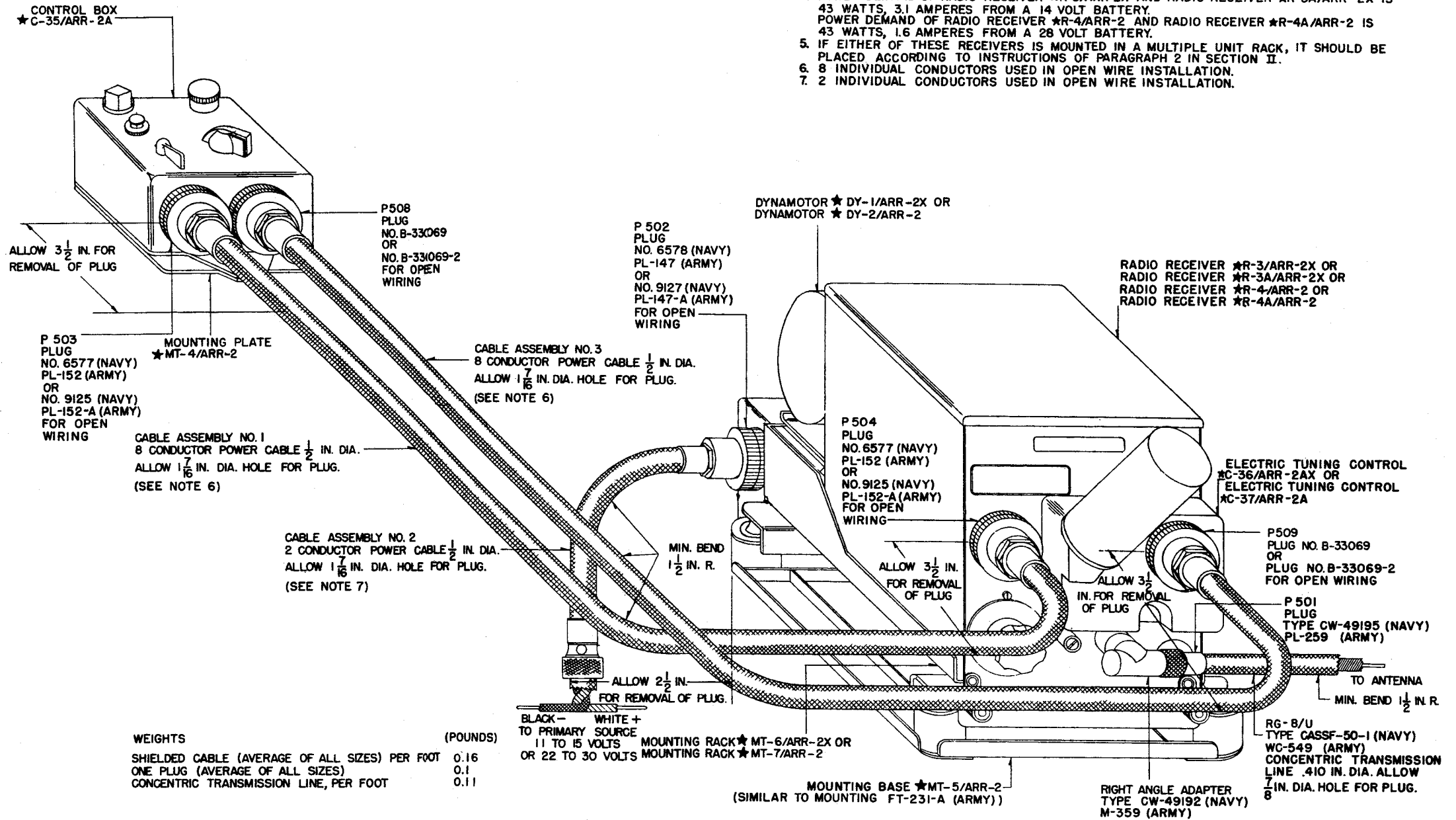


Figure 7—Interconnecting Cable Diagram for Radio Receiving Equipment *AN/ARR-2A, -2AX

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NOTES:

1. RADIO RECEIVER *R-4/ARR-2 AND RADIO RECEIVER *R-4A/ARR-2 WILL FIT INTO ONE RACK OF ARA RECEIVER RACK OR RACK FT-233-A (ARMY) WHICH IS PART OF RADIO SET SCR-274-N.
 2. DYNAMOTOR *DY-1/ARR-2X IN REAR OF RECEIVER IS A PLUG-IN UNIT INTERCHANGEABLE WITH DM-32 OF RADIO SET SCR-274-N.
 3. MAXIMUM LENGTH OF GROUND LEAD SHALL BE 3 FEET.
 4. POWER DEMAND OF RADIO RECEIVER *R-3/ARR-2X AND RADIO RECEIVER *R-3A/ARR-2X IS 43 WATTS, 3.1 AMPERES FROM A 14-VOLT BATTERY.
 5. POWER DEMAND OF RADIO RECEIVER *R-4/ARR-2 AND RADIO RECEIVER *R-4A/ARR-2 IS 43 WATTS, 1.6 AMPERES FROM A 28-VOLT BATTERY.
- IF EITHER OF THESE RECEIVERS IS MOUNTED IN A MULTIPLE UNIT RACK, IT SHOULD BE PLACED ACCORDING TO INSTRUCTIONS OF PARAGRAPH 2 IN SECTION II.

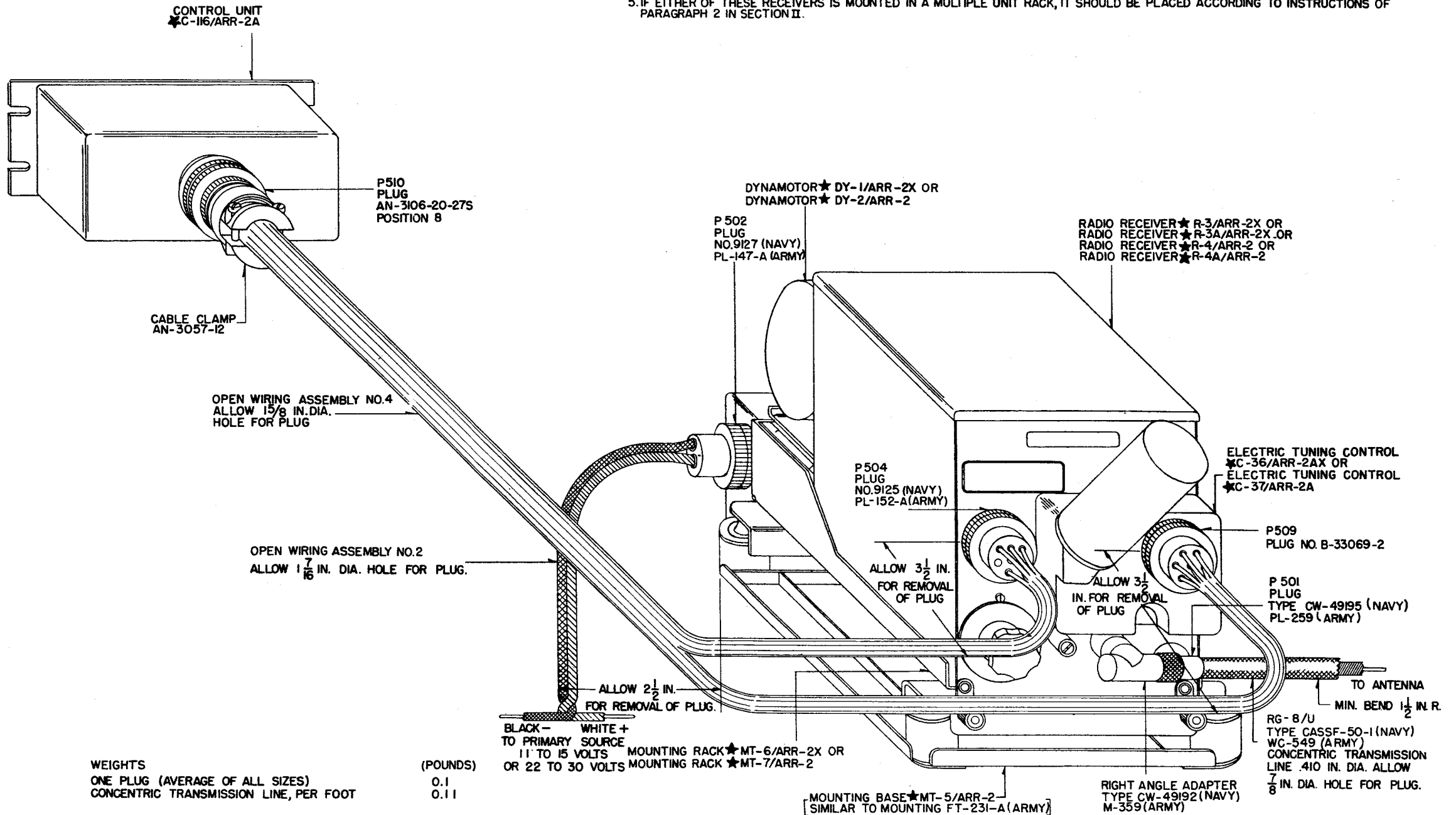
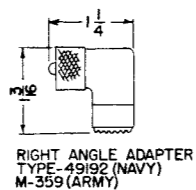
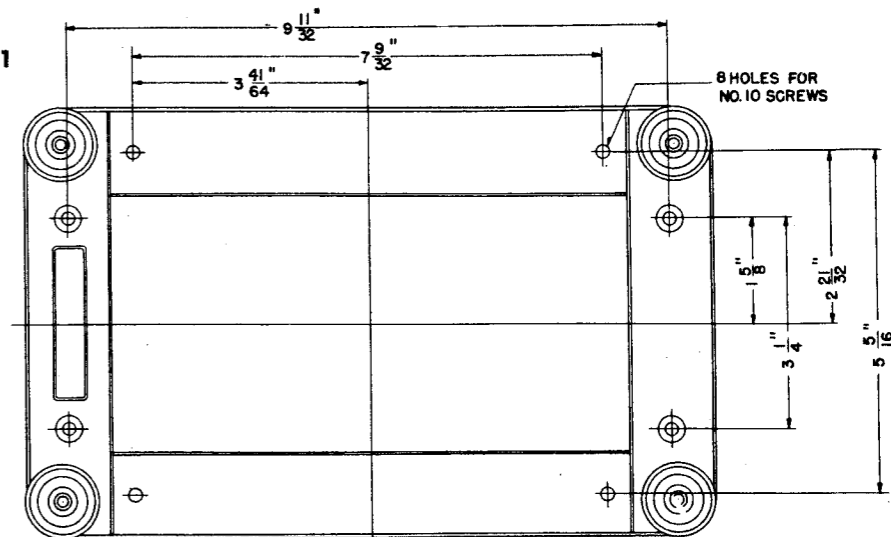


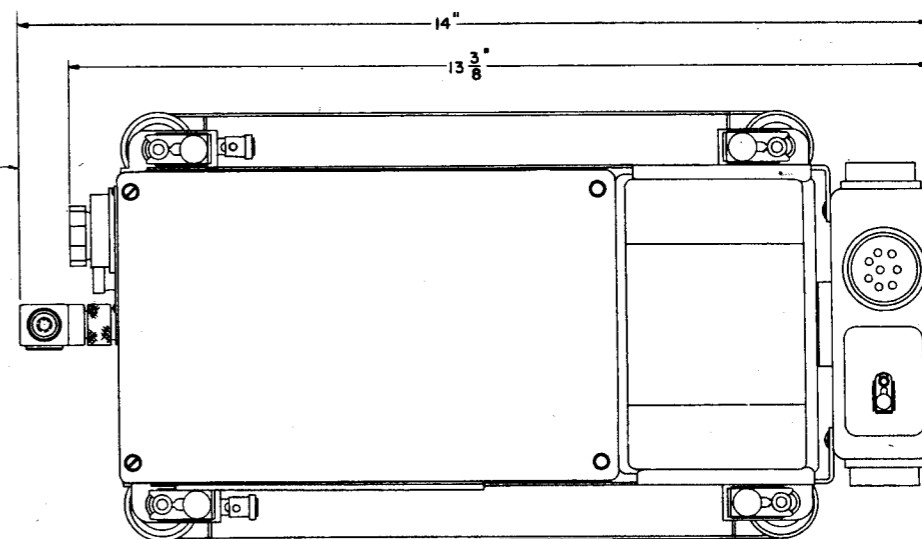
Figure 8—Interconnecting Cable Diagram for Radio Receiving Equipment *AN, ARR-2X -2AX with Control Unit *C-116, ARR-2A

WEIGHTS OF COMPONENT UNIT	(POUNDS)
ONE RECEIVER UNIT (LESS TUBES, ELECTRIC TUNING CONTROL & DYNAMOTOR)	6.4
ONE DYNAMOTOR UNIT	3.0
ONE SET OF TUBES	0.25
MOUNTING BASE	0.9
MOUNTING RACK	1.4

MOUNTING BASE
★ MT-5/ARR-2



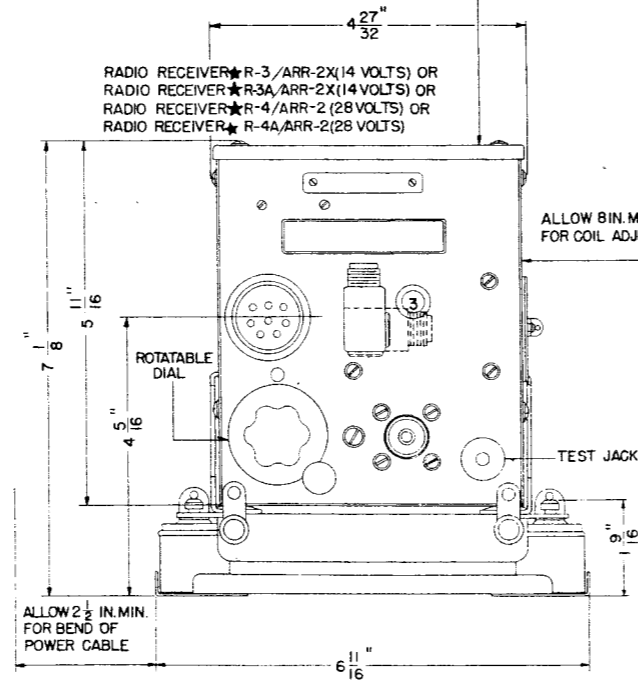
ALLOW 4 IN. MIN. FOR
REMOVAL OF RECEIVER



ALLOW 4 IN. MIN. FOR
BEND OF MECHANICAL
LINKAGE.

RADIO RECEIVER ★ R-3/ARR-2X (14 VOLTS) OR
RADIO RECEIVER ★ R-3A/ARR-2X (14 VOLTS) OR
RADIO RECEIVER ★ R-4/ARR-2 (28 VOLTS) OR
RADIO RECEIVER ★ R-4A/ARR-2 (28 VOLTS)

ALLOW 8 IN. MIN.
FOR COIL ADJUSTMENT



REMOVABLE PLATE FOR
ACCESS TO TUNING
UNIT ADJUSTMENT

DYNAMOTOR ★ DY-1/ARR-2X (14 VOLTS) OR
DYNAMOTOR ★ DY-2/ARR-2 (28 VOLTS)

ALLOW $3 \frac{1}{2}$ IN.
FOR REMOVAL OF
PLUG

MOUNTING RACK
★ MT-6/ARR-2X (14 VOLTS)
OR ★ MT-7/ARR-2 (28 VOLTS)

MOVEMENT ON
SHOCK MOUNTING
 $\frac{1}{4}$ IN.

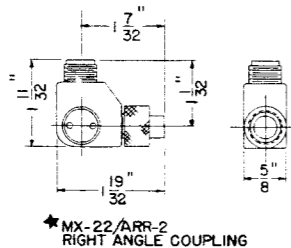
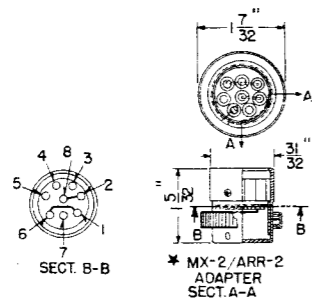
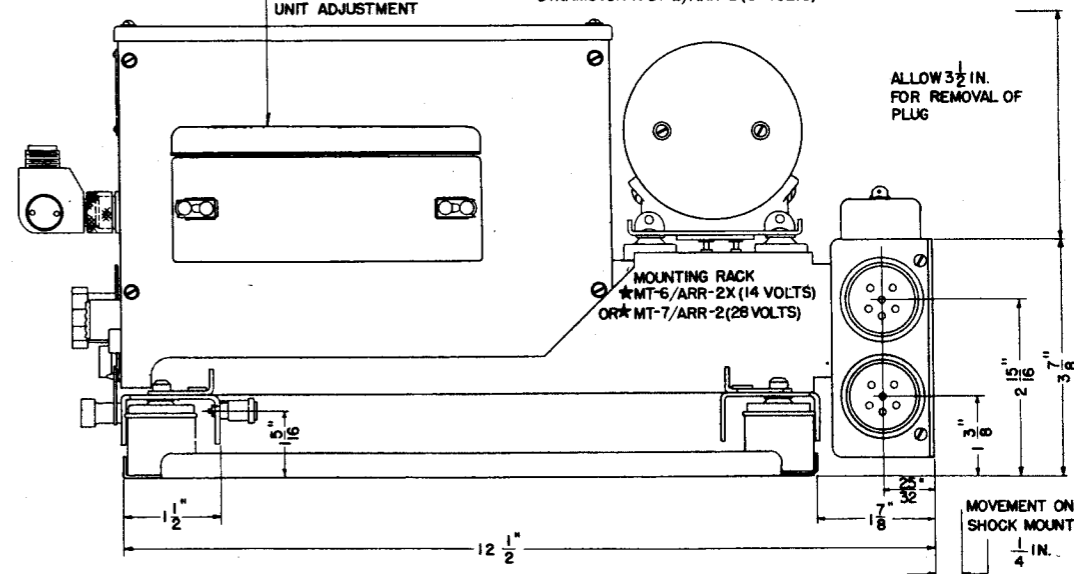
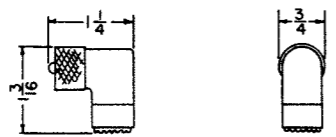
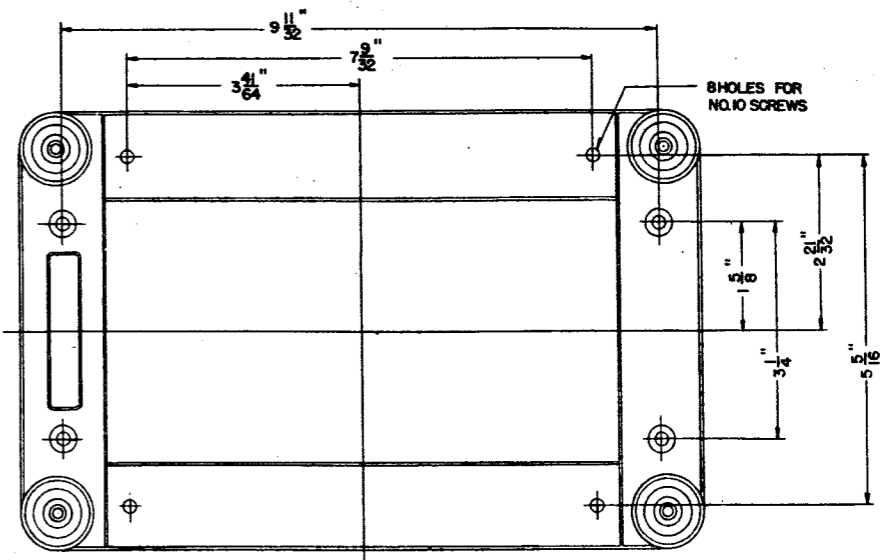


Figure 9—Outline Dimensional Drawing of Radio Receiver, Mount, and Rack

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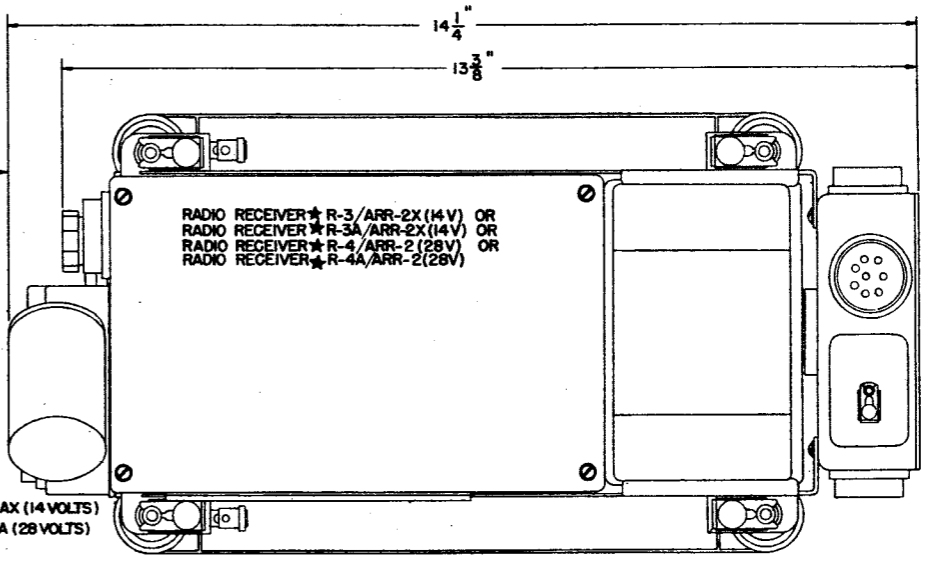
WEIGHTS OF COMPONENT UNIT	(POUNDS)
ONE RECEIVER UNIT (LESS TUBES, ELECTRIC TUNING CONTROL & DYNAMOTOR)	6.4
ONE DYNAMOTOR UNIT	3.0
ONE SET OF TUBES	0.25
ONE ELECTRIC TUNING CONTROL	0.94
MOUNTING RACK	1.4
MOUNTING BASE	0.9

MOUNTING BASE
★ MT-5/ARR-2

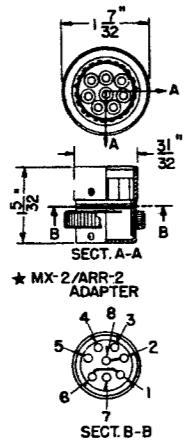


RIGHT ANGLE ADAPTER
TYPE-49192 (NAVY)
M-359 (ARMY)

ALLOW 4 IN. MIN.
FOR REMOVAL OF RECEIVER.



ELECTRIC TUNING CONTROL ★ C-36/ARR-2AX (14 VOLTS)
OR ELECTRIC TUNING CONTROL ★ C-37/ARR-2A (28 VOLTS)



★ MX-2/ARR-2
ADAPTER

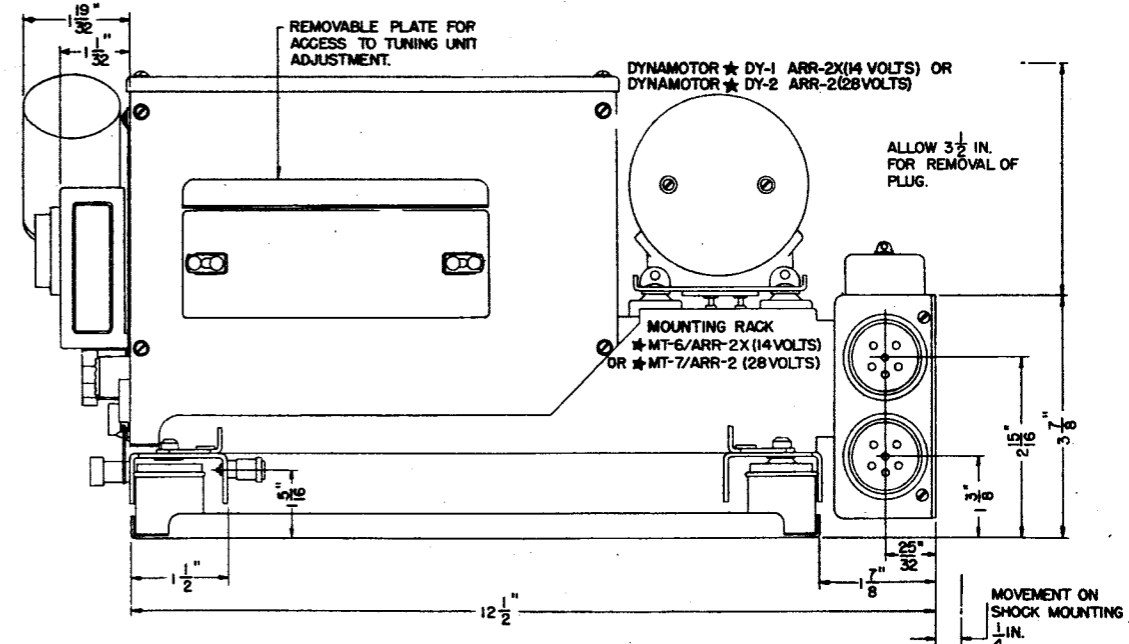
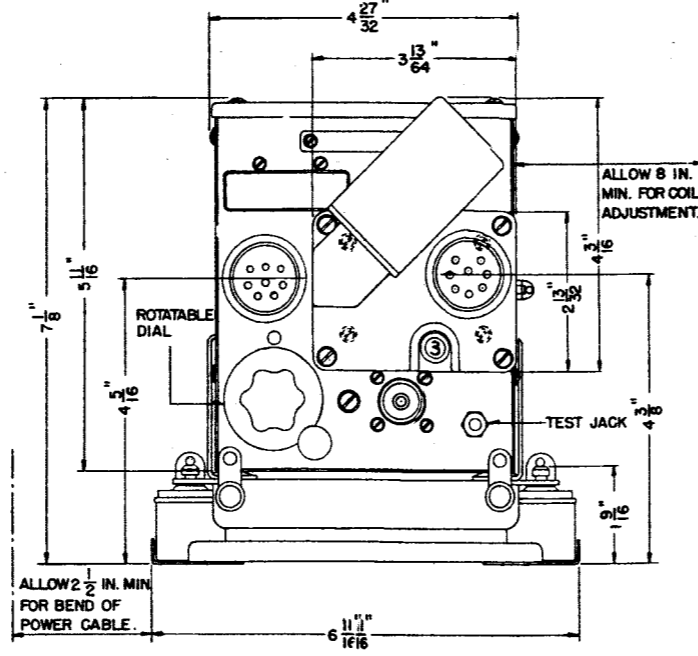
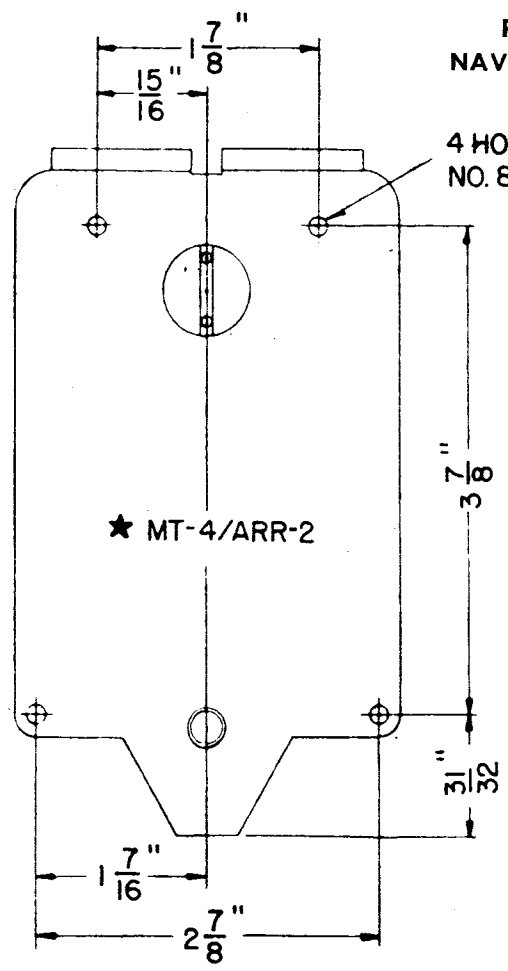


Figure 10—Outline Dimensional Drawing of Radio Receiver with Electric Tuning Control Adapter, Mount, and Rack

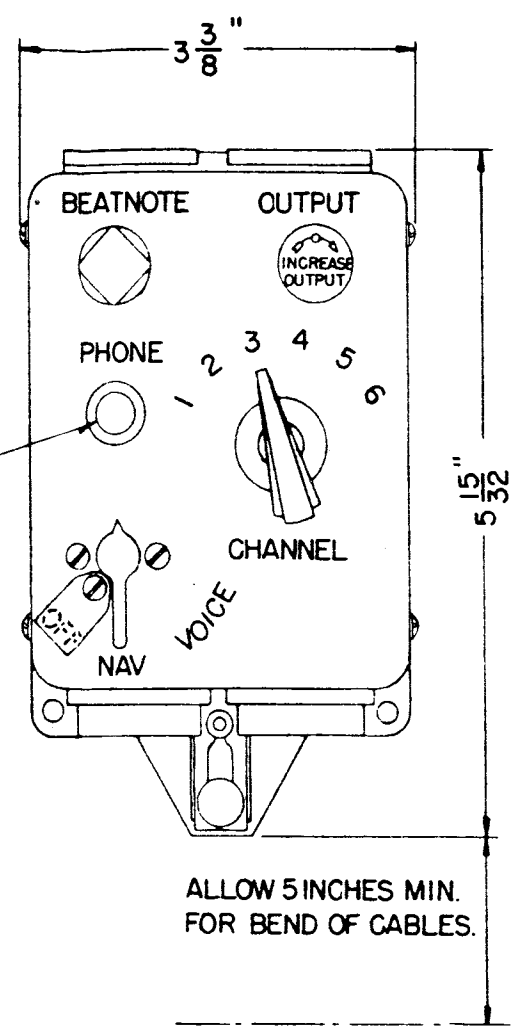
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4 HOLES FOR
NO. 8 SCREWS

★ MT-4/ARR-2

★ MT-4/ARR-2
MOUNTING PLATE



★ C35/ARR-2A
CONTROL BOX

WEIGHT	(POUNDS)
CONTROL BOX	0.9
MOUNTING PLATE	0.2

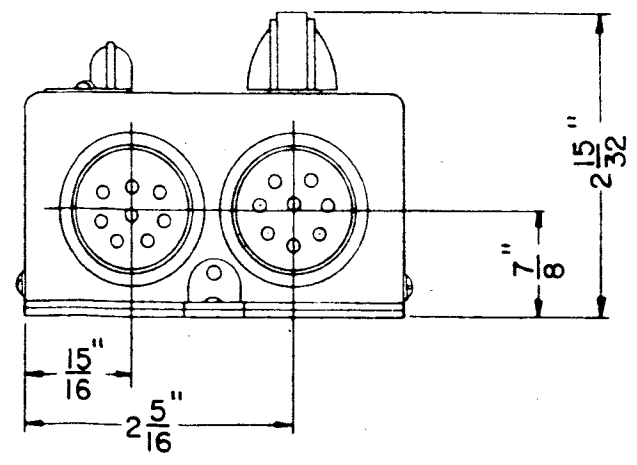
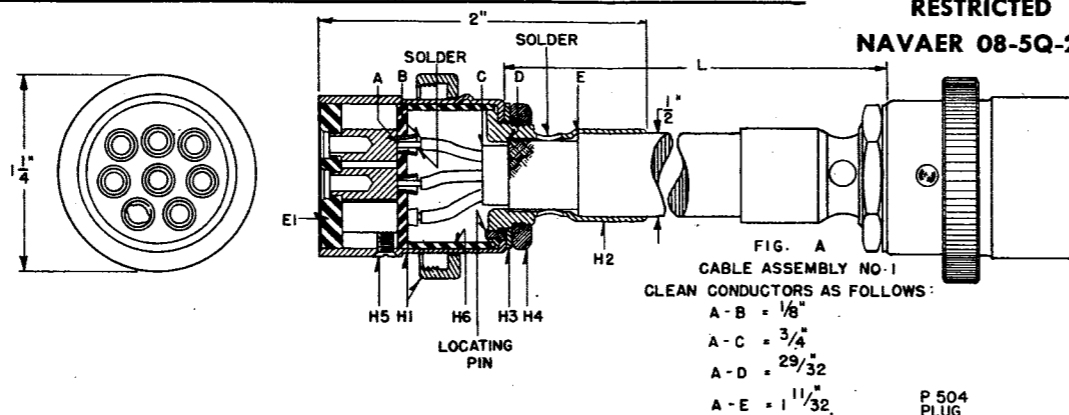
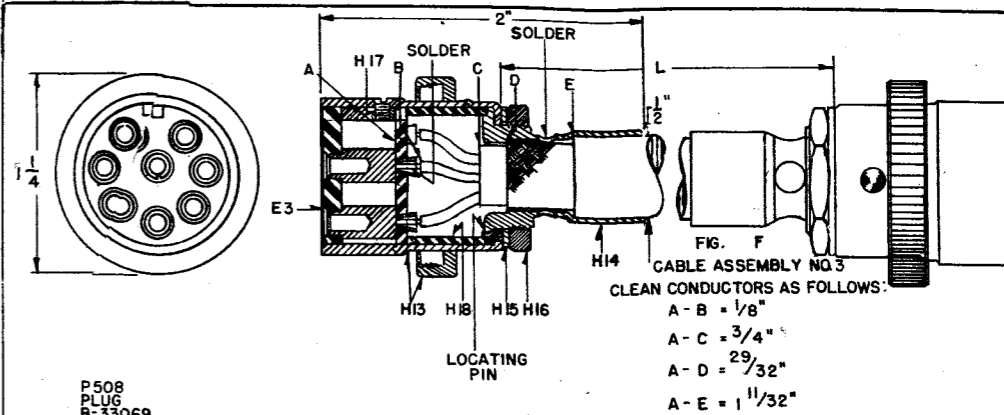
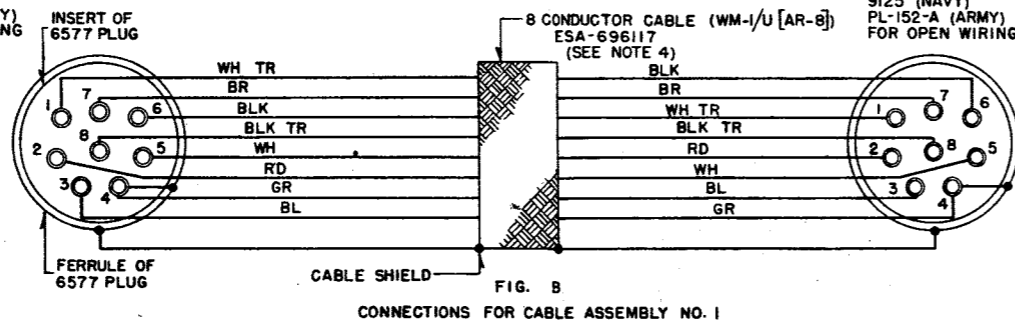


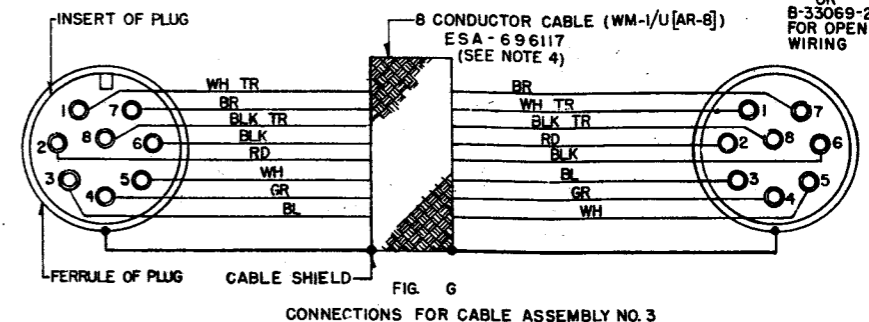
Figure 12—Outline Dimensional Drawing of Control Unit *C-35/ARR-2A



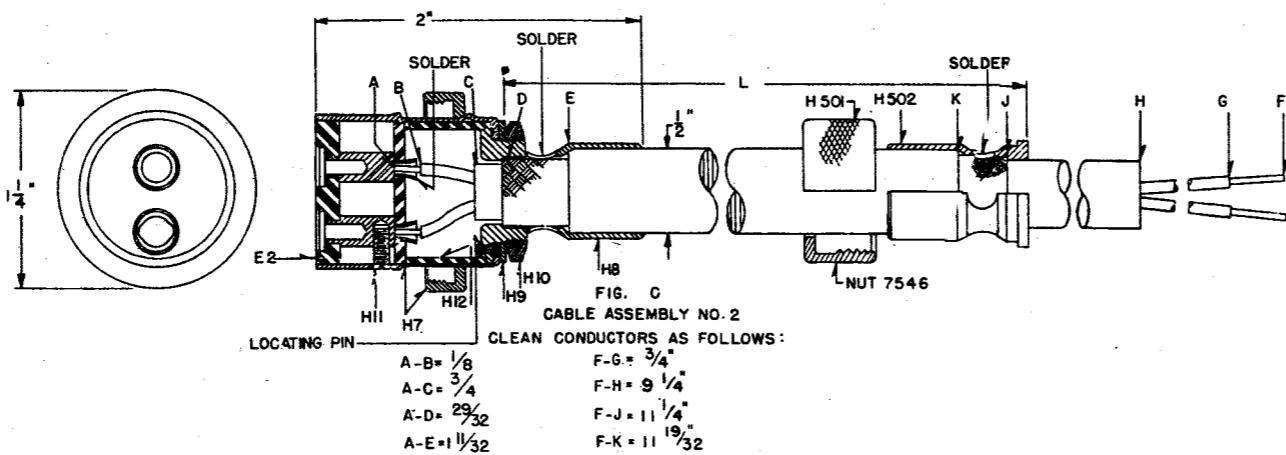
P 503
PLUG
NO. 6577 (NAVY)
PL-152 (ARMY)
OR
9125 (NAVY)
PL-152-A (ARMY)
FOR OPEN WIRING



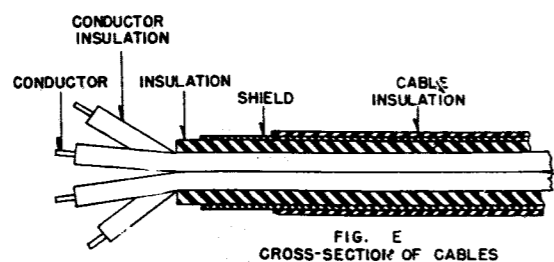
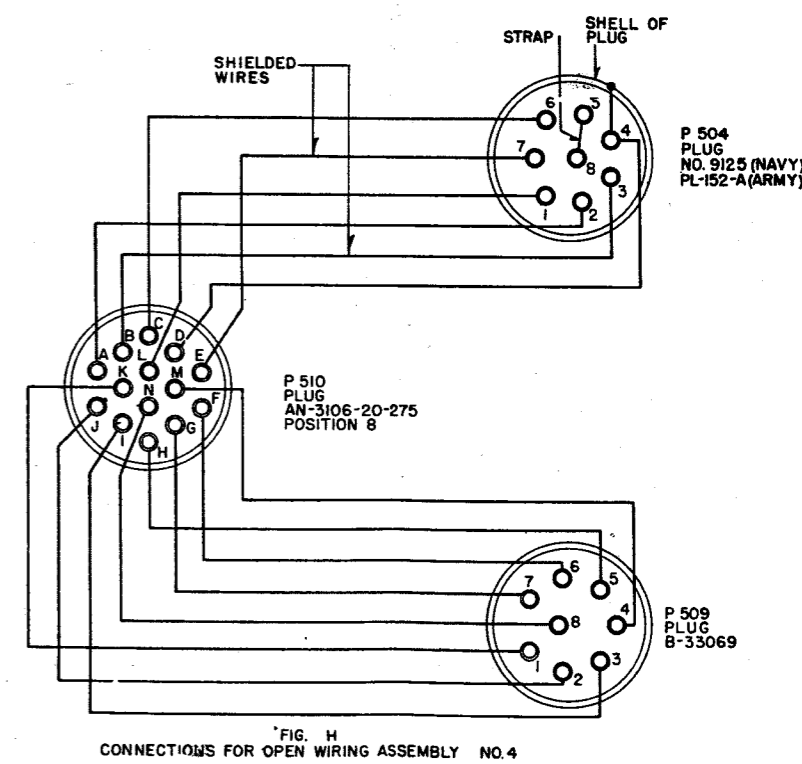
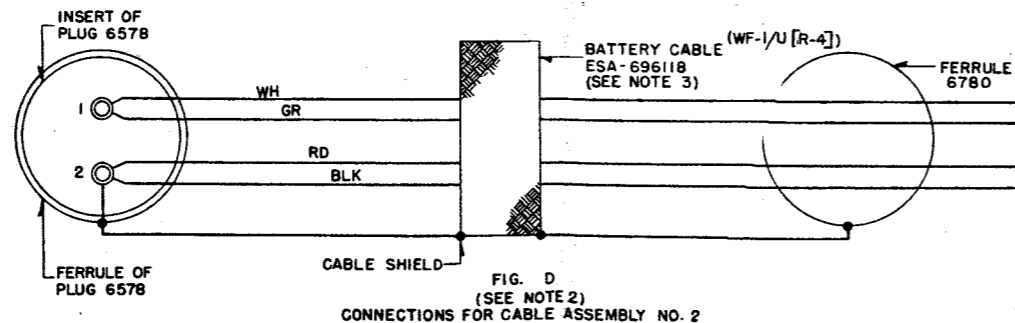
P 508
PLUG
B-33069
OR
B-33069-2
FOR OPEN WIRING



P 509
PLUG
B-33069
OR
B-33069-2
FOR OPEN WIRING



P 502
PLUG
NO. 6578 (NAVY)
PL-147 (ARMY)
OR
NO. 9127 (NAVY)
PL-147-A (ARMY)
FOR OPEN WIRING



NOTES:

1. TR INDICATES A RIDGE TRACER ON LEADS.
2. THE CONDUCTORS SHALL BE PAIRED AT THE BATTERY TERMINATIONS AS AT THE PLUG END.
3. USE TWO OPEN WIRES FOR OPEN WIRE INSTALLATION.
4. USE EIGHT OPEN WIRES FOR OPEN WIRE INSTALLATION.

Figure 14—Assembly of Power Cables and Plugs

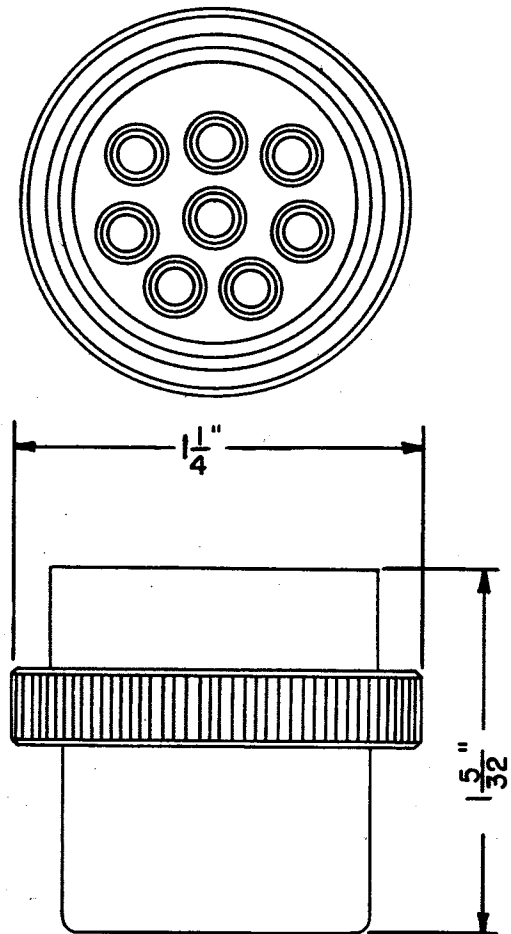


Fig. 15A—8-Conductor Plug for Open Wiring
B-41725; 9125 (Navy); PL-152-A (Army)

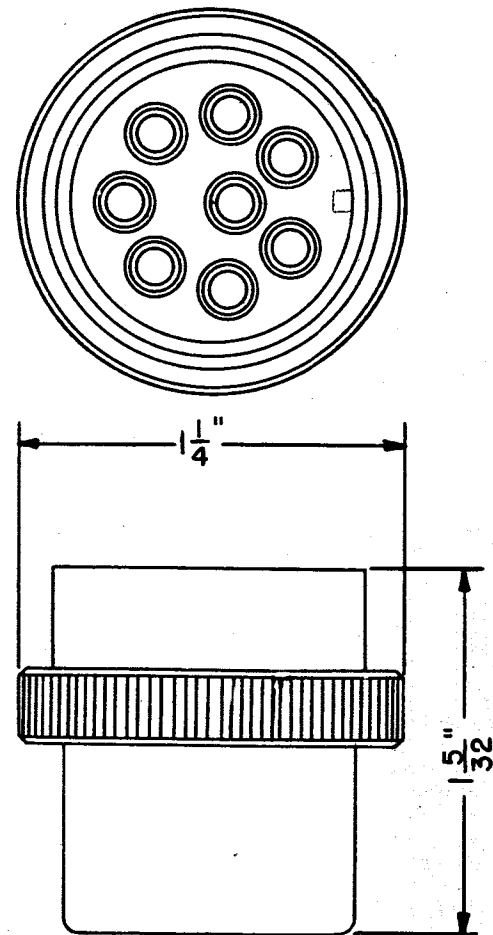


Fig. 15B—8-Conductor Plug for Open Wiring
B-33069-2

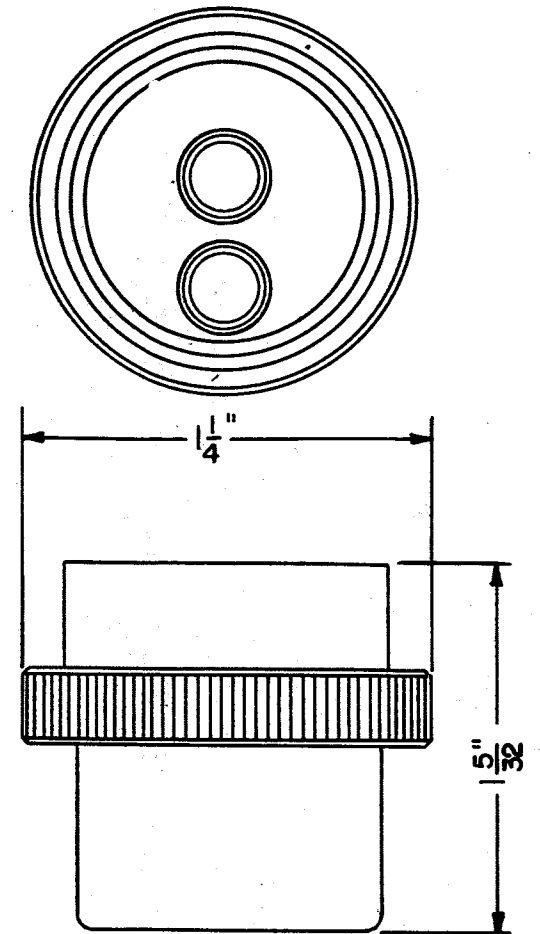
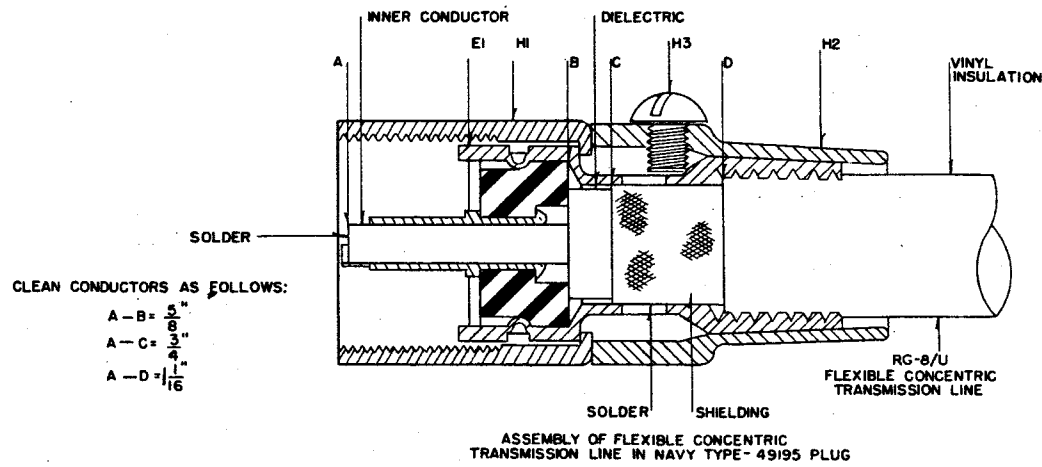
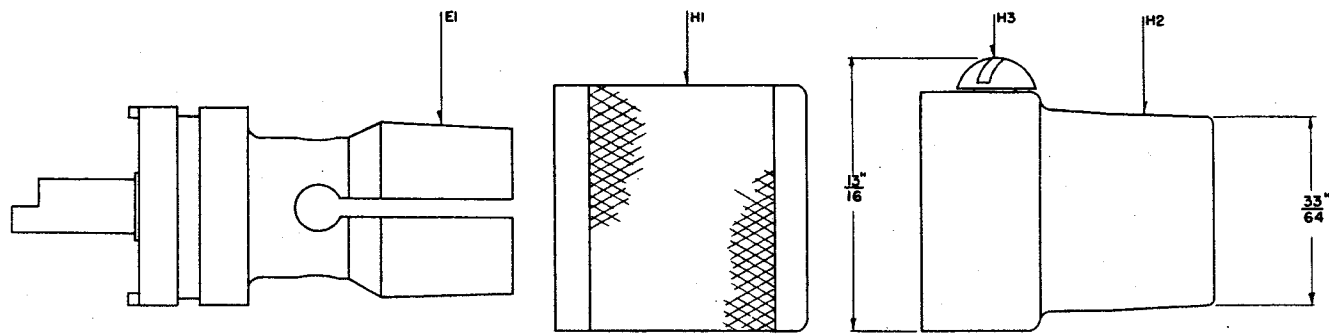


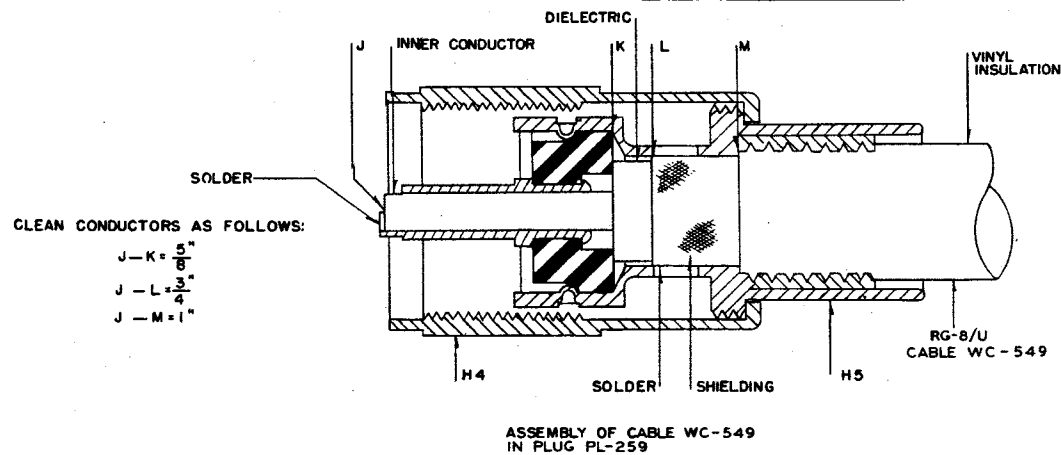
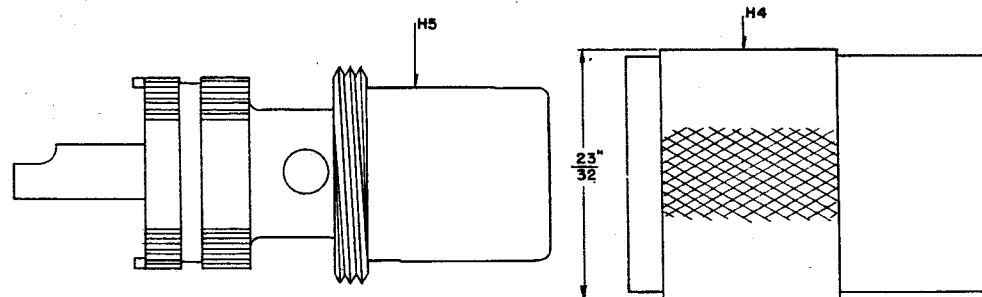
Fig. 15C—8-Conductor Plug for Open Wiring
B-14726; 9127 (Navy); PL-147-A (Army)

Figure 15—Outline Dimensional Drawing of Open Wire Plugs

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NAVY



NOTE:

- (A) NAVY TRANSMISSION LINE CASSF-50-1 IS SIMILAR TO CABLE WC-549-() (ARMY)
- (B) NAVY PLUG 49195 IS INTERCHANGEABLE WITH PLUG PL-259 (ARMY)

ARMY

Figure 16—Assembly of Concentric Transmission Cable

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4-23—4-24

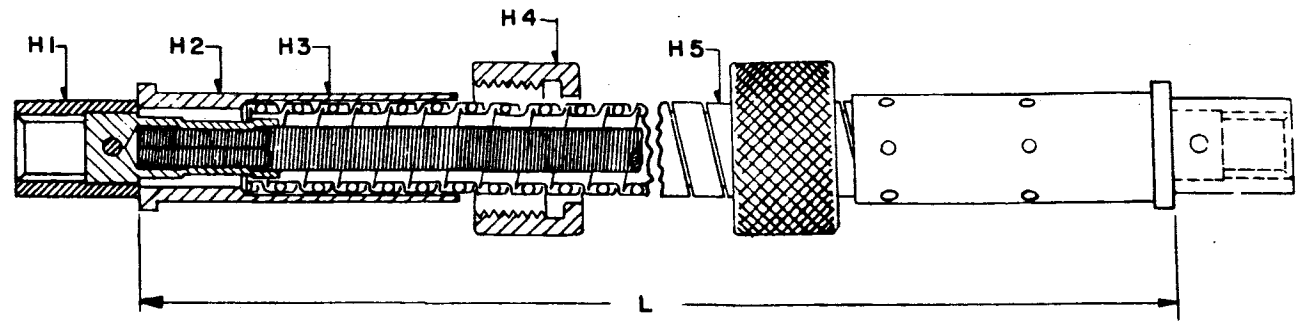
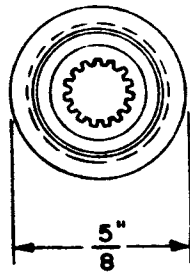


Fig. 17A—Assembly of Mechanical Linkage

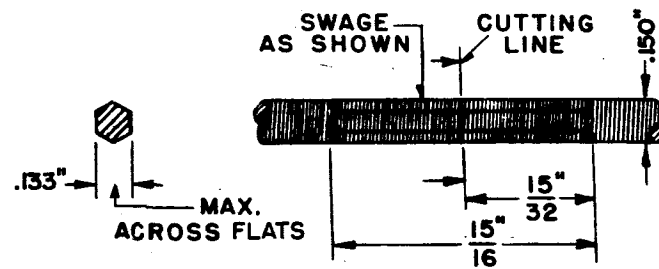


Fig. 17B—Preparation of Shaft for Cutting

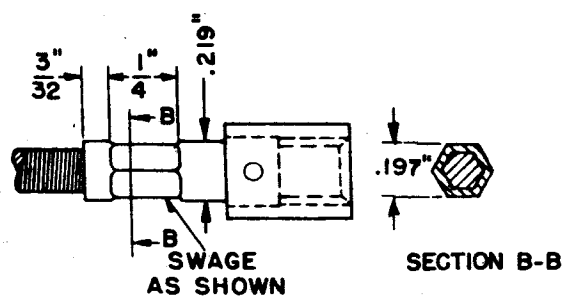


Fig. 17C—Assembly of Shaft and Spline

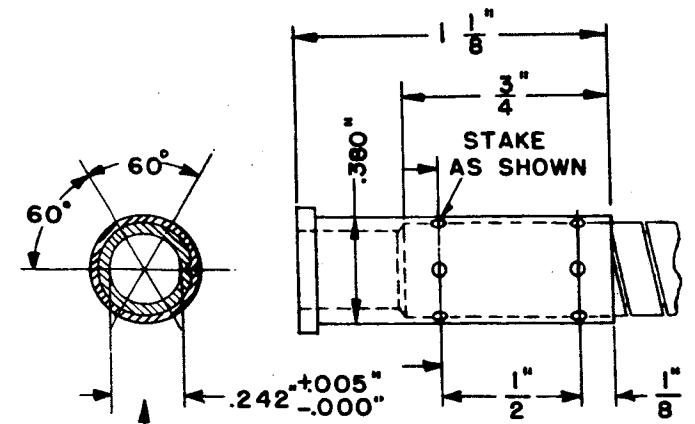


Fig. 17D—Assembly of Casing and Ferrule

PILOT OR ARBOR
MUST BE INSERTED
DURING SWAGING TO
INSURE FINAL INSIDE
DIAMETER.

Figure 17—Assembly of Mechanical Linkage

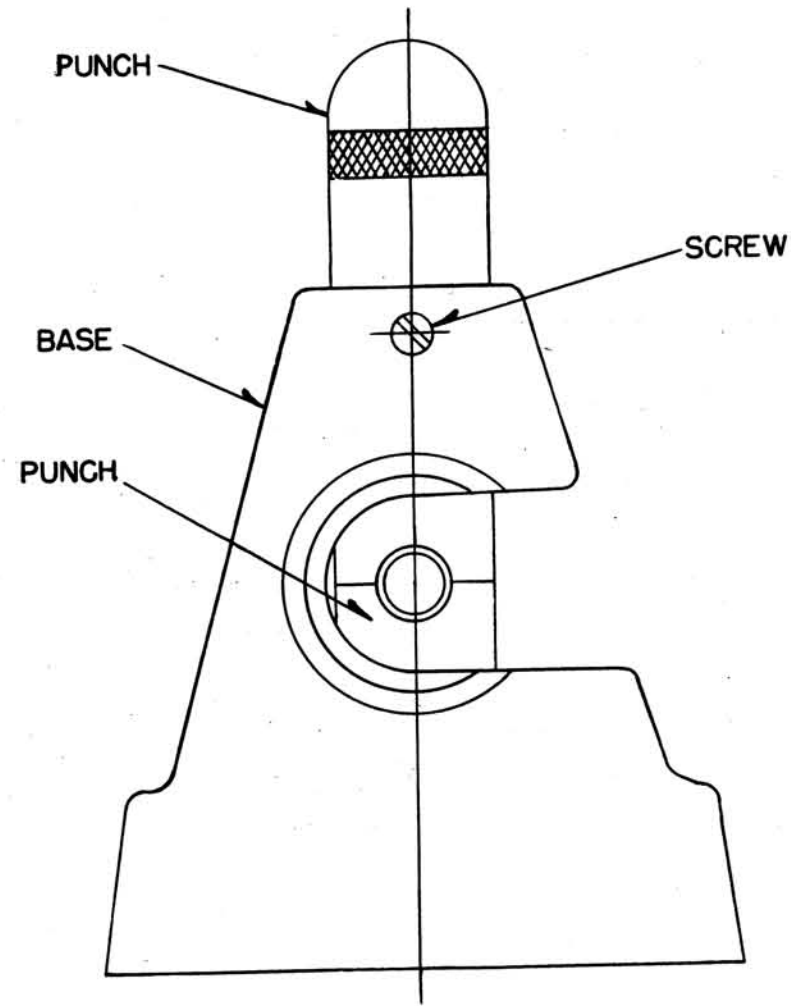


Fig. 18A—Typical Handtool for Attaching Casing Ferrule

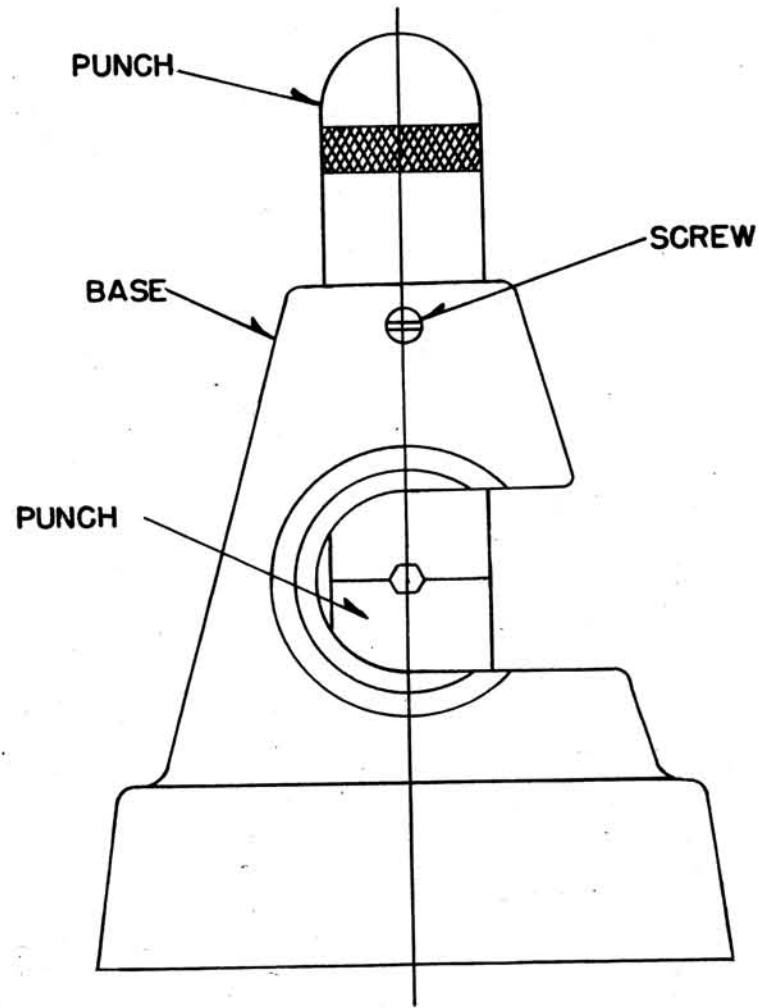


Fig. 18B—Typical Handtool for Swaging the Shaft

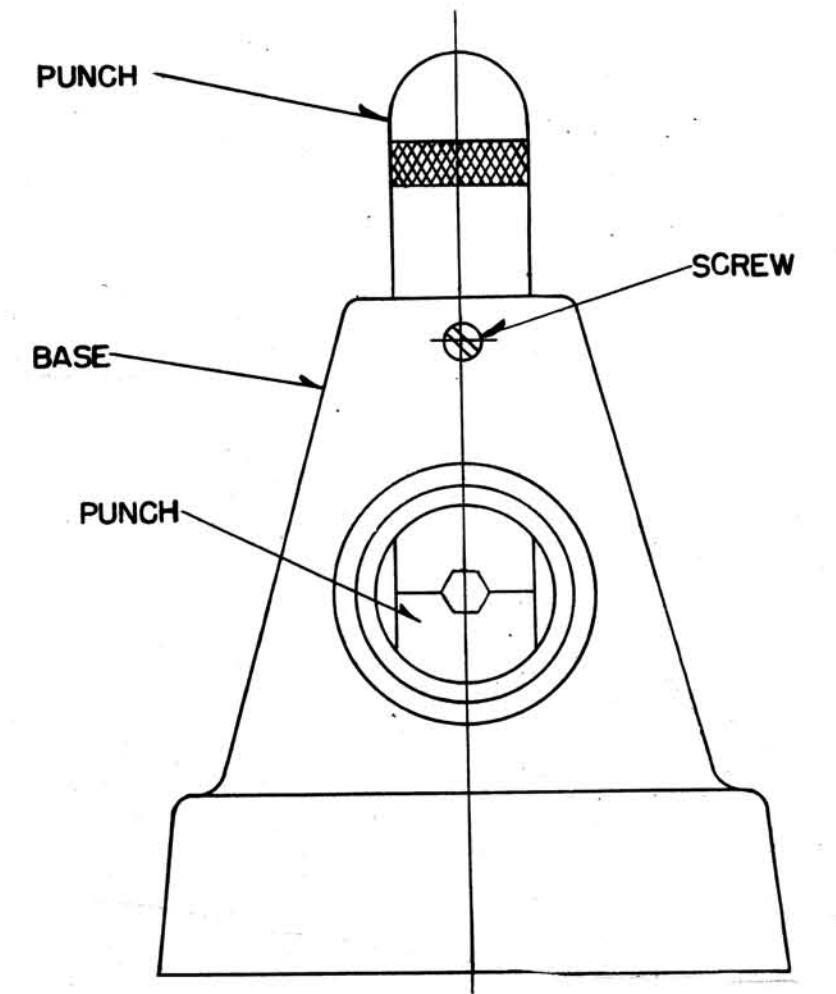
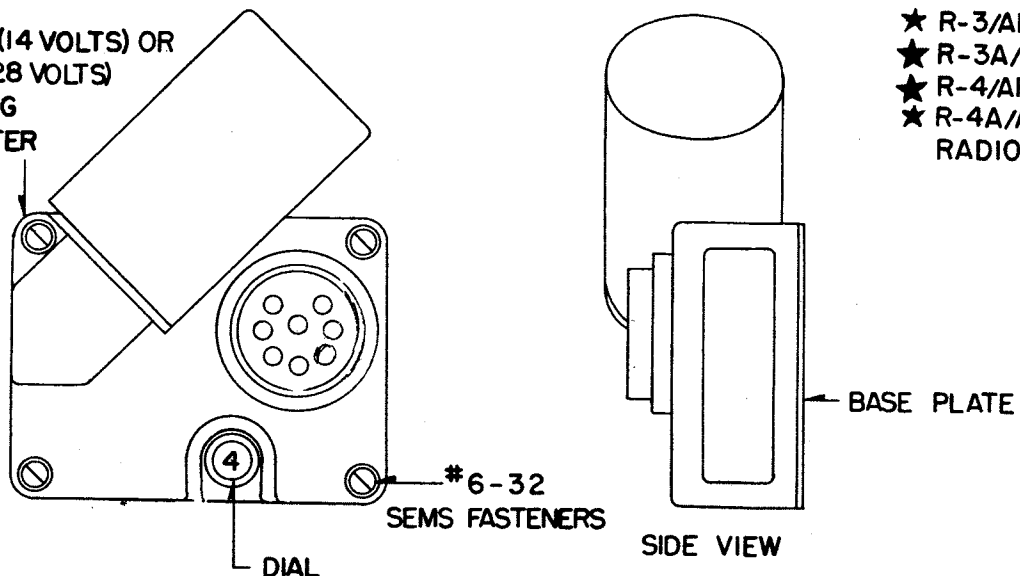


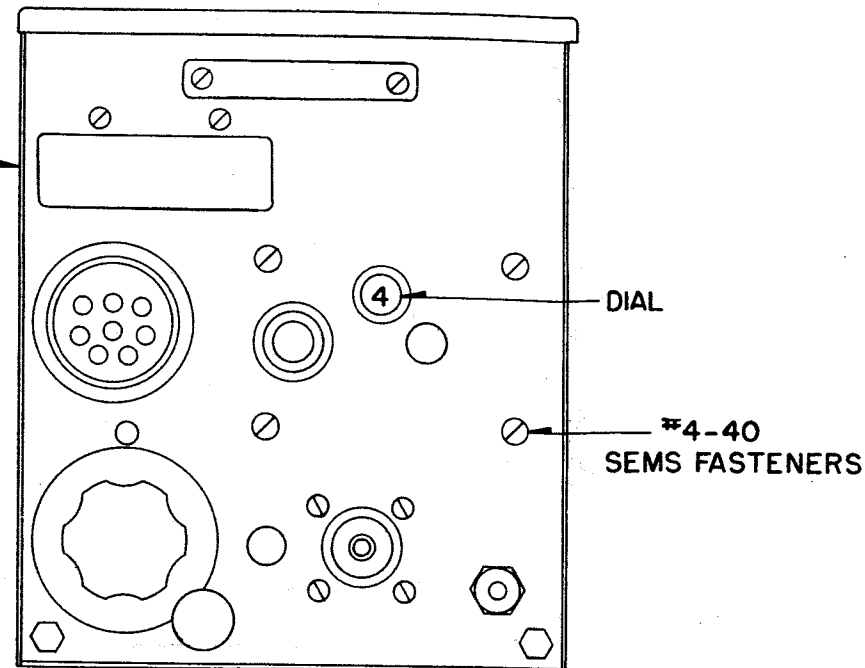
Fig. 18C—Typical Handtool for Swaging Spline Sleeve End Fitting

Figure 18—Typical Tool Fixtures for Assembly of Mechanical Linkage

- ★ C-36/ARR-2AX(14 VOLTS) OR
 - ★ C-37 ARR-2A(28 VOLTS)
- ELECTRIC TUNING CONTROL ADAPTER

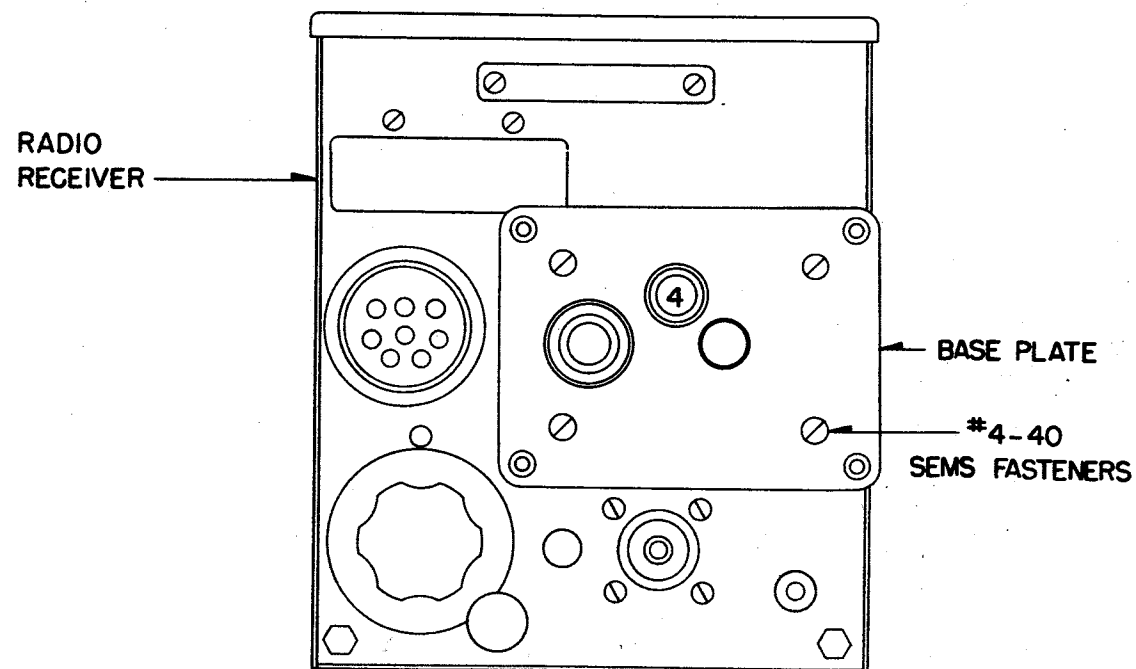


- ★ R-3/ARR-2X (14 VOLTS) OR
 - ★ R-3A/ARR-2X(14 VOLTS) OR
 - ★ R-4/ARR-2 (28 VOLTS) OR
 - ★ R-4A/ARR-2(28 VOLTS)
- RADIO RECEIVER



STEP 1

DISASSEMBLE ADAPTER FROM BASE PLATE BY REMOVING FOUR #6-32 SEMS FASTENERS.

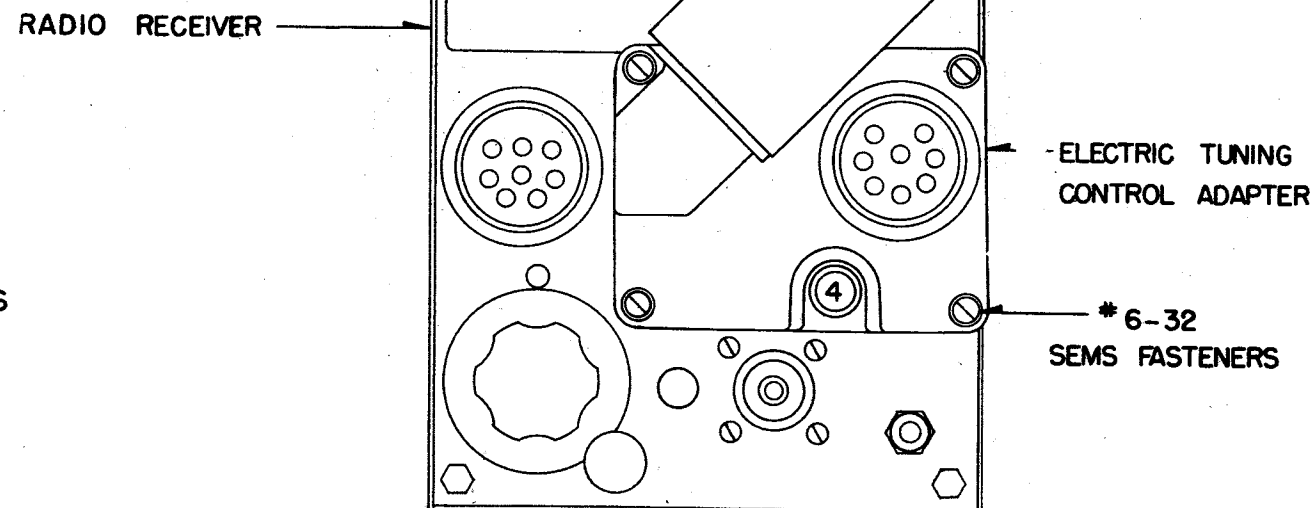
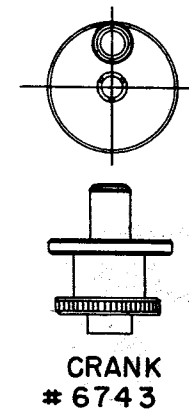


STEP 3

MOUNT BASE PLATE OF ADAPTER TO RECEIVER WITH FOUR #4-40 SEMS FASTENERS REMOVED IN STEP 2.

STEP 2

- (A) SET DIAL OF RECEIVER TO SAME NUMERAL AS DIAL OF ADAPTER.(USE CRANK #6743).
- (B) REMOVE FOUR #4-40 SEMS FASTENERS FROM RECEIVER.



STEP 4

MOUNT ADAPTER TO BASE PLATE WITH FOUR #6-32 SEMS FASTENERS REMOVED IN STEP 1.

DIMENSIONS UP TO AND INCLUDING 72 INCHES EXPRESSED IN INCHES

Figure 19—Method of Mounting Electric Tuning Control Adapter to Aircraft Radio Receiver

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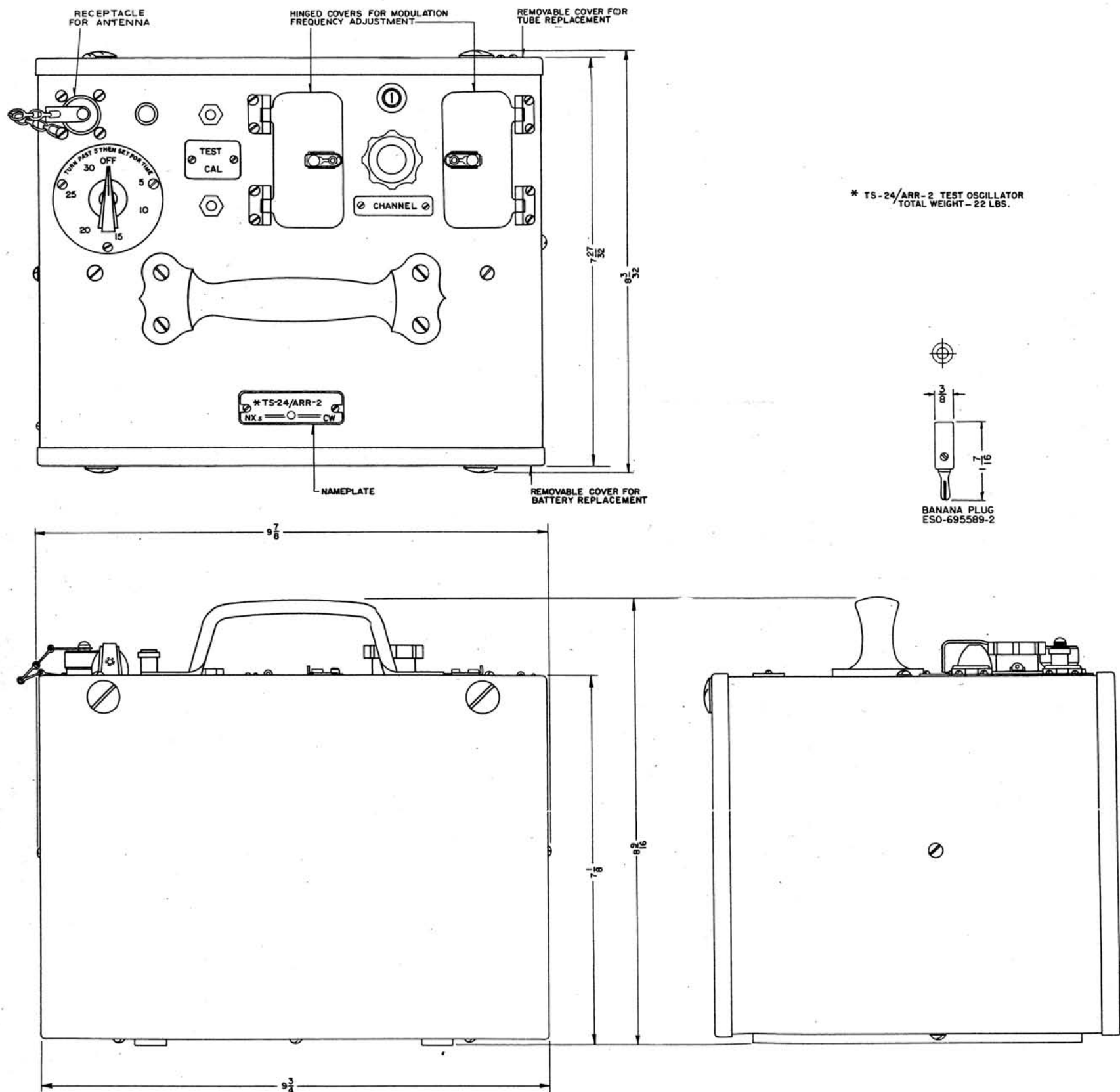


Figure 20—Outline Dimensional Drawing of Portable Test Oscillator *TS-24/ARR-2
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