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Handbook of
MAINTENANCE INSTRUCTIONS
FOR
AN/ARC-4, AN/ARC-4X and 233A
AIRBORNE RADIO EQUIPMENTS

CONFIDENTIAL

FOR U. S.

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24 FEBRUARY 1944

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REPORT OF FAILURE

FOR U. S. ARMY AIR FORCE PERSONNEL

UNSATISFACTORY REPORT

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, New York, N. Y., 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 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. Where possible, and when time permits, bury all debris or dispose of it in streams or other bodies of water.

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 in 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.

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 in the equipment with the high-voltage supply on. Always shut down motor generators or other power equipment. Under certain conditions, dangerous potentials may exist in circuits with power control in the "OFF" position, due to charges retained by capacitors, etc. To avoid casualties always discharge and ground circuits prior to touching them.

The attention of officers and operating personnel is directed to Bureau of Engineering Circular Letter No. 5A of Oct. 3, 1934 or subsequent revisions thereof on the subject of "Radio—Safety Regulations to be Observed."

Medical Department—United States Navy *(Division of Preventive Medicine—1942)*

ELECTRIC SHOCK FIRST-AID TREATMENT

SAFETY FIRST

Regard electrical apparatus generally, and especially all current-carrying parts, as dangerous, irrespective of voltage. Exercise great care in handling, and avoid broad contacts such as are made by standing on a metal deck or in water.

Dangerous contact may result through lessened resistance when the skin and clothing are wet with perspiration. Contact with damp metal surfaces—decks, bulkheads, guns, machinery—may allow the current to ground through the moist skin and body.

Electric shock is due to current passing through the body—current actually passing—irrespective of the voltage. A pressure as low as 110 volts has caused death. Current passing through the body in the region of the heart is especially dangerous. In using electric breast drills avoid the possibility of a ground. Usually electric shock does not kill instantly. Life can often be saved even though breathing has stopped.

1. **Free the Victim from the Circuit Immediately**

   Use a dry nonconductor (rubber gloves, clothing, rope, board) to move either the victim or the wire.

   Beware of using metal or moist material.

   Shut off the current.

   If necessary to cut a live wire, use an ax or hatchet with a dry wooden handle; turn your face away from the electrical flash.

2. **Attend Instantly to the Victim's Breathing**

   Begin resuscitation at once on the spot. Do not stop to loosen clothing; every moment counts.

RESUSCITATION BY THE PRONE PRESSURE METHOD OF ARTIFICIAL RESPIRATION TO BE USED IN CASES OF

Gas Asphyxiation **ELECTRIC SHOCK** **Drowning**

Waste no time. When the patient is removed from the water, gas, smoke, or electric contact, get to work at once with your own hands. No reliance should be placed upon any special mechanical apparatus, as it is frequently out of order and often is not available when most needed.

Send for the medical officer or nearest physician.

Fig. A

The patient's mouth should be cleared of any obstruction such as chewing gum or tobacco, false teeth, or mucus, so that there is no interference with the entrance and escape of air.

POSITION

1. Lay the patient on his belly, one arm extended directly overhead, the other arm bent at elbow and with the face turned outward and resting on hand or forearm, so that the nose and mouth are free for breathing. (See Inset, Fig. A.)

2. Kneel, straddling the patient's thighs, with your knees placed at such a distance from the hip bones as will allow you to assume the position shown in Fig. A.

Place the palms of the hands on the small of the back with fingers resting on the ribs, the little finger just touching the lowest rib, with the thumb and fingers in a natural position, and the tips of the fingers just out of sight. (See Fig. A.)

FIRST MOVEMENT

3. With arms held straight, swing forward slowly, so that the weight of your body is gradually brought to bear upon the patient. The shoulder should be directly over the heel of the hand at the end of the forward swing. (See Fig. B.) Do not bend your elbows.

This operation should take about two seconds.

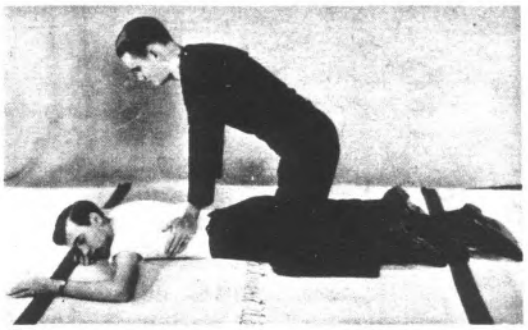


Fig. B

SECOND MOVEMENT

4. Now immediately swing backward, so as to remove the pressure completely. (See Fig. C.)

5. After two seconds, swing forward again. Thus repeat deliberately twelve to fifteen times a minute the double movement of compression and release, a complete respiration in four or five seconds.

Fig. C

6. Continue artificial respiration without interruption until natural breathing is restored. Do not get discouraged at the slow results that sometimes happen when resuscitating the apparently drowned. Efforts often have to be continued a long time before signs of life are apparent. Do not discontinue the efforts until certain that all chance is lost. Sometimes, even after several hours' work, recovery takes place.

7. As soon as this artificial respiration has been started and while it is being continued, an assistant should loosen any tight clothing about the patient's neck, chest or waist. **To keep the patient warm during artificial respiration is most important and it may be necessary to cover him with blankets and work through them, as well as to apply hot-water bottles, hot bricks, etc.** Do not give any liquids whatever by mouth until the patient is fully conscious.

8. To avoid strain on the heart when the patient revives, he should be kept lying down and not allowed to stand or sit up. If the doctor has not arrived by the time the patient has revived, he should be given some stimulant, such as one teaspoonful of aromatic spirits of ammonia in a small glass of water or a hot drink of coffee or tea, etc. Continue to keep the patient warm and at rest.

9. Resuscitation should be carried on at the nearest possible point to where the patient received his injuries. As a general rule he should not be moved from this point until he is breathing normally of his own volition and then moved only in a lying position. Should it be necessary, due to extreme weather conditions, etc., to move the patient before he is breathing normally, resuscitation should be carried on during the time that he is being moved.

10. A brief return of natural respiration is not a certain indication for stopping the resuscitation. Not infrequently the patient, after a temporary recovery of respiration, stops breathing again. The patient must be watched, and if natural breathing stops, artificial respiration should be resumed at once.

11. In carrying out resuscitation it may be necessary to change the operator. This change must be made without losing the rhythm of respiration. The relief operator should kneel behind the one giving the artificial respiration and at the end of the movement, the operator crawls forward while the relief takes his place. By this procedure no confusion results at the time of change of operator, and a regular rhythm is kept up.

Practice in the Performance of Artificial Respiration on a Volunteer Subject should be obtained by everyone

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 the aforementioned period and the contractor is notified thereof in writing 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 the 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 effecting 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.

SECTION I
DESCRIPTION

1. GENERAL.

DURING THE MANUFACTURE OF THIS EQUIPMENT, "AN" NOMENCLATURE WAS APPLIED TO ALL MAJOR UNITS COMPRISING THIS EQUIPMENT. THE 233A AND AN/ARC-4X EQUIPMENTS ARE SUPPLIED WITH DUAL 12/24-VOLT DYNAMOTORS, AND THE AN/ARC-4 EQUIPMENT IS SUPPLIED WITH 24-VOLT DYNAMOTORS. THE EQUIPMENTS ARE OTHERWISE IDENTICAL, AND ALL REFERENCES TO THE AN/ARC-4 AIRBORNE RADIO EQUIPMENT IN THIS HANDBOOK APPLY TO THE AN/ARC-4X AND 233A EQUIPMENTS AS WELL.

The AN/ARC-4 Airborne Radio Equipment is a very high frequency communication unit designed for aircraft use in the 140- to 144-mc band. It is intended for two-way radio telephone communication between airplanes, and from airplanes to ground stations. It also provides an interphone system for the pilots.

The equipment consists of a very high frequency transmitter and a very high frequency receiver mounted on a single chassis. Both the transmitter and the receiver may be pretuned for operation on four crystal-controlled frequencies in the 140- to 144-mc band. One of the four frequencies is intended for plane-to-plane communication. The three remaining frequencies are intended for plane-to-ground communication. The spread between these three frequencies should not exceed 1 to 1.5 megacycles to avoid undue loss of receiver sensitivity. A transmitter crystal and a receiver crystal are mounted in a single crystal holder and are so selected that the transmitter and the receiver both operate on the same carrier frequency. Crystal-switching relays incorporated in the equipment permit rapid selection of any of the four pretuned carrier frequencies.

The radio receiver has two independent r-f amplifier and mixer input circuits, which permit simultaneous monitoring on two carrier frequencies. One input circuit may be used to monitor continuously on the plane-to-plane carrier frequency. The other input circuit may be used simultaneously to monitor any one of the plane-to-ground frequencies. Provision is made to disable either circuit temporarily if two signals are received at the same time.

The AN/ARC-4 and AN/ARC-4X Airborne Radio Equipments may be used interchangeably in airplanes equipped with either 12- or 24-volt d-c power supplies, provided the power receptacle DP-D32-33S on the MT-101/ARC-4 mounting base in the plane is properly wired, and provided the proper dynamotor is inserted in the equipment. A single dynamotor provides a high-voltage supply for both the transmitter and the receiver, and is transferred by means of a relay controlled by the press-to-talk switch on the microphone. The same relay also transfers the antenna to the receiver or to the transmitter.

2. ASSOCIATED EQUIPMENT.

a. MAJOR UNITS.

The major units provided with the AN/ARC-4 Airborne Radio Equipment are:

One RT-19/ARC-4 Radio Transmitter-Receiver
One Set of Vacuum Tubes
One Set of four Western Electric 703A Crystal Units for operation on the following carrier frequencies: 140.580, 142.020, 142.560 and 142.740 mc, respectively
One DY-9/ARC-1 Dynamotor
(for 24-volt operation)
or
One DY-10/ARC-4X Dynamotor
(for dual 12- or 24-volt operation)
One MT-101/ARC-4 Mounting Base complete with one Cannon DP-D32-33S Receptacle
One C-51/ARC-4 Control Unit
One J-23/ARC-4 Junction Box
Two MT-80/ARC-5 Mounting Plates

b. CONNECTING CABLES.

The connecting cables must be made up from wire and plugs that are furnished in bulk. The cables required are described under Fig. 19, Page 93.

Cable Assembly No. 1 requires a sixteen-wire shielded cable terminated at one end with a Plug 6963 and a two-wire shielded cable terminated with a Plug 6965. These two cables form a junction in the Cannon DP-D32-33S Receptacle that is furnished as part of the MT-101/ARC-4 Mounting Base.

Cable Assembly No. 2 requires a two-wire shielded cable terminated at one end with a Plug 6965; the other end is left bare for connection to the battery supply.

Cable Assembly No. 3 requires a sixteen-wire shielded cable terminated at each end with a Plug 6963.

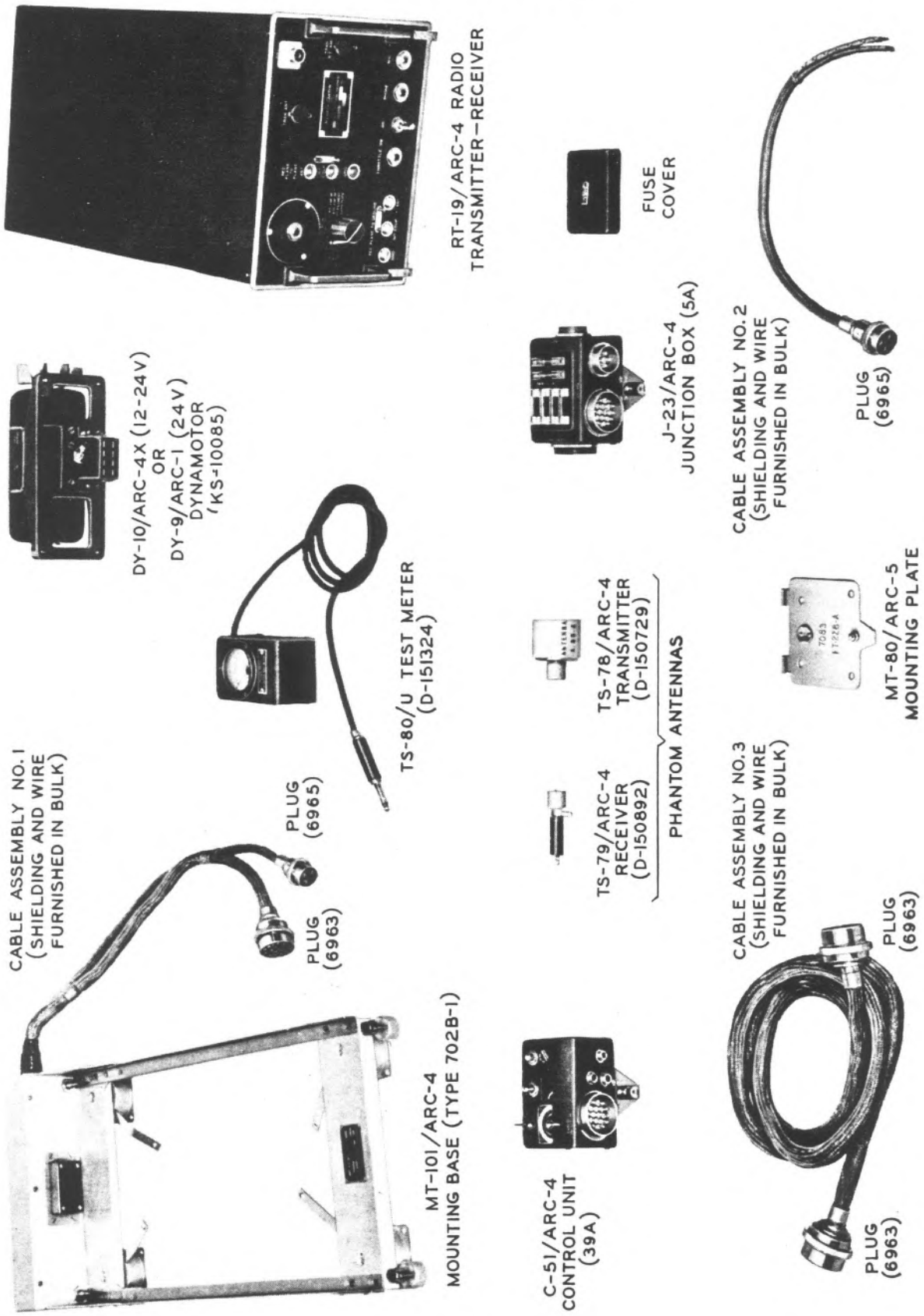


Figure 1—Principal Units of AN/ARC-4, AN/ARC-4X, and 233A Airborne Radio Equipments

TABLE I

Major Units and Assemblies for AN/ARC-4, AN/ARC-4X and 233A Radio Telephone Equipment

Name and Description of Unit or Accessory	*Army – Navy Designation*	*Western Electric Designation*	*Symbol Number or Group*	*Quantity Required for Each Installation*		
				AN/ARC-4	*AN/ARC-4X*	*233A*
Radio Transmitter – Receiver	RT-19/ARC-4		IC-100C IR-100R IT-100T	1	1	1
Dynamotor, 24-Volt, for High-Voltage Supply	DY-9/ARC-1	KS-10085, List 2		1		
Dynamotor, 12/24-Volt, for High-Voltage Supply	DY-10/ARC-4X	KS-10085, List 3			1	1
Junction Box	J-23/ARC-4	5A	300-399	1	1	1
Control Unit	C-51/ARC-4	39A	200-299	1	1	1
Mounting Plate for Control Unit	MT-80/ARC-5	7083		1	1	1
Mounting Plate for Junction Box	MT-80/ARC-5	7083		1	1	1
Mounting Base for Transmitter – Receiver	MT-101/ARC-4	702B-1		1	1	1
Plugs		6965		2	2	2
Plugs		6963		3	3	3
Power Receptacle (Furnished with mounting base MT-101/ARC-4 and in bulk)		DP-D32-33S		1	1	1
Cable Assembly #1 (Parts furnished in bulk; assembly consists of one 16-conductor cable and one 6963 plug, one 6965 plug and one DP-D32-33S receptacle, shielded)				1	1	1
Cable Assembly #2 (Parts furnished in bulk; assembly consists of one 2-conductor cable and one 6965 plug, shielded)				1	1	1
Cable Assembly #3 (Parts furnished in bulk; assembly consists of one 16-conductor cable and two 6963 plugs, shielded)				1	1	1
Test Meter	TS-80/U	D-151324		1 for each 10 equipments		
Phantom Receiver Antenna	TS-79/ARC-4	D-150892		1 for each 10 equipments		
Phantom Transmitter Antenna	TS-78/ARC-4	D-150729		1 for each 10 equipments		
Antenna (Not furnished by contractor)	AT-8/AR			1	1	1
Head Phones (Not furnished by contractor)	AN-H-1/AR Helmet Assembly *or* AN-H-4/AR Head Band Assembly			1	1	1
Microphone (Not furnished by Contractor)	RS38A or AN-B-MC-1 oxygen mask type microphone			1	1	1

c. TEST ACCESSORIES.

In addition to the major units and connecting cables listed on page 1, the following components required at the test location are provided in ten-per-cent quantities (one set of the following items is provided with every ten sets of the above list).

One TS-80/U Test Meter, complete with case, cord and plug

One TS-78/ARC-4 Phantom Transmitter Antenna (A85A)

One TS-79/ARC-4 Phantom Receiver Antenna (A69A)

One Cannon DP-D32-33S Receptacle

d. EQUIPMENT NOT PROVIDED.

The following items, not provided as part of the AN/ARC-4 Airborne Radio Equipment, must be secured by the purchaser to complete a multichannel radio telephone system.

A microphone and headphones (see list of accessories)

An antenna system (AT-8/AR; or AN-74BX; or AN-104A)

A primary power supply, 12- or 24-volt d-c

e. TABLE OF UNITS AND ASSEMBLIES.

Table I on page 3 gives cross-reference information for the AN/ARC-4, AN/ARC-4X and 233A Airborne Radio Equipments.

3. CRYSTAL UNITS.

One 703A Crystal Unit is required for each channel. A maximum of four channels can be accommodated in the equipment. Each crystal unit contains two quartz crystals: one controls the frequency of the radio receiver and the other controls the frequency of the radio transmitter. The frequencies of the crystals are so selected that the receiver and

Figure 2—RT-19/ARC-4 Radio Transmitter-Receiver: External Front View

transmitter both operate on the same carrier frequency; hence the frequency stamped on the nameplate of the 703A Crystal Unit is the carrier frequency on which the RT-19/ARC-4 Radio Transmitter-Receiver operates when that particular unit is in control.

The frequency of each quartz crystal in the 703A Crystal Unit is calculated as follows:

Transmitter Crystal

(Connected between pins C and 1 of the crystal unit)

$$\text{Crystal Frequency (mc)} = \frac{\text{Nameplate Frequency (mc)}}{24}$$

Receiver Crystal

(Connected between pins C and 2 of the crystal unit)

$$\text{Crystal Frequency (mc)} = \frac{\text{Nameplate Frequency (mc)} - 10 \text{ mc (IF)}}{16}$$

The crystal units are calibrated and tested in a reference test oscillator circuit to be within frequency limits of +0.01 per cent and —0.015 per cent throughout the temperature range —31 degrees Fahrenheit (—35 degrees centigrade) to +176 degrees Fahrenheit (+80 degrees centigrade). The performance of the 703A Crystal Unit in the RT-19/ARC-4 Radio Transmitter-Receiver will be within frequency limits of +0.012 per cent and —0.017 per cent through the ambient temperature range —31 degrees Fahrenheit (—35 degrees centigrade) to +140 degrees Fahrenheit (+60 degrees centigrade).

4. C-51/ARC-4 CONTROL UNIT.

The components required for the complete control of the equipment are provided in a C-51/ARC-4 Control Unit. The functions of the various controls are outlined in Section I, Par. 23. The diagram is shown in Fig. 18.

5. MT-101/ARC-4 MOUNTING BASE.

When installed in an airplane, the RT-19/ARC-4 Radio Transmitter-Receiver is mounted on an MT-101/ARC-4 Mounting Base. The receptacle on the mounting base must be properly wired for use with the particular power source available in the plane, as shown in Fig. 15. The essential dimensions of the apparatus mounting are indicated on Fig. 13.

6. ANTENNA SYSTEM.

The antenna is located in front of the base of the vertical fin, and its fore-and-aft position is determined by sliding the antenna along the fuselage while taking field strength readings at the rear of the airplane. Maximum radiation to the rear occurs at one or more relatively sharp points, and a matter of six inches may mean the difference between full output and a null.

The antenna should be fed by a 50- to 70-ohm low-loss coaxial transmission line equipped with a Navy Type 49195 or 49190 Plug. This plug is designed for use with the RG-8/U or Navy CASSF-50-1 Coaxial Transmission Line. As this line requires a relatively large radius of curvature, it may be found convenient to use a right-angle adapter Navy Type 49192 between the plug and the ANT jack.

7. PRIMARY POWER SUPPLY.

The equipment is designed to operate from either a 12- or a 24-volt d-c source of primary power. In order to operate from a 12-volt source, the cannon receptacle DP-D32-33S of the apparatus mounting must be wired for 12-volt operation and a 12/24-volt dynamotor (DY-10/ARC-4X) must be installed. In order to operate from a 24-volt source, the power receptacle DP-D32-33S must be wired for 24-volt operation and a 24-volt dynamotor (DY-9/ARC-1) must be installed. If a 12/24-volt dual input dynamotor (DY-10/ARC-4X) is installed, the equipment will function correctly in an apparatus mounting wired for either 12- or 24-volt operation. The equipment is so wired that in the event a 12-volt dynamotor is installed in an equipment operated from a 24-volt source (or vice versa), the equipment will not function nor will any damage result.

The wiring of the receptacle for both sources of primary power is indicated schematically on Fig. 15. The dynamotor designations are: DY-9/ARC-1, for the dynamotor for operation from the 24-volt source; and DY-10/ARC-4X, for the dual input dynamotor for operation from either the 12- or 24-volt source. The two dynamotors are rated for equal output voltage and current.

8. MICROPHONES AND HEADSETS.

The following types of microphones and headsets are recommended:

RS38A Hand Microphone
ANB-MC-1 Oxygen Mask Microphone
Army-Navy Type H-1/AR Helmet Assembly
Army-Navy Type H-4/AR Head Band Assembly

9. J-23/ARC-4 JUNCTION BOX.

The J-23/ARC-4 Junction Box provides two active fuses: one for the RT-19/ARC-4 Radio Transmitter-Receiver and one for the auxiliary equipment connected to the junction box. The RT-19/ARC-4 Radio Transmitter-Receiver requires a 20-ampere fuse for operation from a 24-volt d-c supply, and a 40-ampere

fuse for operation from a 12-volt d-c supply. Four spare fuses may be carried in the box. Fig. 15 illustrates schematically the correct connections when a J-23/ARC-4 Junction Box is employed.

10. TRANSMITTER CIRCUIT DESCRIPTION.

The transmitter of the RT-19/ARC-4 Radio Transmitter-Receiver consists of a crystal-controlled oscillator-tripler stage, followed by three doubler or harmonic generator stages, driving a radio-frequency amplifier stage. The r-f amplifier is plate-modulated by a single-stage push-pull audio-frequency amplifier. The circuits of the radio-frequency stages are tuned broadly, thus permitting operation on any frequency in the band 140 to 144 mc by simply switching to the proper crystal, without circuit retuning.

Referring to the schematic circuit diagram, Fig. 10, the oscillator-tripler stage employs a Type 6V6GT Vacuum Tube, V1T, in an electron-coupled circuit. The oscillator uses the control grid, cathode, and screen of V1T, with the crystal effectively connected between the control grid and screen grid. By the use of inductance L11T and capacitor C3T, the cathode is maintained above ground potential with respect to radio frequency. This permits the grounding of one side of the crystal and, further, it permits operation of the screen grid at radio-frequency ground potential, thus effectively shielding the plate or load circuit from the frequency controlling circuits. The plate circuit, tuned to the third harmonic of the crystal frequency, employs two inductively-coupled tuned circuits consisting of L1T, C1T, L2T, and C33T, together with tube and stray capacities. Initial adjustment of these circuits is accomplished by varying the inductances of coils L1T and L2T. These coils are equipped with copper cylinders mounted on adjusting screws. The inductance of the coil is varied by changing the position of the copper cylinder with respect to the coil. As the cylinder is inserted into the field of the coil, the inductance decreases.

Following the oscillator-tripler stage are three harmonic generator stages, each operating as a frequency doubler. The first harmonic generator stage uses a Type 6V6GT Vacuum Tube, V2T, with inductively coupled tuned circuits similar to those of the preceding stage in its plate circuit. These circuits are tuned to the sixth harmonic of the crystal frequency and are adjusted by means of the variable inductances L3T and L4T.

The second harmonic generator stage uses a Type 1614 Vacuum Tube, V3T; the plate circuit consists of a single circuit, tuned to the twelfth harmonic of the crystal frequency by means of the variable inductance L5T.

The third harmonic generator stage, using a Type 1614 Vacuum Tube, V4T, drives the r-f amplifier stage. The plate circuit of V4T, which operates at the carrier frequency or the twenty-fourth harmonic of the crystal frequency, is tuned by varying the effective inductance of the plate tuning coil L6T by means of a variable air condenser C6T connected in series with the coil. A link circuit, L7T, couples this stage to the push-pull grids of the amplifier stage.

The amplifier stage, V5T, is a Type 832 Beam Power Tube connected for push-pull operation. Its grid circuit is tuned by the variable inductance L8T, which is equipped with an adjustable copper cylinder. The plate circuit is tuned in the same manner with the variable inductance L9T. The coaxial transmission line leading to the antenna is coupled to the plate circuit by means of the coupling coil L10T. Condenser C10T, in series with this coil, is used to adjust the coupling to load the amplifier plate circuit properly.

The modulator consists of a single transformer-coupled stage using two Type 6L6 Vacuum Tubes, V6T and V7T, in push-pull. This stage has sufficient gain to modulate fully the V5T Amplifier with the output from a RS38A or similar type carbon microphone. Both the plates and screen grids of the V5T Tube are supplied with modulated voltage from the modulating transformer T2T.

11. RECEIVER CIRCUIT DESCRIPTION.

The receiver of the RT-19/ARC-4 Radio Transmitter-Receiver is a very high frequency superheterodyne designed to operate in the 140- to 144-mc band. Two complete r-f input units, connected to a common intermediate-frequency amplifier, provide for simultaneous monitoring on two frequencies in this band. One r-f unit may be used to monitor continuously on a fixed frequency for plane-to-plane communication. The other r-f unit, for plane-to-ground communication, may be operated on any one of three additional frequencies, the selection being made by remote electrical control.

12. R-F INPUT FILTERS.

The input filters for each channel consist of three coupled tuned circuits covering the 140- to 144-mc band. Capacitive coupling is used between the antenna transmission line and the antenna circuit of the input filter which, in turn, is capacitively coupled to

the secondary circuit. The coupling between the secondary and the grid circuit is inductive. The component condensers and coils in each filter are assembled as a unit on a bracket.

The selectivity of these filters provides an image and undesired-response attenuation of 50 db or more. Also, the peak of the selectivity characteristic is flat for approximately one megacycle. Therefore, in the case of plane-to-ground operation, if the filter is tuned to the middle frequency of three plane-to-ground frequencies which are allocated within a one-megacycle band, the attenuation at the other frequencies will be negligible.

13. MIXER CIRCUITS.

Both the plane-to-ground mixer, V3R, and the plane-to-plane mixer, V13R, are Type 6AC7 Vacuum Tubes. The signal-frequency voltage and the beating oscillator voltage in each case are fed to the control grids through small coupling capacitors, C16R and C19R, respectively, for the plane-to-ground unit and capacitors C71R and C67R, respectively, for the plane-to-plane unit. The plates of the two mixers are connected in parallel to the plate terminal of the first i-f filter FL1R.

14. CRYSTAL OSCILLATORS AND HARMONIC GENERATORS.

The crystal oscillator and harmonic generator circuits of each receiver channel are identical. The tubes used for this service in each channel are twin triodes (Type 6N7's). Tubes V1R and V2R are associated with the plane-to-ground unit, and tubes V11R and V12R are associated with the plane-to-plane unit. The plane-to-plane unit crystal is Y1R. It is permanently connected in the grid circuit of the plane-to-plane oscillator (one of the triodes in V11R). The plane-to-ground unit crystal may be either Y2R, Y3R, or Y4R. Crystal-switching relays operated from a remote point provide means of connecting any one of the three crystals in the grid circuit of the plane-to-ground oscillator (one of the triodes in V1R). Each crystal oscillator is followed by a triode functioning as a quadrupler which, in turn, is followed by two triodes in tandem functioning as doublers. The triodes in each channel functioning as quadruplers are in the same envelopes as their respective oscillators; i. e., in tubes V1R and V11R. The two triodes of the remaining tube of each channel are used as the tandem doublers. These tubes are tube V2R for the plane-to-ground unit and tube V12R for the plane-to-plane unit. All circuits are tuned inductively either by copper cores or iron-dust cores within the forms on which the inductance coils are wound. The position of these slugs relative to the winding is controlled by adjusting screws which are on top of the chassis.

NOTE

In the original manufactured lot, serial numbers 101 to 400 a copper tuning core was used and must be rotated clockwise in tuning, in order to approach resonant frequency of the coil. At the completion of this first lot, a modification was made in the design of the receiver oscillator and harmonic generator coils, and in serial numbers above 400, smaller coil forms are used and tuned with iron dust cores, which must be rotated counter-clockwise to approach resonant frequency. This information also applies to step 1 of "Plane-to-Plane Unit Tuning" and to the notes of steps 1 and 8 of "Supplementary Receiver Unit Tuning Instructions" on Fig. 14.

15. I-F AMPLIFIER.

The intermediate-frequency amplifier consists of three stages of selective amplification operating at a frequency of 10 megacycles. Four double-tuned circuits coupled to form band-pass filters, with a pass-band of approximately 80 kc, are used as coupling elements between the first detectors, tubes V3R and V13R; the three intermediate frequency amplifier tubes V4R, V5R, and V6R; and the second detector tube V8R. Resistance capacity networks are used to filter the radio-frequency components from the d-c leads. The i-f filters are tuned inductively by a screw adjustment which moves an iron dust core within the coil form. The fixed tuning capacities of each of the i-f filters have temperature coefficients of a capacity such that the mid-band frequency of the intermediate-frequency amplifier remains substantially constant for a wide variation of ambient temperature.

16. I-F GAIN ADJUSTMENT.

In all equipments with serial numbers above 400, an adjustable potentiometer has been provided; its adjustment is secured either by the application of red lacquer to the point where the shaft extends from the potentiometer body, or else it has a locknut locking feature and a screwdriver slot for adjustment. This potentiometer is provided for fixed gain adjustments

and controls the screen grid voltage of the first i-f amplifier tube V4R, thereby providing a range of adjustment of approximately 15 db. Since the i-f amplifier is common to all channels, any adjustment of this potentiometer will affect the sensitivity of all channels equally.

17. NOISE SUPPRESSION.

Noise suppression is provided by utilizing the plate-cathode circuit of the triode part of tube V7R (a Type 12SQ7) as a series diode noise gate in the audio path to the grid of the first audio-frequency amplifier, which is the triode part of tube V8R (also a Type 12SQ7). The mid-point of the second detector diode load resistor, R29-R30R, is connected to the plate of the noise gate diode. The cathode of the noise gate is connected through resistor R32R to the junction of resistor R31R and capacitor C32R, which are bridged across the detecting diode load resistors R20R and R30R. Audio voltage is applied to the grid of the first audio-frequency amplifier from the cathode of the noise gate through capacitor C31R. *Bias is applied to this grid from the junction of resistors R31R and R32R through resistor R34R.* Although the control grid of the noise gate tube V7R is used for squelch action, the tube is effectively a diode for all radio-frequency and audio-frequency voltages, since its grid and plate are connected together through capacitor C30R. The grid leak resistor R33R is a very high resistance, so that the shunting effect of this path is negligible.

The polarity of the potential developed across the detecting diode load resistor (R29R, R30R) by the d-c component of the rectified carrier is such as to make the cathode end of this resistor positive with respect to all other points on the resistor. Therefore, since the plate of the noise gate diode V7R is connected to the mid-point of resistors R29R and R30R, and since the cathode of the noise gate is effectively connected to a point on the detecting diode load resistor between the mid-point and the i-f filter end of the detecting diode load resistor, the potential of the noise gate diode plate is positive with respect to its cathode. This relative polarity of the plate cathode circuit of the noise gate diode causes it to conduct and, therefore, completes the audio-frequency path through itself and capacitor C31R to the grid of the first audio amplifier tube V8R. This is the normal manner in which the circuit functions when a modulated carrier is being received. When noise peaks of high amplitude and short duration are received, the noise gate diode plate is more negative with respect to the detecting cathode than it is with a received carrier. This is due to the higher amplitude of the rectified direct current resulting from the noise peak. At the same time, the noise gate cathode tends to maintain the same potential as it had when a carrier was received, due to the filtering action of capacitor C32R. As a result, when noise peaks are received, the noise gate plate momentarily goes negative with respect to its cathode and opens the audio path to the grid of the first a-f amplifier. The operation of this noise suppression circuit is dependent upon the highly peaked nature of noise pulses. If it were not for the steepness of the wave front, the relative potentials of the noise gate plate-cathode circuit would adjust themselves as they do with the normal modulated carrier and would complete the audio path before the noise peak had passed.

18. SQUELCH CIRCUIT.

Squelch action is obtained by using the grid of the noise gate as a d-c control element to determine the value of carrier level at the second detector at which the noise gate will function. This grid is connected through a very high resistance resistor R33R, to a point at a potential of +10 volts with respect to ground. The potential of the noise gate cathode with respect to ground is determined by the detecting diode cathode-to-ground potential. This latter potential, when no carrier is being received, is approximately +60 volts. As a result, the noise gate cathode is more positive with respect to ground than the grid or d-c control element, and therefore the net potential of the grid with respect to cathode is negative. Under this condition, the audio path is open. When a carrier is being received, the detecting diode cathode-to-ground potential and the noise gate diode cathode-to-ground potential are decreased as the received carrier level increases. At the point where the net voltage on the d-c control element of the noise gate becomes positive with respect to the cathode, the diode starts to conduct, completes the audio path, and functions as a noise gate as previously explained.

The operating point of the squelch circuit, in equipments with serial numbers above 400, can be adjusted for the prevailing noise conditions by use of the gain-adjustment potentiometer P1R mounted on a bracket on the bottom of the chassis between tube V4R and tube V5R. In using this adjustment the gain reduction should be just sufficient to prevent the noise gate from opening on noise. Excessive gain reductions will result in decreased range.

19. SECOND DETECTOR, AVC AND FIRST AUDIO-FREQUENCY AMPLIFIER.

A Type 12SQ7 Vacuum Tube, V8R, includes the second detector diode, the AVC diode, and the first audio amplifier triode. Intermediate-frequency voltage from filter FL4R is applied to the detecting diode. Both the audio-frequency and d-c components of this voltage appearing across the load resistors R29R-R30R are applied to the grid of the first audio tube, which also functions as a d-c amplifier. The load resistor, R37R, of the triode is connected to the cathode and returns to a potential of —35 volts with respect to ground, obtained from the grid circuit of the first harmonic generator in the plane-to-ground unit at the junction of resistors R4R and R8R. Minimum bias is supplied by the voltage drop across resistor R9C. For this purpose the AVC diode load resistor, R35R, returns to the junction of resistor R9C and terminal 8 of PG2C. If no carrier is being received, the drop across resistor R37R due to plate current is greater than the —B voltage (—35 volts), so that the cathode is positive with respect to the AVC diode plate. The value of this voltage difference is the delay bias for the AVC. When a carrier is received, the d-c component across the diode detector load resistor biases the audio amplifier and reduces the plate current. As the drop across resistor R37R decreases and the cathode becomes negative with respect to the AVC diode plate, this diode starts conducting and the drop across its load resistor, R35R, is applied to the controlled tubes through resistor R36R.

20. SECOND AUDIO-FREQUENCY AMPLIFIER.

The second audio amplifier consists of two Type 12A6 Vacuum Tubes, V9R and V10R, which provide dual audio output. The grids of these tubes are connected together and are resistance-coupled to the load resistor of the first audio amplifier. Separate output transformers (T1.1R and T1.2R), which are potted in the same case, are provided.

In the C-51/ARC-4 Control Unit the dual output feature of the equipment is not utilized; although both output circuits are carried through to the control unit plug, the two headset jacks are supplied from one circuit.

21. POWER CIRCUITS.

A simplified schematic circuit diagram of the filament and relay circuit connections is presented on Fig. 15. The groups of filament circuits and the relays are connected to the terminals of the 32-contact plug PG1C located at the rear of the equipment. When the equipment is mounted in the airplane the plug automatically engages the receptacle of the Mounting Base MT-101/ARC-4. Receptacles wired for 24-volt operation connect the groups of filament circuits in series, and connect the voltage-dropping resistors in series with the relays. Receptacles wired for 12-volt operation connect the groups of filament circuits in multiple, and strap out the voltage-dropping resistors in series with the relays. The 8-contact dynamotor plug PG2C in the equipment is so wired that either a 24- or a 12/24-volt dual input dynamotor is accommodated, provided the receptacle on the dynamotor is correctly wired. The wiring of the plug is such that, should a 12-volt dynamotor be inserted in an equipment supplied from a 24-volt source (or vice versa), the equipment will not function nor will any damage result.

22. TS-80/U TEST METER.

The TEST METER jack on the front panel accommodates a TS-80/U Test Meter.

NOTE

The test meter supplied with this equipment *does not* measure the actual current or voltage but gives a proportionate reading. All values of voltage or current referred to in this book are given for the use of this test equipment, unless otherwise specified

The TEST METER indications refer to the receiver circuits when the equipment is in the RECEIVE condition, and to the transmitter circuits when the equipment is in the TRANSMIT condition. Table II on page 10 gives the switch positions at which the currents and voltages may be measured.

23. CONTROL CIRCUITS.

The C-51/ARC-4 Control Unit and the J-23/ARC-4 Junction Box are indicated schematically on Fig. 15.

The ON-OFF switch of the control unit is connected in series with the ON-OFF (filament and dynamotor relay) switch D1C located on the front panel of the equipment. SWITCH D1C SHOULD BE LEFT PERMANENTLY IN THE ON POSITION WHEN IT IS DESIRED TO CONTROL THE EQUIPMENT FROM THE REMOTE POINT.

The three-position switch marked P-G BOTH P-P permits the reception of either channel by disabling the input circuit of the unwanted channel by removing the screen voltage from the first detector of the interfering channel. For normal operation the switch should be left in the center position energizing BOTH input circuits.

The RADIO-INTERPHONE switch D202 provides a means of disabling the transmitter when it is desired to use the interphone system for communication between the pilots. The switch when thrown to the INTERPHONE position opens the tip or relay control circuit of the microphone jack, hence the high voltage and the antenna are not transferred to the transmitter when the microphone button is pressed. The switch at the same time biases the audio amplifier tubes V6T and V7T to cutoff by removing the short circuit from the cathode-biasing resistor R30T. The input transformer T1T, the dual output tubes V9R and V10R, and the output transformers T1.1R and T1.2R then function as an audio-frequency amplifier for the interphone system. The interphone outlets should be connected in multiple and terminated in plugs for insertion in the TEL and MIC jacks of the control unit. The switch must be returned to the RADIO position when it is desired to transmit. The receiver functions normally with the switch in either position.

The four-position CHANNEL SELECTION switch is connected in series with the coils of the crystal-switching relays and thus permits the selection of any one of the available pretuned transmitting frequencies, together with any one of the three plane-to-ground receiving frequencies in addition to the plane-to-plane reception.

The OUTPUT control provides a means of adjusting the audio output level to the headphones. Maximum output is obtained by rotating the control to the extreme clockwise position.

A jack, mounted on the front panel of the equipment and designated THROTTLE SW, provides a means for using the throttle switch in the cockpit as an alternate method of controlling the transmitter, if the use of the conventional press-to-talk microphone button is undesirable. For this purpose a plug (NAF-A310572-1 or equivalent) and cord must be provided, which complete the tip circuit of this jack to ground (sleeve) through the throttle switch. When this method of control is used, however, the RADIO-INTERPHONE switch does not function normally. The transmitter is operating regardless of the position of the RADIO-INTERPHONE switch whenever the throttle switch is closed.

NOTE

Therefore, when the throttle switch is employed, the interphone cannot be used without radiating a radio signal. This should be kept in mind in text references to the RADIO-INTERPHONE switch.

TABLE II

Test Switch Positions for Voltage or Current Measurements

Test Switch Position	*Voltage or Current Measured*	
	Receiving Condition	*Transmitting Condition*
OSC IG	Receiver Oscillator Grid Current (Plane-to-Ground Channel)	Transmitter Oscillator Grid Current
1ST H-G IG		Transmitter 1st Harmonic Generator Grid Current
2ND H-G IG	Receiver 2nd Harmonic Generator Grid Current (Plane-to-Ground Channel)	Transmitter 2nd Harmonic Generator Grid Current
3RD H-G IG	Receiver 3rd Harmonic Generator Grid Current (Plane-to-Ground Channel	Transmitter 3rd Harmonic Generator Grid Current
RF AMP IG OR P TO P H-G IG	Receiver Plane-to-Plane Unit Oscillator Grid Current, 2nd Harmonic Generator Grid Current and 3rd Harmonic Generator Grid Current. (P-P CH H-G IG Test Jack connected to test terminals.)	Transmitter Final Amplifier Grid Current
RF AMP IP		Transmitter Final Amplifier Plate Current (Output Stage)
AUD AMP IP		Transmitter Audio-Frequency Amplifier Plate Current
FILAMENT	Supply Voltage at Terminals of Plug PG1C. (The meter is connected across a 12-volt portion of the circuit for both the 12- and 24-volt power supplies.)	
PLATE	Transmitter and Receiver +B Supply Voltage.	

SECTION II
INSTALLATION AND ADJUSTMENT

1. INSTALLATION INSTRUCTIONS.

The RT-19/ARC-4 Radio Transmitter-Receiver, when installed in an airplane, should be mounted on an MT-101/ARC-4 Mounting Base. The essential dimensions of the equipment and the mounting are indicated on Fig. 13. Care must be taken in locating the equipment to allow sufficient clearance at both sides for proper ventilation. Particular care should be taken to insure free passage of air to the fan intake located on the left side near the rear of the equipment.

The strapping of the receptacle on the MT-101/-ARC-4 Mounting Base, and the wiring between the mounting base and the junction box, between the junction box and the control unit, and the power supply is shown schematically on Fig. 15. The leads between the MT-101/ARC-4 Mounting Base and the control components should be made up in cable form. All leads should be not smaller than No. 22 AWG, insulated for at least 100 volts. The completed cable must be shielded and securely bonded to the metal structure of the aircraft.

If the C-51/ARC-4 Control Unit is not used, the control panel installation in the pilot's compartment should not expose either the disabling switch or the gain control potentiometer terminals, as these terminals carry d-c potentials in excess of 100 volts.

The size of conductor selected for the primary power leads depends on the lengths of lead and the rating of the power supply. The normal battery drain for operation from a 12-volt source is 21.5 amperes. The normal battery drain for operation from a 24-volt source is 10.5 amperes. The size of conductor to be used for the primary power leads should be such that the voltage drop in the conductor will not exceed 0.2 volt. The necessary receptacle strapping should be made with No. 16 AWG.

The equipment is not fused internally but should be protected by the fuse at the junction box. The fuse must be able to carry the steady primary current and to hold the transient starting current for short intervals. The J-23/ARC-4 Junction Box employs a Type 3AG 40-ampere fuse for 12-volt service or a Type 3AG 20-ampere fuse for 24-volt service.

The antenna should be fed with a 50- or 70-ohm loss coaxial transmission line. The transmission line should be terminated at the equipment end with a Navy Type 49195 or 49190 Plug for insertion into the ANT jack J1C located on the front panel. This plug is designed for use with the RG-8/U or CASS F-50-1 coaxial lines. Owing to the long radius of curvature required for this line, it may be convenient to use a right-angle adapter (Navy Type 49192) between the plug and the ANT jack.

2. ANTENNA ALIGNMENT.

When the equipment is installed in an airplane and connected to the actual antenna system, the following adjustments must be made:

a. RECEIVER ANTENNA ALIGNMENT: PLANE-TO-PLANE CHANNEL.

Loosely couple the output of a signal generator to the antenna mast. A lead two or three feet long, connected to the output termination of the signal generator and brought in the vicinity of the antenna, should give enough coupling. A D-150975 Buzzer, such as furnished in the IE-35-A Test Set, may be used as a source of r-f signal for antenna trimming and r-f alignment, although it is not as satisfactory as a signal generator.

Place the P-G BOTH P-P switch in the P-P position. Operate the CHANNEL SELECTION switch to any of the four positions. Adjust the signal generator to the frequency of the plane-to-plane channel. Listen to the output of the receiver. Reduce the level of the signal generator until a just audible signal is received, then trim the REC PLANE-TO-PLANE ANT control for maximum audio output.

b. RECEIVER ANTENNA ALIGNMENT: PLANE-TO-GROUND CHANNEL.

Place the P-G BOTH P-P switch in the P-G position. Operate the CHANNEL SELECTION switch to position 3 or to the mid-band frequency. Adjust the signal generator to the frequency of this channel. Reduce the level of the signal generator until a just audible signal is received. Then trim the REC PLANE-TO-GROUND ANT adjustment for maximum audio output. Return the P-G BOTH P-P switch to the BOTH position for normal operation.

c. TRANSMITTER ANTENNA ALIGNMENT.

Plug the TS-80/U Test Meter in the TEST METER jack provided on the front panel. Operate the test meter switch to the RF AMP IP position. Operate the CHANNEL SELECTION switch to position 2. Then follow the procedure outlined in steps 9 and 10 of the TRANSMITTER TUNING instructions.

3. SQUELCH OPERATING ADJUSTMENT.

In some installations the noise level may be unusually low and increased receiver sensitivity may be desired. In these cases, the i-f gain potentiometer P1R may be adjusted to a point which will just prevent the noise gate from opening on noise. After adjustment is made, the potentiometer shaft must again be locked in position to prevent any change during operation. In like manner, the sensitivity may be reduced for installations where the noise level is unusually high. However, it must be remembered that excessive reduction in gain will reduce the useful range of this equipment.

SECTION III
OPERATION

1. GENERAL.

The equipment is placed in operation in the following manner:

Place the P-G BOTH P-P switch in the BOTH position (BOTH channels functioning).

Place the RADIO-INTERPHONE switch in the RADIO position.

Plug the headsets and microphones into the jacks provided for them.

Place the CHANNEL SELECTION switch in the position for the desired carrier frequency.

Place the ON-OFF switche in the ON position.

These steps place the equipment in the receive condition for monitoring simultaneously on two frequencies. To transmit, operate the press-to-talk switch on the microphone.

2. CHANNEL SELECTION SWITCH.

Normally, the equipment is adjusted to operate on one of four carrier frequencies, any one of which may be selected by a four-position switch. If the controls are properly wired, the operating frequency of the equipment corresponding to each of the CHANNEL SELECTION switch positions will be that shown in the table below.

Switch Position	*Transmitter Operating Frequency*	*Receiver Operating Frequencies*
1	P-P CH No. 1	P-P CH No. 1 and P-G CH No. 2
2	P-G CH No. 2	P-P CH No. 1 and P-G CH No. 2
3	P-G CH No. 3	P-P CH No. 1 and P-G CH No. 3
4	P-G CH No. 4	P-P CH No. 1 and P-G CH No. 4

3. CHANNEL DISABLING.

Normally the P-G BOTH P-P switch should be in the BOTH position. This position permits reception on both the plane-to-plane and the plane-to-ground channels.

Occasionally, interference will be caused by reception of signals on both frequencies simultaneously. When this occurs, place the switch in the position corresponding to the channel on which clear reception is desired.

4. RADIO-INTERPHONE SWITCH.

When the RADIO-INTERPHONE switch is in the RADIO position, operation of the push-button switch on the microphone places the transmitter *"on the air."* When the switch is in the INTERPHONE position, operation of the push-button switch on the microphone does not energize the transmitter, hence the interphone communications are not radiated.

The interphone system can only be utilized when the microphone is inserted into the MIC jack in the Control Unit C-51/ARC-4. If the microphone jack on the front panel of the equipment is used, or if the THROTTLE SW jack is employed, the interphone feature is disabled and operation of the microphone push-button switch energizes the transmitter regardless of the position of the RADIO-INTERPHONE switch. The receiver functions normally with the switch in either position.

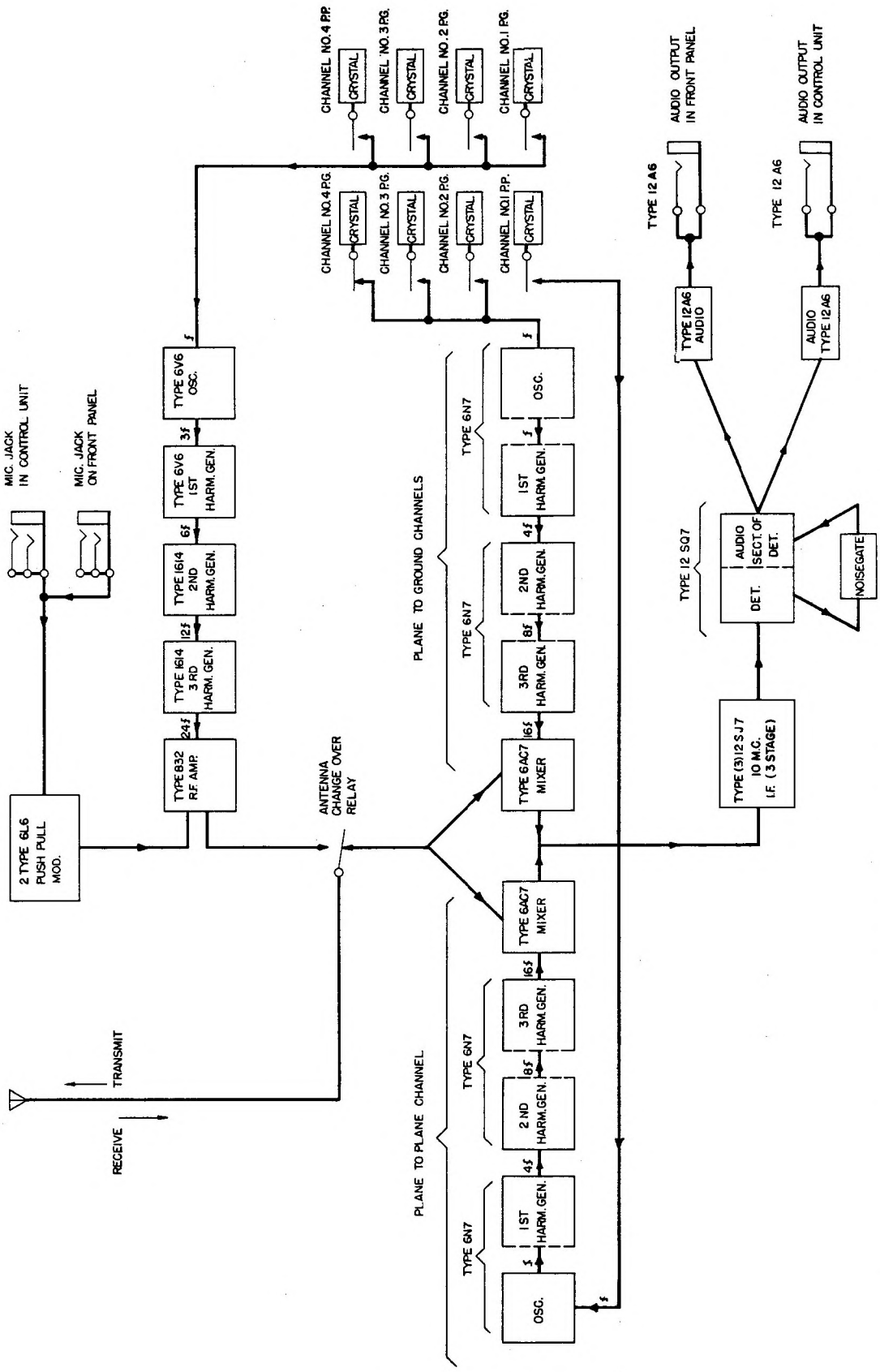


Figure 3—RT-19/ARC-4 Radio Transmitter-Receiver: Block Diagram Illustrating Theory of Operation

SECTION IV

ELECTRICAL AND MECHANICAL CHARACTERISTICS

1. ELECTRICAL CHARACTERISTICS.

FREQUENCY RANGE—140 to 144 megacycles.

R-F CHANNELS—Four crystal controlled r-f channels are provided.

CHANNEL SELECTION—Crystal-switching relays permit selection of a desired channel from a remote point.

HIGH-VOLTAGE POWER SUPPLY—High-voltage power is normally supplied by a plug-in dynamotor, but, if desired, a d-c external source capable of delivering 310 volts at 0.355 amp. may be used.

PRIMARY POWER SOURCE—The equipment is designed to operate from either a 12- or a 24-volt d-c source of primary power.

D-C POWER INPUT

Condition	*D-C Power Input*			
	12-volt Source		*24-volt Source*	
	Volts	*Amps*	*Volts*	*Amps*
Standby (Receiver on)	13.5	14.5	27.0	7.5
Transmit (Carrier only)	13.5	21.0	27.0	10.5
Transmit (Fully modulated carrier)	13.5	21.5	27.0	10.5

TUBE COMPLEMENT

Transmitter	*Receiver*
2 Type 6L6	2 Type 6AC7
2 Type 6V6GT	4 Type 6N7
1 Type 832	2 Type 12A6
2 Type 1614	3 Type 12SJ7
	2 Type 12SQ7

2. THEORY OF OPERATION.

The RT-19/ARC-4 Radio Transmitter-Receiver is a combined radio transmitter and receiver assembled on a common chassis and using a common low-voltage battery supply, high-voltage dynamotor and antenna. A Block Diagram, Fig. 3, outlines the directive path of a signal as it travels through the equipment both in transmit and in receive condition.

a. TRANSMITTER.

The transmitter is of straightforward design. The carrier frequency is crystal-controlled and the r-f signal plate is voltage-modulated. The carrier frequency may be any one of four pre-selected frequencies, and the choice is governed by the channel selection switch in the C-51/ARC-4 Control Unit.

The quartz plate which determines the carrier frequency of any particular channel, controls the frequency of the tri-tet oscillator. The third harmonic of this crystal frequency is coupled to the grid of the first harmonic generator, whose plate circuit is tuned to twice the frequency of its grid circuit. This frequency doubling is repeated in the second and third harmonic generators, thereby furnishing r-f excitation to the r-f amplifier at a frequency twenty-four times that of the crystal frequency.

The audio section of the transmitter is composed of a push-pull audio amplifier. The audio component is impressed upon the grids of the audio amplifier tubes direct from a microphone input transformer, which matches the microphone impedance to the input impedance of the push-pull amplifier or modulator tubes. Any audio voltage so transferred is amplified and flows through the modulation transformer primary winding. This audio voltage is superimposed upon the d-c plate voltage of the r-f amplifier as it flows through the secondary winding of this modulation transformer. The total effective plate voltage under modulation then becomes the sum of the d-c plate voltage and the modulating voltage. This resultant modulated r-f voltage is then transferred to the antenna by way of the antenna inductance and antenna changeover relay, and so radiated.

b. RECEIVER.

The receiver section of the RT-19/ARC-4 Radio Transmitter-Receiver has two individual r-f sections feeding a common i-f amplifier. Both r-f sections may be operated simultaneously or either one individually, depending upon the selection made by the PG-BOTH-PP switch on the C-51/ARC-4 Control Unit.

In both r-f sections, the operation is identical. The oscillator frequency is crystal-controlled and is one section of a two-section triode tube. The second section plate circuit is tuned to the fourth harmonic of the crystal frequency, and the two following harmonic generators each double the frequency, which results in a voltage applied to the mixer at the sixteenth harmonic of the crystal frequency. This voltage beats with the incoming signal and the resultant frequency will be the difference between the signal frequency and the sixteenth harmonic of the oscillator.

This resultant frequency now passes through the four double tuned i-f filter transformers and their associated tubes, and is amplified. Following the last i-f transformer is a diode detector and audio voltage

amplifier. The i-f signal is rectified by the diode detector, and is fed through a squelch circuit and a peak noise limiter of the series diode type, and then is impressed upon the grid of the first audio amplifier, which is the triode section of the detector tube. A detailed explanation of the operation of this circuit is given in Section I, Par. 17.

Following the audio voltage amplifier are two audio power amplifier tubes whose grids are in parallel. The plates provide two isolated audio outputs for low-impedance headsets. Sidetone for intercommunication is supplied by feeding a small amount of audio voltage into the parallel grids of the two audio output stages from the secondary of the microphone transformer.

3. DIMENSIONS.

RT-19/ARC-4 Radio Transmitter-Receiver.

Length — 19-1/2 inches
Width — 10-7/16 inches
Height — 7-11/16 inches

4. NOMINAL WEIGHTS OF MAJOR UNITS.

Unit	*Weight*
RT-19/ARC-4 Radio Transmitter-Receiver (with dynamotor, tubes and crystals)	33.3 lbs.
DY-9/ARC-1 Dynamotor (24-volt) 8.0 lbs. or DY-10/ARC-4X Dynamotor (12 24-volt) 8.2 lbs.	
J-23/ARC-4 Junction Box	0.7 lb.
C-51/ARC-4 Control Box	0.8 lb.
MT-80/ARC-5 Mounting Plate (two needed) each	0.09 lb.
MT-101/ARC-4 Mounting Base (with DP-D32-33S receptacle)	4.0 lbs.
Plug No. 6963 (three needed) each	0.19 lb.
Plug No. 6965 (two needed) each	0.1 lb.
16-Conductor Cable and Shield (per foot)	0.2 lb.
2-Conductor Cable and Shield (per foot)	0.13 lb.

SECTION V
MAINTENANCE

1. TEST BENCH EQUIPMENT.

The circuit for the test bench should simulate that in which the equipment is used, and will readily suggest itself to the maintenance man. In general, for the RT-19/ARC-4 Radio Transmitter-Receiver the following equipment should be available:

One C-51/ARC-4 Control Unit.
One J-23/ARC-4 Junction Box.
A Primary Power Source of 12- or 24-volt d-c supply (depending upon the particular installation).
Interconnection Cable Assembly No. 1, No. 2 and No. 3 (Fig. 19).
An r-f signal generator similar to Ferris 18C, capable of furnishing a modulated r-f signal at the carrier frequency to which the equipment will be aligned.

a. CABLES.

When a C-51/ARC-4 Control Box and a J-23/-ARC-4 Junction Box are employed at the test location the following cables are required:

(1) RT-19/ARC-4 Radio Transmitter-Receiver to the J-23/ARC-4 Junction Box: The control cable should be terminated at the junction box end with an 18-contact plug, No. 6963 as shown on Fig. 19, and on the other end may be terminated in a Cannon Receptacle Type DP-D32-33S, which is used in place of the MT-101/ARC-4 Mounting Base for connecting to the equipment. The power cable should be terminated at the junction box end with a three-contact plug No. 6965; see Fig. 19.

(2) C-51/ARC-4 Control Unit to the J-23/ARC-4 Junction Box: This cable is terminated at both ends with an 18-contact plug No. 6963.

(3) Primary Source to the J-23/ARC-4 Junction Box: The junction box end of this cable should be terminated in a three-contact plug, No. 6965.

b. SIGNAL GENERATOR.

If a signal generator is not available for r-f alignment, an r-f buzzer such as a D-150975 Buzzer, which is furnished as part of an IE-35-A Test Set, may be used. The signal from this buzzer will not be quite as satisfactory as a signal generator, but the r-f input filters of the plane-to-plane channel and the plane-to-ground channels may be aligned by this method. The buzzer should be loosely coupled to the antenna input circuit so as to give sufficient signal for alignment.

2. TEST BENCH SERVICE.

All parts of the equipment should be kept clean. The chassis should be kept clean. The chassis should be inspected at regular intervals. Dust which may have accumulated on the parts inside the equipment should be blown out with clean low-pressure compressed air. All nuts and screws should be checked to see that they are tight. The electrical connections should be examined to see that they are secure.

The dynamotor end bells should occasionally be removed and the carbon dust blown from around the brush holders. The commutator should be occasionally burnished with a strip of canvas. If the commutator is badly pitted, it should be turned down in a lathe. Do not use carbon tetrachloride for cleaning any part of the dynamotor.

CAUTION

A dangerous voltage exists on the high-voltage brushes and the commutator when the dynamotor is operating. Therefore, when burnishing the high-voltage commutator, the armature should be rotated by hand.

The ball bearings should be lubricated about every 300 hours of actual operation with one of the following lubricants: Andok "C", Standard Oil of New Jersey, or Lubriko No. M6, (Navy 14L3B type 2 medium grease) Master Lubricants Co., Philadelphia, Pa. Use only sufficient grease to fill the ball races. Do not pack the bearing housings. Keep the grease off of the commutators. The brushes should be marked as to position, removed and inspected every 300 hours of actual operation. Replace the brushes in the same holders and in the same position. Ordering information for replacement brushes is given under the ordering information for the dynamotor (E1C and E2C in the Replaceable Parts List).

3. LOCATION OF FAULTS.

The transmitter and receiving tuning instructions outline the conditions of the equipment for normal operation. Should the equipment act in an abnormal manner the following tabulated data in Pars. 4 to 7 will be helpful in locating and correcting the trouble.

The tabulated resistance and voltage measurements are made between the vacuum tube socket terminals and the chassis.

Voltage measurements are for an input voltage, measured between terminal A1 of the 32-contact plug and chassis, of 13.5 volts for a 12-volt system or 27.0 volts for a 24-volt system. The 27.0-volt measurements are shown in parentheses in the tables.

The transmitter-voltage measurements are for normal drive and normal output.

The resistance measurements are made with the dynamotor in place, but with the control and power circuits disconnected by removing the plug PG1C from the receptacle of the apparatus mounting (or test cord). The receiver voltage measurements are for maximum sensitivity on both channels and no signal input.

4. TRANSMITTER VOLTAGE MEASUREMENTS (VOLTS).

Tube Type and Function	*Tube Socket Terminal Numbers*							
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
V1T Type 6V6GT Osc. and Tripler	0	0 (26.8)*	295	235	−17	NC	6.5 (20.1)*	14.2
V2T Type 6V6GT 1st H-G	0	6.5 (20.1)*	295	245	−35	NC	13.0 (13.4)*	28.3
V3T Type 1614 2nd H-G	0	0 (26.8)*	295	255	−60	NC	6.5 (20.1)*	46
V4T Type 1614 3rd H-G	0	13.0 (13.4)*	295	260	−65	NC	6.5 (20.1)*	45
V6T Type 6L6 A-F Amp	0	6.5 (20.1)*	295	295	0	NC	0 (26.8)*	22.6
V7T Type 6L6 A-F Amp	0	13.0 (13.4)*	295	295	0	NC	6.5 (20.1)*	22.6
V5T Type 832	13.0 (13.4)*	−12	220	26	6.5 (6.7)*	−12	0 (0)*	285

* Figures in parentheses are for the 24-volt system. See Par. 3 above.

5. TRANSMITTER RESISTANCE MEASUREMENTS (OHMS).

Tube Type and Function	*Tube Socket Terminal Numbers*							
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
V1T Type 6V6GT	0	1.6	∞	∞	100,000	NC	2.5	410
V2T Type 6V6GT	0	2.5	∞	∞	100,000	NC	0.8	1,000
V3T Type 1614	0	1.6	∞	∞	100,000	NC	1.7	1,000
V4T Type 1614	0	0.8	∞	∞	100,000	NC	1.7	800
V6T Type 6L6	0	1.7	∞	∞	2,400	NC	1.7	50,000
V7T Type 6L6	0.8	0.9	∞	∞	2,000	NC	1.7	50,000
V5T Type 832	0.8	20,000	∞	300	0.7	2,000	0	∞

6. RECEIVER VOLTAGE MEASUREMENTS (VOLTS).

Tube Type and Function	Tube Socket Terminal Numbers							
	1	2	3	4	5	6	7	8
V1R Type 6N7 Osc. and 1st H-G . .	0	6.5 (20.1)†	265	−65*	−48*	168	13.0 (13.4)†	0
V2R Type 6N7 2nd H-G and 3rd H-G.	0	6.5 (26.8)†	272	−11*	−7.5*	266	0 (20.1)†	0
V3R Type 6AC7 P-G CH 1st Det. . .	0	0 (0)†	0	−3.0*	0	95	6.5 (6.7)†	230
V4R Type 12SJ7 1st IF Amp. . . . . (Maximum gain)	0	0 (0)†	0	−3.0*	0	110	13.0 (13.4)†	225
V5R Type 12SJ7 2nd IF Amp.	0	0 (0)†	0	−3.0*	0	110	13.0 (13.4)†	225
V6R Type 12SJ7 3rd IF Amp.	0	0 (0)†	0	−3.0*	0	110	13.0 (13.4)†	225
V7R Type 12SQ7 Noise Gate and Squelch	NC	4.5*	9*	NC	NC	33*	0 (0)†	8.9 (9.2)†
V8R Type 12SQ7 2nd Det., AVC and 1st AF Amp.	0	5.3	64	27	−2.8	168	13.0 (13.4)†	0
V9R Type 12A6 2nd AF Amp.	0	0 (26.8)†	148	167	0	NC	13.0 (13.4)†	9
V10R Type 12A6 2nd AF Amp. . . .	0	0 (26.8)†	150	168	0	NC	13.0 (13.4)†	8.5
V11R Type 6N7 Osc. and 1st H-G . .	0	0 (0)†	175	−38*	−107*	256	6.5 (6.7)†	0
V12R Type 6N7 2nd H-G and 3rd H-G	0	6.5 (6.7)†	255	−9.0*	−3.5*	258	13.0 (13.4)†	0
V13R Type 6AC7 P-P CH 1st Det. . .	0	0 (0)†	0	−3.0*	0	83	6.5 (6.7)†	222

* The listed voltages are as measured with an RCA Volt Ohmyst Junior, Navy type 60044, the voltmeter of which is an electronic device of high input impedance. The entries marked with asterisks are voltages across high-impedance circuits which will be radically different if measured with an instrument other than that suggested, and meaningless in so far as the tabulated values are concerned.

† Figures in parentheses are for the 24-volt system. See Par. 3 above.

7. RECEIVER RESISTANCE MEASUREMENTS (OHMS).

Tube Type and Function	Tube Socket Terminal Numbers							
	1	2	3	4	5	6	7	8
V1R Type 6N7 Osc. and 1st H-G . .	0	1.8	28,000	0.6 meg.	15,000	30,000	0.8	0
V2R Type 6N7 2nd H-G and 3rd H-G.	0	1.8	28,000	0.1 meg.	90,000	30,000	1.6	0
V3R Type 6AC7 P-G CH 1st Det. . .	0	0	0	2.2 meg.	0	1 meg.	2.8	30,000
V4R Type 12SJ7 1st IF Amp. (Max. gain)	0	0	0	1 meg.	0	65,000	0.8	30,000
V5R Type 12SJ7 2nd IF Amp.	0	0	0	1 meg.	0	0.16 meg.	0.8	30,000
V6R Type 12SJ7 3rd IF Amp.	0	0	0	1.4 meg.	0	15,000	0.8	30,000
V7R Type 12SQ7 Noise Gate and Squelch	NC	10 meg.	2 meg.	2 meg.	2 meg.	0.8 meg.	0	11
V8R Type 12SQ7 2nd Det., AVC and 1st AF Amp.	NC	2.5 meg.	62,000	1.2 meg.	0.5 meg.	38,000	0.8	0
V9R Type 12A6 2nd AF Amp.	0	1.4	38,000	38,000	0.1 meg.	NC	0.8	530
V10R Type 12A6 2nd AF Amp. . . .	0	1.4	38,000	34,000	0.1 meg.	NC	0.8	530
	V11R, V12R and V13R removed from sockets.							
V11R Type 6N7 Osc. and 1st H-G . .	0	1.2	28,000	28,000	70,000	24,000	∞	0
V12R Type 6N7 2nd H-G and 3rd H-G.	0	∞	28,000	0.1 meg.	0.1 meg.	28,000	0	0
V13R Type 6AC7 P-P CH 1st Det. .	0	0	0	2.2 meg.	0	1 meg.	14.8	30,000

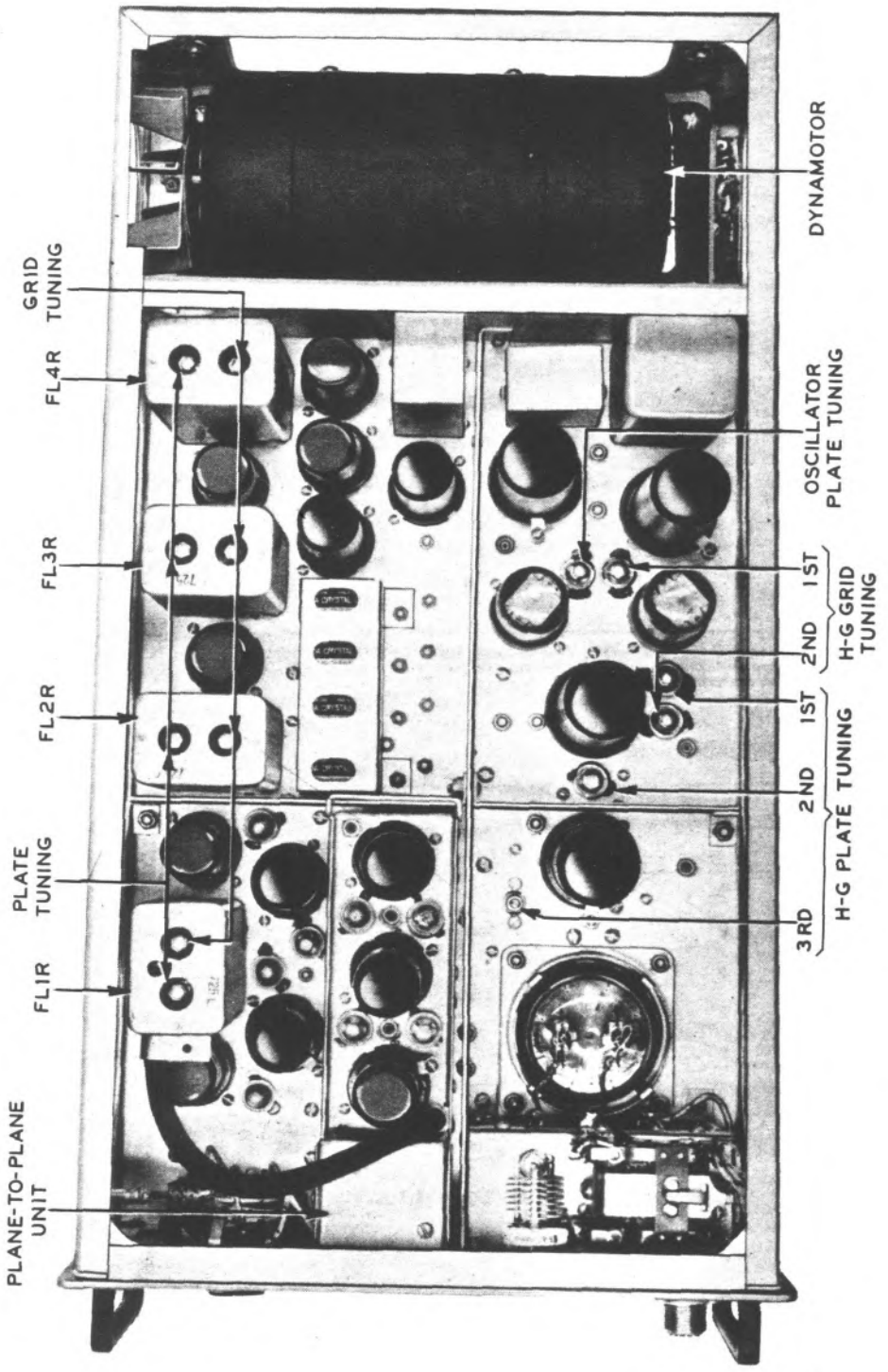


Figure 4—RT-19/ARC-4 Radio Transmitter-Receiver: Internal Top View

8. RELAY ADJUSTMENT.

The contacts of the relays incorporated in the equipment should be occasionally cleaned with the flat end of a toothpick dipped in C.P. carbon tetrachloride. If a relay is suspected of faulty operation it should be adjusted in accordance with the data tabulated below:

	Crystal Relays S1C, S2C, S3C, S4C	*Antenna Relay S5*	*Starting Relay S6*
Air-gap between pole-piece and armature freeze pin when contacts just make	0.015 inch	0.015 inch	0.015 inch
Contact gap, relay not operated	0.020 inch	—	0.063 inch
Minimum contact pressure, relay operated	40 grams	70 grams	50 grams
Minimum pressure against stop, relay not operated	30 grams	70 grams	—
Minimum operate voltage	9.0 V DC	9.0 V DC	9.0 V DC
Maximum continuous voltage	16.2 V DC	16.2 V DC	16.2 V DC
Coil resistance	100 ohms ±5%	30 ohms ±5%	80 ohms ±5%

9. INSTALLATION OF NEW TYPE OSCILLATOR AND HARMONIC-GENERATOR COILS

Since only new-type coils are supplied as spare parts for this equipment, a coil-mounting adapter (per Western Electric Co. Drawing 696149-4) is also supplied for use when a coil of the initial lot (serial Nos. 101 to 400) is replaced. The adapter is a round metal washer with a "D" shaped hole and three dents spaced 120 degrees apart and on a radius slightly less than that of the hole for the old type coil. Two adapters are required for each coil, one being used on each side of the chassis with the dents facing the chassis. The "D" shaped holes accommodate the new coil form and the dents serve to locate the new coil centrally in the old hole.

When replacing coils of the receiver plane-to-ground harmonic generator (L1R, L2R, L3R, L4R) and the transmitter harmonic generator (L1T, L2T, L3T, L4T, L5T), the coil assembly is oriented with the flat of the "D" in the same position as the tab on the old hole, which acted as the key for orienting the old coil form.

When replacing a coil of the plane-to-plane unit harmonic generator (L5R, L6R, L7R, L8R), the flat of the "D" is not in the same position as the tab of the old hole. Rather, the coil is oriented in the holes so that the coil terminals are clear of the side cover and in such a position as to result in short wiring to the tube sockets.

10. INTERMEDIATE-FREQUENCY AMPLIFIER ALIGNMENT.

The i-f amplifier must be aligned at 10,000 kc ± 5 kc. This necessitates that the frequency of the signal generator be known to this degree of accuracy. A convenient means of achieving this is to zero-beat the signal generator with the fundamental or harmonics of a crystal-controlled oscillator for which the frequency is known to be within the desired degree of accuracy. In this method a detector will have to be provided. It can be either a radio receiver which can be tuned to the calibration frequency, or a simple single tube diode detector and audio amplifier. If the calibration point is not at the alignment frequency, it can be used to draw a new calibration curve for which the same slope as the original curve is assumed. This means drawing the new curve through the calibration point and parallel to the original curve. The fundamental of the receiver crystal oscillators will give calibration points in the vicinity of 8,000 kc, while the second harmonic of the transmitter crystal oscillator will give calibration points in the vicinity of 12,000 kc.

a. The i-f filters should be aligned stage-by-stage using the shunting method as follows:

(1) Introduce a 30 per cent modulated 10,000-kc signal by connecting the signal generator to the grid of tube V6R through a 0.006 mf capacitor.

(2) Connect a 2500-ohm resistor in series with a 0.006 mf capacitor from the plate terminal (#1) of the filter FL4R to ground, and tune the grid circuit for maximum audio output from the PHONE jack, using an input which gives approximately 50 milliwatts.

NOTE

For convenience, the alignment shunt should be provided with clips and guards, and tape covering exposed leads.

(3) Connect the alignment shunt from the grid terminal (#4) of filter FL4R to ground and tune the plate circuit for maximum audio output, using an input which gives approximately 50 milliwatts output.

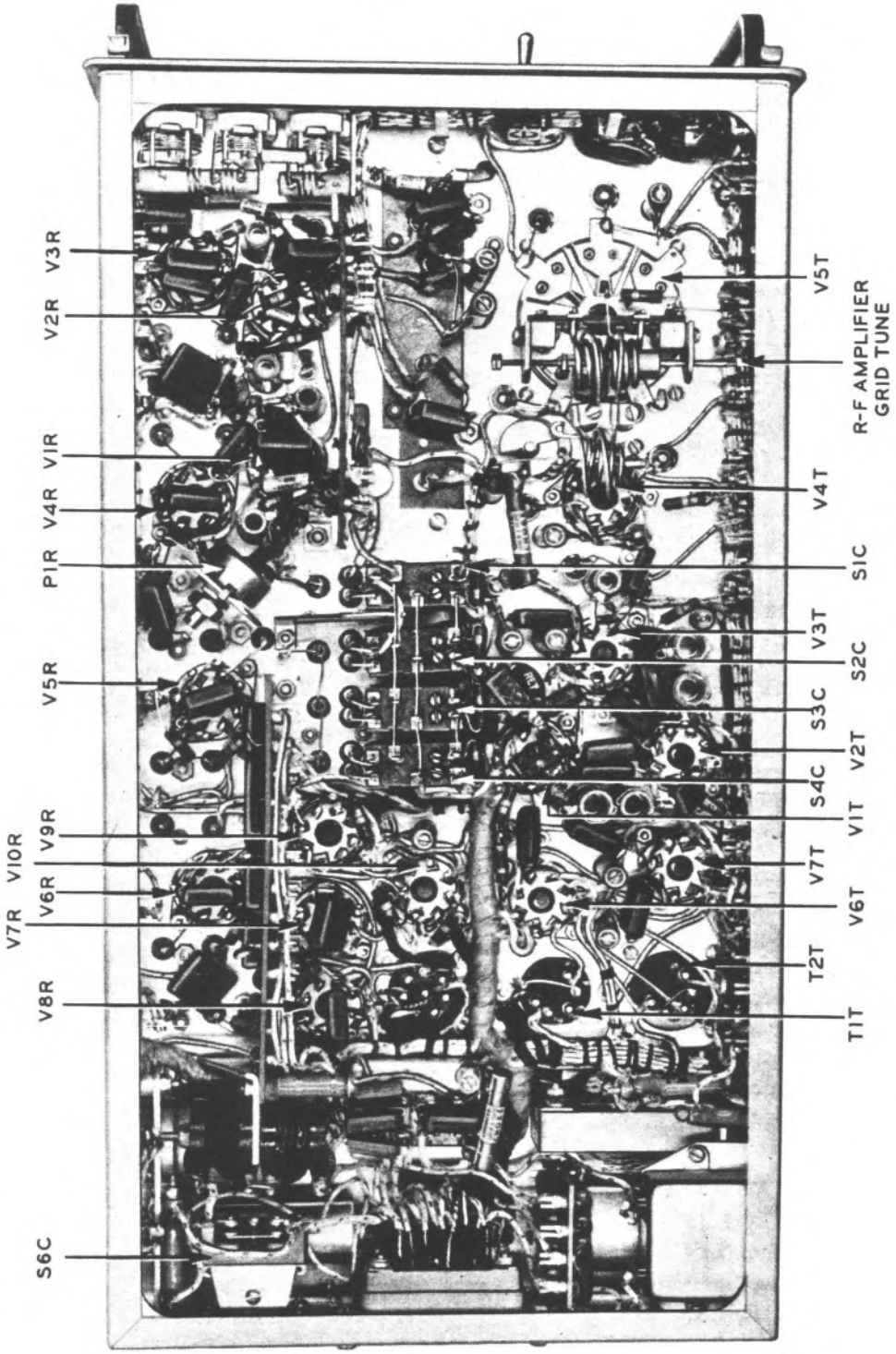


Figure 5—RT-19/ARC-4 Radio Transmitter-Receiver: Internal Bottom View

(4) Repeat steps (1), (2) and (3) for filters FL3R and FL2R. In aligning each stage, progressively reduce the input to maintain approximately 50 milliwatts output.

(5) Connect the signal generator to the grid of tube V4R through an 0.006 mf capacitor. Set the output of the signal generator to 200 microvolts. Adjust the potentiometer P1R for an audio output of 50 milliwatts.

(6) Connect the signal generator to the junction of capacitor C16R and r-f coil L9.3R. Repeat steps (1), (2) and (3) for filter FL1R.

(7) After FL1R is aligned, check the characteristic for bandwidth 6 db down. This 6-db bandwidth may be determined after complete i-f alignment by adjusting the frequency of the signal generator to give peak audio output. The output of the signal generator is then doubled (2:1 voltage ratio) and the signal generator frequency *increased* to a point that gives the same audio output power reading as was recorded at the i-f resonant frequency point. The signal generator frequency is then *decreased* until this same audio output power reading is again obtained; and the frequency difference between these two frequencies of the signal generator is the bandwidth 6 db down from mid-band. The reference point for the 6-db measurement is the peak of the i-f amplifier characteristic. The bandwidth 6 db down from this peak should not be less than 80 kc. The bandwidth 60 db down from this peak should not be more than 300 kc. Mid-band frequency, as determined by adding one-half of the 6-db bandwidth to the frequency of the low-frequency 6-db point, should be within ± 5 kc of the alignment frequency.

11. GENERAL R-F TUNING INSTRUCTIONS.

The tuning adjustments of the RT-19/ARC-4 Radio Transmitter-Receiver should be made at a test bench equipped as outlined under Par. 1 of Section V—MAINTENANCE. The equipment should then be installed in the plane, where the only further adjustments necessary will be to trim the transmitter output circuit and the receiver input circuits to the antenna. The tuning controls not accessible through the front panel are made available by removing the dust cover (fastened at the rear by two Dzus fasteners) from the equipment. The location of all the tuning controls is indicated on Fig. 14. Also included on Fig. 14 are condensed tuning instructions in tabular form, which are intended to supplement the following detailed instructions.

To prepare the equipment for tuning, connect it to the power and control circuit by means of the plug and receptacle at the rear of the equipment. Insert all the vacuum tubes.

NOTE

Before inserting the vacuum tubes V3T, V4T, V2R, V3R, V12R and V13R, remove the paint from the flanges at the points where they are clamped in the equipment, to insure a good connection between the shell of the tube and the chassis.

Insert the dynamotor and secure it to the chassis by means of the four captive screws. Insert the crystal units in the crystal sockets in the following order: Insert the plane-to-plane crystal unit (140.580 mc) in position 1 (socket nearest to front panel). Insert the plane-to-ground crystal units in positions 2, 3 and 4, preferably in the ascending order with respect to frequency.

During the tuning period the supply voltage measured at the power plug should be 13.5 or 27 volts (depending upon the nominal voltage rating of the power supply of the plane in which the equipment is to be installed).

12. TRANSMITTER TUNING.

The time and care required for tuning will depend, to some extent, upon the number of channels to be used and their location in the frequency band. Thus, if only three channels grouped closely together are to be used, less circuit retrimming will be required than if four channels, spaced throughout the band, were to be used. In the following description of tuning procedure, it will be assumed that three plane-to-ground channels, with frequencies of 142.020 mc, 142.560 mc and 142.740 mc, and the plane-to-plane channel with a frequency of 140.580 mc will be used. (See note on Fig. 14.)

a. To tune the transmitter proceed as follows:

(1) Plug the TS-78/ARC-4 (A85A) Phantom Antenna into the ANT jack.

(2) Insert the plug of a microphone (or an equivalent phantom microphone circuit) in the microphone jack located on the front panel.

(3) Operate the ON-OFF switches located on the front panel and the control unit to the ON position. Allow the filaments to warm up (about 30 seconds will be required). Plate voltage may then be applied to the transmitter by operating the push-button switch on the microphone.

CAUTION

When the dynamotor is running, dangerous voltages will be present at the antenna transfer relay terminals, at the plate terminals of the amplifier tube V5T, and at various points on the bottom of the chassis. Be careful to avoid contact with any of these parts.

(4) Connect the TS-80/U Test Meter to the TEST METER jack and rotate the test meter switch located on the front panel to the OSC IG position. Note the oscillator grid current for each of the four frequencies by operating the CHANNEL SELECTION switch. Grid currents should be within the limits indicated in the table on Fig. 14.

(5) Rotate the test meter switch to the 1st H-G IG position. With the CHANNEL SELECTION switch set for the mid-band frequency, normally position 2, adjust the tuning cylinders of coils L1T and L2T (controls designated on Fig. 14 as OSC PLATE TUNING and 1ST H-G GRID TUNING) to obtain approximate maximum indication on the test meter. The CHANNEL SELECTION switch should then be operated to the various channels, and coils L1T and L2T should be retrimmed to equalize the grid currents for the various channels. It should be noted that, since coils L1T and L2T are inductively coupled beyond the critical coupling value, the adjustment of one will affect the adjustment of the other; hence, several trimming adjustments may be required to obtain the best over-all adjustment.

(6) Rotate the test meter switch to the 2ND H-G IG position. Adjust coils L3T and L4T, using the same procedure as given under step (5) above.

(7) Rotate the test meter switch to the 3RD H-G IG position. Set the CHANNEL SELECTION switch to the mid-band frequency, normally position 2 (see note, Fig. 14) and adjust coil L5T for maximum test meter indication. Check the test meter indications for the other channels and retrim coil L5T, if necessary, to equalize the grid currents for each channel.

(8) Rotate the test meter switch to the RF AMP IG position. Reset the CHANNEL SELECTION switch to the mid-band frequency, normally position 2, and adjust capacitor C6T and coil L8T to obtain maximum test meter indication. Retrim to obtain uniformity for the various channels, using the same procedure as given under step (5).

(9) Rotate the test meter switch to the RF AMP IP position. Set TRAN ANT (the antenna coupling capacitor C10T) to its minimum capacity position. Adjust TRAN RF AMP (amplifier plate tuning inductance L9T) control to obtain minimum test meter indication. With normal battery voltage (13.5 or 27 volts), a minimum reading of approximately 0.4 ma should be obtained.

(10) Increase the capacity of the antenna coupling capacitor C10T until a small increase in the meter indication is obtained. Then readjust the TRAN RF AMP control again to obtain minimum meter indication. Increase the capacity of the antenna coupling capacitor again to obtain an increased meter reading and again readjust the TRAN RF AMP control to obtain minimum meter indication. As the loading of the amplifier plate circuit is increased (i.e., as the antenna coupling capacitor capacity is increased), the dip in plate current as the plate circuit is tuned through resonance becomes less pronounced. The loading should be increased in small steps, retuning the plate circuit each time until only a small dip (approximately 0.05 ma) is obtained. Under these conditions, maximum power output will be obtained.

(11) The CHANNEL SELECTION switch may now be operated to the other channel positions. It will be found that there will be only a moderate reduction of power on the adjacent channels.

b. In following the above tuning procedure, it will be noted that steps (4) to (8) direct trimming the tuning until the grid current for each frequency is equalized (i.e., a compromise tuning is obtained which provides the best over-all performance). The tuning of the plate circuit of the r-f amplifier [steps (9), (10) and (11)], depends upon the width of the band over which the frequency assignments are spread. The proper tuning for optimum output over the band should be determined by bench test performance. In general, if the frequency assignments cover a wide range, best over-all performance will be obtained by tuning the amplifier plate circuit to the middle carrier frequency. If the frequency assignment is confined to a band 1 mc wide, best over-all performance will be obtained by tuning the amplifier plate circuit to the lowest of the plane-to-ground channel frequencies.

c. For the frequency assignments used to illustrate the tuning procedure, the following transmitter test meter readings are typical:

Test Switch Position	*Test Meter Indication*
OSC IG	0.1 to 0.4
1ST H-G IG	0.3 to 0.7
2ND H-G IG	0.6 to 0.9
3RD H-G IG	0.4 to 0.7

Test Switch Position	*Test Meter Indication*
RF AMP IG	0.3 to 0.7
RF AMP IP	0.6 to 0.85
AUDIO IP	0.65 to 0.75
FILAMENT	0.6 to 0.7
PLATE	0.5 to 0.6

13. RECEIVER TUNING.

In order to prepare the receiver for tuning, place the RADIO-INTERPHONE switch in the RADIO position. Place the P-G BOTH P-P switch in the BOTH position. Plug a power output meter in one TEL jack and a set of headphones in the other TEL jack. Temporarily disable the squelch circuit by connecting a short-circuiting strap across capacitor C30R (mounted on socket VS7R). Connect the signal generator to the 50-ohm artificial antenna by a properly terminated coaxial line. Plug the TS-79/ARC-4 phantom receiver antenna into the ANT jack.

Variable air capacitors which can be rotated continuously in either direction are used to tune the ANT, INT COUP and GRID circuits of both the plane-to-ground and plane-to-plane input filters. There are, therefore, two settings for each capacitor for which the same capacity is obtained and, hence, for which the circuit is tuned to the same frequency.

The setting for maximum and minimum capacity can be determined from the position of an index on the rim of each adjustment nut. This index is a file notch in line with the screwdriver slot. For the plane-to-ground adjustments, maximum capacity is obtained with the screwdriver slot horizontal and with the index on the left. For the plane-to-plane adjustments, maximum capacity is obtained with the screwdriver slot vertical and with the index on top. In order to make the direction of capacity variation with rotation the same for each capacitor, the same 180 degrees of rotation must be used. On the plane-to-ground adjustment, the 180-degree arc above the horizontal should be used. On the plane-to-plane adjustment, the 180-degree arc to the right of the vertical should be used. Clockwise rotation within these arcs in both cases decreases capacity or, in other words, increases frequency.

The two receiver input circuits may now be tuned independently by the procedure outlined below in Par. 14.

14. PLANE-TO-PLANE UNIT TUNING.

The tuning procedure for the plane-to-plane unit is straightforward, since there is only one crystal associated with this unit. Provisions are made for grid current measurements, but in this case the circuits are not permanently connected to the test meter. Instead, a pin jack, designated P TO P H-G IG TEST, mounted on the left hand side of the chassis near the front, is permanently connected to the test meter position marked RF AMP IG OR P TO P H-G IG. The other terminals for the grid current measurements are located on top of the plane-to-plane unit chassis. The P-P CH G-G Test Terminals shown on Fig. 14 and Fig. 6 as OSC IG, 2ND H-G IG and 3RD H-G IG are identified on the apparatus as X, 4 and 8, respectively.

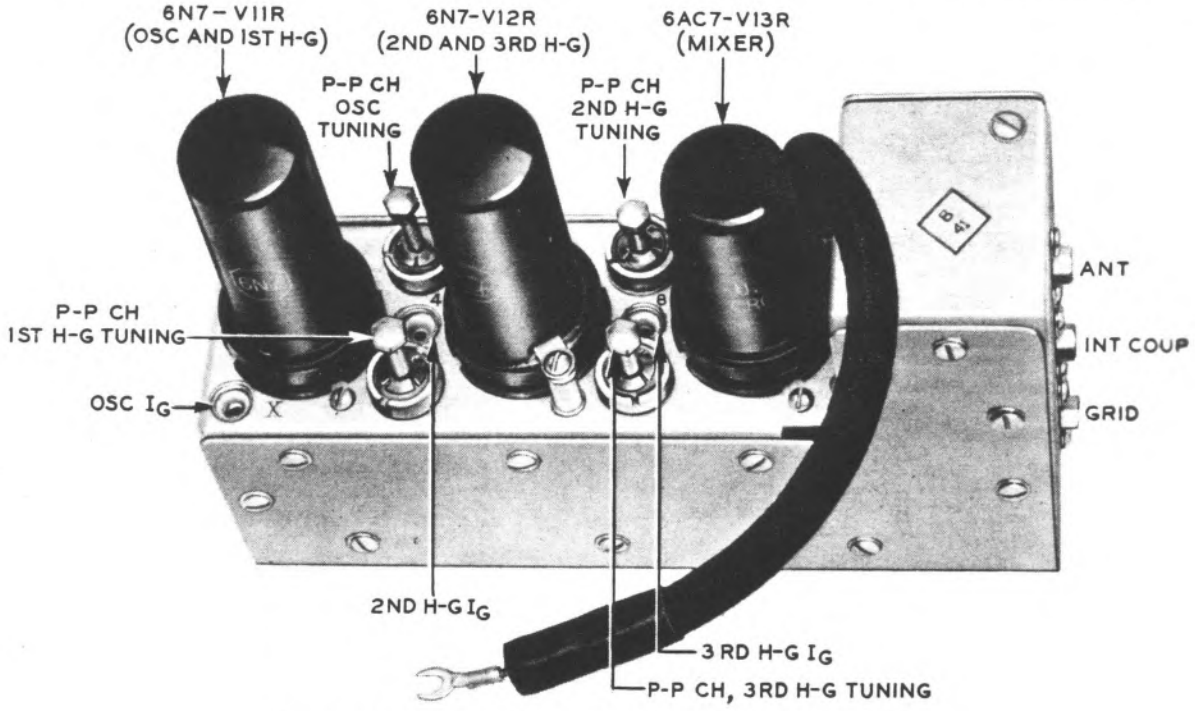


Figure 6—Receiver Plane-to-Plane Unit: External View

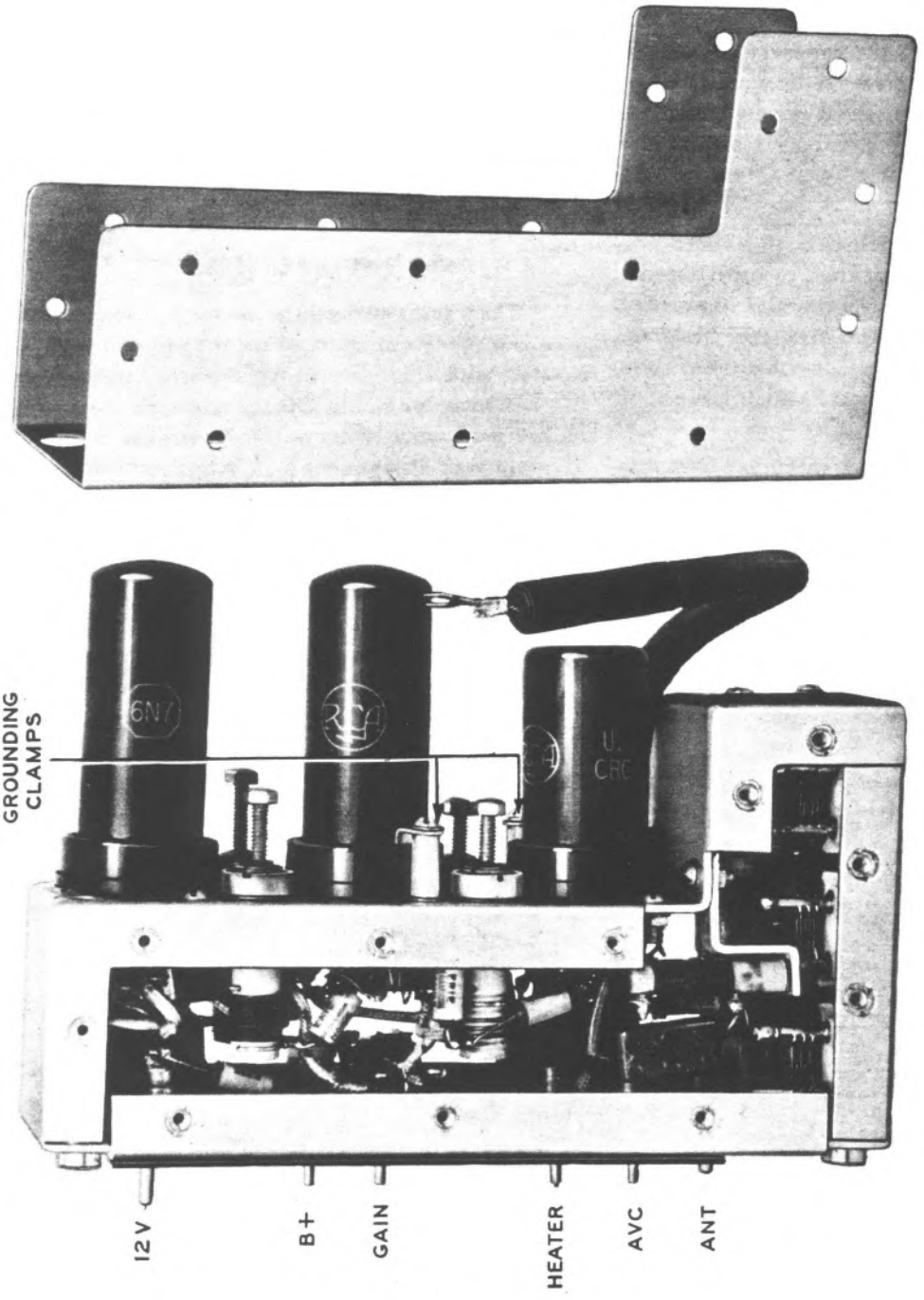


Figure 7—Receiver Plane-to-Plane Unit: Internal View

(1) Place the meter switch in the RF AMP IG OR P TO P H-G IG position.

(2) Place the plug end of a test meter lead in the pin jack marked P TO P H-G IG TEST. Hold the test prod end of the test meter lead on the recessed test terminal "X" (designated OSC IG) on top of the plane-to-plane chassis. Adjust the control designated P-P CH OSC TUNING for maximum meter reading, and then adjust it for 0.8 of the maximum value on the inductive or high-frequency side of resonance by turning the control clockwise (Equipment Serial Nos. 101 to 400) or counterclockwise (Equipment Serial Nos. above 400). See the note in Par. 15 below.

(3) Shift the test prod to the recessed test terminal "4" (designated 2ND H-G IG). Adjust the control designated P-P CH 1ST H-G TUNING for maximum meter reading.

(4) Shift the test prod to test terminal "8" (designated 3RD H-G IG). Adjust the control designated P-P CH 2ND H-G TUNING for maximum meter reading.

(5) Operate the P-P BOTH P-G switch to P-P. Before the input filter circuits are aligned, the harmonic generator control designated P-P CH 3RD H-G TUNING should be turned in a counterclockwise direction until the slug is at the bottom of the coil form. Then introduce a strong modulated carrier (30 per cent modulation) from the signal generator, adjusted to the frequency associated with position 1 on the channel selection switch. Adjust the Input Filter Tuning Controls designated ANT, INT COUP, and GRID, for maximum audio output. Keep the audio output level at a value less than 50 milliwatts as the tuning progresses, by reducing the input signal level. After the input filter is aligned, turn the harmonic generator control designated P-P CH 3RD H-G TUNING in a clockwise direction, until the 400-cycle tone heard in the headphone is at maximum level. Check the adjustment of the grid filter control for maximum audio output on the output meter, after returning the signal generator.

15. PLANE-TO-GROUND UNIT TUNING.

The tuning procedure for the plane-to-ground unit is as follows:

(1) Operate the P-G BOTH P-P switch to P-G. Operate the 4-position CHANNEL SELECTION switch to the channel position of the highest frequency, normally position 4. Place the ON-OFF switches in the ON position. Operate the test meter switch to the OSC IG position. Adjust the control designated on Fig. 15 as P-G CH OSC TUNING for maximum deflection on the test meter. Note this value and then readjust by turning the control clockwise (Serial Nos. 101 to 400) or counterclockwise (Serial Nos. above 400), until a meter reading of 0.8 of the maximum value is obtained. Operate the 4-position CHANNEL SELECTION switch to the other three positions, noting that the test meter readings are slightly less than that obtained at the highest frequency. This checks for the proper operation of the crystal on each channel.

NOTE

In the original manufactured lot, Serial Numbers 101 to 400, a copper tuning core was used and must be rotated clockwise in tuning, in order to approach resonant frequency of the coil. At the completion of this first lot, a modification in design of the receiver oscillator and harmonic generator coils was made; and in Serial Numbers above 400, smaller coil forms are used and tuned with iron dust cores, which must be rotated counterclockwise to approach resonant frequency. This information also applies to step (1) of "Plane-to-Plane Unit Tuning" and to the notes of steps (1) and (8) of "Supplementary Receiver Unit Tuning Instructions" on Fig. 14.

(2) Operate the 4-position CHANNEL SELECTION switch to the mid-band P-G frequency, normally position 3. Operate the test meter switch to the 2ND H-G IG position. Adjust the control designated P-G CH 1ST H-G TUNING for maximum test meter deflection. This reading should be approximately 0.1 milliampere.

(3) Operate the test meter switch to the 3RD H-G IG position. Adjust the control designated P-G CH 2ND H-G TUNING for maximum meter deflection. This reading should be approximately 0.08 milliampere.

(4) Before the input filter circuits are aligned, the harmonic generator control designated P-G CH 3RD H-G TUNING should be turned in a counterclockwise direction until the slug is at the bottom of the coil form. Then introduce a strong modulated carrier (30 per cent modulation) from the signal generator adjusted to the frequency associated with position 3 of the channel selection switch. Adjust the Input Filter Tuning Controls designated ANT, INT COUP, and GRID for maximum audio output. Keep reducing the input signal level as the tuning progresses, so that the audio output level is less than fifty milliwatts. After the input filter is aligned, turn the harmonic generator control designated P-G CH 3RD H-G TUNING in a clockwise direction, until the 400-cycle tone heard in the headphones is a maximum. Now adjust the potentiometer

P1C, so that a five-microvolt input produces 100 milliwatts of audio. Lock the potentiometer in this position.

(5) Operate the CHANNEL SELECTION switch to position 4, readjusting the frequency of the signal generator and noting the input required for 100 milliwatts output without changing any of the tuning adjustments. The input required for 100 milliwatts output should not exceed 10 microvolts.

(6) Operate the CHANNEL SELECTION switch to position 2, readjusting the frequency of the signal generator and noting the input required for 100 milliwatts output. The input required for 100 milliwatts output should not exceed 10 microvolts. Some difficulty might be experienced in getting the sensitivity of channel 2 within the limit of 10 microvolts. This is due to the coupling between the plane-to-ground antenna circuit and the plane-to-plane antenna circuit. This coupling can be reduced by detuning the plane-to-plane ANT tuning slightly. Just a slight turn of the capacitor is required. Next operate the channel selector switch to position 3 and retune the plane-to-ground ANT tuning. Operate the channel selector switch to channel 2, and measure the signal input required for 100 milliwatts output. Operate the P-G BOTH P-P switch to P-P. Measure the signal input required for 100 milliwatts output. If the sensitivity has been reduced to a value less than 10 microvolts, retune the plane-to-plane ANT tuning, bringing the sensitivity within the 10-microvolt requirement. Recheck plane-to-ground channel 2 sensitivity if the plane-to-plane ANT circuit had to be retuned.

16. STAGE-BY-STAGE I-F GAIN MEASUREMENTS.

Stage-by-stage gain measurements are helpful in isolating and locating trouble. The values given below are the average on several equipments, taken with a Ferris 16C Signal Generator modulated 30 per cent at a frequency of 400 cycles per second. A similar set of readings should be taken with the signal generator used for maintenance work to allow for differences in per cent modulation and in attenuators. The gain potentiometer P1R is set at maximum gain position for these values.

Input through 0.006 mf capacitor applied at junction of	*Microvolts for 50 Milliwatts 30 per cent modulation with 400 cps*	
	Ferris 16C	*Other Sig. Gen.*
C16R and L9.3R	125	
V4R Grid	200	
V5R Grid	2,600	
V6R Grid	76,000	

17. PLANE-TO-PLANE UNIT TESTING.

Simultaneous operation of two crystals in a confined space dictated that the plane-to-plane unit should be shielded completely from the rest of the equipment to prevent undesired beats between crystal harmonics. This arrangement makes servicing of this unit inconvenient, since the components cannot be inspected without removing the unit from the equipment. For this reason the unit is a plug-in type which may be quickly removed by loosening the four mounting screws on the bottom of the chassis and by disconnecting the shielded lead to FL1R by loosening the screw terminal through the hole on top of FL1R.

The voltages listed in the tabulated data for the tubes associated with this unit can be measured by partially removing the tubes from their sockets. The voltage measurements, the oscillator and harmonic generator grid current measurements mentioned under Receiving Tuning Instructions, Par. 15, and the following plug-in jack terminal measurements provide sufficient information to analyze any trouble that might develop. The unit then can be removed and the trouble rectified. The wiring diagram for this unit is shown on Fig. 12.

JACK TERMINAL VOLTAGE MEASUREMENTS

Plane-to-Plane Unit Jack Terminal (Numbers start at front end of equipment)	*DC Volts (1000 ohms per volt)*	*Connection (see Fig. 10)*
1	0	ANT
2	−2.8*	AVC
3	6.5	L13R (Heater)
4	100	R62R (Screen)
5	265	R61R (Plate)
6	13	L12R (Heater)

*This voltage is measured with an RCA Volt Ohmyst Junior (Navy Type 60044) because of the high impedance of the circuit.

18. SQUELCH OPERATION CHECK.

Introduce a 30 per cent modulated 10,000 ± 5 kc signal by connecting the signal generator to the grid of tube V4R. Remove any squelch-disabling jumper. Starting with a signal output of 100 microvolts, increase the output of the signal generator until the squelch circuit operates. This is the point at which a ten-microvolt change in signal increases the audio output at least six times. The signal input level at the squelch operating point should be approximately 80 per cent of the signal required to produce 50 milliwatts of audio with the squelch disabled.

19. INSTALLATION OF NEW TUBES.

If it becomes necessary to replace any tube in the transmitter or receiver, it is desirable to replace it with one of the same type as the defective tube. However, in some tube positions, glass replacements are permissible and this information will be found in the Table of Replaceable Parts, Section VII.

NOTE—TYPE 1614 IS A 6L6 TUBE WHICH HAS PASSED AN R-F TEST. NOT ALL 6L6 TUBES ARE TESTED FOR THIS CHARACTERISTIC, BUT ABOUT 95% OF THEM WILL PASS THE TEST. IN THE EVENT A 1614 TUBE IS NOT AVAILABLE, A 6L6 SHOULD BE TRIED IN THE SOCKET. IF IT OPERATES SATISFACTORILY, IT CAN BE CONSIDERED TO BE A 1614, SINCE IT HAS PASSED AN EQUIVALENT R-F TEST.

SECTION VI
SUPPLEMENTARY DATA

1. TRANSMITTER PERFORMANCE.

a. CARRIER FREQUENCY RANGE. — Four crystal-controlled frequencies are provided. The three plane-to-ground channels may be set up to operate anywhere in the 140- to 144-mc band. The fourth or plane-to-plane channel is 140.580 mc.

b. CARRIER POWER.—Five to ten watts for any three frequency assignments in a band 1-mc wide. If three assignments are at the high end of the 140- to 144-mc band, the power output at 140.580 mc will be one watt or more.

c. FREQUENCY STABILITY.—Carrier frequency is maintained to within +0.012 per cent and —0.017 per cent between ambient temperatures of —31 degrees Fahrenheit (—35 degrees centigrade) and +140 degrees Fahrenheit (+60 degrees centigrade) by Western Electric 703A Crystal Units.

d. CRYSTAL FREQUENCY RANGE.—5.83 to 6.0 mc.

e. MODULATION SYSTEM.—High level amplitude modulation.

f. MODULATION CAPABILITY.—100 per cent.

g. AUDIO FIDELITY.—Less than 2 db variation from the 1000-cycle level through the range of 400 to 3000 cycles.

h. AUDIO DISTORTION (1000 CYCLES).—Less than 15 per cent distortion at 95 per cent modulation.

i. AUDIO SENSITIVITY.—Audio input level of 0.006 watt sufficient for complete modulation. (DC provided for carbon microphone).

j. AUDIO INPUT IMPEDANCE.—100 ohms.

k. CARRIER NOISE LEVEL (UNWEIGHTED). —55 db below signal for complete modulation.

2. RECEIVER PERFORMANCE.

a. TYPE OF RECEIVER.—Crystal-controlled superheterodyne receiver. The frequency stability is the same as for the transmitter.

b. FREQUENCY RANGE.—140- to 144-mc.

c. INPUT IMPEDANCE.—Matches 50- to 70-ohm concentric transmission line.

d. R-F INPUT.—Two complete r-f channels are provided. The plane-to-plane channel operates on a fixed crystal-controlled frequency. The three plane-to-ground channels operate on any one of three crystal-controlled frequencies selected by remote electrical control.

e. INTERMEDIATE FREQUENCY.—10 mc.

f. BANDWIDTH.—80 kc at —6 db. 300 kc at —60 db.

g. AUDIO OUTPUT.—Two channels each supplying 300 milliwatts to 500-ohm resistive load.

h. SENSITIVITY.— Plane-to-Plane Channel: 10 microvolts for 50 milliwatts. Plane-to-Ground Channels: 10 microvolts for 50 milliwatts at each frequency if the three frequencies are within a 1-mc band.

i. SIGNAL-TO-NOISE RATIO.— Plane-to-Plane Channel: 10 db at 10 microvolts (30 per cent modulation). Plane-to-Ground Channels: 10 db at 10 microvolts (30 per cent modulation).

j. AUTOMATIC VOLUME CONTROL.—Within 6 db from 10 to 100,000 microvolts input.

k. IMAGE AND UNDESIRED RESPONSES.—Attenuation —50 db.

l. FIDELITY.—Within 6 db from 250 to 2500 cycles.

m. DISTORTION.—Less than 15 per cent at 1000 cycles for 30 per cent modulated signals up to 1 volt.

n. RECEIVER CRYSTAL FREQUENCY RANGE.—8.125 to 8.375 mc.

3. RECEIVER MODIFICATIONS MADE DURING MANUFACTURE.

During manufacture of the 233A Airborne Radio Equipment, some modifications were made, which resulted in differences in various lots of equipments. A listing of these modifications follows:

a. SERIAL NUMBERS 101 TO 400.

The following changes were made during manufacture of equipments in this lot:

Heater by-pass C33R removed from V5R.

Coupling capacitor C76R removed from between L10.1R and L10.2R.

C108R in FL4R changed from 25 mmf to 50 mmf.

C28R changed from 50 mmf to 25 mmf.

The four changes listed above have little effect on performance and they need not be made in the field.

The five modifications given below have been incorporated in the majority of equipments during manufacture. However, some sets may be in the field without these modifications, and improved performance will result if the following changes are made:

(1) Remove the RD-BL-C cable lead which connects to R35R and connect it to the adjacent terminal of R36R.

(2) Remove the shunt screen resistors R65R and R66R which are connected from screen to ground on socket VS5R and socket VS6R, respectively.

(3) Replace resistors R25R and R26R with 150,000-ohm ± 10% ½-watt resistors. These resistors are associated with socket VS5R and socket VS6R.

(4) Remove resistor R79R, which is connected between the AVC terminal of the plane-to-plane unit and ground; and remove resistor R80R, which is connected between resistor R18R and a ground lug on socket VS3R.

(5) Connect a one-megohm ± 10% ½-watt resistor from the screen of tube V3R to ground. Resistor R80R of step (4) can be used for this purpose, by disconnecting it at resistor R18R and connecting it to the bottom terminal of resistor R22R. Connect a one-megohm ± 10% ½-watt resistor from the gain terminal of the plane-to-plane unit jack strip to ground. The resistor R79R of step (4) can be used for this.

b. SERIAL NUMBERS ABOVE 400.

In most equipments with serial numbers above 400, a potentiometer is provided for fixed gain adjustments, and further filtering has been provided in the dynamotor and the AVC circuit. Some of this lot of equipments were not provided with this modification and should be modified in the field. See Fig. 8 and the instructions below.

(1) GAIN ADJUSTMENT POTENTIOMETER P1R.

Assemble one Allen Bradley or equivalent Type J 100,000-ohm screwdriver-adjusted locking-type linear-taper potentiometer to a bracket as shown on Fig. 8.

Mount the bracket with its feet extending toward the side of the chassis, to the two studs of the 725-C filter FL2R with two No. 6-32 x 5/16 hexagonal brass nuts. Assemble the bracket on top of the two nuts fastening the filter to the chassis, with the terminals of the potentiometer projecting toward the side of the chassis.

Remove resistor R64R (100,000 ohms) and resistor R24R (50,000 ohms).

Connect resistor R24R (50,000 ohms) between the ground terminal adjacent to terminal 8 of socket VS4R and the top terminal of potentiometer P1R. Connect a white-black "E" wire No. 20 B&S gauge (KS-8640 Wire) between terminal 6 of socket VS4R and the center terminal of P1R.

Connect resistor R64R (100,000 ohms) between terminal 7 of filter FL2R and the bottom terminal of the potentiometer P1R.

(2) PLANE-TO-PLANE AVC VOLTAGE BY-PASS.

Connect a 0.003 mf mica Cornell-Dubilier Type 1W, a Type CM30A302M or a 0.006 mf Western Electric Type 404-A paper capacitor from pin No. 2 (AVC terminal) of the plane-to-plane unit, to a grounding lug on the chassis at the point where capacitor C39R connects to ground.

(3) DYNAMOTOR NOISE REDUCTION BY-PASS.

Connect a 240-mmf capacitor between pin No. 7 of dynamotor plug and a grounding lug placed under the plug mounting screw. Similarly connect another 240-mmf capacitor between pin No. 8 of dynamotor plug and a grounding lug placed under the plug mounting screw.

(4) TUBE SHIELDS E1R AND E2R.

Tube shields have been placed on tubes V2R, V3R, V12R and V13R. When tube shields are placed on these tubes, the tube grounding clamp is removed and the flexible connection from the tube shield is fastened under the grounding stud next to the tube.

INSTRUCTIONS FOR INSTALLATION OF P1R

1. Remove R64R (100,000 ohms) located between terminals 3 and 6 on VS4R.

2. Remove R24R (47,000 ohms or 50,000 ohms) located between terminals 6 on VS4R and 7 on FL2R.

3. Mount the potentiometer and bracket on the studs of FL2R as shown in Fig. 8.

4. Connect R64R between the top terminal on P1R and terminal 7 on FL2R. (See the wiring diagram.)

5. Connect R24R between the bottom terminal of P1R and the ground lug on VS4R. (See the wiring diagram.)

6. Connect the black wire (in the set) between the center terminal of Potentiometer P1R and terminal 6 on VS4R. (See the wiring diagram.)

7. Loosen the locking nut of the potentiometer shaft and turn the shaft clockwise to the stop position.

8. Turn the equipment "ON" and adjust the supply voltage to 13.5 volts.

9. Place the CHANNEL SELECTION switch on Position 3, and place the P-P BOTH P-G switch on BOTH.

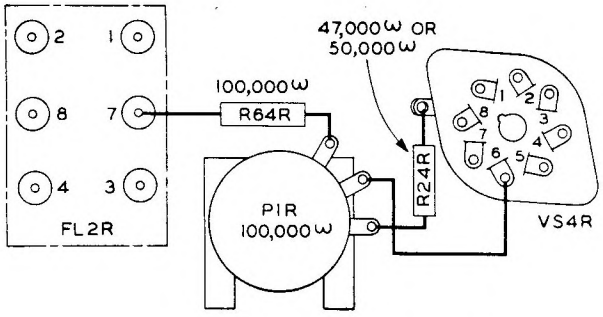
10. Plug the power output indicator (G.R.583A P.L.I. or equivalent set for 500 ohms) into the headset jack on the front panel. Either a vacuum tube voltmeter or an audiofrequency voltmeter can be used as a power output indicator. If such a voltmeter is used it should have a full scale range of from 10 to 15 volts and should be shunted by a resistor (at least ½ watt) of such a value that the parallel combination results in a terminating impedance of 500 ohms.

11. Introduce a 5-microvolt signal, modulated 30% with either 400 or 1,000 cycles per second, from a Ferris 18C Signal Generator into the ANT plug, using the receiver dummy antenna specified for the equipment.

12. Tune the signal generator for maximum audio output.

13. Using a pair of longnose pliers or a screwdriver, being careful to avoid contact with any high voltage, adjust the gain control until the audio output for 5 microvolts input is 100 milliwatts. If a voltmeter terminated to have a 500-ohm impedance is used to indicate audio output power, adjust the gain control to obtain an output reading of 7 volts (approximately 100 milliwatts).

14. Check the input required on each of the other channels to give 100 milliwatts output (7 volts across 500 ohms). The input should be less than 10 microvolts in each case.



Wiring Diagram for Installing P1R

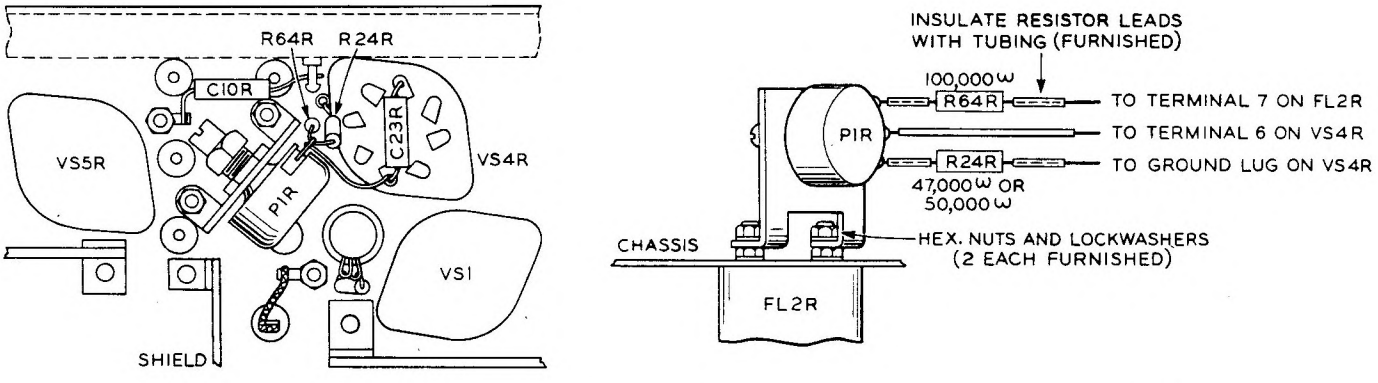


Figure 8—RT-19/ARC-4 Radio Transmitter-Receiver: Modification for Sensitivity Control

SECTION VII

TABLE OF REPLACEABLE PARTS

1. RMA COLOR CODE FOR RESISTORS.

Small composition resistors are color-coded by one of two methods to represent the resistance in ohms.

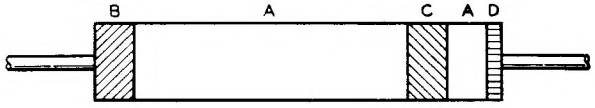


Figure 9A—Resistor Color Code, First Method

The first method is as follows: the first digit of the value of resistance is indicated by the body color (A), the second digit by the tip color (B), and the number of zeros after the second digit by a band or dot painted on the body (C). A narrow end ring (D), represents the tolerance.

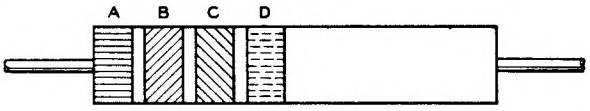


Figure 9B—Resistor Color Code, Second Method

The second method is as follows: three narrow rings are painted around the body starting at one end. The color of the end ring (A), represents the first digit; the second ring (B), the second digit; and the third ring (C), the number of zeros after the second digit. A fourth ring (D), represents the tolerance.

RESISTANCE VALUES		TOLERANCE	
Black . . . 0	Green . . . 5	Gold	± 5
Brown . . . 1	Blue 6	Silver	± 10%
Red 2	Violet . . . 7	No Ring . . .	± 20%
Orange . . 3	Gray . . . 8		
Yellow . . 4	White . . . 9		

Example: 350,000 ohms. First method: body orange, tip green, dot yellow. Second method: orange, green and yellow rings starting at one end.

If the second method were used and the fourth ring were silver, it would denote a tolerance of ± 10 per cent from nominal.

2. RMA COLOR CODE FOR CAPACITORS.

Fixed capacity molded-mica capacitors which are too small to be conveniently marked with capacitance values are color-coded as follows: The colored dots represent the same numbers as listed above for resistors and are read in the direction of the arrow.

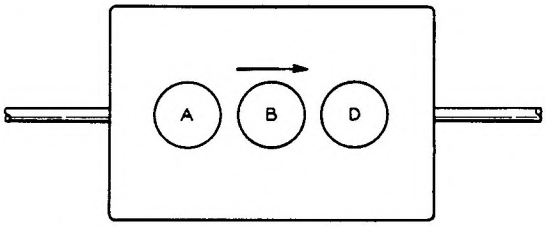


Figure 9C—Capacitor Three-Dot Color Code

a. 500-VOLT CAPACITORS.

First colored dot (A), first digit; second colored dot (B), second digit; third colored dot (C), the number of zeros after the second digit.

Example: 150 micromicrofarads (0.00015 mf) would have a reading from left to right of brown, green, and brown dots; brown standing for one, green for five and brown for one zero, and all three adding up to 150 mmf or 0.00015 mf.

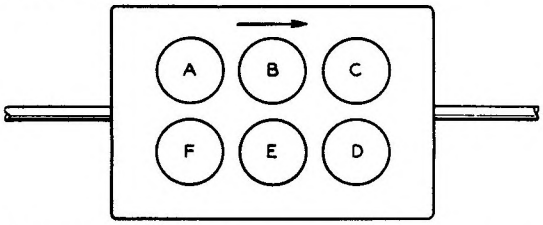


Figure 9D—Capacitor Six-Dot Color Code

b. ALL OTHER VOLTAGE CAPACITORS.

Six markings arranged in two horizontal rows of three each are used. The colors of the dots in the top row, (A, B and C), indicate the capacitance; the right-hand lower marking (D), is colored to indicate the decimal multiplier; the intermediate lower marking (E), is colored to indicate the tolerance; and the left-hand lower marking (F), is colored to indicate the voltage rating of the capacitor.

VALUES FOR SIX-DOT MARKINGS

Color of Dot	*Significant Figure*	*Decimal Multiplier*	*Tolerance*	*Voltage Rating*
Black	0	1	1	
Brown	1	10	1	100 volts
Red	2	100	2	200 volts
Orange	3	1,000	3	300 volts
Yellow	4	10,000	4	400 volts
Green	5	100,000	5	500 volts
Blue	6	1,000,000	6	600 volts
Violet	7	10,000,000	7	700 volts
Gray	8	100,000,000	8	800 volts
White	9	1,000,000,000	9	900 volts
Gold	—	0.1	5	1000 volts
Silver	—	0.01	10	2000 volts
No color	—	—	20	500 volts

Example: 6,000 micromicrofarads (0.006 mf) would have on the top row reading from left to right, blue,

black and black dots, and on the bottom row reading from right to left, brown (for 10 multiplier), silver (for 10 per cent tolerance) and orange to indicate that it is 300 volts. When translated, the top row gives 6+0+0 = 600, which multiplied by 10 gives 6,000 mmf or 0.006 mf.

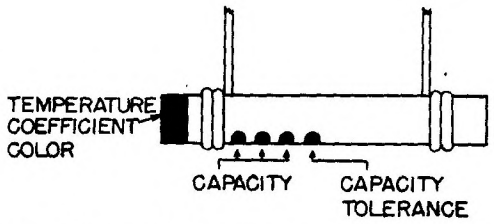


Figure 9E—Color Code for Tubular Ceramic Capacitors

3. TUBULAR CERAMIC CAPACITORS.

The capacity tolerance and temperature coefficient of those fixed ceramic capacitors that do not carry Navy type numbers can be determined from the bands or dots of color on each unit. The table at the foot of this page gives a list of the colors and their meanings.

Temperature coefficient is expressed in mmf per mmf per degree centigrade. The standard tolerance of the coefficient is ± 15 per cent or ± 0.00003 mmf/mmf/C°, whichever is the larger.

The temperature coefficient of capacitance is indicated by the color appearing on that end of the capacitor which provides termination for the inside plate or electrode. This color covers the entire end. (See Fig. 9E.)

The next three dots or bands of color indicate the capacity in micromicrofarads (mmf). The first colored dot or band immediately adjacent to the end color indicates the first significant figure of the capacity in mmf. The second and next adjacent colored dot or band indicates the second significant figure of the capacity in mmf. The third and next adjacent dot or band indicates the multiplier appropriate to the capacity in mmf. The fourth and next adjacent colored dot or band indicates the capacitance tolerance either: in per cent in the case of capacitors of nominal capacitance in excess of 10 mmf., or in mmf. in the case of capacitors of nominal capacitance of 10 mmf. or less.

Example:

End—Black = 0	Temperature Coefficient: Zero	
1st Dot—Black = 0	1st Significant Figure	= 5 mmf
2nd Dot—Green = 5	2nd Significant Figure	
3rd Dot—Black = 0	Multiplier	
4th Dot—Gray = ± 0.25 mmf	Capacity Tolerance	

4. TABLE OF REPLACEABLE PARTS

The Table of Replaceable Parts is given on page 37 to 72 inclusive.

It will be noted that in a number of cases several values are listed for a single component. These different values for a specific component are interchangeable in all equipments, and may be used to replace the original part if listed as an alternative.

On page 73 is given a list of manufacturers, with their addresses and the symbols used in the Table of Replaceable Parts.

TOLERANCE VALUES FOR TUBULAR CERAMIC CAPACITORS

Color	*Significant Figure*	*Multiplier*	*Capacitance more than 10 mmf*	*Capacitance 10 mmf or less*	*Temperature Coefficient in mmf/mmf/C°*
Black	0	1	±20%	±2.0 mmf	Zero
Brown	1	10	± 1%	±0.1 mmf	−.00003 or −30 x 10⁻⁶
Red	2	100	± 2%	±0.2 mmf	−.00008 or −80 x 10⁻⁶
Orange	3	1,000	± 3%	±0.3 mmf	−.00015 or −150 x 10⁻⁶
Yellow	4	10,000	± 4%	±0.4 mmf	−.00022 or −220 x 10⁻⁶
Green	5	.....	± 5%	±0.5 mmf	−.00033 or −330 x 10⁻⁶
Blue	6	.....	± 6%	±0.6 mmf	−.00047 or −470 x 10⁻⁶
Violet	7	0.001	± 7%	±0.7 mmf	−.00075 or −750 x 10⁻⁶
Gray	8	0.01	± 2.5%	±0.25 mmf	.....
White	9	0.1	±10%	±1.0 mmf	.....

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A **MAJOR UNIT** RADIO TRANSMITTER-RECEIVER RT-19/ARC-4

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
C1C		CAPACITOR, fixed, ceramic, 10 mmf ± 1 mmf	Antenna tuning capacitor	CER, N080K or N100K	
C2C		CAPACITOR, fixed, mica, 0.006 mf, 600 V, d-c test or CAPACITOR, fixed, mica, 0.0062 mf, 600 V, d-c test or CAPACITOR, fixed, mica, 0.003 mf, 600 V, d-c test or CAPACITOR, fixed, oil paper, 0.006 mf, 600 V working	Dynamotor r-f by-pass	CD, 1W AWS, CM35A622M AWS, CM30A302M AWS, CN35A602	
C3C		Same as C2C	Dynamotor r-f by-pass		
C4C		CAPACITOR, fixed, paper, 1 mf, 600 V d-c working	Battery by-pass	CD, DYR-6100	
C5.1C		CAPACITOR, electrolytic, part of 3-section, 20 mf, 450 V d-c working	Audio plate by-pass	CMA, FP (1" x 3") or CSF, EL (1" x 3")	
C5.2C		CAPACITOR, electrolytic, part of 3-section, 20 mf, 450 V d-c working	Audio plate by-pass		
C5.3C		CAPACITOR, electrolytic, part of 3-section, 20 mf, 25 V d-c working	R-f amp. cathode by-pass		
C6C		Same as C2C	Noise filter		
C7C		CAPACITOR, fixed, mica, 0.0005 mf, 1000 V d-c test or CAPACITOR, fixed, mica, 0.0005 mf	Noise filter	CD, 5W AWS, CM20A511M	
C8C		Same as C7C	Noise filter		
D1C		SWITCH, power, toggle SPST 3 amp., 250 V; 6 amp., 125 V	ON-OFF switch	CHH	ES-675814-3

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
D2.1C		SWITCH, meter, rotary-non-shorting, 2 circuits, 9 contacts per circuit	Meter circuit switch	CMA	ES-677499-2
D2.2C		Same as D2.1C	Section of D2.1C		
J1C		JACK, antenna, coaxial type	Coaxial antenna jack	CW	D-162865
J2C		JACK, test meter, open circuit, 2 contact insulated	Test meter jack	U, TC-60	
L1C		COIL, retard, iron core, inductance 1.4 henry, d-c resistance 67 ohms	High voltage filter choke	CW	D-159752
L2C		COIL, r-f, choke, 18 turns No. 12 AWG DCC solid copper wire—form 7/16" diameter 1/2" long	Low voltage r-f choke	CW	ES-696065-4
L3C		Same as L2C	Low voltage r-f choke		
L4C		CHOKE, 1000 ma plate air coil—10 microhenries	High voltage r-f choke	COM, Z-1	
M1C		MILLIAMMETER, 0-1 d-c resistance 125 ohms	Test meter	CV, 506	KS-8538
PG1C		PLUG, male, 32-contact plug; 4 contacts with 40 amp. rating; 28 contacts with 10 amp. rating	Chassis plug for rack connection	CED, DP-D32-34	ES-677409-15
PG2C		PLUG, female, 8-contact	Chassis plug for dynamotor	CJC, P-8IAB	
R1C		RESISTOR, fixed, 500,000 ohms ± 2%, 1 watt	Metering resistor	CER, 518	
R2C		RESISTOR, fixed, 20,000 ohms ± 2%, 1/2 watt	Metering resistor	CER, 504	
R3C		RESISTOR, fixed, 30 ohms ± 5%, wire wound	Antenna relay voltage-dropping resistor	CAO, 1-3/4" Z with 206 term. or CWC, 1-3/4" x 3/8" vitreous enamel	

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
R4C		RESISTOR, fixed, 70 ohms ± 5%, wire wound, 10 watt	Power relay voltage-dropping resistor	CAO, 1-3/4" Z with 206 term. or CWC, 1-3/4" x 3/8" vitreous enamel	
R5.1C		RESISTOR, fixed, 1000 ohms ± 10%, 1/2 watt, composition, pigtail, insulated	Relay click filter resistor	CIR, BT-1/2 or CBZ, EB	
R5.2C		Same as R5.1C	Relay click filter resistor		
R6.1C		Same as R5.1C	Relay click filter resistor		
R6.2C		Same as R5.1C	Relay click filter resistor		
R7.1C		Same as R5.1C	Relay click filter resistor		
R7.2C		Same as R5.1C	Relay click filter resistor		
R8.1C		Same as R5.1C	Relay click filter resistor		
R8.2C		Same as R5.1C	Relay click filter resistor		
R9C		RESISTOR, fixed, 23 ohms ± 5%, wire wound, 10 watt	Bias resistor	CAO, 1-3/4" Z with 206 term. or CWC, 1-3/4" x 3/8" vitreous enamel	
S1C		RELAY, crystal switching, DPST, 9 to 16.2 V d-c; coil resistance 90 ohms ± 5%	Crystal switch relay	CW, BJ-34	ES-677080-2
S2C		Same as S1C	Crystal switch relay		
S3C		Same as S1C	Crystal switch relay		
S4C		Same as S1C	Crystal switch relay		
S5C		RELAY, antenna change-over DPDT, coil 30 ohms ± 5%; operating voltage 9.0 V d-c min., 16.2 V d-c max.	Antenna change-over relay	CW	ES-677081-2

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
S6C		RELAY, starting voltage min. 6.5 V d-c, max. 16.2 V d-c DPST, 18 amp. continuous, 100 amp. instantaneous on contacts	Starting relay	CW, B0Y3	ES-677904-1
Y1C		CRYSTAL UNIT—(Channel 1) Composed of 2 crystals—one for transmitter and one for receiver	Frequency control	CW, 703A	
Y2C		CRYSTAL UNIT—(Channel 2) Composed of 2 crystals, one for transmitter and one for receiver	Frequency control	CW, 703A	
Y3C		CRYSTAL UNIT—(Channel 3) Composed of 2 crystals, one for transmitter and one for receiver	Frequency control	CW, 703A	
Y4C		CRYSTAL UNIT—(Channel 4) Composed of 2 crystals—one for transmitter and one for receiver	Frequency control	CW, 703A	
YS1C		SOCKET, crystal unit, 3 contact each—part of 4-unit holder, special	Crystal unit holders	CW	ES-676985-1
YS2C		Same as YS1C, part of 4-unit holder	Crystal unit holders		
YS3C		Same as YS1C, part of 4-unit holder	Crystal unit holders		
YS4C		Same as YS1C, part of 4-unit holder	Crystal unit holders		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

RADIO TRANSMITTER-RECEIVER
MAJOR UNIT RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
C1R		CAPACITOR, fixed, ceramic, 15 mmf ± 0.5 mmf	Osc. tuning capacitor	CER, N080K or N100K	
C2R		CAPACITOR, fixed, ceramic, 25 mmf ± 1 mmf	H.G. tuning capacitor	CER, N80L or N100L	
C3R		Same as C1R	Coupling capacitor		
C4R		CAPACITOR, fixed, mica, 500 mmf, 1000 V d-c test or CAPACITOR, fixed, mica, 510 mmf, 500 V d-c working	Plate by-pass	CD, 5W AWS, CM20A511M	
C5R		Same as C4R	Plate by-pass		
C6R		Same as C4R	Plate by-pass		
C7R		CAPACITOR, fixed, ceramic, 50 mmf ± 2.5 mmf	Coupling capacitor	CER, N680K or N750K	
C8R		Same as C7R	Coupling capacitor		
C9R		Same as C4R	Plate by-pass		
C10R		CAPACITOR, fixed, mica, 0.005 mf ± 10%, 1000 V d-c test or CAPACITOR, fixed, mica, 0.0051 mf, 1000 V d-c test or CAPACITOR, fixed, mica, 0.003 or CAPACITOR, fixed, oil paper, 0.006 mf, 600 V d-c working	Plate filter, by-pass	CD, 1-WP AWS, CM30A512M AWS, CM30A302M AWS, CN35A602	
C11R		CAPACITOR, fixed, ceramic, 10 mmf ± 1 mmf	Antenna coupling capacitor	J, N080K or N100K	
C12R		CAPACITOR, fixed, ceramic, 2 mmf ± 0.25 mmf	Antenna coupling capacitor	J, N080K or N100K	

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
C13R		CAPACITOR, variable air, max. capacity 15 mmf, min. capacity 3 mmf	P.G. ant. tuning capacitor	CHC, APC	ES-614138-23
C14R		Same as C13R	P.G. ant. tuning capacitor		
C15R		Same as C13R	P.G. grid tuning capacitor		
C16R		CAPACITOR, fixed, ceramic, 5 mmf ± 0.5 mmf	Coupling capacitor	CER, N080K or N100K	
C17R		CAPACITOR, fixed, mica, 0.006 mf, 600 V d-c test	AVC by-pass	CD, 1W	
		or			
		CAPACITOR, fixed, mica, 0.0062 mf		AWS, CM35A622M	
		or			
		CAPACITOR, fixed, mica, 0.003 mf		AWS, CM30A302M	
C19R		Same as C16R	Coupling capacitor		
C21R		CAPACITOR, fixed, mica, 0.005 mf ± 10%, 1000 V d-c test	Mod. screen grid by-pass	CD, 1WP	
		or			
		CAPACITOR, fixed, mica, 0.0051 mf, 1000 V, d-c test		AWS, CM30A512M	
		or			
		CAPACITOR, fixed, mica, 0.003 mf		AWS, CM30A302M	
C22R		Same as C10R	Mod. plate by-pass		
C23R		Same as C10R	1st i-f screen grid by-pass		
C24R		Same as C10R	2nd i-f screen grid by-pass		
C25R		Same as C10R	3rd i-f screen grid by-pass		
C26R		Same as C17R	Neg. voltage r-f by-pass	-	
C27R		Same as C10R	3rd i-f plate by-pass		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

RADIO TRANSMITTER-RECEIVER
MAJOR UNIT RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
C28R		CAPACITOR, fixed, mica, 25 mmf, 1000 V d-c test or CAPACITOR, fixed, mica, 24 mmf, 500 V d-c working	Det. diode filter	CD, 5W AWS, CM20A240M	
C29R		CAPACITOR, fixed, mica, 0.006 mf, 600 V d-c test or CAPACITOR, fixed, mica, 0.0062 mf or CAPACITOR, fixed, oil paper, 0.006 mf, 600 V d-c working	AVC by-pass	CD, 1W AWS, CM35A622M AWS, CN35A602	
C30R		Same as C29R	Squelch coupling capacitor		
C31R		Same as C29R	1st audio grid coupling capacitor		
C32R		CAPACITOR, fixed, molded paper, 0.02 mf, 600 V d-c working or CAPACITOR, fixed, two 0.01 mf oil-impregnated paper, in parallel	Noise gate capacitor	P, 345-9 CW	 KS-8903
C34R		Same as C29R	AVC by-pass		
C35R		Same as C4R	2nd det. cathode by-pass		
C36R		CAPACITOR, fixed, molded paper, 0.01 mf, 600 V d-c working or CAPACITOR, fixed, oil-impregnated paper, 0.01 mf	Audio coupling capacitor	P, 342-17 CW	 KS-8903
C37.1R		CAPACITOR, electrolytic, 40 mf, 25 V d-c working, part of 4-section	Audio amp. cathode by-pass	CMA, FP (1-3/8"x2") or CMA, WP (1-3/8"x2") or CSF, EL (1-3/8"x2")	

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
C37.2R		CAPACITOR, electrolytic, 40 mf, 25 V d-c working, part of 4-section	Audio amp. cathode by-pass		
C37.3R		CAPACITOR, electrolytic, 15 mf, 400 V d-c working, part of 4-section	High voltage filter by-pass		
C37.4R		CAPACITOR, electrolytic, 15 mf, 400 V d-c working, part of 4-section	High voltage filter by-pass		
C39R		Same as C17R	P.P. det. heater by-pass		
C41R		CAPACITOR, fixed, mica, 0.006 mf, 600 V d-c test	H.G. heater by-pass	CD, 1W	
		or			
		CAPACITOR, fixed, mica, 0.0062 mf		AWS, CM35A622M	
		or			
		CAPACITOR, fixed, mica, 0.003 mf		AWS, CM30A302M	
		or			
		CAPACITOR, fixed, oil paper, 0.006 mf, 600 V d-c working		AWS, CN35A602	
C42R		Same as C41R	2nd Det. heater by-pass		
C43R		Same as C4R	2nd Det. plate by-pass		
C44R		Same as C41R	Osc. heater by-pass		
C45R		Same as C41R	Osc. heater by-pass		
C46R		CAPACITOR, fixed, ceramic, 0.3 mmf ± 0.05 mmf	Coupling capacitor	CER	ES-678763-5
C50R		Same as C7R	Osc. coupling capacitor		
C51R		Same as C1R	Osc. plate tuning capacitor		
C53R		Same as C2R	H.G. plate tuning capacitor		
C55R		Same as C4R	Osc. plate by-pass		
C56R		Same as C4R	H.G. plate by-pass		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
C57R		Same as C7R	Coupling capacitor		
C59R		Same as C4R	H.G. heater by-pass		
C60R		Same as C4R	Plate filter by-pass		
C61R		Same as C7R	Coupling capacitor		
C62R		Same as C4R	H.G. plate by-pass		
C63R		Same as C4R	H.G. plate by-pass		
C66R		Same as C10R	P.P. mod. screen by-pass		
C67R		Same as C16R	Coupling capacitor		
C69R		Same as C4R	Mod. heater by-pass		
C70R		Same as C4R	Mod. grid by-pass		
C71R		Same as C16R	Coupling capacitor		
C72R		CAPACITOR, variable air, max. capacity 15 mmf, min. capacity 3 mmf, 0.0195" air gap between plates	Ant. tuning capacitor	CW, APC	ES-614138-18
C73R		Same as C72R	Ant. tuning capacitor		
C74R		Same as C72R	Grid tuning capacitor		
C75R		Same as C12R	Antenna coupling capacitor		
C77R		CAPACITOR, fixed, ceramic, 3 mmf ± 0.25 mmf	P.G. H.G. plate tuning capacitor	CER, N080K or N100K	
C78R		Same as C77R	P.P. H.G. plate tuning capacitor		
C80R		Same as C10R	P.G. H.G. plate filter by-pass		
C81R		CAPACITOR, fixed, molded paper, 0.05 mf, 600 V d-c working	Mod. screen filter	P, 345-WW	
		or			
		CAPACITOR, fixed, two 0.01 mf oil-impregnated paper, in parallel		CW	KS-8903

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
C82R		Same as C10R	H.G. plate filter by-pass		
C83R		CAPACITOR, fixed, ceramic, 8 mmf ± 1 mmf	Osc. grid padding capacitor	CER, N080K or N100K	
C84R		Same as C17R	Osc. heater by-pass		
C85R		CAPACITOR, fixed, mica, 25 mmf ± 5% or CAPACITOR, fixed, mica, 24 mmf	Mod. plate tuning capacitor	CD, 5R AWS, CM20D240J	
C86R		CAPACITOR, fixed, ceramic, 5 mmf ± 0.5 mmf	Mod. plate tuning capacitor	CER, N680K or N750K	
C87R		Same as C10R	Mod. plate by-pass		
C88R		CAPACITOR, fixed, mica, 50 mmf ± 5% or CAPACITOR, fixed, mica, 51 mmf	1st i-f grid tuning capacitor	CD, 5R AWS, CM20D510J	
C89R		Same as C86R	1st i-f grid tuning capacitor		
C90R		Same as C41R	1st i-f grid by-pass		
C91R		CAPACITOR, fixed, mica, 49 mmf ± 5% or CAPACITOR, fixed, mica, 50 mmf ± 2%	1st i-f plate tuning capacitor	AWS, CM20D490J AWS, CM20D500G	
C92R		Same as C86R	1st i-f plate tuning capacitor		
C93R		Same as C10R	1st i-f plate by-pass		
C94R		Same as C91R	2nd i-f grid tuning capacitor		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

RADIO TRANSMITTER-RECEIVER
MAJOR UNIT RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
C95R		Same as C86R	2nd i-f grid tuning capacitor		
C96R		Same as C41R	2nd i-f grid by-pass		
C97R		Same as C91R	2nd i-f plate tuning capacitor		
C98R		Same as C86R	2nd i-f plate tuning capacitor		
C99R		Same as C10R	2nd i-f plate by-pass		
C100R		Same as C91R	3rd i-f grid tuning capacitor		
C101R		Same as C86R	3rd i-f grid tuning capacitor		
C102R		Same as C41R	3rd i-f grid by-pass		
C103R		Same as C91R	3rd i-f plate tuning capacitor		
C104R		Same as C86R	3rd i-f plate tuning capacitor		
C105R		Same as C10R	3rd i-f plate by-pass		
C106R		Same as C91R	Det. tuning capacitor		
C107R		Same as C86R	Det. tuning capacitor		
C108R		CAPACITOR, fixed, mica, 50 mmf ± 10% or CAPACITOR, fixed, mica, 51 mmf	Det. grid by-pass	CD, 5W AWS, CM20A510M	
C109R		Same as C4R	Mod. heater by-pass		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
C110R		CAPACITOR, fixed, mica, 0.003 mf	AVC by-pass	CD, 1W	
		or			
		CAPACITOR, fixed, mica, 0.003 mf		AWS, CM30A302M	
		or			
		CAPACITOR, fixed, oil paper, 0.006 mf		AWS, CN35A602	
E1R		TUBE SHIELD, with pigtail for grounding, spl.	Shields V2R and V12R	CW	B0-32662-5
E2R		TUBE SHIELD, with pigtail for grounding, spl.	Shields V3R and V13R	CW	B0-32662-1
FL1R		FILTER, composed of L15R, L16R, C85R, C86R, C88R, C89R, C87R, C90R, R71R and R72R enclosed in shield can	1st i-f filter	CW, 725L	
FL2R		FILTER, composed of L17R, L18R, C91R, C92R, C93R, C94R, C95R, C96R, R73R and R74R enclosed in shield can	2nd i-f filter	CW, 725C	
FL3R		Same as FL2R	3rd i-f filter		
FL4R		FILTER, composed of L21R, L22R, C103R, C104R, C105R, C106R, C107R, C108R, R77R and R78R enclosed in shield can	4th i-f filter	CW, 725D	
J1R		JACK, 2-contact open circuit insulated	Output phone jack	U, TC-60	
L1R		COIL, 37 turns #30 AWG D.S. copper wire	P.G. - Osc. plate tuning coil	CW	ES-696147-3
L2R		COIL, 12 turns #23 AWG B enameled copper wire	P.G. 1st H.G. plate tuning coil	CW	ES-696147-4
L3R		COIL, 5-1/4 turns #22 AWG bare tinned copper wire	P.G. 2nd H.G. plate tuning coil	CW	ES-696259-2
L4R		COIL, 2-3/4 turns # 22 AWG bare tinned copper wire	P.G. 3rd H.G. plate tuning coil	CW	ES-696259-3
L5R		Same as L1R	P-P osc. plate tuning coil		

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MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

RADIO TRANSMITTER-RECEIVER
MAJOR UNIT RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
L6R		Same as L2R	P-P 1st H.G. plate tuning coil		
L7R		Same as L3R	P-P 2nd H.G. plate tuning coil		
L8R		Same as L4R	P-P 3rd H.G. plate tuning coil		
L9.1R		COIL, 3 turns #20 AWG tinned copper wire	Ant. tuning inductor	CW	ES-696115-5
L9.2R		COIL, 3 turns #20 AWG bare tinned copper wire (on same form with L9.3R)	Inter. tuning inductor	CW	ES-696115-7
L9.3R		COIL, 2-1/2 turns #20 AWG bare tinned copper wire (on same form with L9.2R)	Grid tuning inductor	CW	ES-696115-7
L10.1R		COIL, 3 turns #20 AWG bare tinned copper wire	P-P ant. tuning inductor	CW	ES-696115-6
L10.2R		COIL, 3 turns #20 AWG bare tinned copper wire (on same form with L10.3R)	P-P int. tuning inductor	CW	ES-696115-8
L10.3R		COIL, 2-1/2 turns #20 AWG bare tinned copper wire (on same form with L10.2R)	P-P grid tuning inductor	CW	ES-696115-8
L11R		COIL, 20 turns #28 AWG D.S. wire	P-P mod. grid r-f choke coil	CW	ES-678466-2
L12R		COIL, 24 turns #26 AWG B.E.S.S. wire wound on an IRC 1 meg. BT 1/2 watt resistor	P-P H.G. heater r-f choke coil	CW	ES-680603-5
L13R		Same as L12R	P-P mod. heater r-f choke coil		
P1R		POTENTIOMETER, carbon 100,000 ohm ± 10% screwdriver adjusted, locking type, linear taper	1st i-f gain adjustment	CBZ, J	
R1R		RESISTOR, fixed, composition, pigtail, insulated, 1000 ohms ± 10%, 1/2 watt	Metering resistor	CIR, BT-1/2 or CBZ, EB	
R2R		RESISTOR, fixed, composition, pigtail, insulated 15,000 ohms ± 10%, 1/2 watt	Osc. grid resistor	CIR, BT-1/2 CBZ, EB	

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
R3R		RESISTOR, fixed, composition, pigtail, insulated 300 ohms ± 10%, 1/2 watt	Metering resistor	CIR, BW-1/2	
		or			
		RESISTOR, fixed, composition, pigtail, insulated 330 ohms ± 10%, 1/2 watt		CBZ, EB	
R4R		RESISTOR, fixed, composition, pigtail, insulated 500,000 ohm ± 10%, 1/2 watt	H.G. grid resistor	CIR, BT-1/2	
		or			
		RESISTOR, fixed, composition, pigtail, insulated 560,000 ohm ± 10%, 1/2 watt		CBZ, EB	
R7R		RESISTOR, fixed, composition, pigtail, insulated 6000 ohms ± 10%, 1 watt	Osc. plate voltage dropping resistor	CIR, BT-1	
		or			
		RESISTOR, fixed, composition, pigtail, insulated 6200 ohms ± 5%, 1 watt		CBZ, GB	
R8R		RESISTOR, fixed, composition, pigtail, insulated 100,000 ohms ± 10%, 1/2 watt	H.G. grid resistor	CIR, BT-1/2 or CBZ, EB	
R10R		Same as R1R	1st H.G. plate filter resistor		
R11R		Same as R1R	2nd H.G. plate filter resistor		
R12R		Same as R8R	2nd H.G. grid bias resistor		
R13R		Same as R1R	Metering resistor		
R14R		Same as R1R	Metering resistor		
R15R		Same as R8R	3rd H.G. grid bias resistor		
R17R		Same as R1R	3rd H.G. plate filter resistor		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

RADIO TRANSMITTER-RECEIVER
MAJOR UNIT RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
R18R		RESISTOR, fixed, composition, pigtail, insulated, 1 megohm ± 10%, 1/2 watt	P.G. mod. AVC filter resistor	CIR, BT-1/2 or CBZ, EB	
R19R		Same as R8R	P.G. mod. grid resistor		
R20R		Same as R18R	P-P mod. AVC filter resistor		
R22R		RESISTOR, fixed, composition, pigtail, insulated, 1500 ohms ± 5%, 1/2 watt	P.G. mod. screen resistor	CIR, BT-1/2 or CBZ, EB	
R23R		RESISTOR, fixed, wire wound, 14 ohms ± 10%, 10 watt	P.G. mod. heater resistor	CAO, 1-3/4" Z with 206 term. or CWC, 1-3/4" x 3/8" vitreous enamel	
R24R		RESISTOR, fixed, composition, pigtail, insulated 50,000 ohms ± 10%, 1/2 watt	1st i-f screen resistor	CIR, BT-1/2	
		or			
		RESISTOR, fixed, composition, pigtail, insulated 47,000 ohms ± 10%, 1/2 watt		CBZ, EB	
R25R		RESISTOR, fixed, composition, pigtail, insulated 150,000 ohms ± 10%, 1/2 watt	2nd i-f screen resistor	CIR, BT-1/2 or CBZ, EB	
R26R		Same as R25R	3rd i-f screen resistor		
R29R		RESISTOR, fixed, composition, pigtail, insulated 250,000 ohms ± 10%, 1/2 watt	Squelch voltage-dividing resistor	CIR, BT-1/2	
		or			
		RESISTOR, fixed, composition, pigtail, insulated 260,000 ohms ± 10%, 1/2 watt		CBZ, EB	
R30R		Same as R29R	Squelch voltage-dividing resistor		
R31R		Same as R4R	Squelch voltage-dividing resistor		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
R32R		Same as R4R	Squelch voltage-dividing resistor		
R33R		RESISTOR, fixed, composition, pigtail, insulated 10 megohms ± 10%, 1/2 watt	Squelch grid-decoupling resistor	CIR, BT-1/2 or CBZ, EB	
R34R		Same as R18R	1st audio grid resistor		
R35R		Same as R4R	AVC decoupling resistor		
R36R		Same as R4R	AVC decoupling resistor		
R37R		Same as R8R	Noise gate cathode resistor		
R38R		Same as R4R	AVC decoupling resistor		
R39R		RESISTOR, fixed, composition, pigtail, insulated, 10,000 ohms ± 10%, 1/2 watt	1st audio grid coupling resistor	CIR, BT-1/2 or CBZ, EB	
R40R		Same as R8R	Audio grid resistor		
R41.1R		RESISTOR, fixed, 1200 ohm ± 10%; one section of 2-section flat wire-wound resistor strip. 12 watt capacity	Plate voltage divider	CIR, MW5	
R41.2R		Same as R41.1R; one section of 2-section resistor strip	Plate voltage divider		
R42R		RESISTOR, fixed, 1500 ohms ± 10%, flat wire wound resistor strip; 7.4 watt capacity	Plate voltage divider	CIR, MW2	
R43R		RESISTOR, fixed, composition, pigtail, insulated 600 ohms ± 10%, 1/2 watt or RESISTOR, fixed, composition, pigtail, insulated 560 ohms ± 10%, 1/2 watt	Audio cathode resistor	CIR, BT-1/2 CBZ, EB	
R44R		Same as R43R	Audio cathode resistor		
R45R		Same as R8R	Audio terminating resistor		
R46R		Same as R8R	Audio terminating resistor		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
R47.1R		RESISTOR, fixed, 10,000 ohms ± 10%; one section of 2-section flat wire-wound resistor strip; 10.5 watt capacity	Audio plate dropping resistor	CIR, MW4	
R47.2R		Same as R47.1R (one section of above 2-section flat wire-wound resistor strip)	Audio plate dropping resistor		
R48R		Same as R23R	Heater resistor		
R49R		Same as R8R	Crystal osc. meter resistor		
R50R		Same as R2R	Osc. grid resistor		
R51R		Same as R8R	1st H.G. grid resistor		
R52R		RESISTOR, fixed, composition, pigtail, insulated 6200 ohms ± 5%, 1 watt	Osc. plate decoupling	CBZ, GB	
R53R		RESISTOR, fixed, 560 ohms ± 10%, 1 watt, composition, pigtail, insulated	1st H.G. plate decoupling resistor	CBZ, GB	
R54R		Same as R1R	2nd H.G. meter resistor		
R55R		Same as R8R	2nd H.G. grid resistor		
R56R		Same as R53R	2nd H.G. plate decoupling resistor		
R57R		RESISTOR, fixed, 750 ohms ± 10%, 1/2 watt, composition, pigtail, insulated	3rd H.G. plate decoupling resistor	CIR, BT-1/2	
		or			
		RESISTOR, fixed, 680 ohms ± 10%, 1/2 watt, composition, pigtail, insulated		CBZ, EB	
R58R		Same as R1R	3rd H.G. meter resistor		
R59R		Same as R8R	3rd H.G. grid resistor		
R61R		RESISTOR, fixed, 120 ohm ± 10%, 1 watt, composition, pigtail, insulated	H.G. decoupling plate resistor	CBZ, GB	

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

RADIO TRANSMITTER-RECEIVER
MAJOR UNIT RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
R62R		RESISTOR, fixed, 20,000 ohms ± 10%, 1/2 watt composition, pigtail, insulated or RESISTOR, fixed, 22,000 ohms ± 10%, 1/2 watt composition, pigtail, insulated	P-P mod. screen decoupling resistor	CIR, BT-1/2 CBZ, EB	
R63R		Same as R8R	P-P mod. grid decoupling resistor		
R64R		Same as R8R	1st i-f screen voltage divider		
R67R		Same as R1R	3rd H.G. plate decoupling resistor		
R68.1R		RESISTOR, fixed, 6000 ohms ± 5%; 2 watt wire-wound, pigtail, insulated	Screen grid voltage divider	CIR, BW2	
R68.2R		RESISTOR, fixed, 7000 ohms ± 5%; 2 watt wire-wound, pigtail, insulated	Screen grid voltage divider	CIR, BW2	
R68.3R		Same as R68.1R	Screen grid voltage divider		
R68.4R		Same as R68.1R	Screen grid voltage divider		
R68.5R		Same as R68.1R	Screen grid voltage divider		
R68.6R		RESISTOR, fixed, 4000 ohms ± 5%; 2 watt wire-wound, pigtail, insulated	Screen grid voltage divider	CIR, BW2	
R68.7R		RESISTOR, fixed, 1500 ohms ± 5%; 1/2 watt, composition, pigtail, insulated	Screen grid voltage divider	CIR, BT-1/2 or CBZ, EB	
R70R		RESISTOR, fixed, 30 ohms ± 5%; 10 watt wire-wound	Squelch heater resistor	CAO, 1-3/4" Z with 206 term. or CWC, 1-3/4" x 3/8" vitreous enamel	
R71R		Same as R1R	Mod. plate decoupling resistor		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
R72R		RESISTOR, fixed, 50,000 ohms ± 10%; 1/2 watt composition, pigtail, insulated	1st i-f grid decoupling resistor	CIR, BT-1/2	
		or			
		RESISTOR, fixed, 56,000 ohms ± 10%; 1/2 watt composition, pigtail, insulated		CBZ, EB	
R73R		RESISTOR, fixed, 2000 ohms ± 10%, 1/2 watt composition, pigtail, insulated	1st i-f plate decoupling resistor	CIR, BT-1/2	
		or			
		RESISTOR, fixed, 2200 ohms ± 10%, 1/2 watt composition, pigtail, insulated		CBZ, EB	
R74R		Same as R72R	2nd i-f grid decoupling resistor		
R75R		Same as R73R	2nd i-f plate decoupling resistor		
R76R		Same as R72R	3rd i-f grid decoupling resistor		
R77R		Same as R73R	3rd i-f plate decoupling resistor		
R78R		Same as R72R	2nd Det. diode decoupling resistor		
R79R		Same as R18R	P-P mod. screen by-pass discharge resistor		
R80R		Same as R18R	H.G. mod. screen by-pass discharge resistor		
R81R		Same as R1R	I-f plate decoupling resistor		
T1.1R		TRANSFORMER, audio output dual, impedance ratio 15,000 ohms to 500 ohms between windings (3-4) and (1-2); frequency range 250 cycles to 3000 cycles, 1000 V insulation	Audio output transformer, output from one audio channel	CW	D-159749

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (RECEIVER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
T1.2R		Same as T1.1R (second section of dual audio output trans. terminals (5-6) and (7-8)	Audio output transformer for second audio channel		
V1R		TUBE, vacuum	Osc. and 1st H.G. tube	6N7	
V2R		Same as V1R	2nd and 3rd H.G. tube		
V3R		TUBE, vacuum	P.G. modulator tube	6AC7	
V4R		TUBE, vacuum *(Substitution necessitates i-f realignment)	1st i-f tube	12SJ7* or 12SJ7-GT*	
V5R		Same as V4R	2nd i-f tube		
V6R		Same as V4R	3rd i-f tube		
V7R		TUBE, vacuum	Squelch and noise gate tube	12SQ7 or 12SQ7-GT	
V8R		Same as V7R	Det. and 1st audio tube		
V9R		TUBE, vacuum	Audio output tube	12A6 or 12A6-GT	
V10R		Same as V9R	Audio output tube		
V11R		Same as V1R	P-P Osc. and 1st H.G. tube		
V12R		Same as V1R	P-P 2nd and 3rd H.G. tube		
V13R		Same as V3R	P-P modulator tube		
VS1R to VS13R, inc.		SOCKETS, vacuum tube, 8-prong octal base	Vacuum tube socket	CW	ES-678315-10
Y1R		RECEIVER CRYSTAL of crystal unit Y1C Channel 1	Frequency control		
Y2R		RECEIVER CRYSTAL of crystal unit Y2C Channel 2	Frequency control		

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REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
Y3R		RECEIVER CRYSTAL of crystal unit Y3C Channel 3	Frequency control		
Y4R		RECEIVER CRYSTAL of crystal unit Y4C Channel 4			
PP1R		PLANE-TO-PLANE UNIT, comprising osc. harmonic generator and mixer tubes and associated circuits enclosed in metal shield; plug in	Plane-to-Plane channel oscillator, harmonic generators and mixer circuits with r-f input coils	CW	ES-678463

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (TRANSMITTER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
C1T		CAPACITOR, fixed ceramic 3 mmf ± 0.25 mmf	Oscillator plate tuning capacitor	CER, N080K or N100K	
C2T		CAPACITOR, fixed mica 0.00005 mf, 1000 V test or CAPACITOR, fixed mica 0.000051 mf	Oscillator r-f voltage divider capacitor	CD, 5W AWS, CM20A510M	
C3T		CAPACITOR, fixed mica 0.0004 mf, 1000 V test or CAPACITOR, fixed mica 0.00039 mf	Oscillator r-f voltage divider capacitor	CD, 5W AWS, CM20A391M	
C4T		CAPACITOR, fixed mica, 0.01 mf, 600 V test or CAPACITOR, fixed mica 0.01 mf or CAPACITOR, fixed mica 0.0062 mf	Oscillator r-f voltage divider capacitor	CD, 1W AWS, CM35A103M AWS, CM35A622M	
C5T		CAPACITOR, fixed mica 0.003 mf, 1000 V test or CAPACITOR, fixed mica 0.003 mf or CAPACITOR, fixed oil paper 0.003 mf	Oscillator screen by-pass capacitor	CD, 1W AWS, CM30A302M AWS, CN35A302	
C6T		CAPACITOR, 25 mmf, variable air, 0.03" spacing, metal parts cadmium plated, standard rotor terminal position, 3/32" long mounting studs (tapped) 0.112-40; rotor ground strapped to studs	3rd harmonic generator plate tuning capacitor	CHC, APC	
C7T		Same as C5T	Oscillator plate by-pass capacitor		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (TRANSMITTER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
C8T		CAPACITOR, fixed mica, 0.01 mf, 600 V test or CAPACITOR, fixed mica, 0.01 mf or CAPACITOR, fixed mica, 0.0062 mf or CAPACITOR, fixed-oil paper, 0.006 mf	Oscillator heater by-pass capacitor	CD, 1W AWS, CM35A103M AWS, CM35A622M AWS, CN35A602	
C9T		CAPACITOR, fixed mica, 0.00025 mf, 1000 V test or CAPACITOR, fixed mica, 0.00024 mf	1st harmonic generator grid coupling capacitor	CD, 5W AWS, CM20B241M	
C10T		CAPACITOR, 25 mmf variable air, 7 rotor plates, 6 stator plates, 0.030" spacing, cadmium plated	Antenna coupling capacitor	CHC, APC	ES-677499-3
C11T		Same as C8T	1st harmonic generator cathode by-pass capacitor		
C12T		Same as C5T	1st harmonic generator screen by-pass capacitor		
C13T		Same as C8T	1st harmonic generator heater by-pass capacitor		
C14T		Same as C5T	1st harmonic generator plate by-pass capacitor		
C15T		CAPACITOR, fixed, 1 mmf ± 0.25 mmf ceramic	1st harmonic generator plate tuning capacitor	CER, N080K or N100K	
C16T		Same as C9T	2nd harmonic generator grid coupling capacitor		
C17T		Same as C8T	2nd harmonic generator cathode by-pass capacitor		

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MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4: AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (TRANSMITTER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
C18T		CAPACITOR, 0.0005 mf fixed mica button ± 50 mmf, 1300 d-c test, 500 V working	2nd harmonic generator screen by-pass capacitor	CER, 370	ES-691628
C19T		Same as C8T	2nd harmonic generator heater by-pass capacitor		
C20T		Same as C18T	2nd harmonic generator plate by-pass capacitor		
C21T		CAPACITOR, fixed, 5 mmf ± 0.5 mmf ceramic	2nd harmonic generator plate tuning capacitor	CER, N080K or N100K	
C22T		Same as C9T	3rd harmonic generator grid coupling capacitor		
C23T		Same as C18T	3rd harmonic generator cathode by-pass capacitor		
C24T		Same as C18T	3rd harmonic generator heater by-pass capacitor		
C25T		Same as C18T	3rd harmonic generator screen by-pass capacitor		
C26T		Same as C18T	R-f amp. cathode by-pass capacitor		
C27T		Same as C18T	R-f amp. heater by-pass capacitor		
C28T		Same as C18T	R-f amp. screen by-pass capacitor		
C29T		CAPACITOR, fixed mica, 0.003 mf ± 10% 2000 V test, 800 V working, varnish impregnated, brass case mounted	R-f amp. plate by-pass capacitor	CD, 734AVBP	
C30T		Same as C8T	Aud. amp. cathode by-pass capacitor		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

RADIO TRANSMITTER-RECEIVER
MAJOR UNIT RT-19/ARC-4 (TRANSMITTER SECTION)

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C31.1T		CAPACITOR, electrolytic 15 mf; 400 V d-c working; part of 4-section	Plate supply filter capacitors	CMA, FP (1-3/8"x2") or CMA, WP (1-3/8"x2") or CSF, EL (1-3/8"x2")	
C31.2T		CAPACITOR, electrolytic 15 mf; 400 V d-c working; part of 4-section	Plate supply filter capacitors		
C31.3T		CAPACITOR, electrolytic 40 mf; 25 V d-c working; part of 4-section	Aud. amp. cathode by-pass capacitor		
C31.4T		CAPACITOR, electrolytic 40 mf; 25 V d-c working; part of 4-section (The above 4-section capacitor is equipped with a metal mounting plate.)	Microphone supply filter capacitor		
C32T		CAPACITOR, fixed mica, 0.006 mf, 600 V d-c test or CAPACITOR, fixed mica, 0.0062 mf or CAPACITOR, fixed oil paper, 0.006 mf	Sidetone coupling capacitor	CD, 1W AWS, CM35A622M AWS, CN35A602	
C33T		CAPACITOR, fixed ceramic, 2 mmf ± 0.25 mmf	1st harmonic generator grid tuning capacitor	CER, N080K or N100K	
J1T		JACK (supply with 3 metal washer and 1 Hex. nut) 3-contact open circuit, non-insulated	Microphone jack	U, TC61	
J2T		JACK (supply with 3 metal washers and 1 Hex. nut) 2-contact open circuit, non-insulated	Throttle sw. jack	U, TC60	
L1T		COIL, 32 turns #26 AWG D.C.C. wire	Oscillator plate tuning inductance	CW	ES-677192-1
L2T		Same as L1T	1st harmonic generator grid tuning inductance		

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MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

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REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
L3T		COIL, 16 turns #22 AWG bare tinned copper wire	1st harmonic generator plate tuning inductance	CW	ES-677193-1
L4T		Same as L3T	2nd harmonic generator grid tuning inductance		
L5T		COIL, 4-1/2 turns #18 AWG bare tinned copper wire	2nd harmonic generator plate tuning inductance	CW	ES-696259-4
L6T		COIL, 3-3/4 turns #12 AWG hard-drawn copper wire, silver plated, 5/32 pitch, 1/2" inside diameter	3rd harmonic generator plate tuning inductance	CW	ES-677448-8
L7T		COIL, comprises 2 coils—2 turns each, #14 AWG hard-drawn copper wire, silver plated, 5/16 pitch, 15/16" inside diameter, special	3rd harmonic generator r-f amp. coupling coil	CW	ES-677448-6
L8T		COIL, 6 turns #10 AWG hard drawn copper wire, silver plated, 5/32 pitch, 9/16" inside diameter	R-f amp. grid tuning inductance	CW	ES-677448-10
L9T		COIL, 6 turns #10 AWG bare copper wire, silver plated, 5/8" inside diameter	R-f amp. plate tuning inductance	CW	ES-677331-5
L10T		COIL, U-shaped coil, #12 AWG silver plated wire, 1" inside diameter	Antenna coupling coil	CW	ES-677332-3
L11T		COIL, retard, 0.5 millihenry inductance	Oscillator cathode choke coil	CW, 200A	
L12T		CHOKE, 1000 ma plate, 10 microhenries inductance	3rd harmonic generator plate, air choke coil	COM, Z-1	
L13T		Same as L12T	R-f amp. plate circuit choke coil		
R1T		RESISTOR, fixed 100,000 ohms ± 10%, 1/2 watt, composition, pigtail, insulated	Oscillator grid leak resistor	CIR, BT-1/2 or CBZ, EB	
R2T		RESISTOR, fixed 500 ohms ± 10%, 1/2 watt, composition, pigtail, insulated or RESISTOR, fixed 560 ohms ± 10%, 1/2 watt, composition, pigtail, insulated	Oscillator metering resistor	CIR, BT-1/2 CBZ, EB	

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REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
R3T		RESISTOR, fixed 400 ohms ± 5% wire-wound, 4 watt	Oscillator cathode bias resistor	CAO, 1" Z with 206 term. or CWC, 1"x3/8" vitreous enamel	
R4T		RESISTOR, fixed 20,000 ohms ± 10%, 1 watt, composition, pigtail, insulated	Oscillator screen voltage dropping resistor	CIR, BT-1	
		or			
		RESISTOR, fixed 22,000 ohms ± 10%, 1 watt, composition, pigtail, insulated		CBZ, GB	
R5T		RESISTOR, fixed 400 ohms ± 10%, 1/2 watt, composition, pigtail, insulated	1st harmonic generator metering resistor	CIR, BT-1/2	
		or			
		RESISTOR, fixed 390 ohms ± 10%, 1/2 watt, composition, pigtail, insulated		CBZ, EB	
R6T		Same as R1T	1st harmonic generator grid leak resistor		
R7T		Same as R2T	1st harmonic generator metering resistor		
R8T		RESISTOR, fixed 1000 ohms ± 5%, wire wound, 10 watt	1st harmonic generator cathode bias resistor	CAO, 1-3/4" Z with 206 term. or CWC, 1-3/4" x 3/8 vitreous enamel	
R9T		Same as R4T	1st harmonic generator screen voltage dropping resistor		

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REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
R10T		RESISTOR, fixed 600 ohms ± 10%, 1/2 watt, composition, pigtail, insulated or RESISTOR, fixed 560 ohms ± 10%, 1/2 watt, composition, pigtail, insulated	2nd harmonic generator metering resistor	CIR, BT-1/2 CBZ, EB	
R11T		Same as R2T	2nd harmonic generator metering resistor		
R12T		Same as R1T	2nd harmonic generator grid leak resistor		
R13T		Same as R8T	2nd harmonic generator cathode resistor		
R14T		RESISTOR, fixed 10,000 ohms ± 10%, 1/2 watt composition, pigtail, insulated	2nd harmonic generator screen voltage dropping resistor	CIR, BT-1/2 or CBZ, EB	
R15T		Same as R1T	3rd harmonic generator grid leak resistor		
R16T		Same as R2T	3rd harmonic generator metering resistor		
R17T		Same as R5T	3rd harmonic generator metering resistor		
R18T		RESISTOR, fixed, 800 ohms ± 5%, wire-wound, 10 watt	3rd harmonic generator cathode bias resistor	CAO, 1-3/4" Z with 206 term. or CWC, 1-3/4" x 3/8" vitreous enamel	
R19T		Same as R14T	3rd harmonic generator screen voltage dropping resistor		

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REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
R20T		RESISTOR, fixed 20,000 ohms ± 10%, 1/2 watt composition, pigtail, insulated	R-f amp. grid leak resistor	CIR, BT-1/2	
		or			
		RESISTOR fixed 22,000 ohms ± 10%, 1/2 watt composition, pigtail, insulated		CBZ, EB	
R21T		Same as R2T	R-f amp. metering resistor		
R22T		RESISTOR, fixed 750 ohms ± 10%, 1/2 watt, composition, pigtail, insulated	R-f amp. metering resistor	CIR, BT-1/2	
		or			
		RESISTOR, fixed 680 ohms ± 10%, 1/2 watt, composition, pigtail, insulated		CBZ, EB	
R23T		RESISTOR, fixed, 300 ohms ± 5%, wire-wound 4 watt	R-f amp. cathode resistor	CAO, 1" Z with 206 term. or CWC, 1"x3/8" vitreous enamel	
R24T		RESISTOR, fixed, 30,000 ohms ± 2%, 1/4 watt composition	R-f amp. metering resistor	CER, 504	
R25.1T		RESISTOR, fixed, 15,000 ohms ± 10%, 1 watt composition, pigtail, insulated	R-f amp. screen voltage dropping resistors	CIR, BT-1 or CBZ, GB	
R25.2T		Same as R25.1T	R-f amp. screen voltage dropping resistor		
R26T		Same as R23T	Aud. amp. cathode bias resistor		
R27T		Same as R24T	Aud. amp. metering resistor		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (TRANSMITTER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
R28T		RESISTOR, fixed 250,000 ohms ± 10%, 1/2 watt, composition, pigtail, insulated	Sidetone coupling resistor	CIR, BT-1/2	
		or			
		RESISTOR, fixed 270,000 ohms ± 10%, 1/2 watt, composition, pigtail insulated		CBZ, EB	
R29T		RESISTOR, fixed 100 ohms ± 10%, 1/2 watt, wire-wound, pigtail, insulated	Microphone supply filter resistor	CIR, BW-1/2 or CBZ, EB	
R30T		RESISTOR, fixed 50,000 ohms ± 10%, 1/2 watt, composition, pigtail, insulated	Audio amp. interphone amplifier bias resistor	CIR, BT-1/2	
		or			
		RESISTOR, fixed 56,000 ohms ± 10%, 1/2 watt, composition, pigtail, insulated		CBZ, EB	
R31T		RESISTOR, fixed 500,000 ohms ± 10%, 1/2 watt, composition, pigtail, insulated	Audio amp. cathode voltage divider resistor	CIR, BT-1/2	
		or			
		RESISTOR, fixed 560,000 ohms ± 10%, 1/2 watt, composition, pigtail, insulated		CBZ, EB	
R32T		RESISTOR, fixed 200 ohms ± 5%, wire-wound, 4 watt	Microphone supply current limiting resistor	CAO, 1" Z with 206 terms. or CWC, 1"x3/8" vitreous enamel	
T1T		TRANSFORMER, input, impedance ratio 100 ohms to 134,000 ohms; frequency range 400 to 3000 cycles, 500 V insulation	Microphone input transformer	CW	D-159747
T2T		TRANSFORMER, output modulation transformer between 6L6 audio and 832 r-f stage. Impedance ratio 4500 ohms to 9000 ohms; frequency range 400 to 3000 cycles	Modulation transformer	CW	D-159748
V1T		TUBE, vacuum	Oscillator	6V6GT	

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT RADIO TRANSMITTER-RECEIVER RT-19/ARC-4 (TRANSMITTER SECTION)

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
V2T		Same as V1T	1st harmonic generator		
V3T		TUBE, vacuum	2nd harmonic generator	1614	
V4T		Same as V3T	3rd harmonic generator		
V5T		TUBE, vacuum	R-f amplifier	832	
V6T		TUBE, vacuum	Audio amplifier	6L6	
V7T		Same as V6T	Audio amplifier		
VS1T to VS4T VS6T-VS7T		SOCKET, vacuum tube, 8-prong octal base	Vacuum tube socket	V	ES-678315-10
VS5T		SOCKET, vacuum tube (special socket with coil mounting)	R-f amplifier vacuum tube socket	CHC	ES-677497-1
Y1T		CRYSTAL, transmitter of crystal unit Y1C channel 1	Frequency control		
Y2T		CRYSTAL, transmitter of crystal unit Y2C channel 2	Frequency control		
Y3T		CRYSTAL, transmitter of crystal unit Y3C channel 3	Frequency control		
Y4T		CRYSTAL, transmitter of crystal unit Y4C channel 4	Frequency control		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A **MAJOR UNIT** J-23/ARC-4 JUNCTION BOX

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
F301		FUSE, 40 amp. (for 12-volt)	Fuse	CLF, 4AG	
		or			
		FUSE, 20 amp. (for 24-volt)	Fuse	CLF, 3AG	
F302		FUSE, 20 amp. (for 12-volt)	Fuse	CLF, 3AG	
		or			
		FUSE, 10 amp. (for 24-volt)	Fuse	CLF, 3AG	
J301		RECEPTACLE, male connector mounted in unit	3-conductor batt. cable connector	CW	7024 of D-150580 Receiver
J302		Same as J301	3-conductor batt. cable connector		
J303		Same as J301	3-conductor batt. cable connector		
J304		RECEPTACLE, male connector mounted in unit	18-conductor cable connector	CW	7027 of D-150580 Receiver
J305		Same as J304	18-conductor cable connector		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A **MAJOR UNIT** C-51/ARC-4 CONTROL UNIT

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
C201		CAPACITOR, 3X 0.05 mf ± 15%, non-inductive paper, wax filled. Working voltage 300 d-c; test 900 d-c	Click filter	CW	ES-692644
D201		SWITCH, "channel selection" 4-position rotary switch, special	Frequency selector	CW	7079 of D-150580 Receiver
D202		SWITCH, "radio-interphone" DPST, 3 amp. 250 V or SWITCH, "radio-interphone" DPST, 6 amp. 125 V	Radio or interphone selector	CW	ES-676800-32
D203		SWITCH, "P-G-Both-P-P" 3-position rotary, special	Channel selector switch	CW	ES-693705
D204		SWITCH, "On-Off" toggle type, 3 amp., 250 V SPST	On-Off operation switch	Cutler-Hammer 8280	
J201		JACK, "TEL", 2-contact, open circuit, insulated	Output audio jack	CW	7565 of D-150580 Receiver
J202		Same as J201	Output audio jack		
J203		JACK, "MIC", 3-contact open circuit, non-insulated	Microphone input jack	CW	1754 of D-150580 Receiver
J204		RECEPTACLE, 18-contact male, mounted in unit	18-conductor cable connector	CW	7027 of D-150580 Receiver
P201		POTENTIOMETER, 1000 ohms ± 10%, linear taper, 20 ma capacity	Audio output control	CBZ, Type J	ES-692267
R201		RESISTOR, fixed, 56 ohms ± 10%, 1/2 watt, composition, pigtail, insulated or RESISTOR, fixed, 50 ohms ± 10%, 1/2 watt, composition, pigtail, insulated	Click filter resistor	CBZ, EB CIR, BT-1/2	

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A **MAJOR UNIT** C-51/ARC-4 CONTROL UNIT

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
R202		RESISTOR, fixed, 30,000 ohms ± 10%, 1 watt, composition, pigtail, insulated	Screen grid voltage divider	CIR, BT-1	
		or			
		RESISTOR, fixed, 33,000 ohms ± 10%, 1 watt, composition, pigtail, insulated		CBZ, GB	
R203		Same as R201	Audio output pad		

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT DY-9/ARC-1 AND DY-10/ARC-4X DYNAMOTOR

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
MG1C	DY-10/ARC-4X	DYNAMOTOR (used in AN/ARC-4X and 233A Radio Telephone Equipment) 12.7 V at 8.0 amps. input; 360 V, 0.135 amp. continuous output; or 12.7 V at 15 amps. input; 310 V, 0.355 amp. intermittent output or 26 V at 4 amps. input; 360 V, 0.135 amp. continuous output or 26 V at 7.5 amps. input; 310 V, 0.355 amp. intermittent output. Weight not more than 8.5 lbs.	High voltage supply	CPG or CC or CAFF	KS-10085 List 3
MG1C	DY-9/ARC-1	DYNAMOTOR (used in AN/ARC-4 Radio Telephone Equipment) 26 V at 4 amps. input; 360 V, 0.135 amp. continuous output or 26 V at 7.5 amps. input; 310 V, 0.355 amp. intermittent output. Weight not more than 8.5 lbs.	High voltage supply	CC or CAFF	KS-10085 List 2
E1C		BRUSH, input dynamotor brush	Low voltage transfer	CPG, CM5-H	KS-10085 Input
E2C		BRUSH, output dynamotor brush	High voltage transfer	CPG, HM6782	KS-10085 Output
C9C		CAPACITOR, fixed, 0.003 mf, mica, 2000 V d-c test or CAPACITOR, fixed, oil paper, 0.003 mf, 800 V d-c working	Dynamotor noise filter	CD, 1WP AWS, CN35A302	

TABLE OF REPLACEABLE PARTS

MODEL RADIO TELEPHONE EQUIPMENT AN/ARC-4; AN/ARC-4X; AND 233A

MAJOR UNIT DY-9/ARC-1 AND DY-10/ARC-4X DYNAMOTOR

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NUMBER
C10C		Same as C9C	Dynamotor noise filter		
C11C		Same as C9C	Dynamotor noise filter		
C12C		Same as C9C	Dynamotor noise filter		
C13C		CAPACITOR, fixed, mica, 250 mmf, 1000 V test or	Dynamotor noise filter	CD, 5W	
		CAPACITOR, fixed, mica, 240 mmf, 1000 V test	Dynamotor noise filter	AWS, CM20B241M	
C14C		Same as C13C	Dynamotor noise filter		

LIST OF MANUFACTURERS

FOR MODELS AN/ARC-4; AN/ARC-4X; AND 233A RADIO TELEPHONE EQUIPMENT

Mfr. Prefix	Name of Manufacturer	Address
AWS	Denotes American Standard Associations C75.3 American War Standard Capacitors	
B	Aeronautical Radio, Inc.	Washington, D.C.
CAFF	A. G. Redmond Company	Owosso, Mich.
CAO	Ward-Leonard Electric Co.	Mt. Vernon, N.Y.
CBZ	Allen-Bradley	136 West Greenfield Ave., Milwaukee, Wis.
CC	Continental Electric Company	323 Ferry St., Newark, 5, N.J.
CCQ	Allied Control Co., Inc.	2 East End Ave., New York, N.Y.
CD	Cornell-Dubilier Electric Corp.	1000 Hamilton Ave., So. Plainfield, N.J.
CED	Cannon Electric Development Co.	3209 Humbolt St., Los Angeles, Calif.
CER	Erie Resistor Corp.	640 W. 12th St., Erie, Pa.
CHC	Hammarlund Mfg. Co.	460 W. 33rd St., New York, N.Y.
CHH	Arrow-Hart & Hegeman	Hartford, Conn.
CIR	International Resistance Corp.	401 N. Broad St., Philadelphia, Pa.
CJC	Howard B. Jones	2300 Wabansia Ave., Chicago, Ill.
CLF	Littelfuse, Inc.	4755 Ravenswood Ave., Chicago, Ill.
CMA	P. R. Mallory & Co., Inc.	3029 E. Washington St., Indianapolis, Ind.
COM	Ohmite Manufacturing Co.	4818 Flournoy St., Chicago, Ill.
CPG	Pioneer Gen-E-Motor Co.	5841 W. Dickens Ave., Chicago, Ill.
CPH	American Phenolic Corps.	1830 S. 54th St., Chicago, Ill.
CSF	Sprague Specialties Co.	North Adams, Mass.
CV	Weston Electrical Instrument Corp.	614 Frelinghuysen Ave., Newark, N.J.
CW	Western Electric Company	195 Broadway, New York, N.Y.
CWC	Wirt Company	5221 Greene St., Philadelphia, Pa.
G	Doolittle Radio Inc.	7421 So. Loomis Blvd., Chicago, Ill.
H	Struthers-Dunn, Inc.	1321 Arch St., Philadelphia, Pa.
P	Micamold Radio Corp.	1087 Flushing Ave., Brooklyn, N.Y.
U	Telephonics Corporation	350 West 31st St., New York, N.Y.
V	Ucinite Company	Newtonville, Mass.

COMPONENTS COMMON TO BOTH TRANSMITTER AND RECEIVER

Capacitors						Resistors					
Desig.	*Value*	*Desig.*	*Value*	*Desig.*	*Value*	*Desig.*	*Value*	*Desig.*	*Value*	*Desig.*	*Value*
C1C	10 mmf	C5.3C	20.0 mf	C10C	0.003 mf	R1C	0.5 meg.	R5.2C	1,000 ohms	R7.2C	1,000 ohms
C2C	0.006 mf	C6C	0.006 mf	C11C	0.003 mf	R2C	0.02 meg.	R6.1C	1,000 ohms	R8.1C	1,000 ohms
C3C	0.006 mf	C7C	500 mmf	C12C	0.003 mf	R3C	30 ohms	R6.2C	1,000 ohms	R8.2C	1,000 ohms
C4C	1.0 mf	C8C	500 mmf	C13C	250 mmf	R4C	70 ohms	R7.1C	1,000 ohms	R9C	23 ohms
C5.1C	20.0 mf	C9C	0.003 mf	C14C	250 mmf	R5.1C	1,000 ohms				
C5.2C	20.0 mf										

TRANSMITTER COMPONENTS

Capacitors						Resistors					
Desig.	*Value*	*Desig.*	*Value*	*Desig.*	*Value*	*Desig.*	*Value*	*Desig.*	*Value*	*Desig.*	*Value*
C1T	3 mmf	C13T	0.01 mf	C25T	500 mmf	R1T	0.1 meg.	R12T	0.1 meg.	R23T	300 ohms
C2T	50 mmf	C14T	0.003 mf	C26T	500 mmf	R2T	500 ohms	R13T	1,000 ohms	R24T	0.03 meg.
C3T	400 mmf	C15T	1 mmf	C27T	500 mmf	R3T	400 ohms	R14T	0.01 meg.	R25.1T	0.015 meg.
C4T	0.01 mf	C16T	250 mmf	C28T	500 mmf	R4T	0.02 meg.	R15T	0.1 meg.	R25.2T	0.015 meg.
C5T	0.003 mf	C17T	0.01 mf	C29T	0.003 mf	R5T	400 meg.	R16T	500 ohms	R26T	300 ohms
C6T	25 mmf	C18T	500 mmf	C30T	0.01 mf	R6T	0.1 meg.	R17T	400 ohms	R27T	0.03 meg.
C7T	0.003 mf	C19T	0.01 mf	C31.1T	15 mf	R7T	500 ohms	R18T	800 ohms	R28T	0.25 meg.
C8T	0.01 mf	C20T	500 mmf	C31.2T	15 mf	R8T	1,000 ohms	R19T	0.01 meg.	R29T	100 ohms
C9T	250 mmf	C21T	5 mmf	C31.3T	40 mf	R9T	0.02 meg.	R20T	0.02 meg.	R30T	0.05 meg.
C10T	25 mmf	C22T	250 mmf	C31.4T	40 mf	R10T	600 ohms	R21T	500 ohms	R31T	0.5 meg.
C11T	0.01 mf	C23T	500 mmf	C32T	0.006 mf	R11T	500 ohms	R22T	750 ohms	R32T	200 ohms
C12T	0.003 mf	C24T	500 mmf	C33T	2 mmf						

RECEIVER COMPONENTS

Capacitors						Resistors					
Desig.	*Value*	*Desig.*	*Value*	*Desig.*	*Value*	*Desig.*	*Value*	*Desig.*	*Value*	*Desig.*	*Value*
C1R	15 mmf	C37.1R	40 mf	C78R	3 mmf	R1R	1,000 ohms	R35R	0.5 meg.	R59R	0.1 meg.
C2R	25 mmf	C37.2R	40 mf	C80R	0.005 mf	R2R	0.015 meg.	R36R	0.5 meg.	R61R	120 ohms
C3R	15 mmf	C37.3R	15 mf	C81R	0.05 mf	R3R	300 ohms	R37R	0.1 meg.	R62R	0.02 meg.
C4R	500 mmf	C37.4R	15 mf	C82R	0.005 mf	R4R	0.5 meg.	R38R	0.5 meg.	R63R	0.1 meg.
C5R	500 mmf	C39R	0.006 mf	C83R	8 mmf	R7R	6,000 ohms	R39R	0.01 meg.	R64R	0.1 meg.
C6R	500 mmf	C41R	0.006 mf	C84R	0.006 mf	R8R	0.1 meg.	R40R	0.1 meg.	R67R	1,000 ohms
C7R	50 mmf	C42R	0.006 mf	C85R	25 mmf	R10R	1,000 ohms	R41.1R	1,200 ohms	R68.1R	6,000 ohms
C8R	50 mmf	C43R	500 mmf	C86R	5 mmf	R11R	1,000 ohms	R41.2R	1,200 ohms	R68.2R	7,000 ohms
C9R	500 mmf	C44R	0.006 mf	C87R	0.005 mf	R12R	0.1 meg.	R42R	1,500 ohms	R68.3R	6,000 ohms
C10R	0.005 mf	C45R	0.006 mf	C88R	50 mmf	R13R	1,000 ohms	R43R	600 ohms	R68.4R	6,000 ohms
C11R	10 mmf	C46R	0.3 mmf	C89R	5 mmf	R14R	1,000 ohms	R44R	600 ohms	R68.5R	6,000 ohms
C12R	2 mmf	C50R	50 mmf	C90R	0.006 mf	R15R	0.1 ohms	R45R	0.1 meg.	R68.6R	4,000 ohms
C13R	15 mmf	C51R	15 mmf	C91R	50 mmf	R17R	1,000 ohms	R46R	0.1 meg.	R68.7R	1,500 ohms
C14R	15 mmf	C53R	25 mmf	C92R	5 mmf	R18R	1.0 meg.	R47.1R	0.01 meg.	R70R	30 ohms
C15R	15 mmf	C55R	500 mmf	C93R	0.005 mf	R19R	0.1 meg.	R47.2R	0.01 meg.	R71R	1,000 ohms
C16R	5 mmf	C56R	500 mmf	C94R	50 mmf	R20R	1.0 meg.	R48R	14 ohms	R72R	0.05 meg.
C17R	0.006 mf	C57R	50 mmf	C95R	5 mmf	R22R	1,500 ohms	R49R	0.1 meg.	R73R	2,000 ohms
C19R	5 mmf	C59R	500 mmf	C96R	0.006 mf	R23R	14 ohms	R50R	.015 meg.	R74R	0.05 meg.
C21R	0.005 mf	C60R	500 mmf	C97R	50 mmf	R24R	0.05 meg.	R51R	0.1 meg.	R75R	2,000 ohms
C22R	0.005 mf	C61R	50 mmf	C98R	5 mmf	R25R	0.15 meg.	R52R	6,000 ohms	R76R	0.05 meg.
C23R	0.005 mf	C62R	500 mmf	C99R	0.005 mf	R26R	0.15 meg.	R53R	560 ohms	R77R	2,000 ohms
C24R	0.005 mf	C63R	500 mmf	C100R	50 mmf	R29R	0.25 meg.	R54R	1,000 ohms	R78R	50,000 ohms
C25R	0.005 mf	C66R	0.005 mf	C101R	5 mmf	R30R	0.25 meg.	R55R	0.1 meg.	R79R	1 meg.
C26R	0.006 mf	C67R	5 mmf	C102R	0.006 mf	R31R	0.5 meg.	R56R	560 ohms	R80R	1 meg.
C27R	0.005 mf	C69R	500 mmf	C103R	50 mmf	R32R	0.5 meg.	R57R	750 ohms	R81R	1,000 ohms
C28R	25 mmf	C70R	500 mmf	C104R	5 mmf	R33R	10 meg.	R58R	1,000 ohms	P1R	0.1 meg.
C29R	0.006 mf	C71R	5 mmf	C105R	0.005 mf	R34R	1.0 meg.				
C30R	0.006 mf	C72R	15 mmf	C106R	50 mmf						
C31R	0.006 mf	C73R	15 mmf	C107R	5 mmf						
C32R	0.02 mf	C74R	15 mmf	C108R	50 mmf						
C34R	0.006 mf	C75R	2 mmf	C109R	500 mmf						
C35R	500 mmf	C77R	3 mmf	C110R	0.003 mf						
C36R	0.01 mf										

CONTROL UNIT COMPONENTS

Capacitors		Resistors	
Designation	*Value*	*Designation*	*Value*
C201	3 x 0.5 mf	R201	56 ohms ± 10%
		R202	30,000 ohms ± 10%
		R203	56 ohms ± 10%

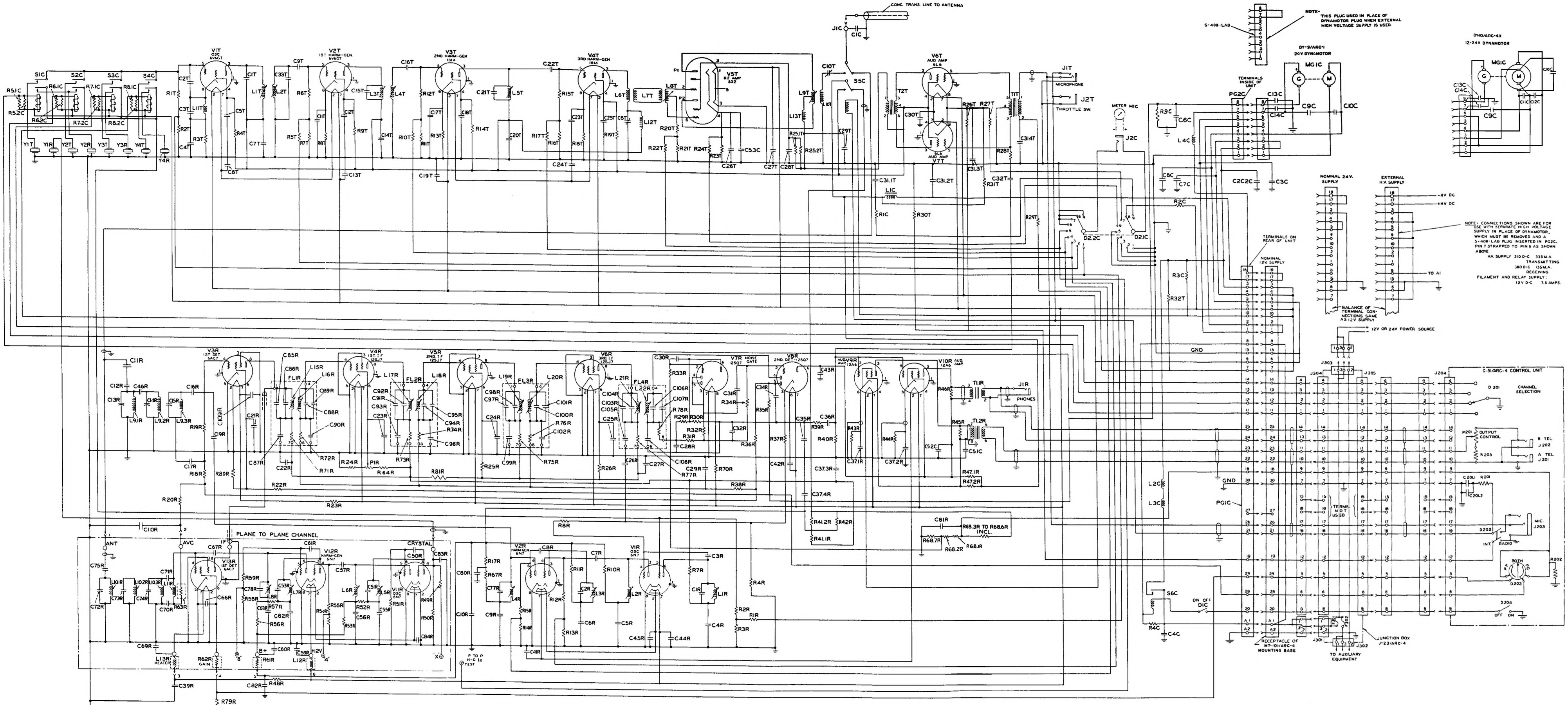


Figure 10—RT-19/ARC-4 Radio Transmitter-Receiver: Schematic Diagram of Circuit

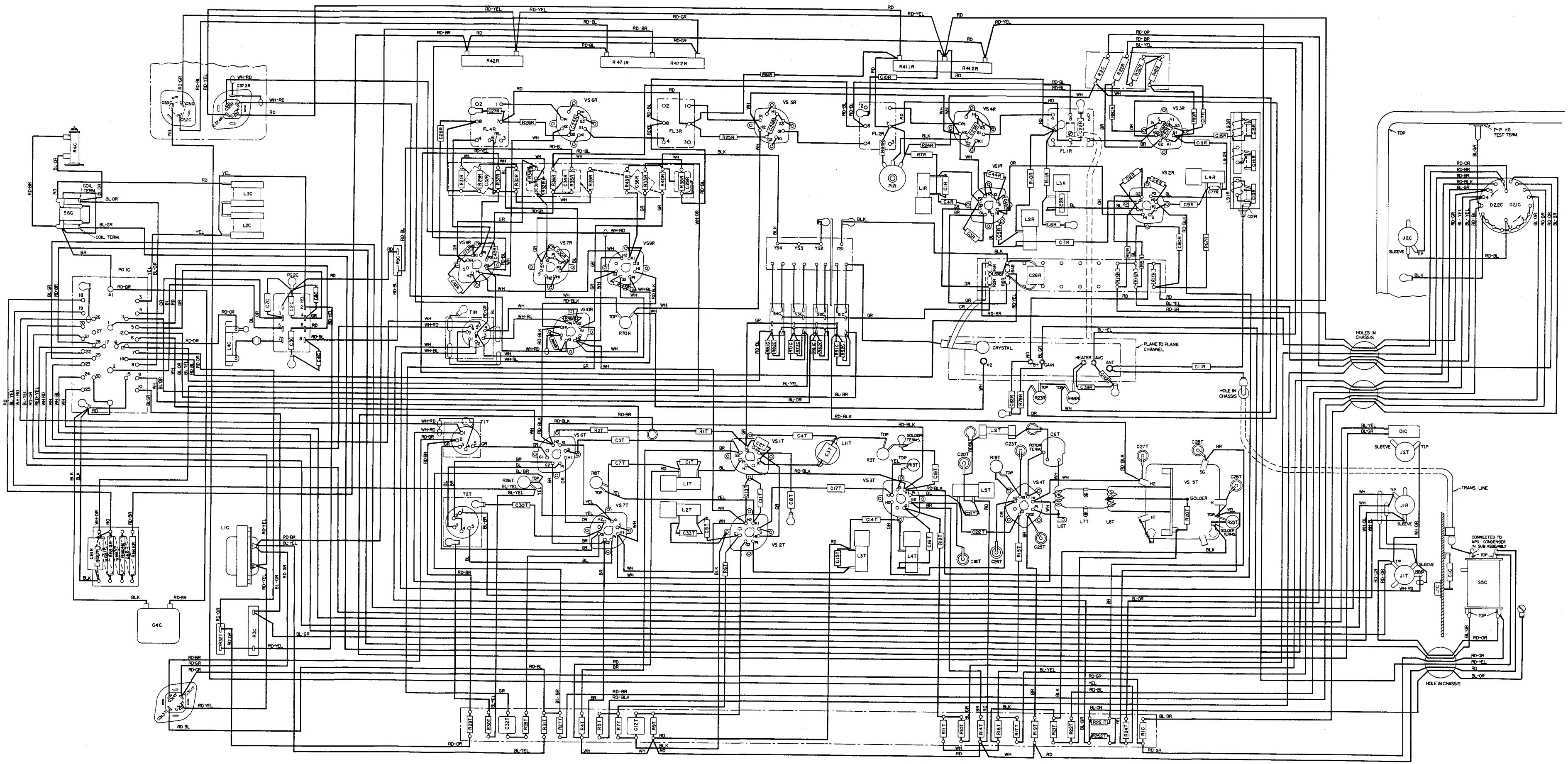


Figure 11—RT-19/ARC-4 Radio Transmitter-Receiver: Main Wiring Diagram

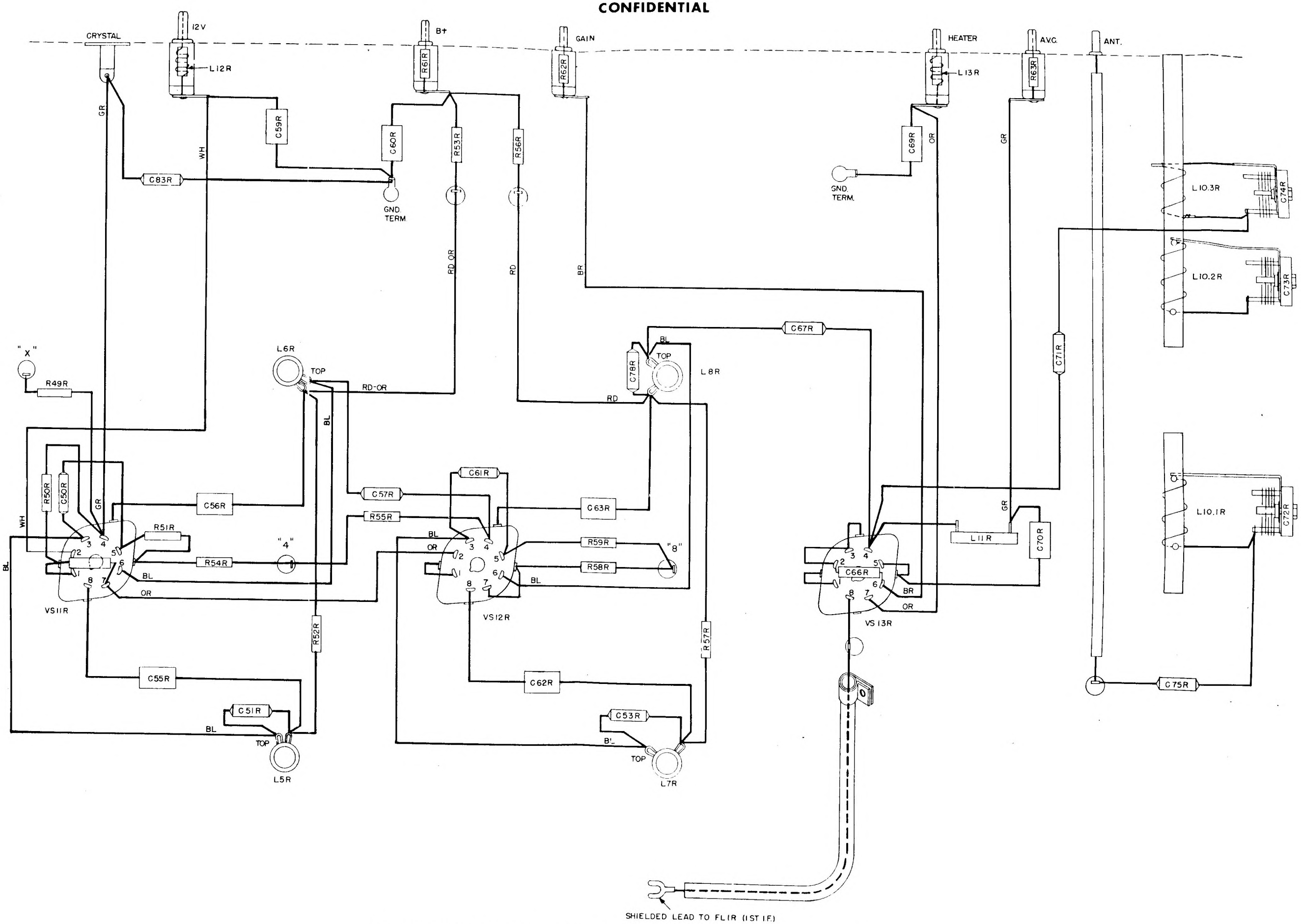
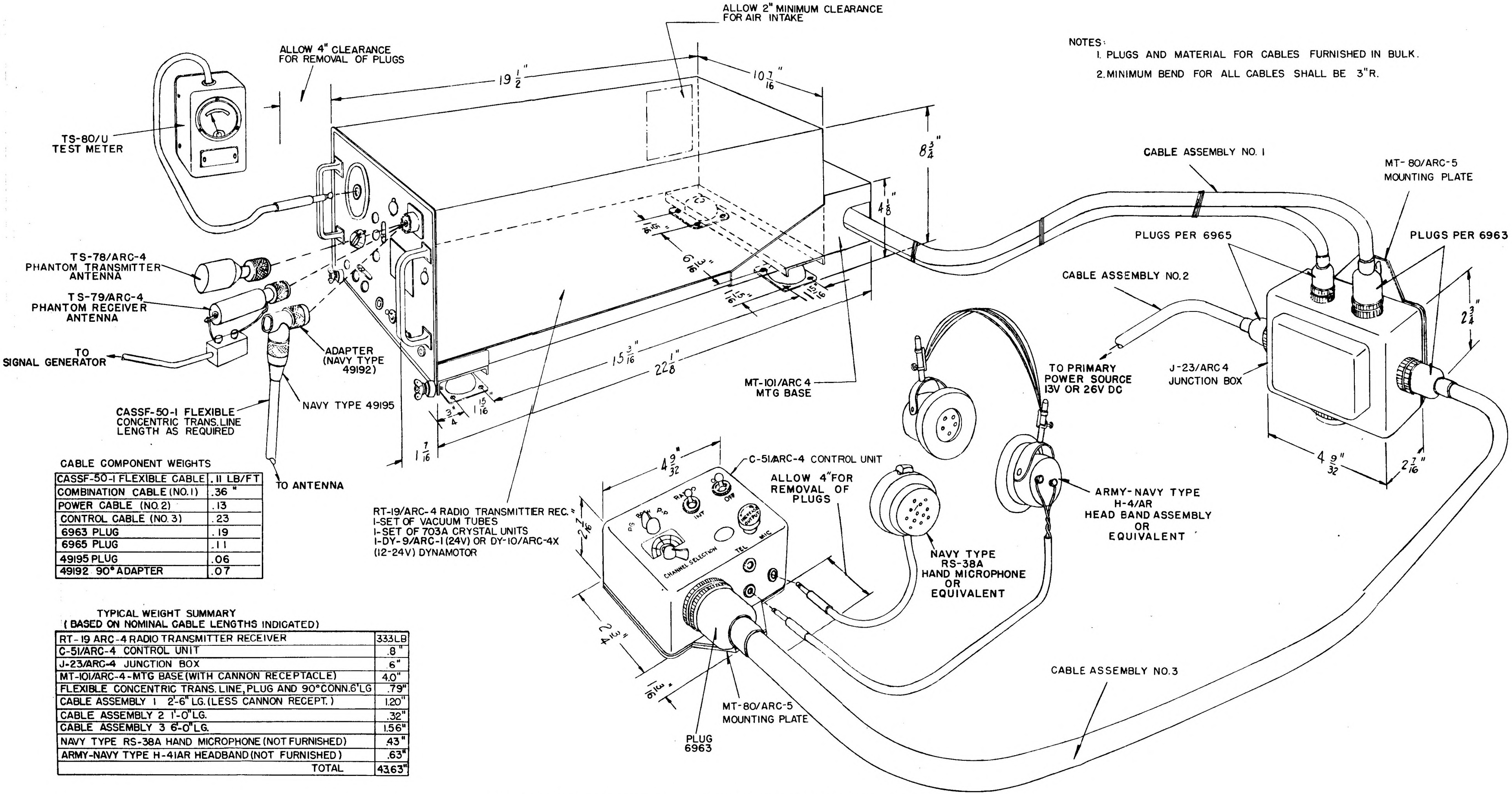


Figure 12—RT-19/ARC-4 Radio Transmitter-Receiver: Wiring Diagram of Plane-to-Plane Unit



NOTES:
1. PLUGS AND MATERIAL FOR CABLES FURNISHED IN BULK.
2. MINIMUM BEND FOR ALL CABLES SHALL BE 3"R.

CABLE COMPONENT WEIGHTS

CASSF-50-1 FLEXIBLE CABLE	.11 LB/FT
COMBINATION CABLE (NO.1)	.36 "
POWER CABLE (NO.2)	.13
CONTROL CABLE (NO.3)	.23
6963 PLUG	.19
6965 PLUG	.11
49195 PLUG	.06
49192 90° ADAPTER	.07

TYPICAL WEIGHT SUMMARY
(BASED ON NOMINAL CABLE LENGTHS INDICATED)

RT-19 ARC-4 RADIO TRANSMITTER RECEIVER	33.3LB
C-51/ARC-4 CONTROL UNIT	.8 "
J-23/ARC-4 JUNCTION BOX	.6"
MT-101/ARC-4-MTG BASE (WITH CANNON RECEPTACLE)	4.0"
FLEXIBLE CONCENTRIC TRANS. LINE, PLUG AND 90° CONN. 6'LG	.79"
CABLE ASSEMBLY 1 2'-6" LG. (LESS CANNON RECEPT.)	1.20"
CABLE ASSEMBLY 2 1'-0" LG.	.32"
CABLE ASSEMBLY 3 6'-0" LG.	1.56"
NAVY TYPE RS-38A HAND MICROPHONE (NOT FURNISHED)	.43"
ARMY-NAVY TYPE H-41AR HEADBAND (NOT FURNISHED)	.63"
TOTAL	43.63"

Figure 13—Cabling Diagram: AN/ARC-4, AN/ARC-4X, and 233A Airborne Radio Equipments

SUPPLEMENTARY RECEIVER TUNING INSTRUCTIONS

Step	Circuit Being Tuned	Tuning Control Designation	Channel Selection Switch Position (See Note 11)	Test Meter Switch Position	Connect P-P CH H-G Ig Test Jack To	Deflection of Test Meter, Tune For	Approximate Meter Reading	See Note
	RECEIVER PLANE-TO-GROUND CHANNEL							
1	Oscillator Plate Circuit	P-G CH OSC TUNING (L1R)	4 Normally Highest Frequency	OSC Ig		Approx. 0.8 Ig Max.	0.6 ma	1
2	1st Harmonic Generator Plate Circuit	P-G CH 1ST H-G TUNING (L2R)	3 Normally Mid-Band P-G Frequency	2ND H-G Ig		Maximum	0.1 ma	
3	2nd Harmonic Generator Plate Circuit	P-G CH 2ND H-G TUNING (L3R)	3	3RD H-G Ig		Maximum	0.12 ma	
4	3rd Harmonic Generator Plate Circuit	P-G CH 3RD H-G TUNING (L4R)	3			Max. Audio		
5	Input Filter Antenna Circuit	ANT (C13R)	3			Max. Audio		2
6	Input Filter Secondary Circuit	INT COUP (C14R)	3			Max. Audio		2
7	Input Filter Grid Circuit	GRID (C15R)	3 (2 and 4)			Max. Audio		2
	RECEIVER PLANE-TO-PLANE CHANNEL							
8	Oscillator Plate Circuit	P-P CH OSC TUNING (L5R)	3	RF AMP Ig OR P-P H-G Ig	Test Terminal OSC Ig	0.8 Ig Max.	0.4 ma	3
9	1st Harmonic Generator Plate Circuit	P-P CH 1ST H-G TUNING (L6R)	3	RF AMP Ig OR P-P H-G Ig	Test Terminal 2ND H-G Ig	Maximum	0.2 ma	
10	2nd Harmonic Generator Plate Circuit	P-P CH 2ND H-G TUNING (L7R)	3	RF AMP Ig OR P-P H-G Ig	Test Terminal 3RD H-G Ig	Maximum	0.15 ma	
11	3rd Harmonic Generator Plate Circuit	P-P CH 3RD H-G TUNING (L8R)	3			Max. Audio		
12	Input Filter Antenna Circuit	ANT (C72R)	3					4
13	Input Filter Secondary Circuit	INT COUP (C73R)	3					4
14	Input Filter Grid Circuit	GRID (C74R)	3					4

SUPPLEMENTARY TRANSMITTER TUNING INSTRUCTIONS

Step	Circuit Being Tuned	Tuning Control Designation	Channel Selection Switch Position (See Note 11)	Test Meter Switch Position	Deflection of Test Meter, Tune For.	Meter Reading Limits	See Note
1	None		1, 2, 3, 4	OSC Ig	—	.15 — .40	5
2	Oscillator Plate Circuit	OSC PLATE TUNING (L1T)	2	1ST H-G Ig	Maximum	.20 — .70	6
3	1st H-G Grid Circuit	1ST H-G GRID TUNING (L2T)	2	1ST H-G Ig	Maximum	.20 — .70	6
4	1st H-G Plate Circuit	1ST H-G PLATE TUNING (L3T)	2	2ND H-G Ig	Maximum	.35 — .85	6
5	2nd H-G Grid Circuit	2ND H-G GRID TUNING (L4T)	2	2ND H-G Ig	Maximum	.35 — .85	6
6	2nd H-G Plate Circuit	2ND H-G PLATE TUNING (L5T)	2	3RD H-G Ig	Maximum	.35 — .70	6
7	3rd H-G Plate Circuit	2ND H-G PLATE TUNING (L6T)	2	RF AMP Ig OR P-P H-G Ig	Maximum	.25 — .70	6
8	RF Amplifier Grid Circuit	RF AMP GRID TUNING (L8T)	2	RF AMP Ig OR P-P H-G Ig	Maximum	.25 — .70	6
9	Ant Coupling Cohdenser	TRAN ANT (C10T)	—	RF AMP Ip	—	—	7
10	RF Amplifier Plate Circuit	TRAN RF AMP (L9T)	2	RF AMP Ip	Minimum	.40 — .60	8
11	Ant Coupling Condenser	TRAN ANT (C10T)	2	RF AMP Ip	Small Increment Increase	—	9
12	RF Amplifier Plate Circuit	TRAN RF AMP (L9T)	2	RF AMP Ip	Minimum	.75 — .90	10

NOTES

Note 1. Adjust for maximum value of Ig. Readjust by turning clockwise (Serial Nos. 101 to 400) or counter-clockwise (Serial Nos. above 400) to obtain approximately 0.8 of maximum Ig.

Note 2. Introduce a modulated carrier of the correct frequency into the antenna plug. Tune each circuit for maximum audio output. The r-f source may be a signal generator or another equipment from which a weak signal is being received. Check operation of Channels 2 and 4.

Note 3. Adjust for maximum value of Ig. Readjust by turning clockwise (Serial Nos. 101 to 400) or counter-clockwise (Serial Nos. above 400) to obtain approximately 0.8 of maximum Ig.

Note 4. See Note 2 above for similar circuits in the Plane-to-Ground Channel.

Note 5. Check for oscillator grid current on each position of the Channel Selection Switch for which a crystal is provided.

Note 6. Tune for maximum indication on Position 2. Then observe the indication on the highest and the lowest frequencies, and trim the tuning until equal grid currents are observed on these frequencies.

Note 7. Adjust for minimum capacity to provide minimum coupling.

Note 8. Adjust the TRAN RF AMP control for minimum plate current.

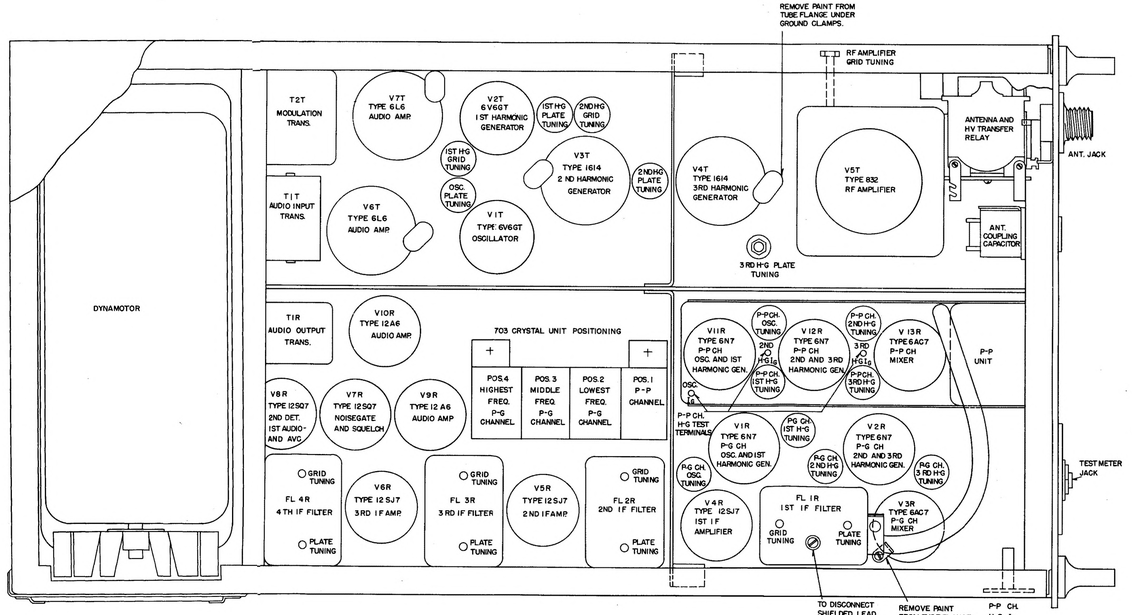
Note 9. Increase the coupling by a small increment.

Note 10. Readjust the TRAN RF AMP for minimum current. Repeat Steps 11 and 12 until only a barely perceptible small dip in plate current is observed when the TRAN RF AMP control is adjusted for minimum meter deflection.

Note 11. In using these tuning instructions, it is assumed that the frequencies selected are in the ascending order, i.e., Channel 1—lowest P-P Frequency; Channel 2—lowest P-G Frequency; and Channel 4—highest P-G Frequency. If other frequency combinations are used, the following changes in these instructions must be observed:

RECEIVER TUNING.—In tuning the Oscillator Plate Circuit (Step 1) it must be aligned at the highest plane-to-ground frequency. The Harmonic Generators (Steps 2, 3, 4) and R-F Input Circuits (Steps 5, 6, 7) must be aligned at the frequency midway between the lowest and highest P-G frequency being used.

TRANSMITTER TUNING.—Rotate the Channel Selection Switch to the channel (normally Channel 2) most nearly midway between the lowest and highest carrier frequency being used and proceed as outlined above.



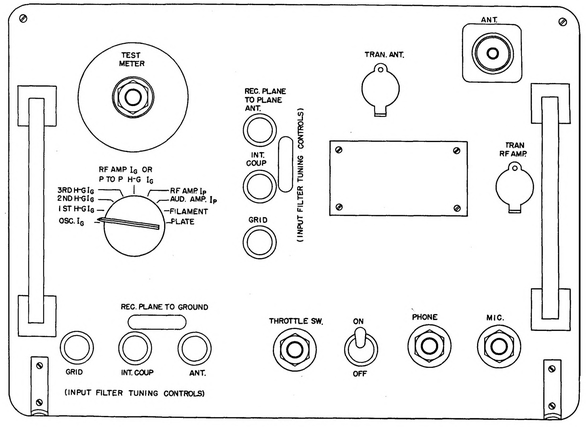


Figure 14—Supplementary Tuning Instructions

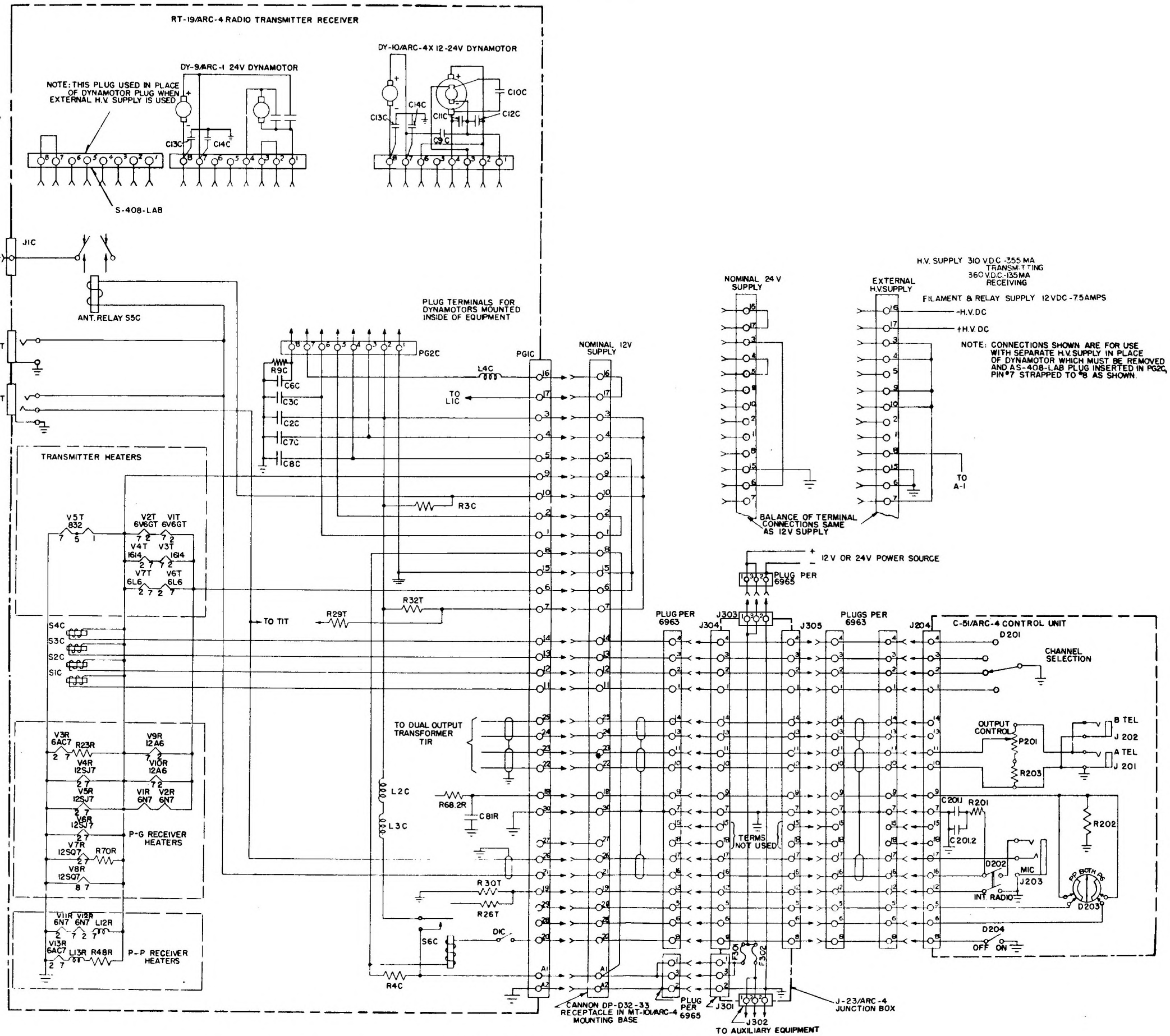
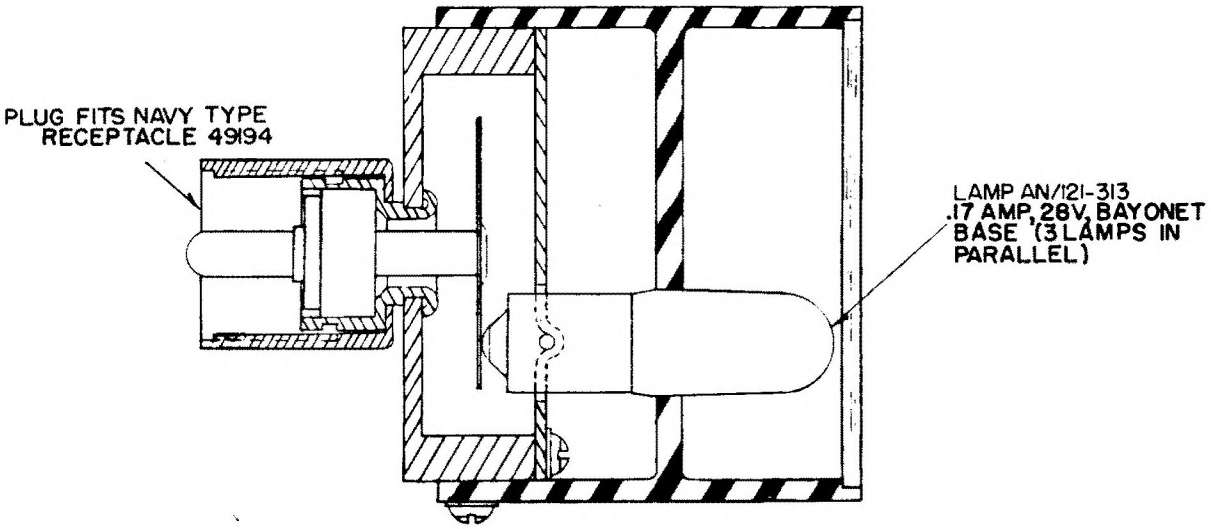
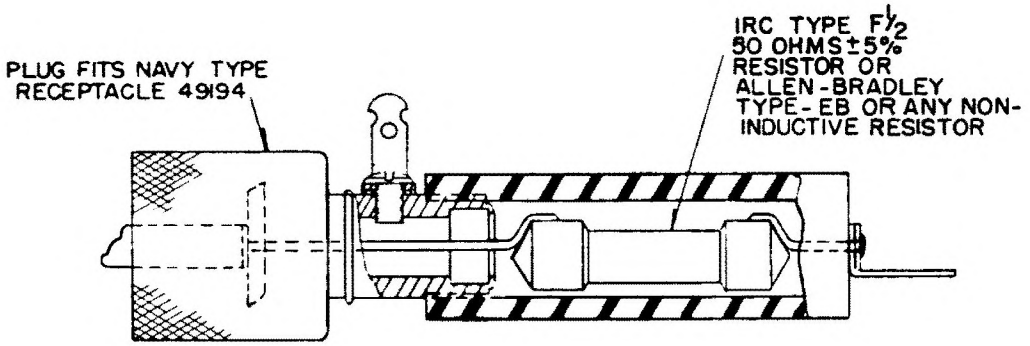


Figure 15—Power and Control Circuits

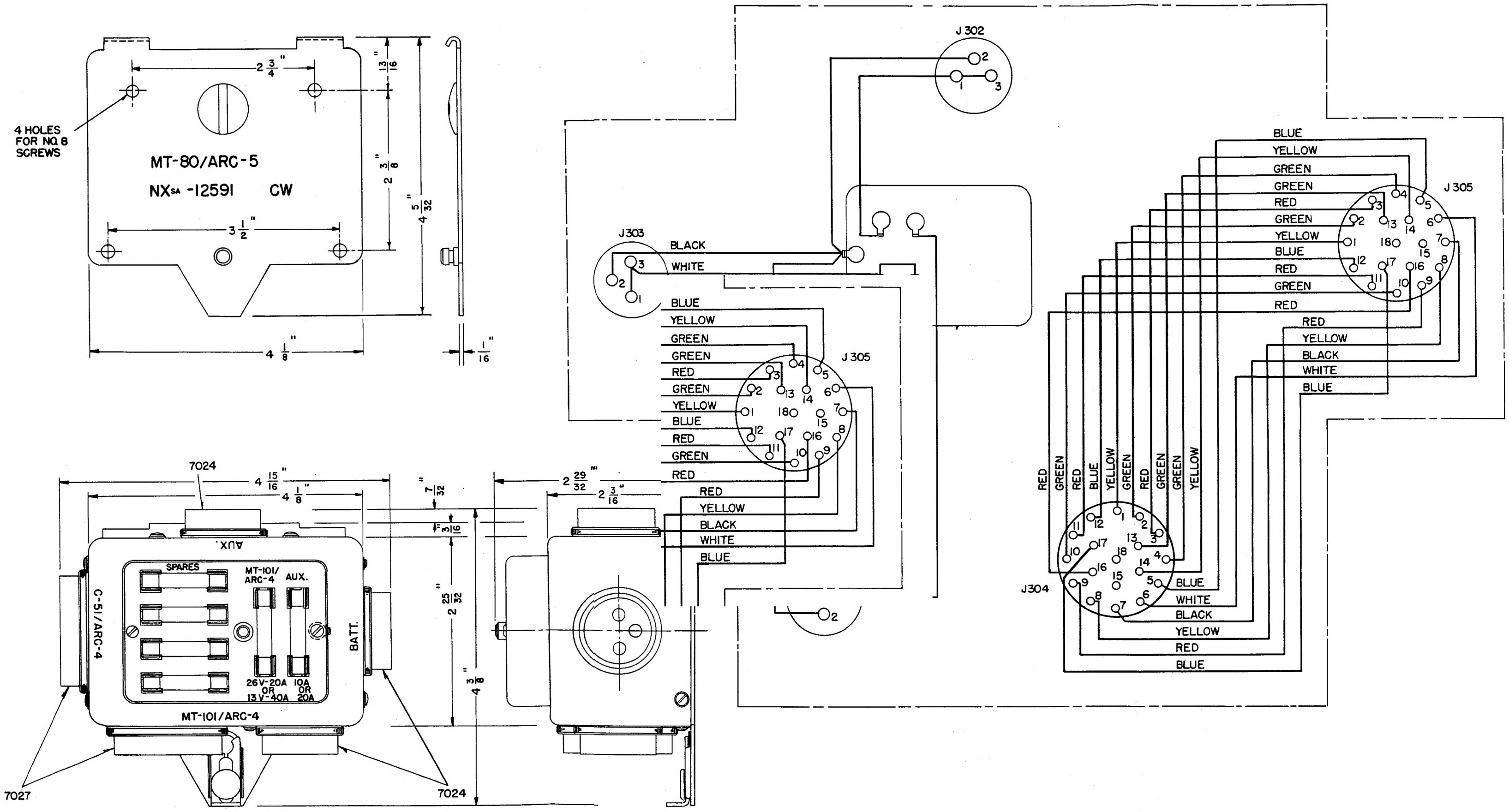


TS-78/ARC-4 TRANSMITTER PHANTOM ANTENNA



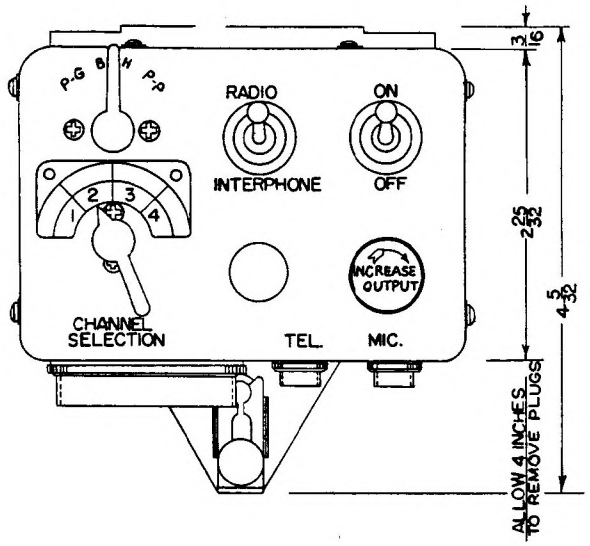
TS-79/ARC-4 RECEIVER PHANTOM ANTENNA

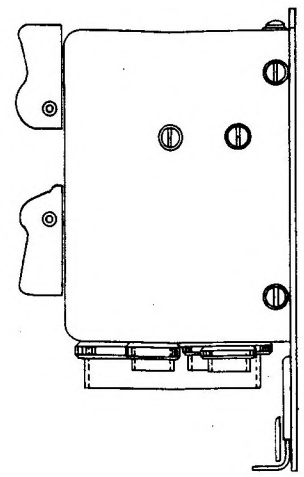
Figure 16—TS-78 ARC-4 Phantom Antenna and TS-79/ARC-4 Phantom Antenna

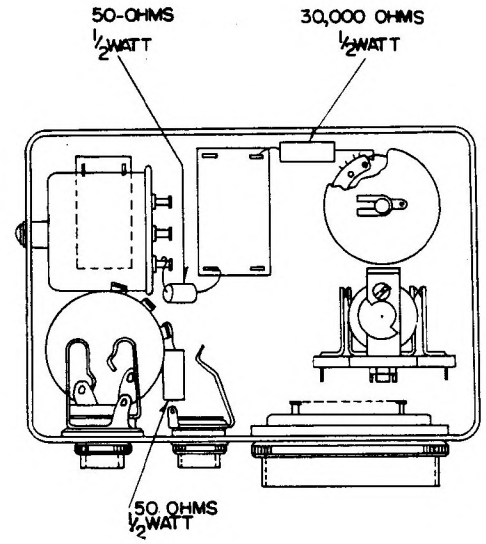


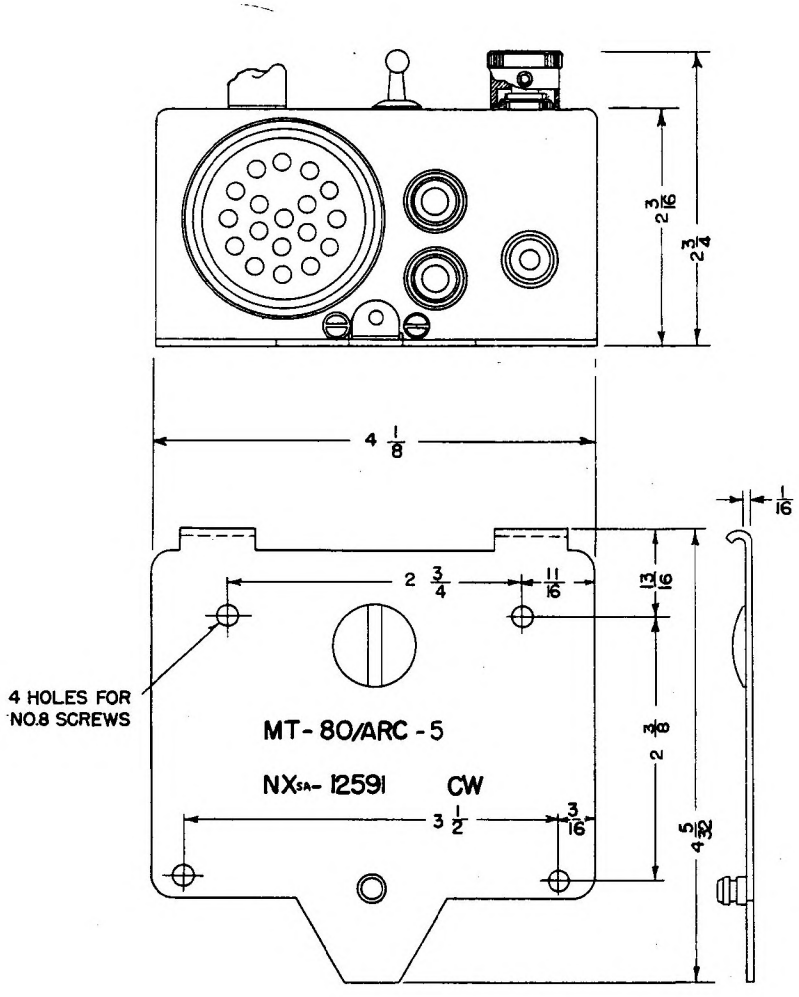
VIEW WITH FUSE COVER REMOVED

Figure 17—J-23/ARC-4 Junction Box









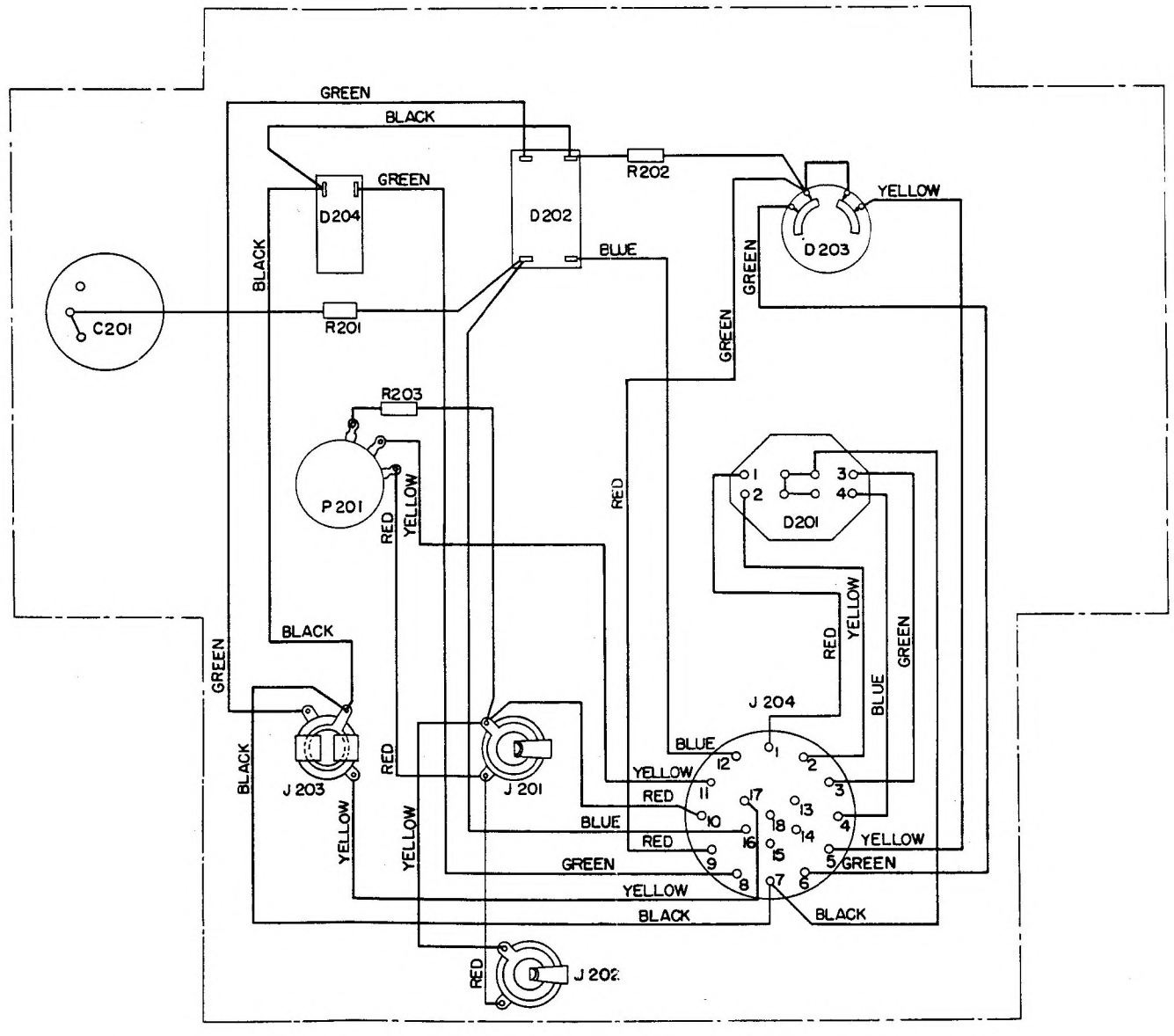
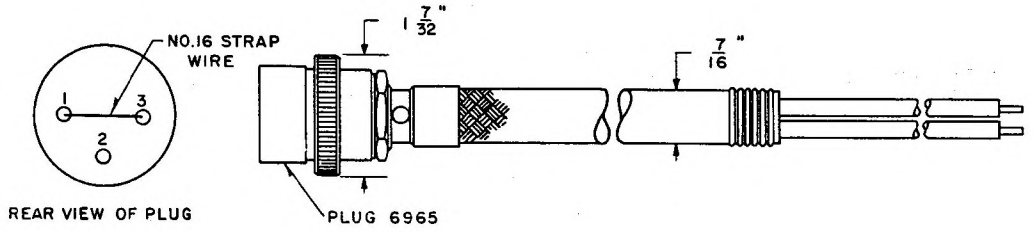


Figure 18—C-51/ARC-4 Control Unit



CUTTING DETAIL

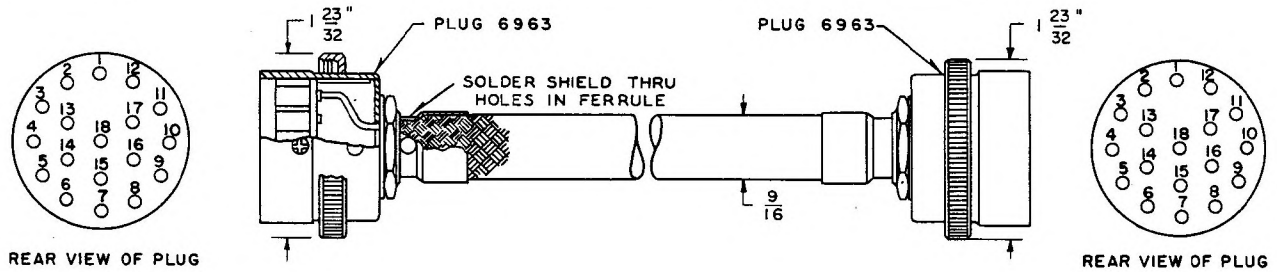
TERMINAL CONNECTION	CONDUCTORS			TERMINAL CONNECTION
	AWG SIZE	TYPE	COLOR	
1 & 3	NO.10	W.E. KS-8640	WHITE	OPEN
2	"	"	BLACK	"

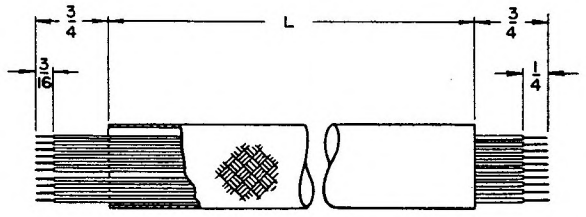
ASSEMBLY PROCEDURE

A. ENCASE CONDUCTORS IN BRAIDED SHIELDING; PREPARE ENDS AS SHOWN.

B. SLIP DISASSEMBLED PLUG PARTS OVER CABLE; MAKE SOLDERED CONNECTIONS SHOWN IN TABLE, SOLDER SHIELD INSIDE FERRULES.

CABLE ASSEMBLY NO.2





CUTTING DETAIL

ASSEMBLY PROCEDURE

A. LACE INDICATED CONDUCTORS INTO COMPACT FORM, CUT TO LENGTH.

B. BOND SHIELDED PAIRS AND PREPARE CONDUCTOR ENDS AS SHOWN.

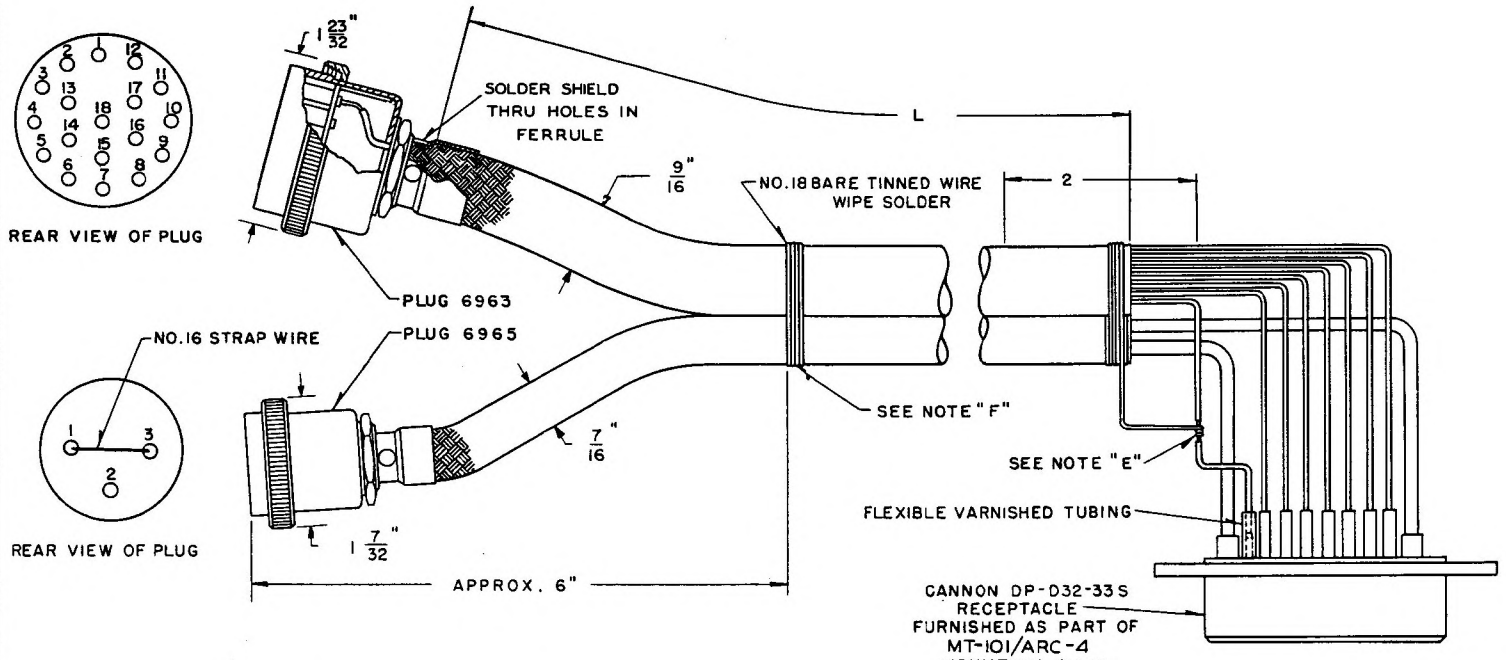
C. ENCASE IN 9/16" BRAIDED SHIELDING, CUT LENGTH OF WHICH MUST ALLOW FOR SHRINKAGE WITH INCREASED DIAMETER.

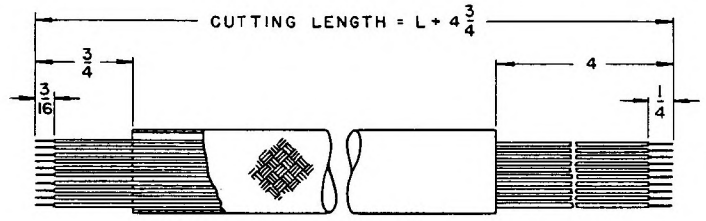
D. SLIP DISASSEMBLED PLUG PARTS OVER CABLE; MAKE SOLDERED CONNECTIONS SHOWN IN TABLE, SOLDER SHIELD INSIDE FERRULES.

TERMINAL CONNECTION	CONDUCTORS			TERMINAL CONNECTION
	AWG SIZE	TYPE	COLOR	
1	NO.20	W.E. KS-8640	RED	1
2	"	"	YEL	2
3	"	"	BL-OR	3
4	"	"	RD-GR	4
5	"	"	BR	5
6	"	"	BL	6
7 GND.	"	"	BLK	7 GND.
8	"	"	GR	8
9	"	"	OR	9
10	"	"	WH *	10
11	"	"	BLK *	11
12	"	"	RD-BL	12
13	"	"	YEL *	13
14	"	"	GR *	14
15		NOT USED		15
16	NO.20	W.E. KS-8640	BL *	16
17	"	"	RED *	17
18		NOT USED		18

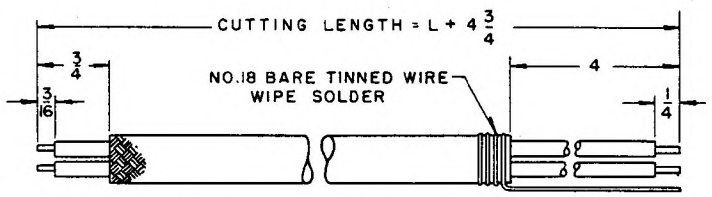
* COLORS DESIGNATED BY ASTERISK ARE SOLID COLORS. ALL OTHER COLORS ARE TRACERS THRU WHITE BRAID.

CABLE ASSEMBLY NO.3





DETAIL OF CONTROL CABLE



DETAIL OF POWER CABLE

ASSEMBLY PROCEDURE

A. LACE INDICATED CONDUCTORS INTO COMPACT FORM, CUT TO LENGTH.

B. BOND SHIELDED PAIRS AND PREPARE CONDUCTOR ENDS AS SHOWN.

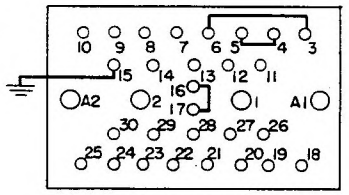
C. ENCASE IN 9/16" BRAIDED SHIELDING, CUT LENGTH OF WHICH MUST ALLOW FOR SHRINKAGE WITH INCREASED DIAMETER.

D. SLIP DISASSEMBLED PLUG PARTS OVER CABLE; MAKE SOLDERED CONNECTIONS SHOWN IN TABLE, SOLDER SHIELD INSIDE FERRULES.

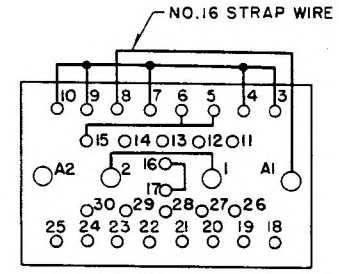
E. SHIELD BOND OF POWER CABLE SPLICES TO BLACK WIRE OF CONTROL CABLE, TIED TO TERMINAL 30 OF CANNON RECEPTACLE.

F. BOND CABLES TOGETHER AS SHOWN, APPROX. 12" BETWEEN BONDS.

NOTE: PLUG NUMBERS ARE DRAWING REFERENCES FROM D-150580 RADIO SET



STRAPS SHOWN ARE FOR 24V. SUPPLY



STRAPS SHOWN ARE FOR 12V. SUPPLY

REAR VIEW OF RECEPTACLE

	TERMINAL CONNECTION	CONDUCTORS			TERMINAL CONNECTION
		AWG SIZE	TYPE	COLOR	
6963	1	NO.20	W.E. KS-8640	RED	11
	2	"	"	YEL	12
	3	"	"	BL-OR	13
	4	"	"	RD-GR	14
	5	"	"	BR	29
	6	"	"	BL	28
	7	"	"	BLK	30
	8	"	"	GR	20
	9	"	"	OR	18
	10	"	"	WH *	22
	11	"	"	BLK *	23
	12	"	"	RD-BL	19
	13	"	"	YEL *	24
	14	"	"	GR *	25
	15		NOT USED		
	16	NO.20	W.E. KS-8640	BL *	21
	17	"	"	RED *	26
	18		NOT USED		
6965	1 & 3	NO.10	W.E. KS-8640	WH	A1
	2	"	"	BLK	A2

* COLORS DESIGNATED BY ASTERISK ARE SOLID COLORS. ALL OTHER COLORS ARE TRACERS THRU WHITE BRAID.

CABLE ASSEMBLY NO.1

Figure 19—Cable Assembly Instructions

INDEX BY PAGES