TM 11-285

TO 16-30 VRC 7-5

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

RADIO SET AN/VRC-7

DEPARTMENT OF THE ARMY • MARCH 1951

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WARNING

HIGH VOLTAGE

is used in the operation of this equipment

DEATH ON CONTACT

may result if operating personnel fail to observe safety precautions



First Aid for Electric Shock

RESCUE.

In case of electric shock, shut off the high voltage at once and ground the circuits. If the high voltage cannot be turned off without delay, free the victim from contact with the live conductor as promptly as possible. Avoid direct contact with either the live conductor or the victim's body. Use a dry board, dry clothing, or other nonconductor to free the victim. An ax may be used to cut the high-voltage wire. Use extreme caution to avoid the resulting electric flash.

SYMPTOMS.

a. Breathing stops abruptly in electric shock if the current passes through the breathing center at the base of the brain. If the shock has not been too severe, the breath center recovers after a while and normal breathing is resumed, provided that a sufficient supply of air has been furnished meanwhile by artificial respiration.

b. The victim is usually very white or blue. The pulse is very weak or entirely absent and unconsciousness is complete. Burns are usually present. The victim's body may become rigid or stiff in a very few minutes. This condition is due to the action of electricity and is not to be considered rigor mortis. Artificial respiration must still be given, as several such cases are reported to have recovered. The ordinary and general tests for death should never be accepted.

TREATMENT.

a. Start artificial respiration immediately. At the same time send for a medical officer, if assistance is available. Do not leave the victim unattended. Perform artificial respiration at the scene of the accident, unless the victim's or operator's life is endangered from such action. *In this case only*, remove the victim to another location, but no farther than is necessary for safety. If the new location is more than a few feet away, artificial respiration should be given while the victim is being moved. If the method of transportation prohibits the use of the Shaeffer prone pressure method, other methods of resuscitation may be used. Pressure may be exerted on the front of the victim's diaphragm, or the direct mouth-to-mouth method may be used. Artificial respiration, once started, must be continued, without loss of rhythm.

b. Lay the victim in a prone position, one arm extended directly overhead, and the other arm bent at the elbow so that the back of the hand supports the head. The face should be turned away from the bent elbow so that the nose and mouth are free for breathing.

c. Open the victim's mouth and remove any foreign bodies, such as false teeth, chewing gum, or tobacco. The mouth should remain open, with the tongue extended. Do not permit the victim to draw his tongue back into his mouth or throat.

d. If an assistant is available during resuscitation, he should loosen any tight clothing to permit free circulation of blood and to prevent restriction of breathing. He should see that the victim is kept warm, by applying blankets or other covering, or by applying hot rocks or bricks wrapped in cloth or paper to prevent injury to the victim. The assistant should also be ever watchful to see that the victim does not swallow his tongue. He should continually wipe from the victim's mouth any frothy mucus or saliva that may collect and interfere with respiration.

e. The resuscitating operator should straddle the victim's thighs, or one leg, in such manner that:

(*1*) the operator's arms and thighs will be vertical while applying pressure on the small of the victim's back;

(*2*) the operator's fingers are in a natural position on the victim's back with the little finger lying on the last rib;

(*3*) the heels of the hands rest on either side of the spine as far apart as convenient without allowing the hands to slip off the victim;

(*4*) the operator's elbows are straight and locked.

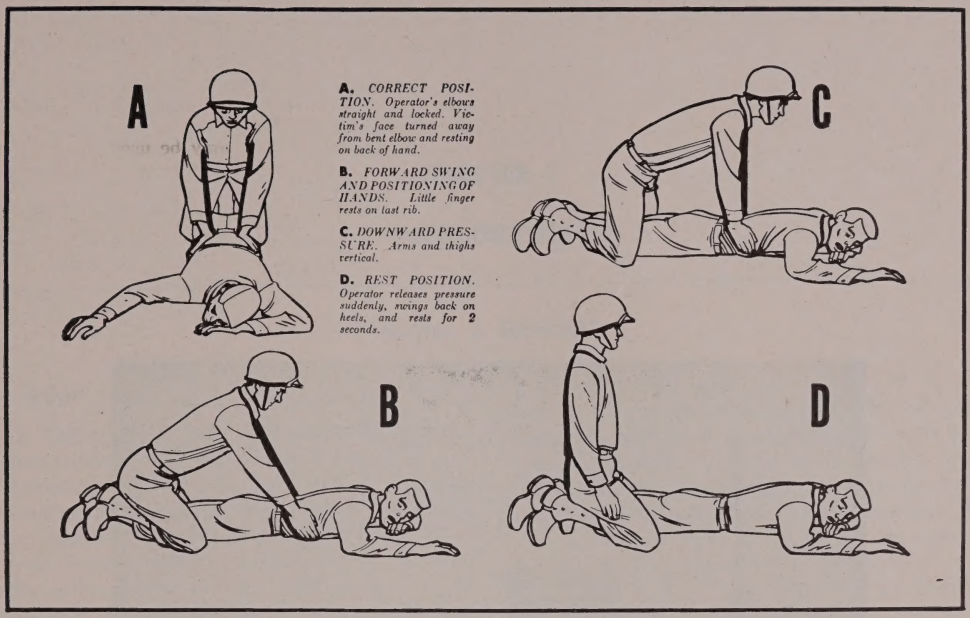
f. The resuscitation procedure is as follows:

(*1*) Exert downward pressure, not exceeding 60 pounds, for 1 second.

(*2*) Swing back, suddenly releasing pressure, and sit on the heels.

(*3*) After 2 seconds rest, swing forward again, positioning the hands exactly as before, and apply pressure for another second.

g. The forward swing, positioning of the hands, and the downward pressure should be accomplished in one continuous motion, which requires 1 second. The release and backward swing require 1 second. The addition of the 2-second rest makes a total of 4



seconds for a complete cycle. Until the operator is thoroughly familiar with the correct cadence of the cycle, he should count the seconds aloud, speaking distinctly and counting evenly in thousands. Example: one thousand and one, one thousand and two, etc.

h. Artificial respiration should be continued until the victim regains normal breathing or is pronounced dead by a medical officer. Since it may be necessary to continue resuscitation for several hours, relief operators should be used if available.

RELIEVING OPERATOR.

The relief operator kneels beside the operator and follows him through several complete cycles. When the relief operator is sure he has the correct rhythm, he places his hands on the operator's hands without applying pressure. This indicates that he is ready to take over. On the backward swing, the operator moves and the relief operator takes his position. The relieved operator follows through several complete cycles to be sure that the new operator has the correct rhythm. He remains alert to take over instantly if the new operator falters or hesitates on the cycle.

STIMULANTS.

a. If an inhalant stimulant is used, such as aromatic spirits of ammonia, the individual administering the stimulant should first test it himself to see how close he can hold the inhalant to his own nostril for comfortable breathing. Be sure that the inhalant is not held any closer to the victim's nostrils, and then for only 1 or 2 seconds every minute.

b. After the victim has regained consciousness, he may be given hot coffee, hot tea, or a glass of water containing ½ teaspoon of aromatic spirits of ammonia. *Do not give any liquids to an unconscious victim.*

CAUTIONS.

a. After the victim revives, keep him LYING QUIETLY. Any injury a person may have received may cause a condition of shock. Shock is present if the victim is pale and has a cold sweat, his pulse is weak and rapid, and his breathing is short and gasping.

b. Keep the victim lying flat on his back, with his head lower than the rest of his body and his hips elevated. Be sure that there is no tight clothing to restrict the free circulation of blood or hinder natural breathing. Keep him warm and quiet.

c. A resuscitated victim must be watched carefully as he may suddenly stop breathing. *Never leave a resuscitated person alone until it is CERTAIN that he is fully conscious and breathing normally.*

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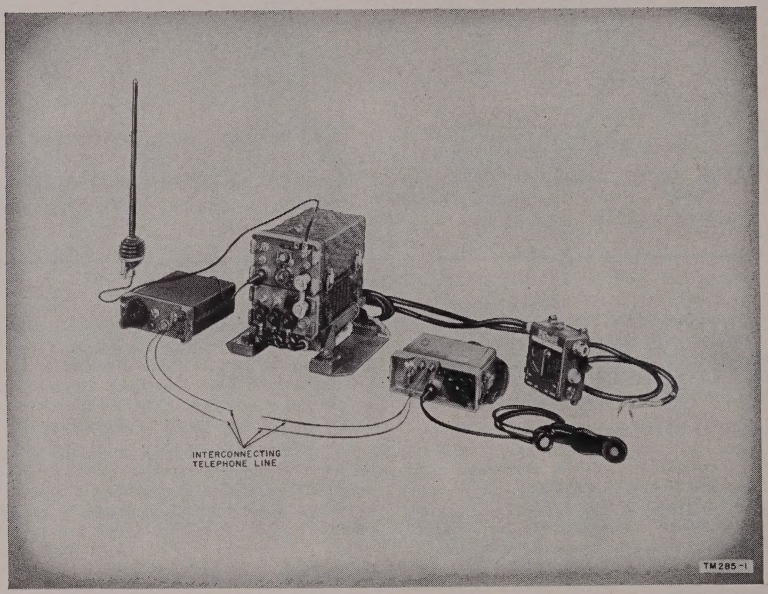


Figure 1. Radio Set AN/VRC-7.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This technical manual contains instructions for the installation, operation, and organizational maintenance of Radio Set AN/VRC–7. The information is intended primarily for operators and organizational maintenance personnel and hence is restricted to system considerations. Detailed information on the various units which comprise the system is presented only to the extent that system applications are involved. Detailed field maintenance instructions for the individual major components are contained in separate manuals (app. I).

b. Illustrations in this manual are in numerical sequence except figures 35, 52, 54, 65, and 66 which appear in an envelope at the back of the manual.

2. Nomenclature

To clarify the discussion of Radio Set AN/VRC–7, an arbitrary nomenclature has been devised to refer to the set and its several units. This expedient is outlined in *a* through *d* below.

a. When Radio Set AN/VRC–7 is installed in a vehicle, the operating installation is referred to as a *system.* The radio set proper is referred to as a *basic set* (par. 6) and it must be combined with an *installation unit* (par. 7) before an operating system can be effected.

b. Receiver-Transmitter RT–70/GRC, which is a unit of Radio Set AN/VRC–7, is often referred to simply as the *receiver-transmitter.* Because it often is used in conjunction with other receiver-transmitters in more complex systems, Receiver-Transmitter RT–70/GRC is referred to also as *Set 2* on control unit panels and some schematic diagrams. In Radio Set AN/VRC–7 there is no *Set 1* receiver-transmitter, although panel and schematic references are made to such a set.

c. AF Amplifier AM–65/GRC, another major unit of the radio set, generally is referred to by the more functional title of *interphone amplifier.* The various control units of the radio set also are referred to by functional title as follows:

(1) Local Control C–434/GRC is referred to as the *local control unit.*

(2) Remote Control C–433/GRC is referred to as the *remote control unit.*

(3) Control Box C–375/VRC is referred to as the *interphone box* or simply as the *control box.*

d. The term *power supply* is used to designate Power Supply PP–281/GRC, Power Supply PP–282/GRC, or Power Supply PP–448/GRC, any one of which may be used to supply operating voltages for both Receiver-Transmitter RT–70/GRC and AF Amplifier AM–65/GRC. The vehicular battery voltage available determines which power supply must be used, Power Supply PP–448/GR, PP–281/GRC, or PP–282/GRC, being required for 6-volt, 12-volt, or 24-volt operation, respectively.

3. Forms and Records

The following forms will be used for reporting unsatisfactory conditions of Army matériel and equipment.

a. DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745–45–5.

b. DA AGO Form 468, Unsatisfactory Equip-

ment Report, will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700–45–5.

c. DA AGO Form 419, Preventive Maintenance Checklist for Signal Corps Equipment, will be prepared in accordance with instructions on the back of the form.

d. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

4. Purpose of Equipment

a. Radio Set AN/VRC–7 provides f-m (frequency-modulated) radio-telephone facilities within the frequency range of 47 to 58.4 mc (megacycles). The frequency range of this set and of other radio equipment with which this set can communicate is indicated in the frequency spectrum chart (fig. 2).

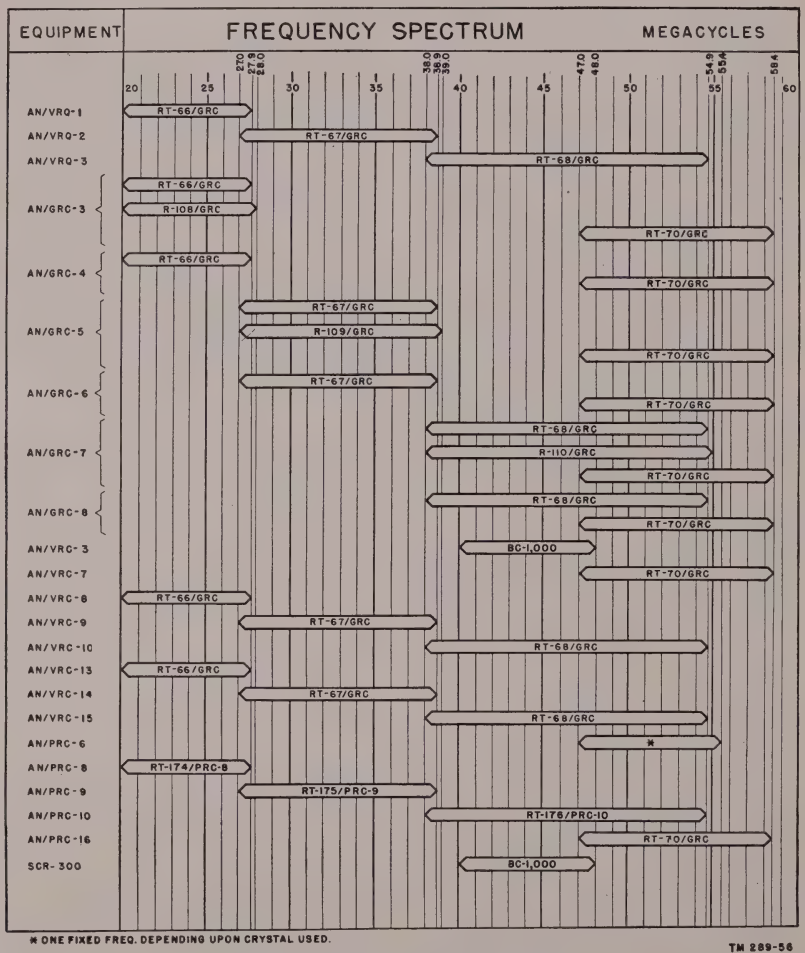


Figure 2. Frequency spectrum chart.

b. Radio Set AN/VRC–7 can be installed and operated in trucks, armored utility vehicles, tanks, and other authorized vehicles (par. 7). It is designed primarily for very short-range operation (up to 1 mile) within and between armored, artillery, and infantry units.

5. Technical Characteristics

Type of transmission and reception.	Frequency-modulated signals.
Frequency range	47 to 58.4 mc.
Type of tuning	Continuous tuning with detent provisions for preselection of any two frequencies.
Operational facilities:	
Monitoring.	
Push-to-talk operation from local or remote control stations.	
Interphone facilities.	
Full-duplex telephone circuit between local and remote control units.	
Communication range	Approximately 1 mile.
Total power drain	From 16 to 63 watts, depending upon the mode of operation. Power drains are as follows:

Unit	Input voltage	Input amperage	
		Stand-by	Transmission
Set 2 and interphone amplifier	6. 3	5. 1	5. 3
	12. 6	4. 1	4. 3
	25. 2	2. 3	2. 5
Interphone amplifier	6. 3	2. 6	3. 4
	12. 6	2. 6	3. 2
	25. 2	1. 4	1. 8

Transmitter r-f (radio-frequency) power output.	Approximately 500 mw (milliwatts).
Receiver a-f (audio-frequency) power output.	Approximately 75 mw.
Interphone amplifier a-f power output:	
Set 1+Interphone channel.	350 mw.
Set 1+Set 2+Interphone channel.	1,800 mw.
Set 2+Interphone channel.	350 mw.
Microphone input impedance.	150 ohms.
Audio output impedance.	150 ohms at the fixed-level Set 1+Set 2+interphone output of the interphone amplifier; 600 ohms at all other audio output terminals.
Receiver bandwidth.	Approximately 80 kc, 6 db (decibels) down.
Receiver sensitivity.	30-db signal-plus-noise to noise ratio with ½-uv (microvolt) input signal.

6. Table of Components

a. A table of components for Radio Set AN/VRC–7 is shown in table I. All dimensions and weights are approximate. Although there is only one listing of components, the availability of Power Supply PP–448/GR, PP–281/GRC, or PP–282/GRC indicates that there are actually three basic sets. A basic set which includes Power Supply PP–448/GR is used in 6-volt systems; for 12-volt or 24-volt systems the basic unit must include Power Supply PP–281/GRC or PP–282/GRC, respectively.

b. As indicated in paragraph 2, a basic set does not, in itself, constitute an operating system. For installation and operation in particular vehicles, the additional equipment listed in paragraph 7 also is required.

7. Additional Equipment Required

a. To install and operate the basic radio set listed in table I, an installation unit also is required. The operating voltage available in the vehicle determines whether a 6-volt, a 12-volt, or a 24-volt basic set is required. The type of vehicle determines what installation unit is supplied (or must be requisitioned), since such items as audio accessories, cables, junction boxes, and mounting hardware vary with the type of vehicle.

b. Table II indicates the vehicular installation units which can be used with each basic radio set. For example, a basic Radio Set AN/VRC–7 installed in a ¼-ton 4 x 4 truck, which has a 12-volt storage battery, utilizes installation unit 2S4502–7–V26/50. The stock number for the basic radio set (2S4502–7/12) indicates that a 12-volt power supply is provided. A complete system (basic set and installation unit) is also designated by a separate stock number; in the above example, 2S4502–7–V26.1 is the complete system or equipment stock number.

c. The complete contents of the installation

units are not listed, but the audio accessories (any of which may be supplied, depending upon the particular vehicular requirements) are described in paragraph 17.

Table I. Components

Component	Quantity	Dimensions of components				
		Height (in.)	Depth (in.)	Length (in.)	Volume (cu. ft.)	Unit weight (lb.)
Receiver-Transmitter RT–70/GRC	1	4¾	13	7⅞	0. 31	25
AF Amplifier AM–65/GRC	1	4¼	13	7⅞	. 30	15. 5
Power Supply PP–281/GRC, PP–282/GRC, or PP–448/GR	1	4½	6	3	. 04	6
Control Box C–375/VRC	1	8	4	7	. 1	3. 5
Mounting MT–300/GR	1	3 1/16	13	8 5/16	. 3	10
Control Group AN/GRA–6:						
Local Control C–434/GRC	1	3½	10½	8¾	. 18	8
Remote Control C–433/GRC	1	3½	7	9⅜	. 13	5
Handset H–33/PT	1	3	2 1/16	3	. 03	2
Bag CW–189/GR	1	11	7¾	10⅝		1
Adapter UG–273/U	1				. 0032	. 17
Case CY–684/GR	1				. 17	3
Mast Base AB–15/GR	1	15	3⅛		. 12	3. 36
Mast Section AB–22/GR	2			23. 5	. 04	1. 36
Mast Section AB–24/GR	2			23. 5	. 005	. 13
Special Purpose Cable Assembly CX–1213/U	1				. 25	4
RF Cable Assembly CG–530/U	1			50	. 01	. 5
Adapter UG–306/U	1	7/16	1	1	. 006	. 36
Bag CW–206/GR	1	3 thick	5 wide	40	. 34	3. 5
Technical Manual TM 11–285	1	8	¼	10	. 08	1
Special Purpose Cable WM–46/U	1	.6 (dia)		120	. 4	9
Connector and bondnut, Appleton Electrical Company No. 61007 and BL–50 or equal	1				. 01	. 5

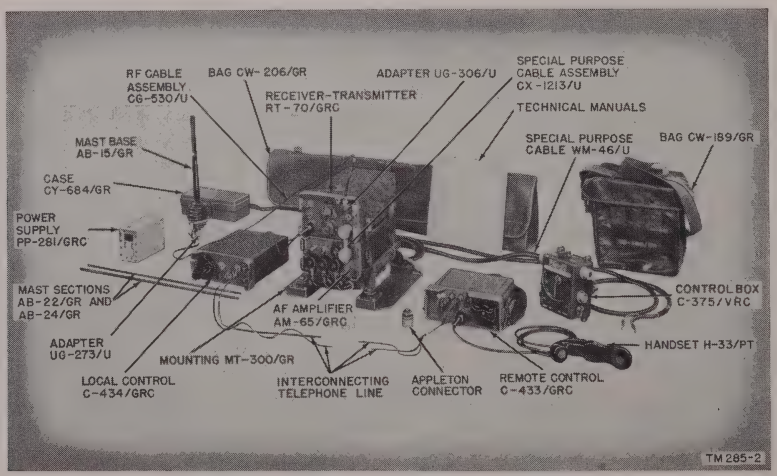


Figure 3. Components of Radio Set AN/VRC–7.

Table II. Vehicular Installation Units

Radio Set	Type of vehicle	Stock number		
		Complete equipment	Basic set	Installation unit
AN/VRC–7	M4 Series Med Tank 76-mm Wet	2S4502–7–V8.2	2S4502–7/24	2S12–3–V8.2/5
AN/VRC–7	M4 Series Med Tank 105-mm and 75-mm Wet.	2S4502–7–V8.3	2S4502–7/24	2S12–3–V8.3/5
AN/VRC–7	Truck ¼ Ton 4 x 4 (6-volt)	2S4502–7–V26	2S4502–7/6	2S4502–7–V26/50
AN/VRC–7	Truck ¼ Ton 4 x 4 (12-volt)	2S4502–7–V26.1	2S4502–7/12	2S4502–7–V26/50
AN/VRC–7	Truck ¼ Ton 4 x 4 Utility M38 (24-volt)	2S4502–7–V76	2S4502–7/24	2S4502–7–V76/50
AN/VRC–7	Tank Recovery Vehicle M32	2S4502–7–V79	2S4502–7/24	2S12–3–V79/50
AN/VRC–7	Medium Tank M26 and M45	2S4502–7–V93	2S4502–7/24	2S12–3–V93/50

d. In addition to the equipment included with basic sets and installation units, the following dry cells are required for Control Group AN/GRA–6 (par. 36):

(1) Four 1½-volt Batteries BA–30.

(2) One 45-volt Battery BA–414/U.

8. Packaging Data

The components of the basic radio set (par. 6) are packed for shipment in three wooden boxes. The components first are packaged individually in moisture-vaporproof containers and then distributed in the three wooden boxes. The over-all weight and volume of each container is listed in *a* below. The contents of each box are listed in *b* below.

Note. Items may be packaged in a manner different from that shown, depending on the supply channels.

a. Weight and Volume of Boxes.

Box No.	Weight (lb.)	Volume (cu. ft.)
1	39	0. 91
2	96	3
3	29	1. 01
Total	164	4. 92

b. Contents of Each Box.

Box No.	Item	Quantity	Notes
1	Receiver-Transmitter RT–70/GRC.	1 ea	
	AF Amplifier AM–65/GRC.	1 ea	
	Power Supply PP–448/GR. or Power Supply PP–281/GRC. or Power Supply PP–282/GRC.	1 ea	PP–448/GR supplied for 6-volt systems; PP–281/GRC supplied for 12-volt systems; PP–282/GRC supplied for 24-volt systems.
2	Mast Base AB–15/GR	1 ea	
	Mast Section AB–22/GR	2 ea	
	Mast Section AB–24/GR	2 ea	
	Control Group AN/GRA–6.	1 ea	
	Adapter UG–273/U	1 ea	
	Adapter UG–306/U	1 ea	
	Special Purpose Cable Assembly CX–1213/U.	1 ea	
	Bag CW–206/GR	1 ea	
	Case CY–684/GR	1 ea	
	Technical Manual TM 11–285.	2 ea	
3	Special Purpose Cable WM–46/U.	10 ft.	
	Control Box C–375/VRC	1 ea	
	Mounting MT–300/GR	1 ea	
	RF Cable Assembly CG–530/U.	1 ea	
	Connector and bondnut, Appleton Electrical Company No. 61007 and BL–50, or equal.	1 ea	

9. General System Description

a. Introduction. Radio Set AN/VRC–7 includes a receiver-transmitter, a power supply, three control units, an interphone amplifier, an

antenna system, and interconnecting cables (fig. 3). The nomenclature outlined in paragraph 2 and the listing of components (table I) will help in the understanding of the following description. The system cordage diagram (fig. 24), which is essentially an outline illustration of the set, also is helpful in understanding the cabling of the system.

b. Major Components. Figure 1 shows the major components of Radio Set AN/VRC–7 connected to simulate an operating installation. Receiver-Transmitter RT–70/GRC and AF Amplifier AM–65/GRC are secured on Mounting MT–300/GR, which normally is bolted to a vehicular mounting surface. The power supply for the system (par. 2*d*) is installed within the amplifier. Connections are made from the mounting to the major units supported on the mounting and to one or more interphone box, Control Box C–375/VRC. The interphone boxes are used for normal push-to-talk control of the radio sets as well as for intercommunication between control stations. Connection to the antenna system is made directly from the panel of the receiver-transmitter (fig. 24).

c. Remote Control Facilities. When remote push-to-talk facilities are required, Local Control C–434/GRC may be connected to the AUDIO receptacle on the receiver-transmitter, and connection made to Remote Control C–433/GRC by telephone wire (figs. 1 and 24). If the local control unit is connected to the interphone amplifier also, limited (one-way) interphone operation is possible from either the remote or local unit to Control Box C–375/VRC. Complete duplex interphone facilities among interphone boxes, the local control unit and remote control unit are available when the local control unit is connected to the interphone amplifier only. In this case, however, push-to-talk operation of the receiver-transmitter is not possible.

10. Receiver-Transmitter RT–70/GRC
(fig. 4)

a. Receiver-Transmitter RT–70/GRC is a small lightweight radio set sometimes referred to as Set 2 (par. 2). A complete description is given in a separate technical manual. Characteristics pertinent to system operation are listed in paragraph 5.

b. Electrically the unit consists of a double-conversion type, superheterodyne f-m receiver which is linked to an f-m transmitter through a

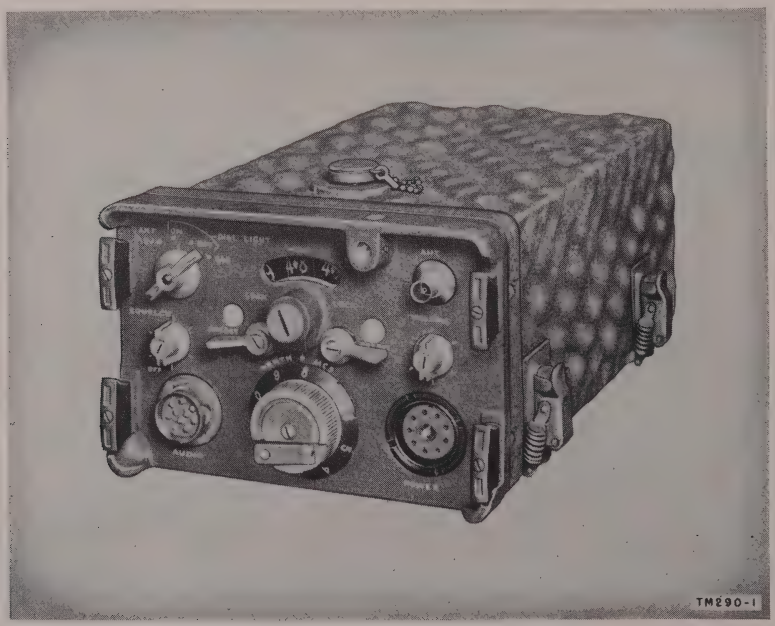


Figure 4. Receiver-Transmitter RT–70/GRC.

common antenna circuit. Tuning is continuous over a range of 47 to 58.4 mc and a detent mechanism is provided for presetting any two frequencies (par. 48). Both receiver and transmitter are tuned simultaneously by one control.

c. Mechanically the receiver-transmitter is a panel-chassis assembly contained in a metal case. Snap catches are provided on the case for mounting it on AF Amplifier AM–65/GRC (fig. 5). When the case is removed (figs. 43, 44, and 45) the r-f and i-f (intermediate-frequency) chassis assemblies are exposed. All tubes are mounted on these vertical chassis.

b. Electrically, the interphone amplifier is a three-channel mixer and a-f amplifier. The three channels provide a *Set 1+Interphone output*, a *Set 1+Set 2+Interphone output*, and a *Set 2+Interphone output*. The interphone signal predominates on the Set 1+Set 2+Interphone channel; the signals from the receiver-transmitters are approximately equal to the interphone signal on the other two channels.

c. In Radio Set AN/VRC–7 the Set 1+Interphone channel provides an interphone output only, since there is no Set 1 receiver-transmitter. Similarly, the Set 1+Set 2+Interphone channel provides only a Set 2+Interphone output.

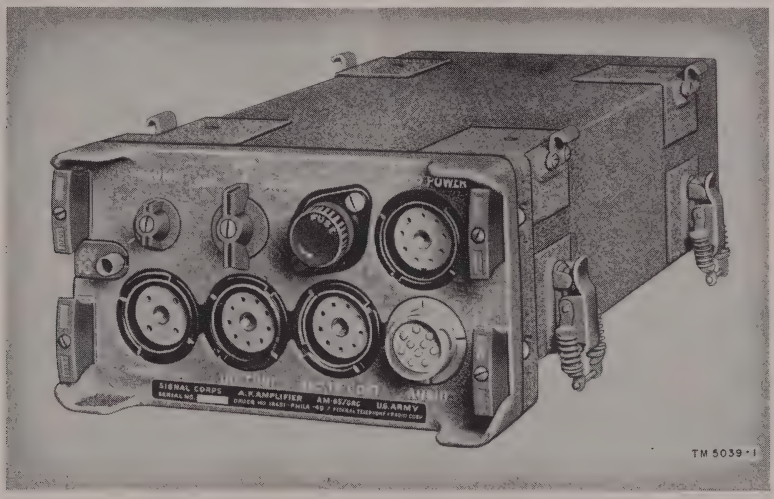


Figure 5. AF Amplifier AM–65/GRC.

d. In vehicular installations the receiver-transmitter obtains its operating voltages from a plug-in power-supply unit installed in AF Amplifier AM–65/GRC (par. 11). In field applications the receiver-transmitter may be powered by dry batteries contained in Case CY–590/GRC (ch. 6).

11. AF Amplifier AM–65/GRC
(fig. 5)

a. AF Amplifier AM–65/GRC is generally referred to as the interphone amplifier because of its function in the interphone system of the radio set. It serves an additional function, however, as a monitor amplifier for the output of the receiver-transmitter. Detailed information on the amplifier is contained in a separate technical manual (app. I).

d. Mechanically the interphone amplifier is a panel-chassis assembly inclosed in a metal case. Channel rails on the bottom of the case permit the unit to be installed on Mounting MT–300/GR; hooks on the case accommodate the snap catches of Receiver-Transmitter RT–70/GRC, which normally mounts on top of the amplifier in a vehicular installation (fig. 3). When the case is removed (fig. 40), all replaceable parts are accessible.

e. A compartment within the amplifier (fig. 40) accommodates a plug-in power supply unit (par. 12), which supplies operating voltages for both the amplifier and the receiver-transmitter. The voltages for the receiver-transmitter are made

available at the RT–70 POWER receptacle on the front panel.

12. Power Supply

(fig. 6)

a. Power Supplies PP–448/GR, PP–281/GRC, and PP–282/GRC are small, light vibrator-type plug-in units which derive power from 6-, 12-, or 24-volt vehicular storage batteries, respectively.

b. These units are designed for plugging into the power-supply compartment of AF Amplifier AM–65/GRC (fig. 40). Besides furnishing operating voltages for the amplifier, the power supplies also furnish operating voltages for Receiver-Transmitter RT–70/GRC.

13. Mounting MT–300/GR

a. Mounting MT–300/GR (fig. 7) serves as a support for the receiver-transmitter and interphone amplifier, and as a junction box for interconnecting the receiver-transmitter and interphone amplifier with Control Box C–375/VRC. As a

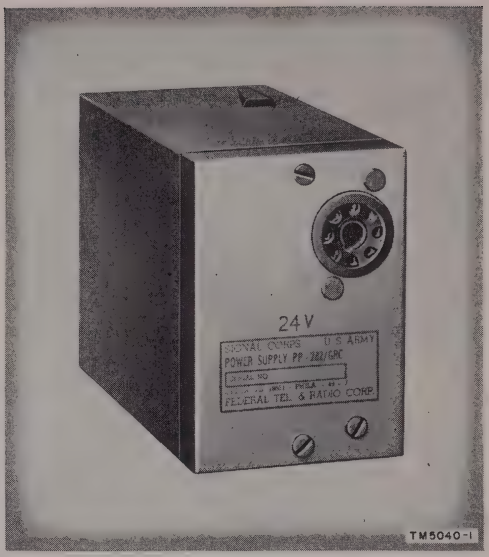


Figure 6. Power Supply PP–282/GRC.

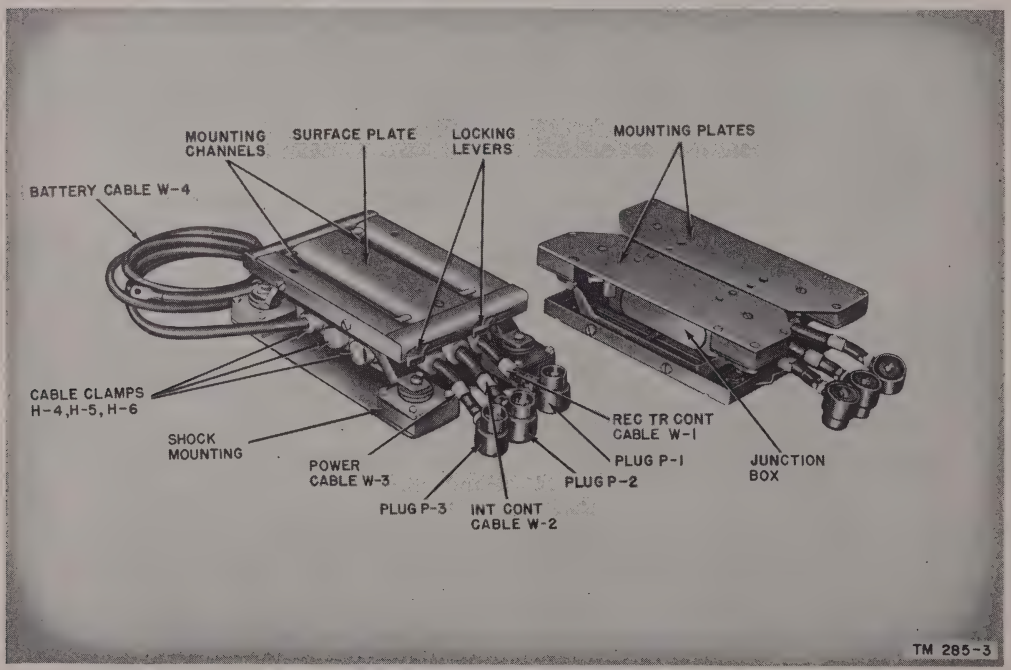


Figure 7. Mounting MT–300/GR.

junction box it also interconnects the vehicular power source and the power supply within the amplifier. Figures 1 and 24 demonstrate the dual function of the mounting.

b. At either end of the mounting are two shock-mounted supports which are normally bolted to the vehicular mounting surface. A mounting table is secured to these supports, and a junction box is suspended from the under surface of the table near the center of the unit (fig. 7).

c. The mounting table is channeled to accept the rails on the bottom of the interphone amplifier. Locking levers are provided on the front edge of the mounting table to secure the amplifier on the table.

d. The junction box at the center of the unit contains the terminal board and electrical circuits (fig. 17) which serve to connect the units in an operating system. Cables are provided on one side of the junction box to connect the mounting to the vehicular battery and to the Control Box C–375/VRC. The cables which connect from the front of the junction box to the interphone amplifier bear the same identifying nomenclature as the panel receptacles to which they should connect. For example, the plug on the end of cable W–1 is designated REC-TR CONT.

14. Control Box C–375/VRC
(fig. 8)

a. One or more interphone box (Control Box C–375/VRC) is used in every installation for push-

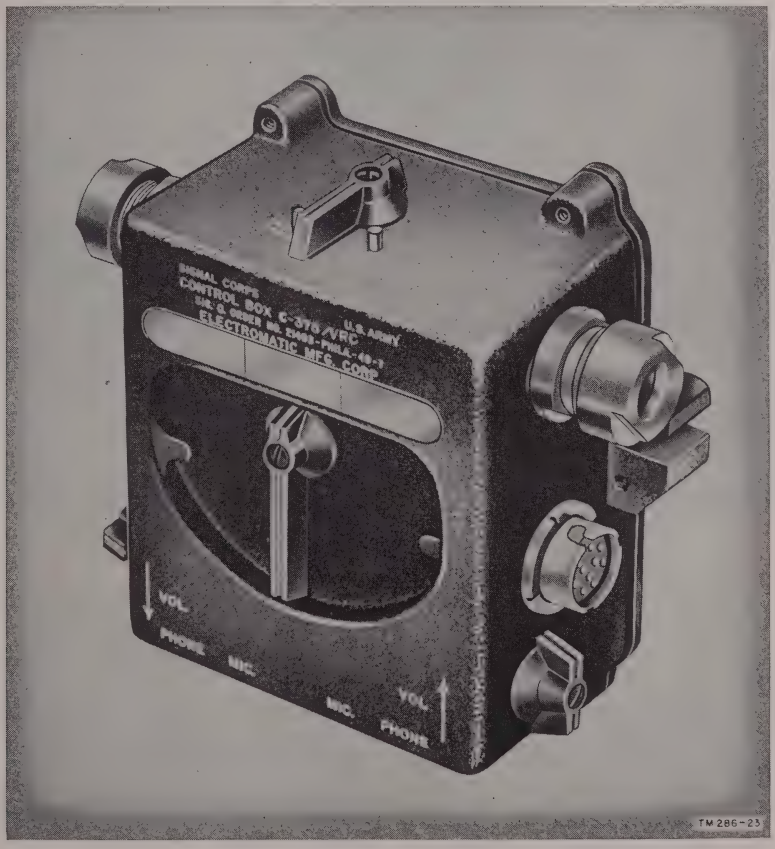


Figure 8. Control Box C–375/VRC.

to-talk control of the radio sets and as an interphone station. One unit is supplied with the basic radio set (par. 6); additional units may be supplied in the installation kits (par. 7).

b. The interphone boxes normally are installed at a distance from Mounting MT–300/GR (in locations convenient for driver, gunner, commander, or another operator) and are connected to the mounting either directly or indirectly by means of

15. Control Group AN/GRA–6
(fig. 9)

a. Control Group AN/GRA–6 may be used to provide local or remote monitoring and push-to-talk control of the radio set, and includes provision for telephone communication between local and remote control stations. The control group includes Local Control C–434/GRC, Remote Con-

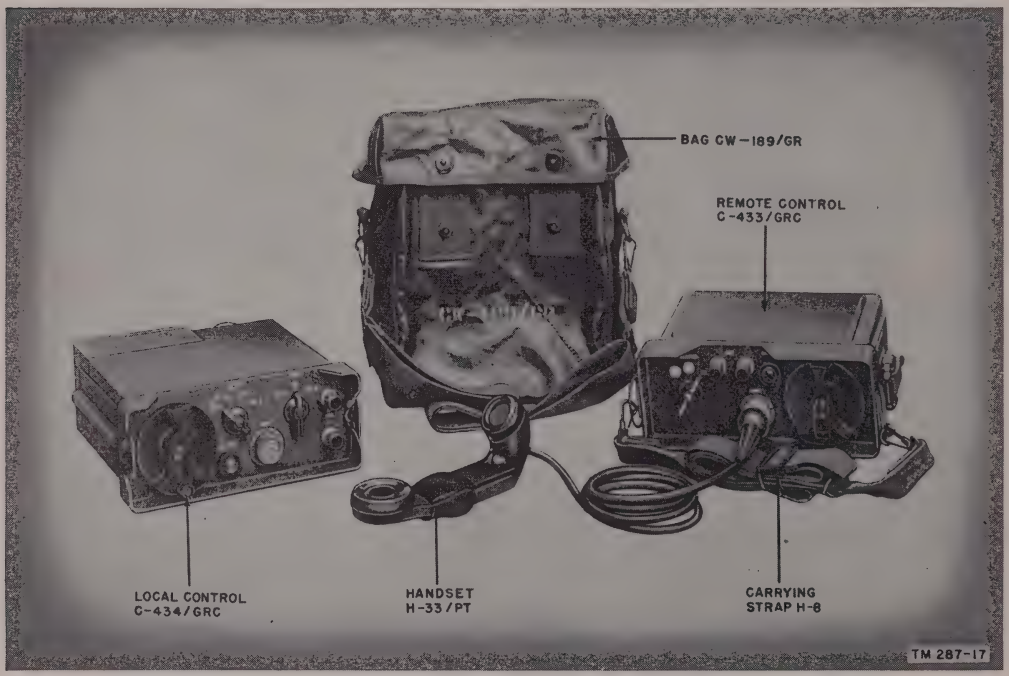


Figure 9. Control Group AN/GRA–6.

Special Purpose Cable WM–46/U. Cable entries are provided at either side of the control box (fig. 8). The cable connection extends the audio and control lines of the receiver-transmitter and interphone amplifier to the switches on the control box. The switches connect these lines to the audio receptacles on either side of the box and to the MIC and PHONE jacks on the bottom of the box (fig. 31). Suitable audio accessories can be connected for monitoring, interphone operation, or push-to-talk control of the radio sets.

trol C–433/GRC, Handset H–33/PT, and Bag CW–189/GR. Complete information on the control group is contained in a separate technical manual.

b. Local Control C–434/GRC is connected directly to the panel of the receiver-transmitter by means of the Set 2 plug-terminated cord at the rear of the unit (fig. 27). The switching facilities of the unit allow for push-to-talk transmission over the receiver-transmitter from a handset or chest set (with headset and microphone) plugged into

the AUDIO receptacle on the front panel. The Set 1 cord can be connected to the AUDIO receptacle on the interphone amplified to provide additional interphone facilities.

c. Remote Control C–433/GRC may be 2 miles distant from the local unit. A telephone line is used to interconnect the two units. The combined switching actions of the two units make it possible to extend monitoring, push-to-talk, and interphone facilities to the remote unit. The remote unit will accommodate a handset at the panel AUDIO receptacle.

d. Handset H–33/PT (fig. 13) may be used at the panel AUDIO receptacle of either control unit. The handset is equipped with a push-to-talk nonlocking switch which incorporates a DPST (double pole, single-throw) switch. The handset cord is terminated in a 10-pin connector which will mate with any of the 10-pin AUDIO receptacles on the control units and receiver-transmitter.

e. Provisions for duplex telephone communication (including ringing) also are incorporated in the control units. This facility makes the control group adaptable for field telephone usage.

f. Bag CW–189/GR is provided for storing and carrying purposes. The units may be stored in the bag when they are not used or when they are being transported.

16. Minor Components

a. The following minor components are illustrated in figure 3:

(1) Mast Base AB–15/GR.
(2) Mast Sections AB–24/GR and AB–22/GR.
(3) Adapters UG–273/U and UG–306/U.
(4) Special Purpose Cable Assembly CX–1213/U.
(5) RF Cable Assembly CG–530/U (4′2″).
(6) Special Purpose Cable WM–46/U.
(7) Bag CW–206/GR.
(8) Case CY–684/GR.
(9) Connector and bondnut, Appleton Electrical Company No. 61007 and BL–50.

Note. With the exception of the last three items listed, all the above components are represented functionally on the system cordage diagram (fig. 24). For physical and electrical descriptions refer to the identification table of parts.

b. The connector and bondnut are used for connecting the power cable of the radio sets to the vehicular power terminal board. The connector is of the feed-through type, and the bondnut locks the connector in place.

c. Case CY–684/GR is a metal box provided for tubes, lamps, fuses, and other replaceable parts. The case may not accommodate all the running spares which are supplied with the various units (par. 18), but will accommodate some of each type. Refer to paragraph 37 for recommendations on the selection of spares to be stored in Case CY–684/GR.

d. Bag CW–206/GR is provided for storage of spare antenna masts, Case CY–684/GR, audio accessories (not in use), and technical manuals.

17. Audio Accessories

a. Type. Audio accessories for operating this radio set are supplied in the installation units. They vary in type and number according to the type of vehicular installation. Some or all of the following items may be supplied:

(1) Chest Set Group AN/GSA–6 and Headset-Microphone H–63/U.
(2) Dynamic Loudspeaker LS–166/U.
(3) Handset H–33/PT.
(4) Microphone M–29/U.
(5) Headset, Navy type CW–49507 and Headset Cord CX–1334/U.

Note. The above listed audio accessories can be connected only to the 10-pin audio receptacle on the radio set. Control Box C–375/VRC is the only unit equipped with jacks which will accommodate any substitute accessories (*h below*).

b. Chest Set Group AN/GSA–6. Chest Set Group AN/GSA–6 (fig. 10), in conjunction with Headset-Microphone H–63/U (*c* below), is the audio accessory most commonly used with the radio set. The chest set group consists of a chest-mounting switch box and a 5-foot cord which terminates in an 8-contact receptacle and a 10-pin audio plug. The receptacle mates with the plug on one end of the switch box and provides a quick-disconnect feature for the chest set. The audio plug will mate with any one of the 10-pin receptacles on the control units, the receiver-transmitter, and the interphone amplifier. Two plugs provided on the switch box will mate with the jacks

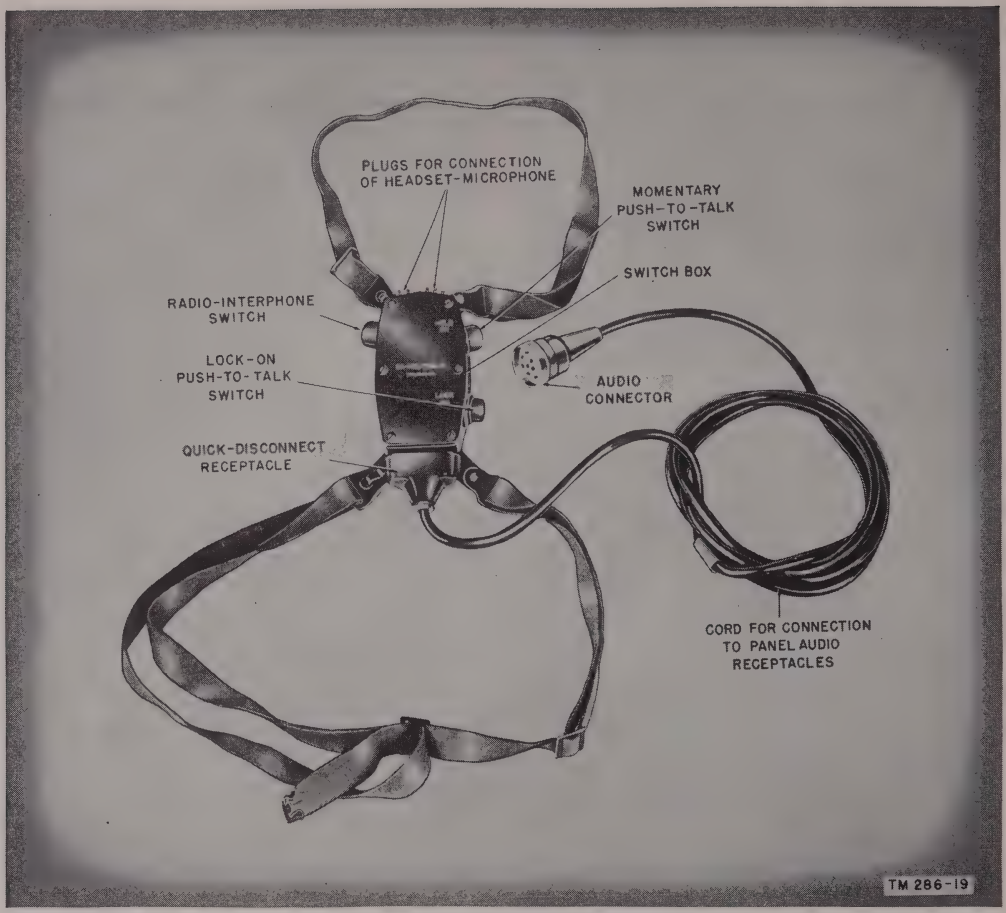


Figure 10. Chest Set Group AN/GSA–6.

on Headset-Microphone H–63/U. Two push-to-talk buttons are provided on one side of the switch box; a push-button RADIO-INT switch is provided on the other side of the box. The push-to-talk buttons are electrically identical, but one provides momentary contact and the other locks in position. The lock-on button may be disabled by means of an internal adjustment (fig. 25) when desired. The RADIO-INT switch is a momentary type switch normally in the INT position. An internal adjustment is provided (fig. 25) to lock the switch in either the RADIO or INT position.

c. Headset-Microphone H–63/U. Headset-Microphone H–63/U (fig. 11) consists of two series-connected 300-ohm receivers and a 40-ohm microphone. The microphone is mounted on an adjustable boom attached to the receiver headband. Two 14-inch conductors from the microphone and headset are terminated in two-pin and three-pin jacks, respectively. These jacks will mate with the plugs on Chest Set Group AN/GSA–6.

d. Dynamic Loudspeaker LS–166/U. Dynamic Loudspeaker LS–166/U (fig. 12) is a 4-inch permanent magnet dynamic loudspeaker with a

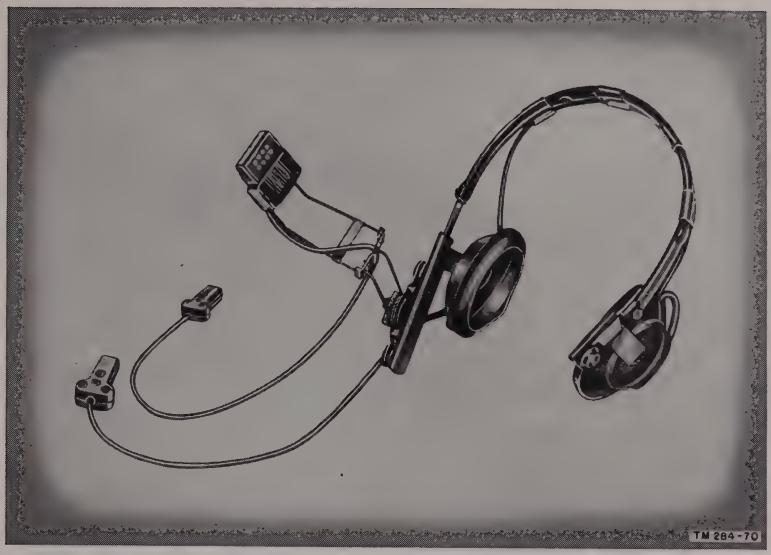


Figure 11. Headset-Microphone H–63/U.

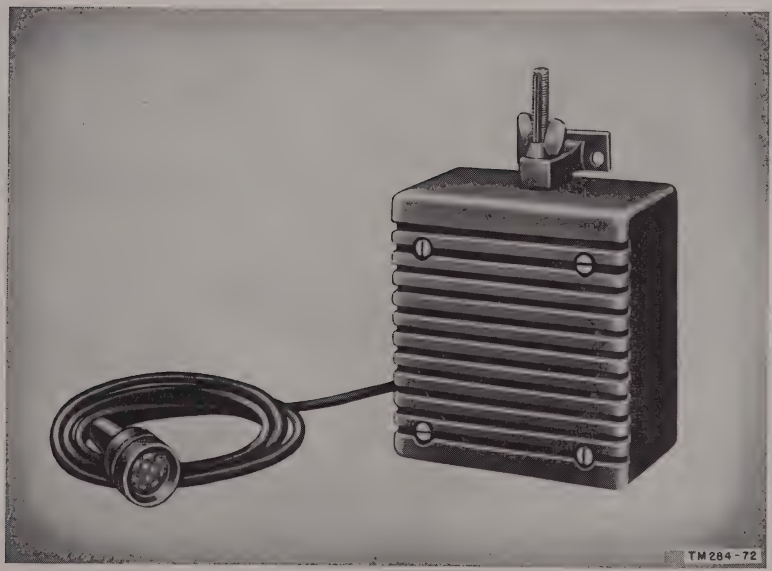


Figure 12. Dynamic Loudspeaker LS–166/U.

voice-coil impedance of 8 ohms and a matching transformer to provide a 600-ohm input impedance. A 5-foot cord, terminated in a 10-pin audio plug, is provided for connecting the speaker to audio receptacles wired for loudspeaker or phone operation. A rotary switch on the side of the speaker may be used to switch the units from speaker to phone output. The speaker and phone output positions are designated VEHICULAR SET and FIELD OR PACK SET, respectively. A universal type clamp is provided on the speaker case for mounting purposes.

connecting cord is 5 feet long and terminates in a 10-pin audio plug which will mate with the receptacles on the receiver-transmitter and the control units.

g. Headset Navy Type CW–49507 and Headset Cord CX–1334/U. Headset Navy Type CW–49507 (fig. 15) consists of two series-connected 300-ohm receivers. A 14-inch cord is connected to the receivers and is terminated in a Plug PL–54. The plug will mate with Jack JK–26 on one end of Headset Cord CX–1334/U. Headset Cord CX–1334/U is 5 feet long. It is terminated in a

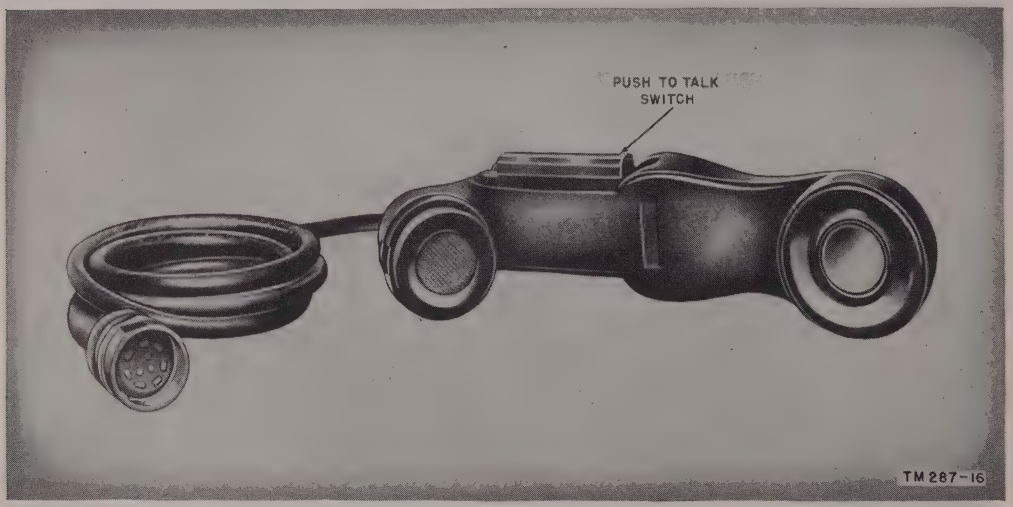


Figure 13. Handset H–33/PT.

e. Handset H–33/PT. Handset H–33/PT (fig. 13) is a combination microphone and receiver with a push-to-talk switch and connecting cord. Microphone impedance is 40 ohms; receiver impedance is 300 ohms. The push-to-talk button is a nonlocking DPST switch. The cord is 5 feet long and is terminated in a 10-pin audio plug which will mate with the audio receptacles on the receiver-transmitter and the control units.

f. Microphone M–29/U. Microphone M–29/U (fig. 14) consists of a 300-ohm carbon-microphone element in a plastic case with a push-to-talk switch and connecting cord attached. The push-to-talk control is a nonlocking DPST switch. The 10-pin audio plug, and serves to connect the headset to the audio receptacles on the receiver-transmitter and the control units.

Note. The audio accessories should not be used indiscriminately on any of the units, even though it is possible to connect them physically. Refer to paragraph 33 for correct usage of the audio accessories.

h. Substitute Accessories. The substitute accessories listed in the following chart may be used only if absolutely necessary. Performance will be inefficient, however, because of impedance mismatches. Operating facilities will be confined solely to Control Box C–375/VRC.

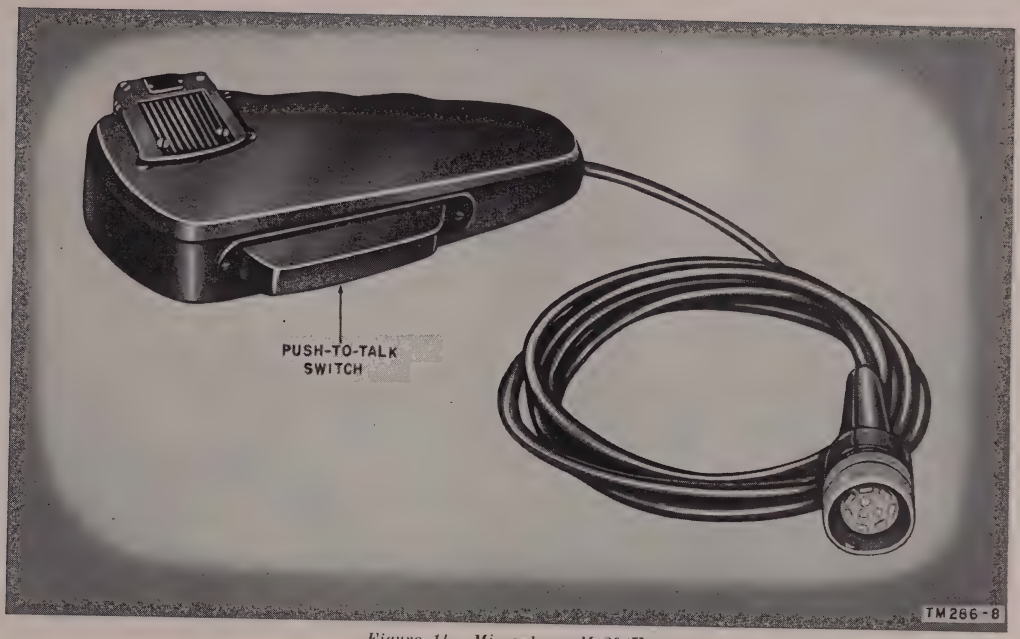


Figure 14. Microphone M–29/U.



Figure 15. Headset Navy type CW–49507 and Headset Cord CX–1334/U.

Standard item	Substitute item
Chest Set Group AN/GSA–6.	Chest Set TD–4 or Cords CD–307–A and CD–318.
Headset-Microphone H–63/U.	Headset H–16/U and Microphone T–45 or Headset HS–30 with Cord CD–933 and Microphone T–45.
Headset Navy Type CW–49507.	Headset H–16/U or Headset HS–30 with Cord CD–933.
Headset Cord CX–1334/U.	Cord CD–307–A.
Microphone M–29/U	Microphone T–17.
Dynamic Loudspeaker LS–166/U.	None.
Handset H–33/PT	None.

18. Running Spares

Running spares for normally expendable items, such as tubes, fuses, and vibrators, are supplied with some of the system components. The spares supplied are listed in *a* through *e* below.

Note. Case CY–684/GR, provided for carrying the spare parts, may not be ample for carrying all of the parts supplied; therefore it may be necessary to make a selection of those parts most likely to be needed. A suggested list of such parts is given in paragraph 37.

a. Spare Parts for Receiver-Transmitter RT–70/GRC. The following spare parts are provided for Receiver-Transmitter RT–70/GRC:

1 lamp, incandescent, 1.35-volt, .06 ampere GM type #3331.
1 tube, electron, type 1AE4.
2 tubes, electron, type 1I4.
2 tubes, electron, type 1R5.
1 tube, electron, type 1S5.
10 tubes, electron, type 1U4.
2 tubes, electron, type 3A5.
1 tube, electron, type 3B4.
6 tubes, electron, type 3Q4.

b. Spare Parts for AF Amplifier AM–65/GRC.

1 fuse, cartridge, 4 amperes (F–1).
1 fuse, cartridge, 10 amperes (F–1).
1 tube, ballast (R–32).
1 relay, thermal (K–1).
2 tubes, electron, type 6AK6.
3 tubes, electron, type 12AU7.
2 tubes, electron, type OB2.

c. Spare Parts for Power Supplies PP–281/GRC, PP–282/GRC, and PP–448/GR.

(1) Power Supply PP–281/GRC:
2 vibrators, plug-in type, 6-volt input.
(2) Power Supply PP–282/GRC:
2 vibrators, plug-in type, 24-volt input.
(3) Power Supply PP–448/GR:
2 vibrators, plug-in type, 6-volt input.

d. Spare Parts for Control Group AN/GRA–6.

4 lamps, glow, 125 volts, 1/25 watts GE lamp #NE–51.

e. Spare Mast Sections for Radio Sets AN/VRC–8.

1 Mast Section AB–22/GR.
1 Mast Section AB–24/GR.

CHAPTER 2

INSTALLATION INSTRUCTIONS

Section I. INTRODUCTION

19. Scope of Instructions

The installation instructions included in this manual are generalized to make them applicable to any installation. The variety of vehicles in which the radio sets may be installed limits the amount of detail which can be given for exact location of units, routing of cables, placement of antennas, etc. Required clearances, interconnection data, and all other essential information are included. For specific details pertinent to particular vehicles, refer to the installation instructions supplied with the installation units for the vehicles. Each of the installation units listed in paragraph 7 contains instructions adapted to the particular vehicle for which the unit is intended.

20. General Unpacking Instructions

Take the usual precaution against damage to equipment during the unpacking procedure. The following points of procedure should be observed whenever possible:

a. Unless instructions are given to the contrary, unpack equipment as required in the order described. Unpacking all boxes at the same time may interfere with orderly procedure and will complicate any possible division of labor.

b. Unpack one box at a time and check its contents against the master packing slip.

c. Use cutters to clip metal bands.

d. Do not pry off the tops or sides of boxes; use a nail puller to remove the nails and lift off the sides and/or the tops of boxes.

e. Save boxes, containers, and other packaging material, if practicable, for possible use for storage or reshipment.

Section II. VEHICULAR INSTALLATION DETAILS

Note. Vehicular installation procedures are those which involve modification of the vehicle (for example, drilling of holes) or some special technique peculiar to a type of vehicle (for example, routing of cables).

21. Unpacking

The material comprising the installation unit and the material contained in box 3 of the basic unit (par. 8) are required for the vehicular installation details. Unpack the installation unit and box 3 of the basic unit, observing the general precautions noted in paragraph 20.

22. Mounting MT–300/GR

Mounting MT–300/GR should be located and secured in place. All external connections should be completed.

a. Locate Mounting MT–300/GR according to the installation instructions for the particular vehicle. In any installation allow the minimum clearances indicated in figure 16.

b. Spot and drill the eight mounting holes in accordance with the dimensional data shown in figure 16.

c. Turn the mounting upside down to allow easy access to the junction box, and remove the cover plate (fig. 17).

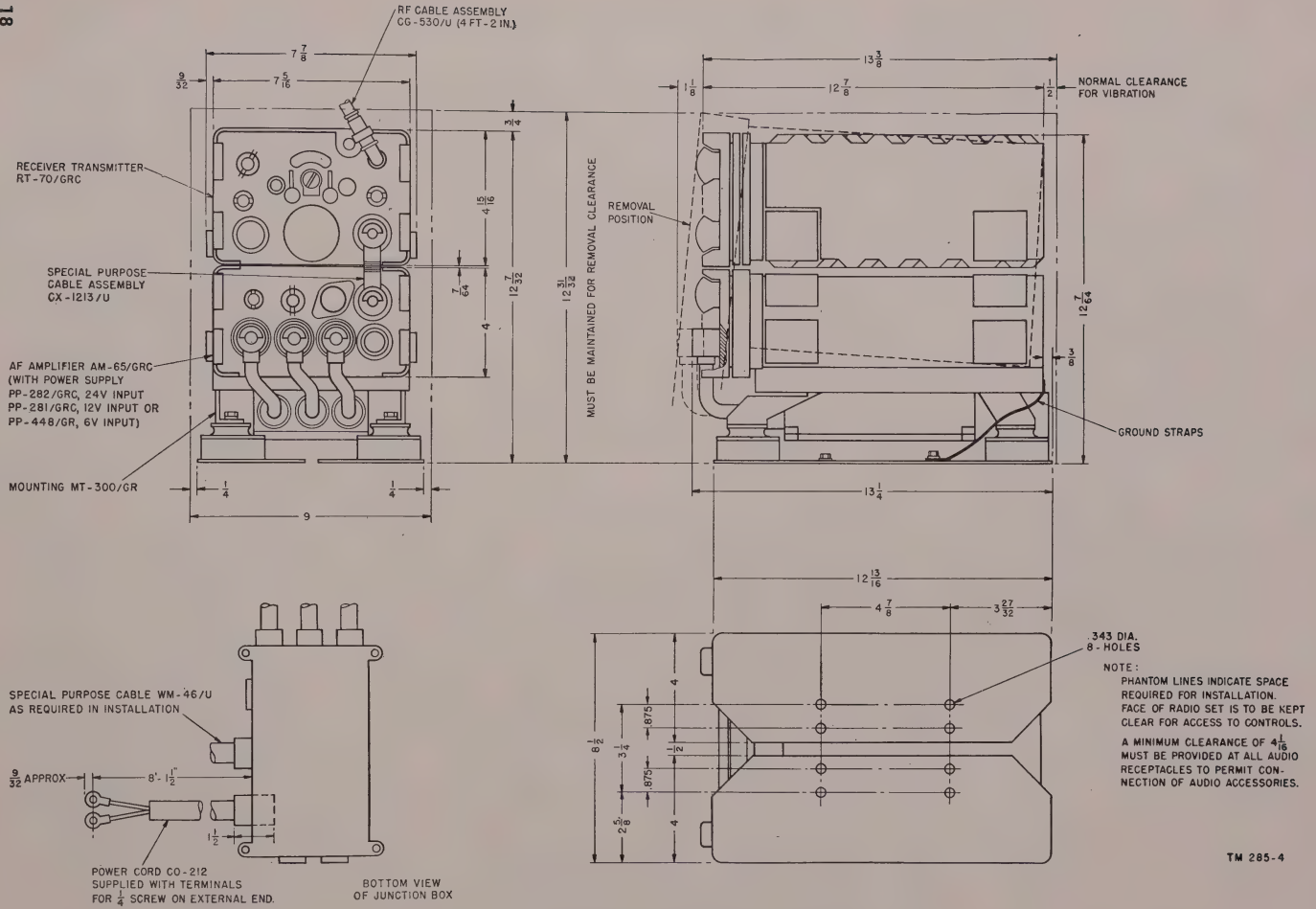


Figure 16. Radio Set AN/VRC-7, outline drawing.

d. Prepare one end of the 10-foot length of Special Purpose Cable WM–46/U for connection to the mounting in accordance with the instructions given in figure 18.

e. Loosen the bondnut on the cable clamp at one of the unused cable entries (fig. 17), preferably the one at the top center. Remove the nut, metal ring, and rubber washer from the cable clamp, and slip them over the prepared end of the cable. The rubber plug, which will be found in the cable entry, is for waterproofing an unused entry. It will be required in the final assembly, but should be saved for use when the equipment is disassembled for reshipment or storage.

f. Insert the prepared end of the cable through the cable entry, and solder the individual conductors to the terminals of the terminal board E–1 in the junction box (fig. 17). (All conductors can be connected, even though some of them are not used.) Observe the color coding indicated in figure 19. The cable should be inserted until the outer insulation protrudes into the inside of the junction box. Sufficient slack should be allowed for all terminal connections. Note that each terminal on E–1 has a pair of contacts. The connections should be made to the open contacts of each pair.

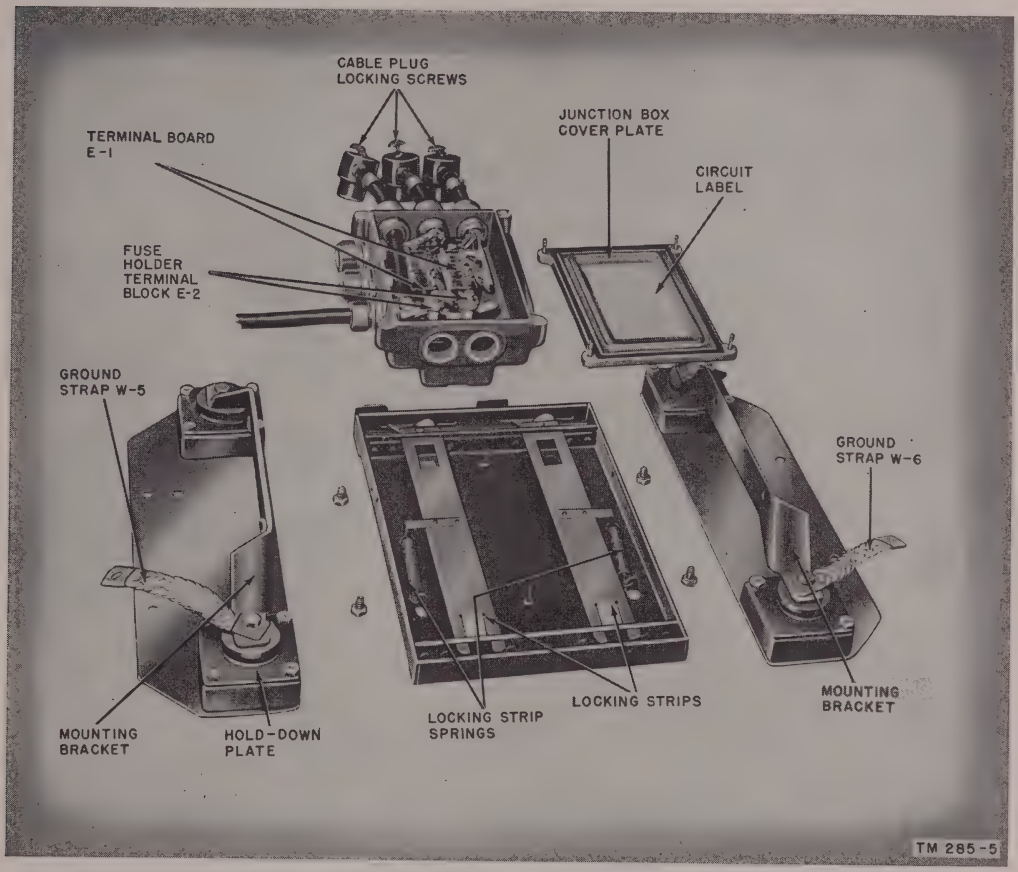


Figure 17. Mounting MT–300/GR, open view.

g. When the connections are complete, tighten

the bondnut on the cable to effect a watertight seal.

Note. If for some reason the color coding is different from that in figure 19, note which wire is connected to each terminal and tag the opposite end of the wires accordingly. If necessary, make a continuity check of the individual wires.

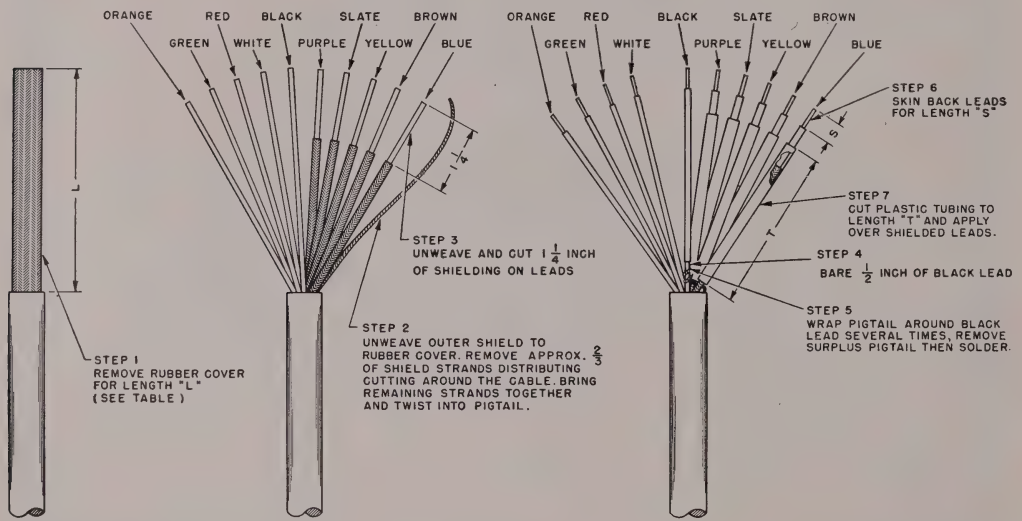
h. Before replacing the cover on the junction box, check the continuity of fuse F–1 and check the tightness of the solderless connectors, E–2 (fig. 17). Cable compression can cause these connectors to loosen over a period of time.

i. Replace the cover on the junction box.

j. Turn the mounting right-side up and bolt it to the vehicle.

k. Route the loose end of Special Purpose Cable WM–46/U in accordance with the instructions outlined in the installation instructions supplied with the vehicular installation unit. Although the units to be interconnected are Mounting MT–300/GR and Control Box C–375/VRC, vehicular lay-out will determine whether a direct connection should be made or whether junction boxes and slip rings, or junction boxes alone, will intervene (par. 23*b*).

l. Connect the battery cable (W–4 on figs. 7 and 24) in accordance with instructions furnished with the installation unit. Generally, the cable will connect to a vehicular junction box rather than directly to the battery. Use the connector



COMPONENT	LENGTH "L"	LENGTH "S"	LENGTH "T"
CONTROL BOX C-375/VRC	4	3/8	3 3/8
MOUNTINGS MT-297/GR, MT-298/GR, MT-299/GR, MT-300/GR	6	3/8	5 3/8
TERMINAL BOX SC-D-5319	6	3/8	5 3/8
TURRET TERMINAL BOX IN MEDIUM TANK M46	10	3/8	9 3/8
BENDIX - SCINTILLA CONNECTOR SIZE 28 SHELL	1 3/8	5/16	NOT USED
BENDIX - SCINTILLA CONNECTOR SIZE 22 SHELL	1 1/4	1/4	NOT USED

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Figure 18. Preparation of Special Purpose Cable WM–46/U.

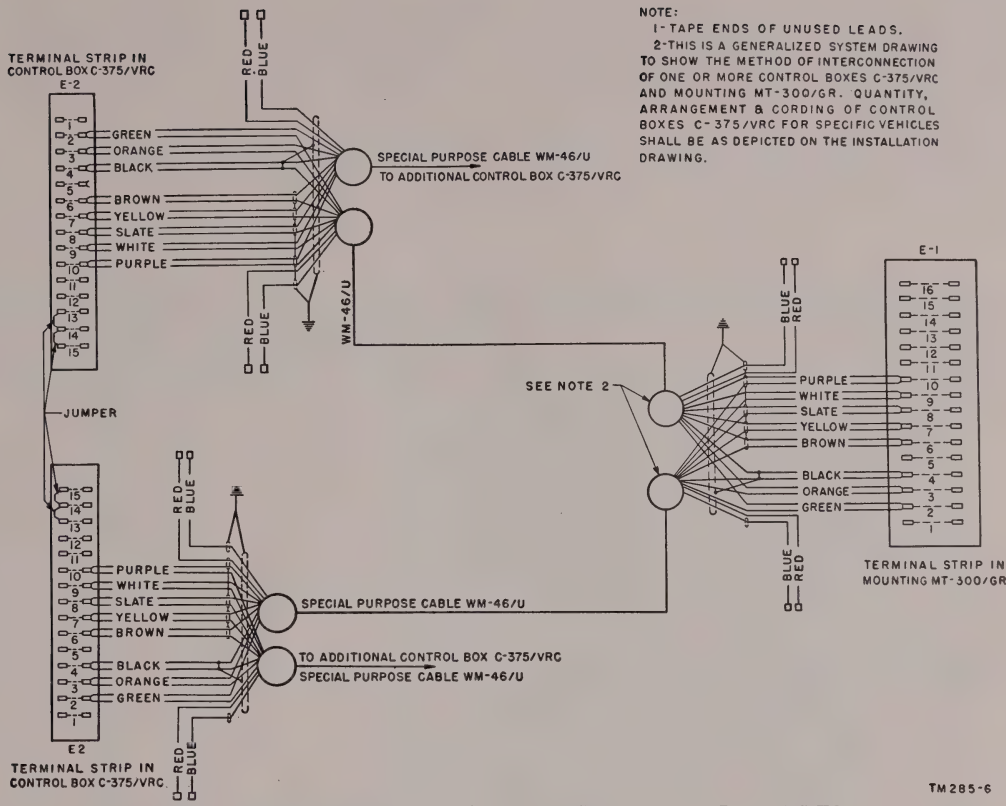


Figure 19. Interconnection of Mounting MT–300/GR and Control Box C–375/VRC.

and bondnut supplied with the basic unit to secure the cable at its point of entry into the junction box. Leave enough slack to allow the mounting table to be swung back (for access to the junction box) without straining the cable.

Caution: The plug end of cable W–3 (fig. 24) will be *hot* after the battery connection has been made. Use care in handling.

23. Control Box C–375/VRC

One Control Box C–375/VRC or more may be supplied in the installation unit in addition to the box supplied with the basic unit. The boxes must be located, mounted, and interconnected with Mounting MT 300/GR.

a. Spot the location of the control boxes, and drill the mounting holes. The exact location will vary from vehicle to vehicle, and must be determined from the specific instructions supplied with the installation unit. Minimum clearances which are required are indicated in figure 20. The clearances can be reduced when all the facilities, for example, the jacks at the bottom of the box, are not required. Before mounting the units, make the connections described for each unit (*b* and *c* below).

b. Remove the cover from the control box. Remove the bondnut, ring, and washer from one of the cable clamps at the side of the box, and slip the nut, ring, and washer over the loose end of Special Purpose Cable WM–46/U. This may be the opposite end of the cable connected to Mounting MT 300/GR; more commonly it will be an extension of this cable from a vehicular junction box or another Control Box C–375/VRC. In all cases,

the cable end should be prepared in accordance with instructions for Control Box C–375/VRC as shown on figure 18. The waterproofing plugs found in the cable entries should be saved (par. 22*e*), if practicable.

c. Insert the prepared end of the cable through the cable entry, and solder the individual conductors to the open contacts of terminal board E–2 in the control box (fig. 21), observing the color code shown in figure 19. If for some reason the color coding is different, a continuity check should be made to determine that similarly numbered terminals in the mounting and control box are interconnected.

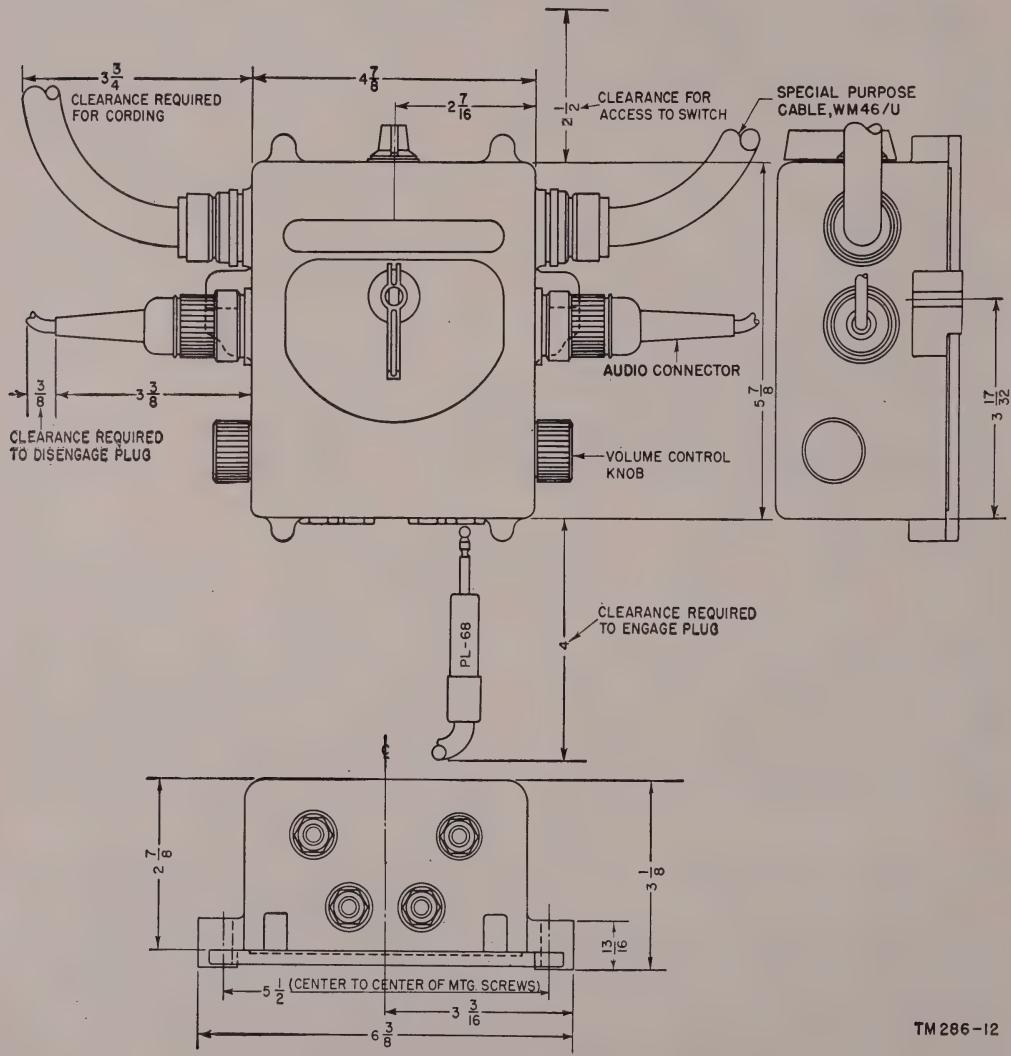


Figure 20. Control Box C–375/VRC, outline drawing.

d. When connections are complete, tighten the cable clamp, replace the cover, and mount the units in place.

e. On the composition strips above the selector switch on the panel of each control box, write the following designations from left to right, respectively: INTERPHONE, REC & INTERPHONE, and REC-TRANS & INTERPHONE.

cable with the audio accessories (par. 26), and connect them after the units have been installed on the mounting (par. 32).

b. If holes must be drilled in the vehicle, or any other vehicular modification must be made in order to route the antenna cables, follow the instructions supplied in the installation unit.

c. If the antenna cable is to be clamped to the

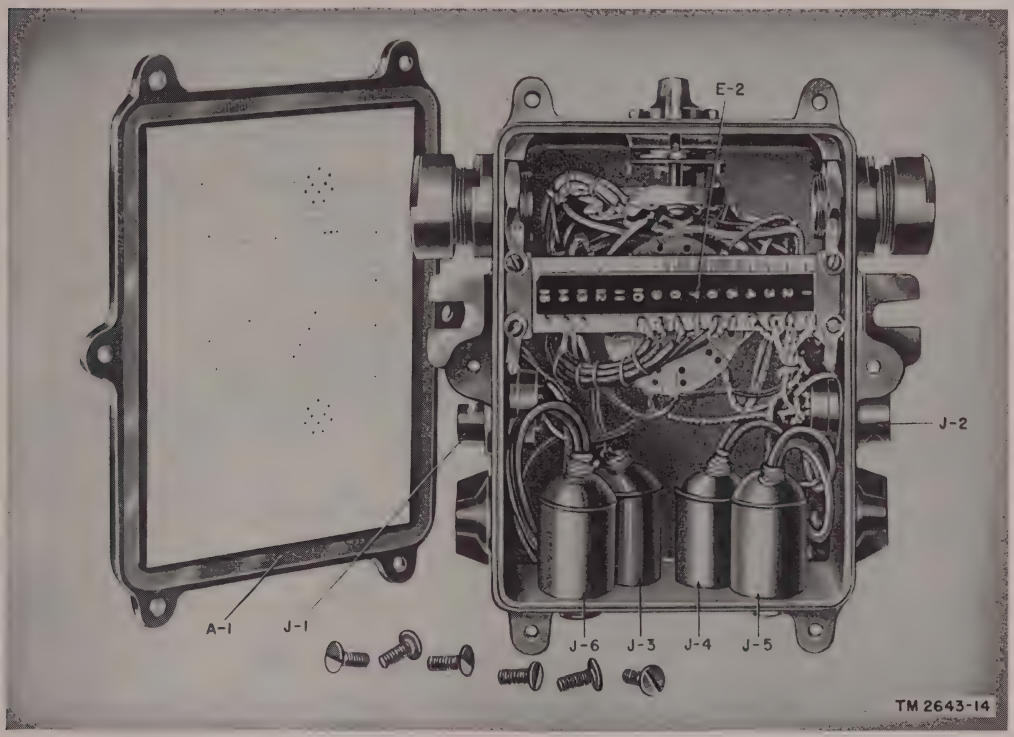


Figure 21. Control Box C–375/VRC, rear view.

24. Routing Antenna Cables

The antenna cable will be connected from the receiver-transmitter panel to the antenna mast base. While actual connections cannot be made at this time, provisions must be made for routing the cables. RF Cable Assembly CG–530/U is provided as the antenna cable for Radio Set AN/VRC–7.

a. If the antenna cable is to run free (without clamping), between the panels of the receiver-transmitter and the antenna mast base, store the vehicle, follow the instructions supplied in the installation unit. When a particular installation calls for the use of Adapter UG–306/U (supplied in the installation units), connect the adapter to the cable end which will connect to the mast base.

Note. In most cases, the 50-inch antenna cables supplied with the basic units will be sufficiently long. In those cases where a greater length is required, cable and connectors will be supplied in the installation units. If the connectors are not already attached to the cables, terminate the cables in accordance with instructions given in figure 22.

25. Vehicular Provisions for Antenna Mast Base

a. Any drilling, installation of mounting bracket, and other vehicular details which are necessary for installing the antenna mast base should be made at this time. Location of the mast and mounting provisions are different for each type of vehicle, and necessary instructions will be supplied with the vehicular installation unit.

b. Because it is possible, in some instances, that the remaining installation procedures will not be completed until after the vehicle has been shipped to a different depot or organizational unit, actual mounting of the antenna mast base is not included as a vehicular installation detail. (Its installation might complicate the shipment of the vehicle.) Whether the entire installation is carried through to completion in one or two stages, the antenna mast base is the next item to be installed (par. 28).

26. Storing of Audio Accessories

The audio accessories supplied in the installation unit will not be required until the equipment is ready for an operational test (par. 34). The accessories should be unpacked and stored in the vehicle until they are needed.

Section III. EQUIPMENT INSTALLATION DETAILS

Note. The term *equipment installation* has been arbitrarily selected to refer to those installation procedures which are independent of the vehicle in which the radio set is installed.

27. Unpacking

When all vehicular installation details have been completed, unpack the remaining boxes (1 and 2) of the basic unit (par. 8). Observe the general precautions noted in paragraph 20.

28. Mounting Mast Base AB–15/GR (fig. 23)

The location of the mast base is, in most cases, prescribed by the vehicle. In general, however, the mast bases should be placed as high as possible, with a maximum cable length of 50 inches between the base and the receiver-transmitter. To install the mast base, follow the instructions outlined below and on figure 23.

a. Loosen the ground clamp on the adapter which is supplied on the mast base. Remove the adapter and replace it with Adapter UG–273/U. Tighten the ground clamp on the new adapter.

b. Separate the two cup insulators by unscrewing the body of the mast base.

c. Insert the body of the mast base, with upper cup insulator attached, through the hole in the mounting surface. (The mounting surface may be a special bracket, or it may be the shell of the vehicle.)

d. Bring the lower cup insulator up from the under side of the mounting surface so that the bolt in the lower insulator engages the body of the mast base. The lockwasher and the ground braid from the clamp on the adapter should be between the mounting surface and the lower insulator (fig. 23).

e. Screw the body of the mast base in a clockwise direction to tighten the assembly.

f. If the mounting surface does not provide a good ground, an additional ground bond must be made between the mounting surface and the vehicle.

29. Antenna Mast Sections (fig. 24)

Radio Set AN/VRC–7 utilizes two short mast sections, Mast Section AB–22/GR and AB–24/GR. Screw the two sections together and screw the assembly into the mast base.

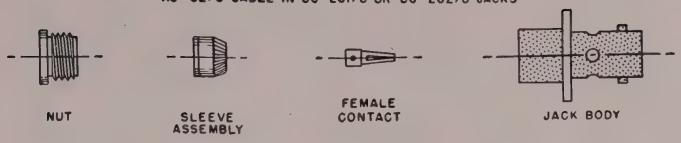
30. AF Amplifier AM–65/GRC

A power supply must be installed in the amplifier, and the fuse and internal power-supply switch must be checked before the amplifier is secured on the mounting. Perform the following steps:

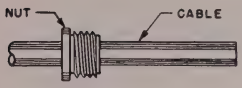
a. Remove the panel-chassis assembly from the outer case (par. 88).

b. Insert and clamp the plug-in power supply unit (fig. 6) in the compartment on the amplifier chassis (fig. 40) so that the receptacle on the power supply mates with the plug within the amplifier compartment. Use Power Supply PP–281/GRC for 12-volt systems, Power Supply PP–282/GRC for 24-volt systems, and Power Supply PP–448/GR for 6-volt systems.

RG-62/U CABLE IN UG-261/U OR UG-262/U JACKS

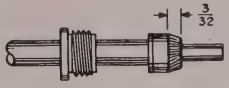


OUTLINE

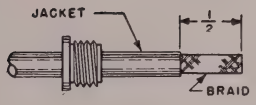


1. CUT OFF SHARP

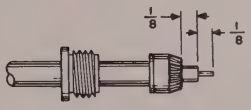
OUTLINE



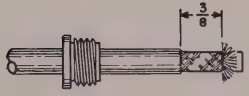
6. WITH SLEEVE IN PLACE, COMB OUT BRAID, FOLD BACK SMOOTH AS SHOWN, AND TRIM TO $\frac{3}{32}$ INCH FROM END.



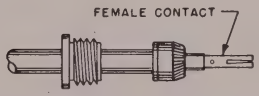
2. CUT OFF JACKET $\frac{1}{2}$ INCH FROM END, BEING CAREFUL NOT TO NICK BRAID.



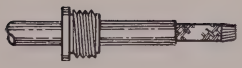
7. CUT INNER DIELECTRIC $\frac{1}{8}$ INCH FROM BRAID, BEING CAREFUL NOT TO NICK INNER CONDUCTOR AND CUT OFF INNER CONDUCTOR $\frac{1}{8}$ INCH FROM END OF DIELECTRIC.



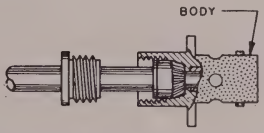
3. CUT OFF INNER INSULATION AND WIRE UNDER BRAID $\frac{3}{8}$ FROM END OF JACKET.



8. TIN INSIDE HOLE OF FEMALE CONTACT, TIN CENTER CONDUCTOR OF CABLE, SLIP FEMALE CONTACT IN PLACE AND SOLDER, REMOVE EXCESS SOLDER. BE SURE CABLE DIELECTRIC IS NOT HEATED EXCESSIVELY AND SWOLLEN SO AS TO PREVENT DIELECTRIC ENTERING BODY.



4. TAPER BRAID

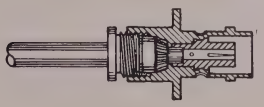


9. PUSH INTO BODY AS FAR AS IT WILL GO, THEN SLIDE NUT INTO BODY AND SCREW INTO PLACE, WITH WRENCH, UNTIL MODERATELY TIGHT. HOLD CABLE AND SHELL RIGIDLY AND ROTATE NUT.



5. SLIDE SLEEVE OVER TAPERED BRAID TO FIT TIGHT AGAINST JACKET. BE SURE INNER SHOULDER OF SLEEVE FITS SQUARELY AGAINST END OF CABLE JACKET.

FINAL ASSEMBLY SHOWN IN SECTION



10. THE ASSEMBLY FOR PLUGS IS THE SAME EXCEPT FOR THE USE OF MALE CONTACTS AND A UG-260/U BODY.

TM 284-76

Figure 22. Termination of RF Cable Assembly CG–530/U.

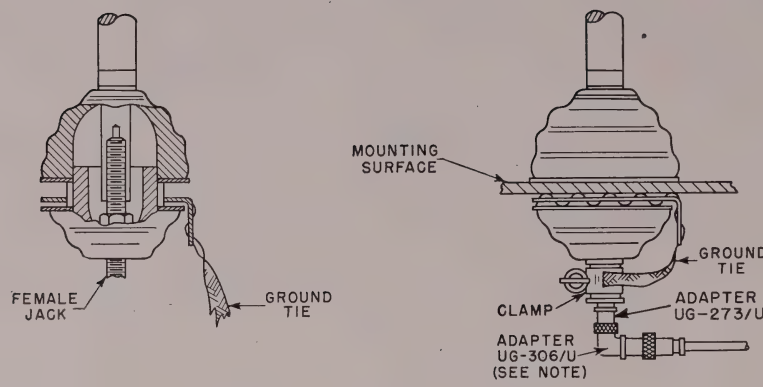


Figure 23. Mast Base AB–15/GR, installation drawing.

c. Turn the internal switch on the amplifier chassis (fig. 40) to the 6V, 12V or 24V position, depending upon the supply voltage being used.

d. Check the fuse in the fuse holder on the front panel of the amplifier. The amplifier is shipped with a 4-ampere fuse which is suitable for operation in a 24-volt system utilizing Power Supply PP–282/GRC. For 12-volt and 6-volt systems, utilizing Power Supplies PP–281/GRC and PP–448/GR, respectively, replace the 4-ampere fuse with a 10-ampere fuse from the running spares supplied with the unit (par. 18). Place a spare fuse of the proper amperage in the clips on the chassis (fig. 40).

e. Fasten the correct supply-voltage label on the left-hand side of the amplifier panel (fig. 7). The amplifier generally is shipped with a 24v 4a label in place. A second label, with *12v 10a* stamped on alternate sides, is secured beneath the *24v 4a* label. In 6-volt and 12-volt installations, loosen the thumbscrew which holds the labels, place the correct label on top, and retighten the thumbscrew. The label serves as a reminder that the plug-in power-supply unit, the fuse, and the setting of the internal switch (*c* and *d* above) should correspond to the storage battery being used.

f. Replace the panel-chassis assembly in the case and turn the OFF-INT-RT 70 switch to the OFF position.

g. Release the locking mechanism for the amplifier channels of the mounting by moving the locking handles (fig. 7) towards the left.

h. Place the amplifier on the mounting so that the rails on the bottom of the case rest in the channels of the mounting. Turn the locking handles to the right to secure the amplifier in place.

31. Receiver-Transmitter RT–70/GRC

The internal FIELD-VEH-TANK switch of the receiver-transmitter must be set before the unit is installed. Perform the following steps:

a. Remove the panel-chassis assembly from the outer case (par. 88).

b. Set the FIELD-VEH-TANK switch, on the chassis of the receiver-transmitter (fig. 45), to the TANK or VEH position in accordance with one of the following conditions:

(1) If more than one Control Box C–375/VRC is used in the system, set the switch at TANK.

(2) If one Control Box C–375/VRC is used in the system, set the switch at VEH.

c. Replace the panel-chassis assembly in the case.

d. Place the receiver-transmitter on top of the amplifier, so that the mounting feet on the bottom of the receiver-transmitter set in the recesses on the top of the amplifier case.

e. Fasten the receiver-transmitter to the interphone amplifier by means of the snap catches and hooks attached to the two units.

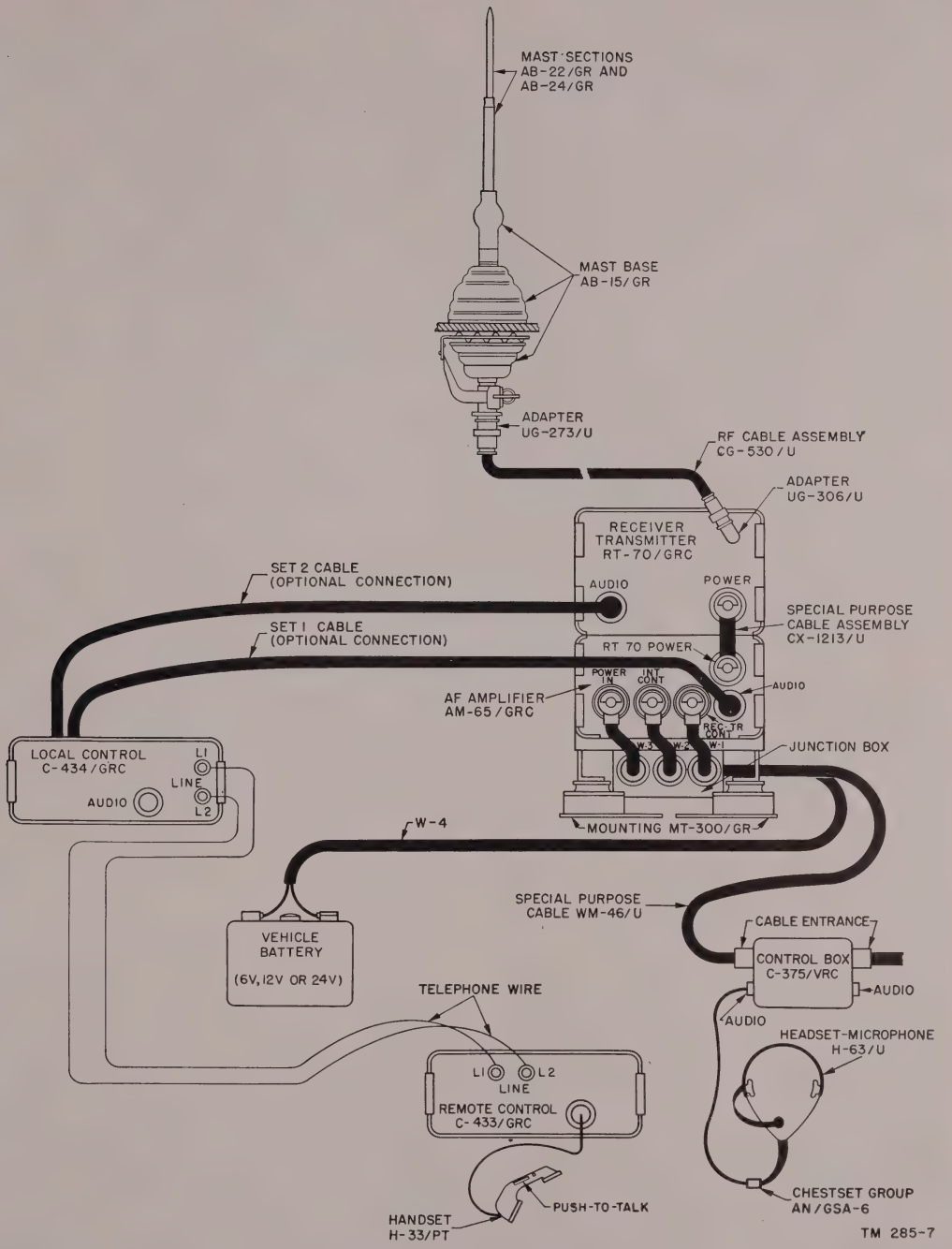


Figure 24. System cordage diagram.

32. Interconnections

Make the system interconnections outlined below and illustrated on figure 24.

a. Connect Adapter UG–306/U to the ANT receptacle on the receiver-transmitter. Connect one end of the antenna cable (RF Cable Assembly CG–530/U as indicated in fig. 24) to the adapter, and connect the other end of the cable to Adapter UG–273/U on Mast Base AB–15/GR (par. 28).

b. Connect Special Purpose Cable Assembly CX–1213/U between the RT–70 POWER receptacle on the amplifier and the POWER receptacle on the receiver-transmitter. Tighten the screw handles on the cable-assembly connectors.

c. Connect cable W–1 from the mounting (fig. 24) to the REC-TR CONT receptacle on the amplifier. Tighten the screw handle on the cable connector.

d. Connect cable W–2 from the mounting to the INT CONT receptacle on the amplifier. Tighten the screw handle on the cable connector.

Caution: Be careful when connecting cable W–3 (below). The cable will be *hot* if the battery connections have been completed.

e. Connect cable W–3 from the mounting to the POWER IN receptacle on the amplifier. Tighten the screw handle on the cable connector.

33. Audio Accessories

a. Assembly. The chest sets, headsets, and headset-microphone sets provided in the installation unit must be assembled and made ready for use. The remaining audio accessories are shipped assembled.

b. Disposition. The specific disposition and usage of audio accessories depends, in part, upon vehicular conditions and mode of operation. Probable dispositions are indicated in *c* through *g* below.

c. Chest Set Group AN/GSA–6 Chest Set Group AN/GSA–6 should be used with Headset-Microphone H–63/U at the audio receptacles of the interphone boxes, the receiver-transmitter, the interphone amplifier and, when Control Group AN/GRA–6 is used (par. 36), at the local control unit.

(1) When the chest set is used at any of the above-listed units, the lock-on push-to-talk switch should be disabled by moving the internal adjustable stop (fig. 25) against the push-to-talk rocker arm. To move the stop, remove the switch-box cover, loosen the stop adjustment screw, lift and turn the stop until the pin on the stop engages the stop guide-hole, and retighten the screw.

(2) When the chest set is used at the amplifier, the receiver-transmitter, or the local control unit, the RADIO-INT switch should be locked in the RADIO position. To lock the switch, remove the cover of the switch box, press the RADIO-INT button, and slide the lock-on lever towards the switch (fig. 25) to hold the button depressed.

d. Handset H–33/PT. The handset can be used at the receiver-transmitter panel for push-to-talk control of the receiver-transmitter only. When Control Group AN/GRA–6 is used (par. 36), the handset is utilized at the remote control unit.

e. Dynamic Loudspeaker LS–66/U. The loudspeaker can be used strictly as a monitor at any of the audio receptacles in the radio set. It is used most practically as a monitor for both received signals and interphone signals at the AUDIO receptacle of the interphone amplifier.

(1) When connected to the interphone amplifier, the receiver-transmitter, or local control unit, reception is possible for both the VEHICULAR SET or FIELD OR PACK SET positions of the speaker-selector switch.

(2) When connected to an interphone box, reception is possible only at the FIELD OR PACK SET position of the speaker-selector switch.

f. Headset Navy Type CW–49507. The headset can be used as a monitor, in the same manner as a loudspeaker, at any one of the audio receptacles.

g. Microphone M–29/U. The microphone can be used at an audio receptacle of the receiver-transmitter or interphone box for push-to-talk control of the transmitter. An additional audio accessory will be required, for monitoring. If the microphone is used at the receiver-transmitter, a speaker or headset should be connected to the interphone amplifier as a monitor.

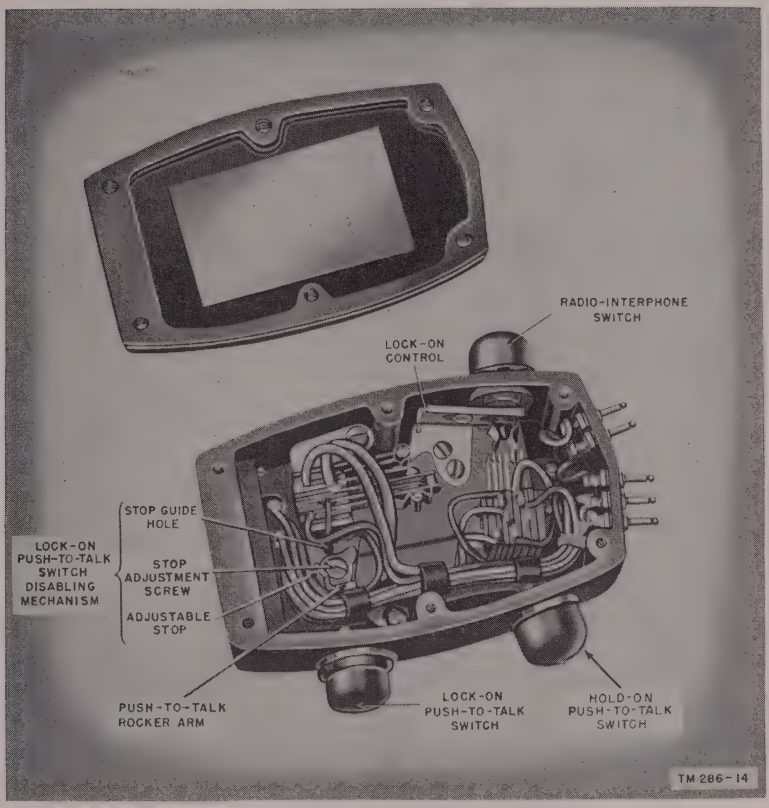


Figure 25. Chest Set Group AN/GSA–6, internal view.

Section IV. ADJUSTMENTS FOR OPERATION

Note. Personnel who are to perform the procedures described in this section should be familiar with the use of controls and instruments and with the operating procedures described in chapter 3.

34. Receiver - Transmitter RT–70/GRC Antenna Tuning

Receiver-Transmitter RT–70/GRC is shipped completely alined, but the antenna circuit must be tuned when the set is connected to a particular antenna system.

a. Perform steps 1 through 10, 13 and 14 of the equipment performance checklist (table III). Perform the items which pertain to *each* interphone box for *one* interphone box only, to determine that the receiver-transmitter is operating. Leave the receiver in an operating condition.

b. Calibrate the receiver-transmitter at 58 mc (par. 47).

c. Remove the cap which covers the antenna tuning control (fig. 4) on the top of the receiver-transmitter.

d. Insert an insulated screw driver or alinement tool through the opening in the case in order to engage the screw-driver slot of the antenna tuning control. Hold the ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch (fig. 30) in the ANT ADJ position and adjust the tuning control for a minimum noise in the headphones.

Note. The above procedure provides a broad adjustment. If it is possible to obtain a weak signal from an external source (in place of the internal signal), a finer adjustment can be made.

35. Operational Check

When the receiver-transmitter has been tuned, make a complete operational check of the system by performing the procedure outlined in the equipment performance checklist (table III). Omit steps 21 to 30 which pertain to Control Group AN/GRA–6. If abnormal indications are obtained, it will be necessary to trouble shoot the system. When required, follow the trouble-shooting suggestions contained in the checklist.

Section V. CONTROL GROUP AN/GRA–6 AND MISCELLANEOUS EQUIPMENT

36. Control Group AN/GRA–6

Control Group AN/GRA–6 should be installed only when its particular facilities (par. 56) are required. An initial installation should be made, however, to determine that the equipment will operate properly. Make this initial installation in accordance with the following instructions after the rest of the system has been completely installed, tuned, and checked.

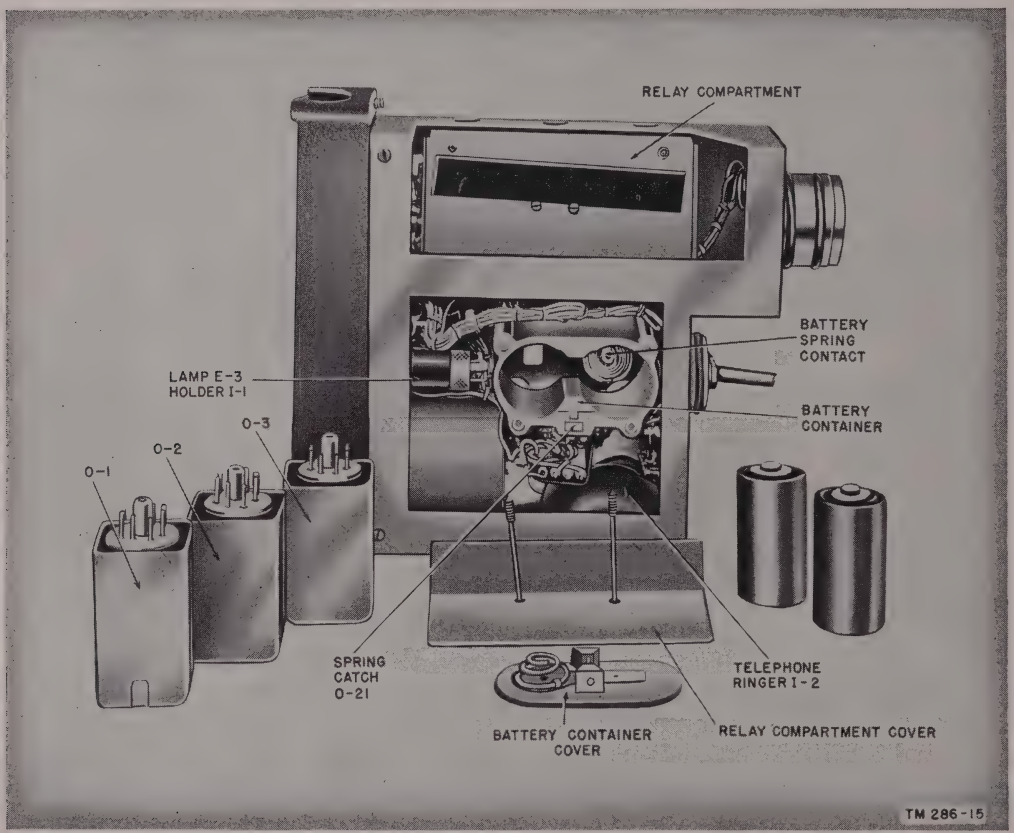


Figure 26. Local Control C–434/GRC, top view of chassis.

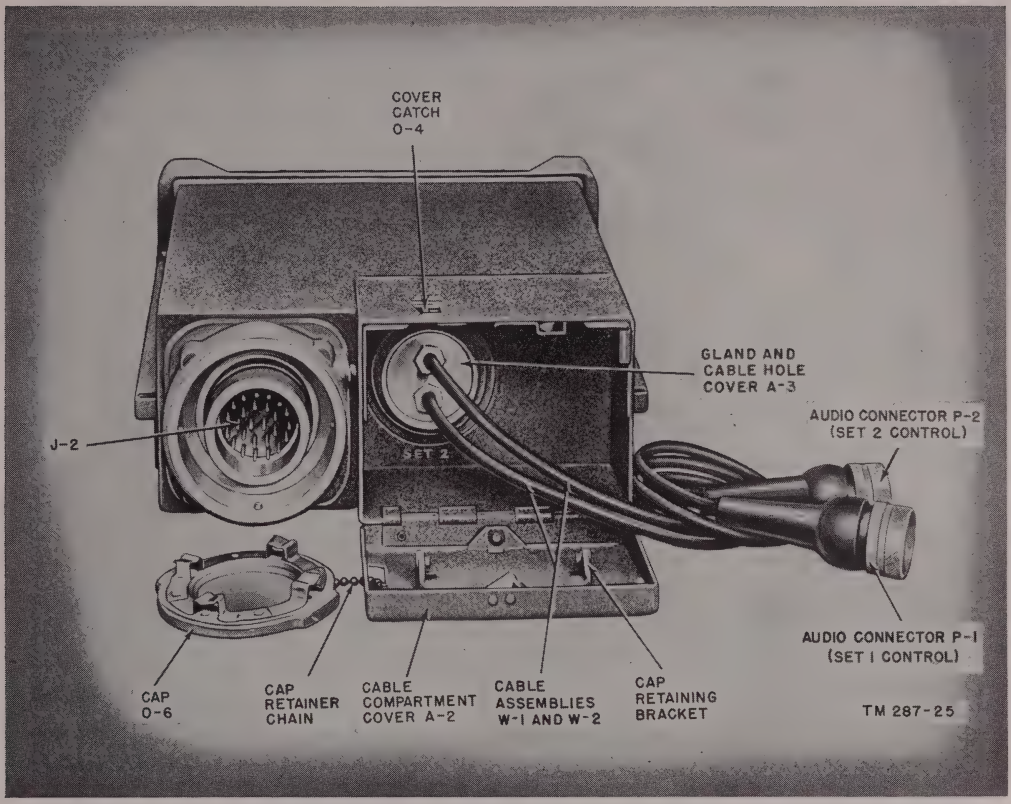


Figure 27. Local Control C-434/GRC, rear view.

a. Local Control C–434/GRC.

(1) Loosen the screw fasteners on the panel and remove the panel-chassis assembly from the case.

(2) Insert two 1½-volt Batteries BA–30 side by side in the battery compartment (fig. 26), making sure that the metal positive terminal of each battery touches its proper battery contact. Place the chassis-mounted switch (S–1) in the BELL position, and replace the panel-chassis assembly in the case.

(3) Open the hinged door at the rear of the local control unit and remove the two cables within the compartment (fig. 27).

(4) For push-to-talk control of the receiver-transmitter, connect the Set 2 cable at the rear of the local unit to the AUDIO receptacle on the receiver-transmitter (fig. 27). To allow interphone operation also, connect the Set 1 cable to the AUDIO receptacle on the interphone amplifier.

(5) Connect a chest set (with headset and microphone) to the AUDIO receptacle in the local unit. Lock the RADIO-INT switch in the RADIO position and disable the lock-on push-to-talk switch (par. 33).

b. Remote Control C–433/GRC.

(1) Loosen the fasteners which secure the case on Remote Control C–433/GRC. Slide the panel-chassis assembly from the case.

(2) Insert two 1½-volt Batteries BA–30 side by side in the battery compartment (fig. 33), making sure that the positive metal terminal of each battery touches its battery contact. Insert and connect a 45-volt Battery BA–414/U in its compartment. Place the chassis-mounted switch in the BELL position and replace the panel-chassis in its case.

(3) Connect a Handset H–33/PT to the AUDIO receptacle on the remote unit.

c. Interconnections. Interconnect Local Control C–434/GRC and Remote Control C–433/GRC over as great a distance (up to 2 miles) as desired. Field wire type WD–1 or an equivalent 2-wire telephone line may be used for the interconnection. Strip the insulation from the wires approximately ¾ inch from the ends, and tin the bared wires before clamping them in the binding posts (designated L1 and L2) on each of the units. Similarly designated posts should be interconnected. Make a continuity check, to insure proper connections.

d. Operational Check. Perform the starting procedure (par. 50) and steps 22 through 33 of the equipment performance checklist (table III).

e. Disassembly Procedure.

(1) Disconnect the cables of Local Control C–434/GRC from the AUDIO receptacles of the receiver-transmitter and the interphone amplifier.

(2) Replace the cables in the compartment at the rear of the local control and close the hinged cover.

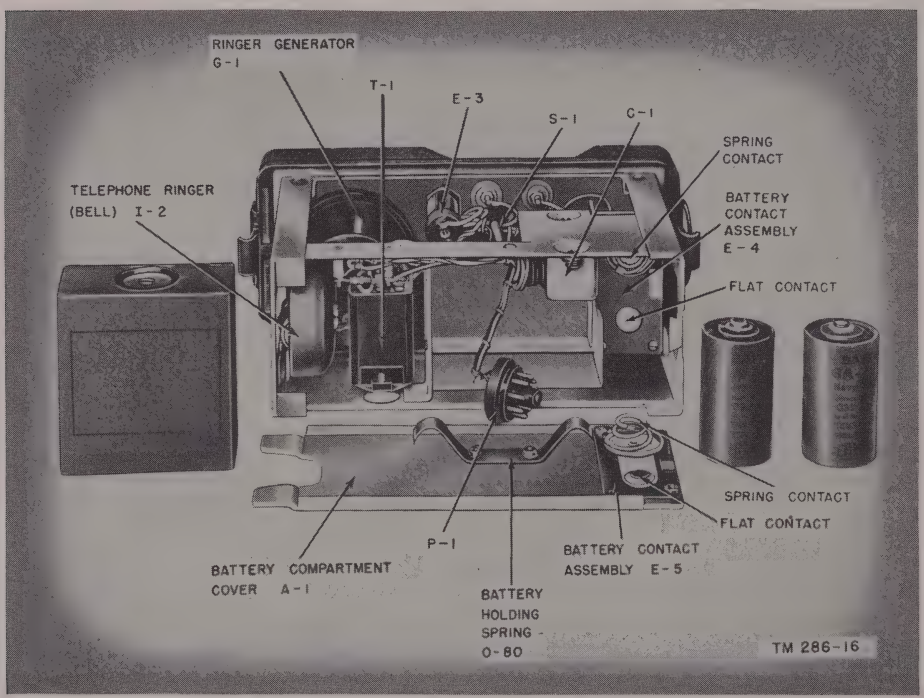


Figure 28. Remote Control C–433/GRC, top view of chassis.

(3) Disconnect the telephone wire from Local Control C–434/GRC and Remote Control C–433/GRC.

(4) Remove the batteries from Local Control C–434/GRC and Remote Control C–433/GRC. Never leave the batteries installed in position unless the units are to be used within a relatively short time.

37. Storage of Equipment Not in Use

Equipment not required immediately for operation, such as running spares, extra audio accessories, or Control Group AN/GRA–6, should be packed in the containers provided and stored in a convenient location within the vehicle.

a. Running Spares. All spare mast sections should be placed in the pockets of Bag CW–206/GR. Case CY–684/GR should be filled with parts from the stock of running spares supplied with each unit, and stored in Bag CW–206/GR. Since Case CY–684/GR may not hold all the spare parts provided, a careful selection should be made from the spares available. It is suggested that the following list be used as a guide in selecting the spares for packaging in Case CY–684/GR.

Spare part	Quantity
Vibrator (6-volt or 24-volt for 12- and 24-volt systems, respectively	1
Relay, Raytheon CK–118	1
Ballast tube, 600 ma	1
Tube type OB2	2
Tube type 6AK6	2
Tube type 3A5	1
Tube type 3Q4	4
Tube type 3B4	1
Tube type 114	2
Tube type 1S5	1
Tube type 1U4	4
Tube type 1R5	2
Tube type 1AE4	2
Tube type 12AU7	3
Fuse, 10 amperes (for 6- and 12-volt systems) or 4 amperes (for 24-volt systems)	6

b. Audio Accessories and Technical Manuals. Audio accessories not required for operation can be stored in Bag CW–206/GR. Technical manuals can be stored in the same bag.

c. Control Group AN/GRA–6. When Control Group AN–GRA–6 is not required for operation, it should be stored in Bag CW–189/GR.

CHAPTER 3

OPERATING INSTRUCTIONS

Section I. MODES OF OPERATION

38. Monitoring

Listening to radio signals without attempting to communicate with the sending station constitutes monitoring. Generally the output of the receiver will be monitored at the interphone box (par. 53), but it is also possible to connect a monitoring device to the AUDIO receptacle on both the amplifier and the receiver-transmitter panels (par. 54). When Control Group AN/GRA–6 is used, the monitoring facilities can be extended to both local and remote control units (par. 56).

39. Push-to-talk Operation

a. Push-to-talk operation utilizes one-way reversible communication facilities. Receiving facilities are available provided that power is supplied to the equipment, but transmission requires closure of one or more switches (generally the push-to-talk switch of a chest set, handset, or microphone). Communication is possible only in one direction at a time and it is impossible for the receiving party to *break in* on the sending party.

b. A chest set (with headset and microphone) may be connected to an interphone box or the receiver-transmitter for push-to-talk operation of the radio set (pars. 53 and 54, respectively). The interphone box is most commonly used. The use of Control Group AN/GRA–6 makes it possible to extend push-to-talk facilities to a control station as much as 2 miles distant from the local installation (par. 56).

40. Interphone Facilities

a. Duplex interphone facilities are normally available to the operators at each interphone box and the panel of the interphone amplifier (par. 53). Duplex operation implies simultaneous two-way (break-in) communication.

b. When Control Group AN/GRA–6 is connected to provide remote monitoring and push-to-talk control of the radio set, it is possible to provide for one-way interphone communication from the remote station to the interphone boxes (par. 56). If remote push-to-talk control of the radio set is not required, it is possible to connect the control group to allow duplex interphone operation between the remote station, the local control unit, and the interphone boxes.

41. Duplex Telephone Facilities

When Control Group AN/GRA–6 is used for remote control of the radio sets, duplex telephone facilities (including ringing) are available for communication between local and remote control units. The control group can also be used as a field telephone independently of the radio sets.

Section II. CONTROLS AND INSTRUMENTS

42. Introduction

Paragraphs 43 through 46 indicate the functions of operational controls and instruments on the panels of the various units. Although ordinary operating procedures are confined mainly to control units and audio accessories, an understanding of the controls and instruments on the

individual units is necessary to provide efficient operation and maintenance of the radio set.

43. AF Amplifier AM–65/GRC

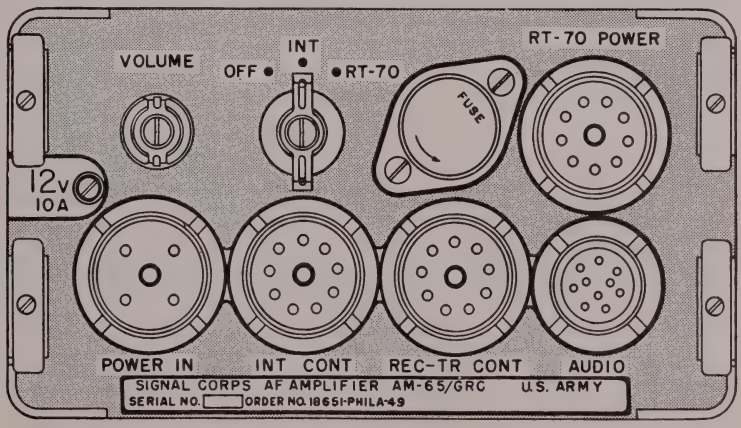
The controls of AF Amplifier AM–65/GRC (the interphone amplifier) are shown in figure 29. Their functions are listed in the following chart.

Control	Function
OFF–INT–RT 70 switch (S–2).	Controls power for the interphone amplifier or for the receiver-transmitter and the interphone amplifier. OFF: Breaks battery circuit at input terminals of the amplifier. INT: Completes power circuits for interphone amplifier. RT–70: Completes power circuits for interphone amplifier and receiver-transmitter.
VOLUME control (R–26).	Controls output level from Set 1+Set 2+Interphone channel to panel-mounted AUDIO connector.
AUDIO connector (J–1).	Provides means for connecting a chest set (with microphone-headset) for monitoring and interphone operation over the Set 1+Set 2+Interphone channel. Local Control C–434/GRC can also be connected at this receptacle for remote interphone control.

44. Receiver-Transmitter RT–70/GRC

The controls and instruments mounted on the panel of Receiver-Transmitter RT–70/GRC are illustrated in figure 30; their functions are listed in the following chart.

Control or instrument	Function
MCS dial and TENTH MCS tuning control.	MCS dial: Calibrations are in megacycles from 47 to 58 and indicate the integral portion of the operating frequency. TENTH MCS tuning control: Selects the operating frequency. The integral portion of the selected frequency is indicated on the MCS dial; the decimal portion of the selected frequency is indicated by the .1-mc calibrations on the tuning control.
PRESET 1 AND PRESET 2 levers.	Provide means of presetting any two frequencies (par. 48).
Dial LAMP (E–201)	Illuminates tuning dial and tuning knob except when dial light switch (below) is in DIAL LIGHT-OFF position.
ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch (S–202).	Controls antenna-tuning, dial light, and calibrating circuits. ANT ADJ: Turns on test signal for tuning antenna (par. 34); turns on dial LAMP; is spring loaded to return to DIAL LIGHT-ON position.



TM 5039-5

Figure 29. AF Amplifier AM–65/GRC, panel view.

Control or instrument	Function
ANT ADJ-DIAL LIGHT—Continued	DIAL LIGHT-ON: Turns on dial LAMP. DIAL LIGHT-OFF: Turns off dial LAMP. CAL: Turns on test signals for calibrating tuning dial (par. 47); is spring loaded to return to DIAL LIGHT-OFF position.
Antenna tuning control.	Provides means of tuning receiver-transmitter antenna circuit. (Internal control asscessible through the top of the case when protective EPA (fig. 4) is removed; not an operational control.)
VOLUME control (R–204).	Adjusts the receiver audio-output level to the interphone amplifier and panel mounted AUDIO connector. Since the amplifier output is supplied to the interphone boxes, the VOLUME control setting determines the level at the interphone boxes.
SQUELCH control (R–202 and S–201).	Controls noise suppression and determines what minimum level of input signal will be required for receiver operation. In OFF position it provides for no noise suppression and allows receiver to operate at maximum sensitivity.
AUDIO connector (J–202).	Provides means for connecting either a chest set (with headset-microphone), a headset, a microphone, or a speaker, for separate local monitoring or push-to-talk operation of the receiver-transmitter. Also used for the connection of the local control unit of Control Group AN/GRA–6.

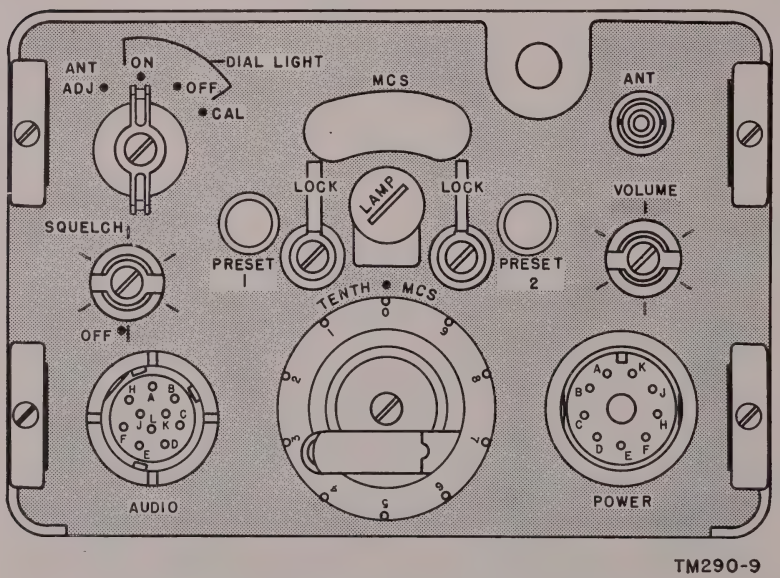


Figure 30. Receiver-Transmitter RT–70/GRC, panel view.

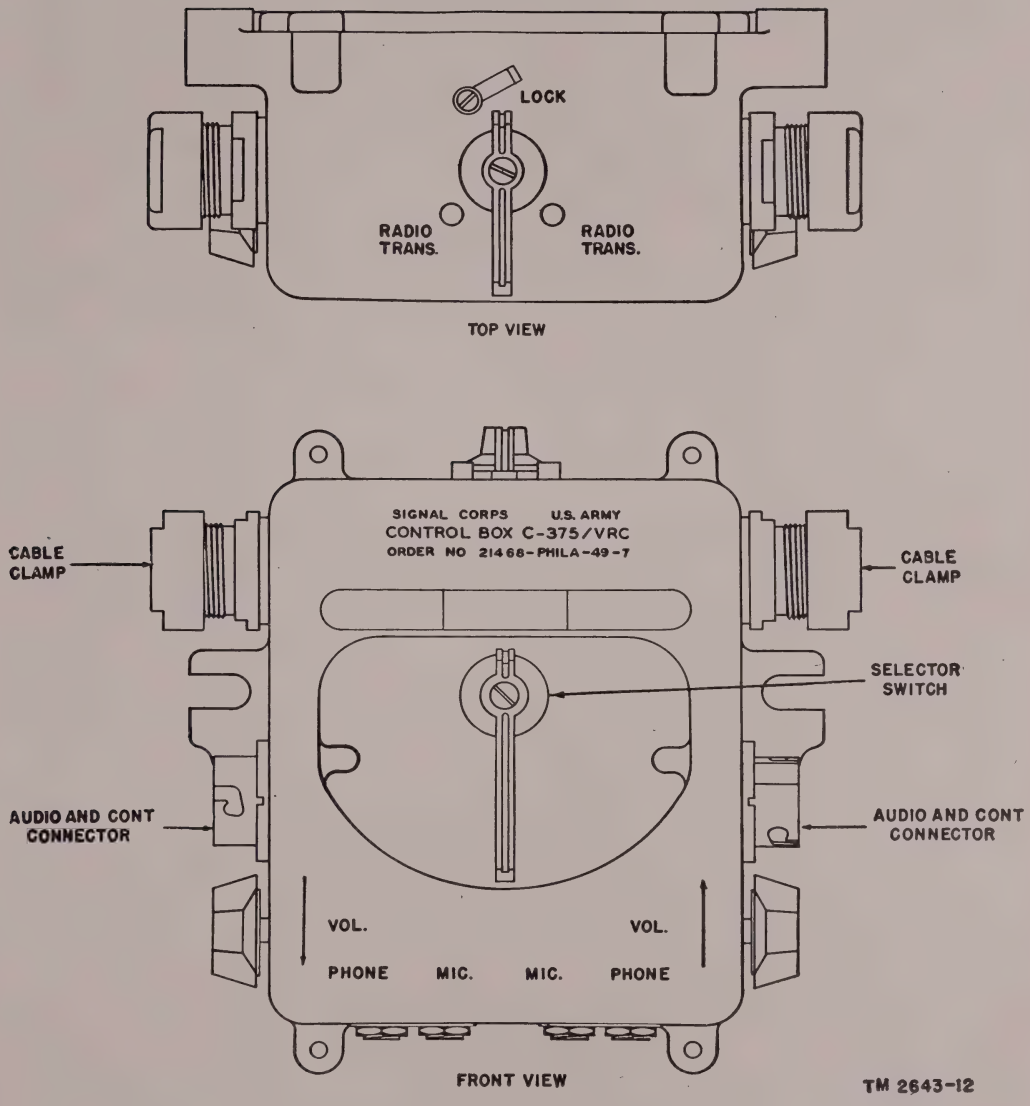


Figure 31. Control Box C–375/VRC, panel view.

45. Control Box C–375/VRC

The controls on Control Box C–375/VRC are illustrated in figure 31. Functions of the controls are listed in the following chart.

Control	Function
Selector switch (S–1)	Completes monitoring circuits to PHONE jacks and audio receptacles. In conjunction with RADIO TRANS switch, completes push-to-talk circuits to MIC jacks and audio receptacles. Counterclockwise position: Completes monitoring and push-to-talk circuits for interphone signals only. Center position: Completes monitoring circuit for interphone and received signals (Set 2+ Interphone). Completes interphone push-to-talk circuit to MIC jacks and audio receptacles. Clockwise position: Completes monitoring circuit for interphone and received signals (Set 2+ Interphone). Completes transmitter (Set 2) push-to-talk circuit to MIC jacks and audio receptacles when RADIO TRANS switch is operated.
RADIO TRANS switch (S–2).	Controls push-to-talk operation of transmitter. Spring loaded to return to the center position if not held in either of the RADIO TRANS positions. A locking device is provided to hold the switch in one of the RADIO TRANS positions. Clockwise and counterclockwise positions: complete Set 2 push-to-talk circuits to MIC jacks and audio receptacles when the selector switch is in a clockwise position. Center position: Opens push-to-talk circuit to transmitter.
VOL controls (R–1 and R–2).	Determine signal levels at PHONE jacks and audio receptacles. (Level at each PHONE jack and audio receptacle is affected by the VOL control nearest the jack or connector.)
Audio receptacles (J–1 and J–2).	Provide for connection of Chest Set Group AN/GSA–6 (with Headset-Microphone H–63/U) for operation of the receiver-transmitter and interphone system.
MIC jacks (J–3 and J–4).	Provide for connection of Microphone T–17 for operation of receiver-transmitter and interphone system. (Efficiency of operation will be affected by such usage and is not advisable if the standard audio accessories are available.)
PHONE jacks (J–5 and J–6).	Provide for connection of Headset H–16/U or Headset HS–30 in combination with Cord CD–933 for monitoring the receiver-transmitter and interphone system. (Efficiency of operation will be affected by such usage and is not advisable if the standard audio accessories are available.)

46. Control Group AN/GRA–6

a. Local Control C–434/GRC. Figure 32 illustrates the layout of controls and instruments on Local Control C–434/GRC. The following chart lists the functions of controls and instruments.

Control or instrument	Function
LOCAL switch (S–3)	Provides for push-to-talk operation of the receiver-transmitter, and for duplex telephone operation with the remote unit. (Allows for interphone operation if local unit is connected to the amplifier.) SET 1: Provides for interphone operation when the local unit is connected to the interphone amplifier. SET 2: Allows push-to-talk operation of the transmitter. TEL: Allows telephone operation with the remote unit, and radio monitoring at the remote unit. (Monitoring circuit is broken if REMOTE switch is at TEL ONLY position.)
REMOTE switch (S–1).	In conjunction with controls at remote unit, provides for remote push-to-talk control of the radio set. Also provides means of limiting operation (at the remote unit) to telephone communication. TEL ONLY: Allows for telephone communication between local and remote control units. SET 1 & 2: Provides for remote push-to-talk operation of either the transmitter or interphone amplifier. SET 1: Provides for remote interphone control. SET 2: Provides for remote push-to-talk operation of the transmitter.
LINE L1 and L2	Binding posts for telephone line connections.
Ringing generator	Provides means of sending a ringing signal to the remote unit.
CALL LIGHT (E–3)	Indicates (when lit) that a ringing signal is being received from the remote unit. (CALL LIGHT indication can be replaced by a bell by means of an internal switch.) Dimmer control provides for masking glow of the lamp.
AUDIO connector (J–1).	Provides means of connecting a chest set (with headset and microphone) for telephone communication and push-to-talk operation of the radio set.

b. Remote Control C–433/GRC. Figure 33 illustrates the controls and instruments on Remote Control C–433/GRC. The following chart lists the functions of the controls and instruments.

Control or instrument	Function
SELECTOR switch	In conjunction with controls at local control unit, provides for remote push-to-talk operation of the receiver-transmitter, remote interphone control, and telephone communication between local and remote units. Right-hand write-in position: Provides for remote push-to-talk operation of the radio set when the REMOTE switch on the local unit is in either the SET 1 & 2 or SET 2 position.* Left-hand write-in position: Provides for remote interphone control when the REMOTE switch on the local unit is in either the SET 1 & 2 or SET 1 position.* TEL position: Limits operation (at the remote unit) to monitoring and telephone communication with the local unit.
LINE L1 and L2	Binding posts for connecting the telephone line.
Ringing generator	Provides means of sending a ringing signal to the local control unit.
CALL LIGHT (E–3)	Indicates (when lit) that a ringing signal is being received from the local control unit. (CALL LIGHT indication can be replaced by a bell by means of an internal switch.) Dimmer control provides for masking glow of the lamp.
AUDIO connector (J–1).	Provides means of connecting Handset H–33/PT for telephone communication with the local unit, interphone operation, and push-to-talk operation of the radio set.

*The functions of the write-in positions will be reversed if the telephone line connections are reversed or if the SET 1 cable and SET 2 cable connections are reversed between the local unit and interphone amplifier, and between the local unit and the receiver-transmitter, respectively.

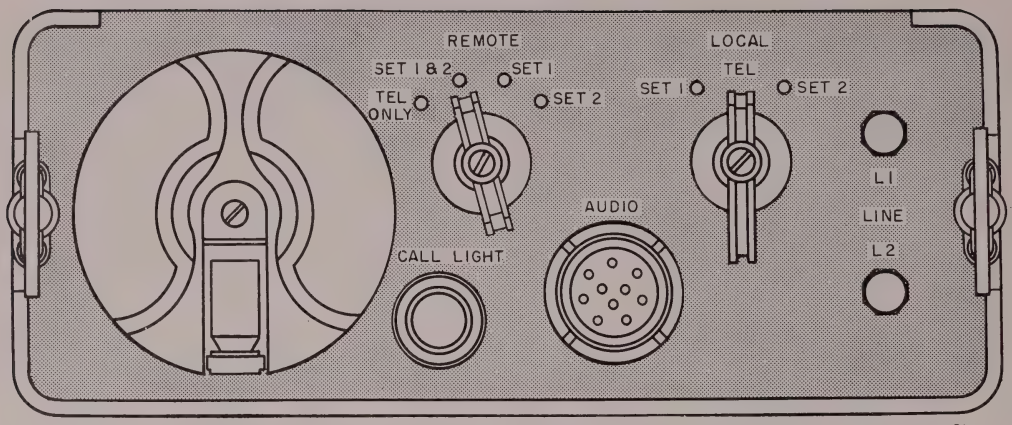


Figure 32. Local Control C–434/GRC, panel view.

Section III. FREQUENCY SELECTIONS

47. Tuning Receiver-Transmitter RT–70/GRC

When frequency selections are made, the tuning dial of the receiver-transmitter should always be calibrated at the nearest mc calibration. Perform the following steps:

a. Apply power to the set by placing the OFF-INT-RT–70 switch of the interphone amplifier in the RT–70 position.

b. Provide a means of monitoring. (A headset at the panel AUDIO connector or at a convenient interphone box will be adequate.)

c. Turn the TENTH MCS tuning control until the integral mc calibration nearest the desired frequency is indicated on the MCS dial.

d. Turn the SQUELCH control to OFF to obtain noise output in the headset.

e. Hold the ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch in the CAL position and listen for a beat note or zero-beat indication in the head-

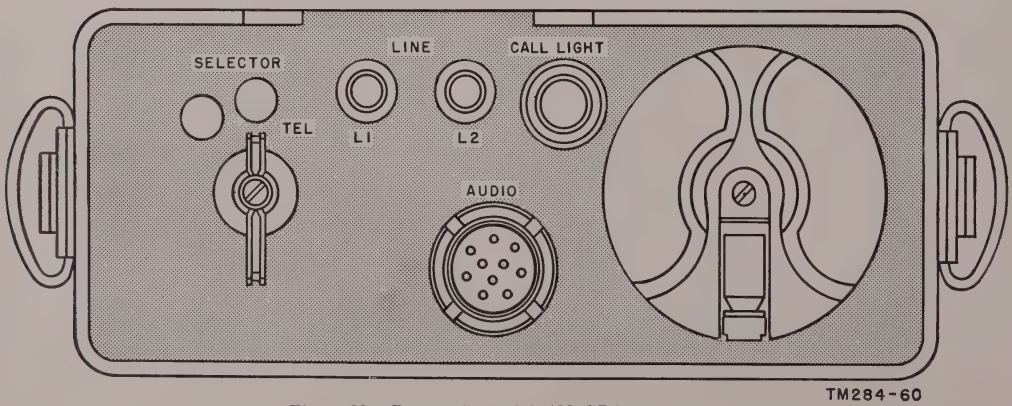


Figure 33. Remote Control C–433/GRC, panel view.

set. Adjust the TENTH MCS tuning control slightly, if necessary, until the zero-beat indication is obtained. The zero beat is an indication that the receiver-transmitter is tuned to the integral mc indicated on the MCS dial.

f. If the zero calibration of the dial on the TENTH MCS control is not exactly opposite the index line on the panel, hold the control and adjust the calibration plate physically until the dial calibration and panel index are in line.

g. Turn the TENTH MCS tuning control to obtain the exact frequency desired. Each calibration is .1 mc.

48. Presetting

a. General. The two locking levers designated PRESET 1 and PRESET 2 on the panel of the receiver-transmitter (figs. 4 and 20) may be used to preset (detent) any two frequencies. When the frequencies have been preset as outlined below, they may be rapidly selected by turning the TENTH MCS control until the desired detent is engaged.

b. Initial Setting. To preset any two frequencies initially, perform the following steps:

(1) Release the two preset levers by turning each of them to the horizontal position.

(2) Turn the TENTH MCS control over its entire range (from one end to the other) before selecting the desired frequency. Calibrate and tune the receiver-transmitter to one of the desired frequencies as outlined in paragraph 47.

(3) Turn one of the preset levers to the vertical (LOCK) position. Mark the preset frequency on the label next to the lever.

(4) Calibrate and tune the receiver-transmitter to the second desired frequency.

(5) Turn the second preset lever to the vertical (LOCK) position and mark the preset frequency on the label next to the lever.

Note. Unless the preset frequencies are labeled or recorded, it is impossible to distinguish which lever controls which detented frequency.

c. Changing Preset Frequencies. When it is desired to change the frequency which a preset lever controls, perform the following steps:

(1) Turn the TENTH MCS control until the original preset frequency is engaged.

(2) Remove the detent by turning the associated lever (PRESET 1 or PRESET 2 as indicated on the marker) to the horizontal position.

(3) Calibrate and tune the receiver-transmitter to the new frequency and return the preset lever to the LOCK position. It is not necessary to sweep across the dial (step 2 of *a* above) if the preset lever is unlocked while the dial is set at the preset frequency.

Section IV. OPERATION

49. Operational Procedures

a. Operation of the radio set involves the following procedures:

(1) Start-stop operations.
(2) Squelch adjustments.
(3) Volume-level adjustments.
(4) Frequency selection.
(5) Transmit-control operations.

b. The first four of the above procedures are local operations (performed at the panels of the various major units) and are not necessarily repeated during normal operating periods. (It may be necessary to repeat tuning and squelch adjustments from time to time.) The transmit-control operations are normally performed at Control Box C–375/VRC and are continually repeated during normal operating periods. If desired, the radio set may be operated completely from the panel of the receiver-transmitter. When the tactical situation requires it, transmit-control and interphone facilities can be extended to a remote station by means of Control Group AN/GRA–6.

50. Starting Procedure

a. Apply power to the entire radio set by turning the OFF-INT-RT–70 switch to the RT–70 position.

b. Apply power to the interphone amplifier only, by turning the OFF-INT-RT–70 switch to the INT position.

51. Squelch and Volume-Level Adjustments

The SQUELCH and VOLUME controls of the receiver-transmitter should be set as soon as the equipment is placed in operation. The SQUELCH control setting should be checked periodically to insure operation at maximum sensitivity for the particular noise condition present. Set the controls as outlined in the following steps.

a. Provide a monitor for the receiver by connecting a chest set (with headset and microphone) to one of the audio receptacles on Control Box C–375/VRC. Turn the VOL control associated with the connector to the approximate midpoint of its range. Turn the Selector switch on the control box to the clockwise position. Repeat the connections and settings for each control box used.

b. Turn the SQUELCH control counterclockwise until noise is audible in the headsets, and advance the VOLUME control on the receiver-transmitter to obtain a comfortable listening level in the headsets. Then advance the SQUELCH control in a clockwise direction to the point at which the receiver quiets. Any subsequent volume-level adjustments should be made at the individual control boxes.

Note. When the tuning of the set is changed, it may be necessary to reset the SQUELCH control.

c. The VOLUME control on the interphone amplifier controls the audio output only to the interphone amplifier panel AUDIO receptacle. Adjust this VOLUME control for comfortable listening level when the AUDIO receptacle on the interphone amplifier is used for monitoring. If Local Control C–434/GRC is connected to the amplifier (par. 56*g*) adjust the VOLUME control as directed for remote interphone operation.

52. Frequency Selection

a. To tune to and calibrate a frequency, follow the procedure outlined in paragraph 47.

b. To preset two frequencies, follow the procedure outlined in paragraph 48.

53. Operation from Control Box C–375/VRC

a. Modes of Operation. When power has been supplied to the radio set, squelch and volume-level adjustments made, and when the frequency of operation has been selected, the following modes of operation are possible at the interphone box (Control Box C–375/VRC):

(1) Monitoring.
(2) Push-to-talk.
(3) Interphone communication among control boxes and interphone amplifier. When Control Group AN/GRA–6 is connected for interphone operation (par. 56*g*), the interphone facilities can be extended to the local and remote control units.

b. Connection of Audio Accessories. For all modes of operation connect Chest Set Group AN/GSA–6 to one of the audio connectors on the control box, and connect Headset-Microphone H–63/U to the chest set. Lock the RADIO TRANS switch of the control box in the RADIO TRANS position and turn the Selector switch to the clockwise position. Disable the lock-on push-to-talk switch (fig. 25, par. 33).

c. Monitoring. Received signals will be audible in the headset when the audio accessories have been connected and the switches have been set as outlined above. To vary the signal level in the headset, adjust the VOL control next to the audio connector being used.

d. Interphone Operation.

(1) Interphone operation is possible for any position of the Selector switch. The signal level in the headset will be highest, however, when the switch is in the center position.
(2) To communicate with an operator at any interphone box or the interphone amplifier, press the push-to-talk button on the chest set and talk into the microphone. The operator can *break in* on a conversation at any time without waiting for the sending party to stop talking. *Do not press the RADIO-INT button switch on the chest set if the Selector switch is in the right-hand position. The transmit-control circuits will be operated.*
(3) To communicate with an operator at the local or remote control unit, follow the same procedure as in (2) above.

Note. Duplex interphone operation with the local and remote control units is possible only when Control Group AN/GRA–6 is connected solely for interphone control. If the control group is connected for both interphone and

radio control, only one-way interphone communication is possible (control units *to* interphone boxes) and the VOLUME control on the interphone amplifier must be turned down (counterclockwise) to avoid feedback.

e. PUSH-TO-TALK OPERATION. For push-to-talk operation of the receiver-transmitter, turn the Selector switch to the clockwise position, press the push-to-talk and RADIO-INT buttons on the chest set, and talk into the microphone. Release the push-to-talk button to listen.

54. Operation from Receiver-transmitter and Amplifier Panels

The receiver-transmitter and interphone amplifier can each be operated locally by using a chest set (with headset and microphone) at their respective panel-mounted AUDIO receptacles. Lock the RADIO-INT switch of the chest set in the RADIO position (fig. 25 and par. 33).

a. STARTING PROCEDURE. Power must first be supplied to the set, squelch and volume-level adjustments made, and frequency of operation selected as outlined in paragraphs 50, 51, and 52. Received signals will then be audible in a headset at the receiver-transmitter or amplifier.

b. PUSH-TO-TALK OPERATION. Press the push-to-talk button on the chest set connected to the receiver-transmitter, and talk into the microphone. Release the button to listen.

c. INTERPHONE OPERATION. Signals from the interphone box will be audible in the headset of the AUDIO receptacle of the amplifier. To communicate with the operators of the interphone boxes, press the push-to-talk button on the chest set and talk into the microphone. Duplex operation is possible; that is, it is not necessary to release the button to listen.

55. Stopping Procedure

a. To remove all power from the radio set, place the OFF-INT-RT–70 switch to the OFF position on the interphone amplifier.

b. To make only the receiver-transmitter inoperative, place the OFF-INT-RT–70 switch on the interphone amplifier to the INT position.

56. Operation from Control Group AN/GRA–6

a. MODES OF OPERATION. Although Control Group AN/GRA–6 is provided mainly to allow remote operation of the radio sets from points up to 2 miles from the point of installation, local as well as remote operating facilities are available. The complete facilities are as follows:

(1) Monitoring of received signals at both local and remote units.
(2) Local push-to-talk operation of the receiver transmitter.
(3) Duplex telephone communication, including ringing, between local and remote units.
(4) Remote push-to-talk operation of the receiver-transmitter, without interphone facilities.
(5) Remote push-to-talk operation of the receiver-transmitter, with limited (one-way) interphone operation, *from* the local and remote units to the interphone boxes.
(6) Duplex interphone facilities among the local control unit, remote control unit, and the interphone boxes without push-to-talk control of the receiver-transmitter. (Monitoring will still be possible.)

b. INSTALLATION. Install Control Group AN/GRA–6 as outlined in paragraph 36*a* through *d*. When the installation is completed, start and tune the radio set as outlined in paragraphs 50, 51, and 52.

c. RADIO MONITORING. To monitor the output of the receiver at both the local and remote control units, leave the LOCAL switch at TEL and place the REMOTE switch (of the local unit) at any position except TEL ONLY.

d. LOCAL PUSH-TO-TALK OPERATION. For local push-to-talk operation of the transmitter, set the REMOTE switch to SET 1 & 2 (or to SET 2), hold the LOCAL switch in the SET 2 position, press the push-to-talk switch on the chest set, and talk into the microphone. Release the chest set switch and LOCAL switch to listen.

Note. The push-to-talk switch and RADIO-INT switch on the chest set may be locked in position, if desired, by means of internal adjustments (fig. 25 and par. 36).

e. TELEPHONE COMMUNICATION. For normal telephone communication between local and remote units, place the REMOTE switch of the local unit in the TEL ONLY position and place the SELECTOR switch of the remote unit in the TEL position. These are normal positions of the RE-

MOTE switch and the SELECTOR switch when push-to-talk operation is not desired.

(1) To send a ringing signal in either direction, turn the crank of the ringing generator at the sending unit (local or remote). Either a CALL LIGHT will glow, or a bell will ring at the receiving end, depending upon the setting of internal switches in the local and remote units.

Note. A ringing signal should not be sent at any time in either direction unless the LOCAL and REMOTE switches of the local unit are at the TEL and TEL ONLY positions, respectively, and the SELECTOR switch at the remote unit is at TEL.

(2) To communicate, press the push-to-talk switch on the handset (at the remote unit), or the push-to-talk switch on the chest set (at the local unit), and talk into the mouthpiece or the microphone. Full duplex operation is possible. Battery life will be conserved if the push-to-talk switches are released while listening.

f. Remote Push-To-Talk Operation.

(1) The operator at the remote unit must inform the local operator (by telephone) to place the REMOTE switch of the local unit in the SET 1 & 2 (or SET 2) position.

(2) For remote push-to-talk operation of the transmitter, place the SELECTOR switch of the remote unit in the right-hand write-in position, press the push-to-talk switch on the handset, and talk into the mouthpiece. Release the push-to-talk switch to listen.

Note. If the telephone-line connections at either unit are reversed, or the Set 1 cable is used between the receiver-transmitter and local control unit (fig. 27), the left-hand write-in position will control the transmitter instead of the right-hand position. Operation will be unaffected otherwise.

g. Limited Interphone Operation. If both the receiver-transmitter and the interphone amplifier are connected to the local control unit, one-way interphone operation is possible from the local and remote units to the interphone boxes, without affecting the radio monitoring and push-to-talk facilities.

(1) Connect the Set 1 and Set 2 cables at the rear of the local control unit (fig. 27) to the AUDIO receptacles of the interphone amplifier and receiver-transmitter, respectively.

(2) For interphone operation from the local unit, hold the LOCAL switch in the SET 1 position, press the push-to-talk switch on the chest set, and talk into the microphone. (The RADIO-INT switch of the chest set should be locked in the RADIO position.)

Note. While talking into the microphone, turn the VOLUME control on the interphone amplifier in a counterclockwise direction until there is no interference from feedback. Leave the VOLUME control turned down as long as both the amplifier and receiver-transmitter are connected to the local control unit.

(3) For interphone operation from the remote unit, place the REMOTE switch of the local unit in the SET 1 & 2 or SET 1 position, place the SELECTOR switch of the remote unit in the left-hand write-in position, press the push-to-talk switch on the handset, and talk into the mouthpiece.

h. Duplex Interphone Operation. If only the interphone amplifier is connected to the local control unit, duplex interphone operation is possible among the control unit, the remote control unit, and the interphone boxes, but push-to-talk operation of the receiver-transmitter will not be possible.

(1) Connect the local control unit to the AUDIO receptacle on the interphone amplifier by means of the Set 1 cable (fig. 27).

(2) For interphone operation from the local unit, hold the LOCAL switch in the SET 1 position, press the push-to-talk switch on the chest set, and talk into the microphone. (The RADIO-INT switch of the chest set should be locked in the RADIO position.) It is not necessary to release the switches while listening. Adjust the VOLUME control on the interphone amplifier to obtain a comfortable level in the headset.

(3) For interphone operation from the remote unit, place the REMOTE switch of the local unit in the SET 1 & 2 or SET 1 position, place the SELECTOR switch of the remote unit in the left-hand write-in position, press the push-to-talk switch on the handset, and talk into the mouthpiece. To conserve battery power, release the push-to-talk switch while listening. If necessary, have the local operator readjust the VOLUME control on the interphone amplifier for a comfortable listening level at the remote unit.

CHAPTER 4

THEORY OF OPERATION

Section I. INTRODUCTION

57. General

a. System theory is presented to provide an understanding of how the several units are interrelated in the various set operations. Such an understanding should be an effective trouble-shooting aid to isolate a defective unit or a defective part within a unit.

b. Detailed circuit theory of individual units is not discussed, except where the units are interconnected in a common circuit. For example, the microphone circuits of the system are described since they are interconnected with the control units through the mounting. Details of the i-f amplifier are not important for system understanding and therefore are not discussed. Most of the information presented in this chapter is concerned with system applications of the several units. Complete details on the individual units are published in separate technical manuals (app. I). To provide a general acquaintance with the individual units, however, block diagrams of the major units are included and schematic diagrams of all units will be found at the end of the manual.

58. Basic System Block Diagram

a. The basic units of Radio Set AN/VCR–7 are a receiver-transmitter and the interphone amplifier, with speech-input and monitoring facilities as shown in figure 34. These basic units are the essentials of the system and the power supply, cables, mounting, and accessory equipment are supplied to make the basic units perform their function of transmitting, receiving, and monitoring.

b. In an actual system installation, microphone and headset facilities are provided at each interphone box (Control Box C–375/VRC), and the switching provisions on the box allow selection of the mode of operation, namely: transmission, interphone operation, or monitoring. The control facilities are extended from the individual units to the interphone box through Mounting MT–300/GR and interconnecting cables (fig. 24).

c. An adaptation of the basic system is the extension of the microphone and monitoring facilities to a remote point by means of telephone lines. Control Group AN/GRA–6 is provided to accomplish this function.

59. System Diagram

a. The system diagram (fig. 35) illustrates system interconnections and functions, including complete power distribution, monitoring facilities, and push-to-talk facilities. The push-to-talk circuit is illustrated for both Control Box C–375/VRC and Control Group AN/GRA–6 (Local Control C–434/GRC and Remote Control C–433/GRC). Telephone facilities between the local and remote control units are also shown.

b. In paragraph 61 through 75 the system diagram is discussed in detail for each operational function. By following the discussion and diagram it should be possible to determine what happens when each individual switch is thrown or pressed, the voltages applied to each stage, how the microphone circuits are completed, the disposition of each received signal (from the outputs of the receivers), and other system functions. The passage of a signal through the transmitter (microphone to antenna) or the path of a received signal (antenna to receiver output circuits), are not discussed. Such detail is peculiar to the units (not

the system) and is covered generally in paragraphs 76 through 78. Complete details are published in separate manuals.

60. System Legend

a. A system legend has been devised and used on the system diagram (fig. 35) to facilitate circuit tracing from unit to unit. Because each circuit is generally completed through one or more units, and similar reference symbols are used within each unit, it is impossible to tell (without some form of legend) when a circuit leaves one unit and enters another.

b. As indicated on the legend, a letter has been used to identify each unit and this letter has been prefixed to the reference symbol of the part in a particular unit. Thus, in the reference symbol H/P–2B near the top at the left-hand corner of figure 35, H indicates Mounting MT–300/GR, P–2 is the reference symbol for a plug on a cable leading from the junction box of the mounting, and B indicates pin B of the plug. The complete legend is shown on the diagram and is listed below:

Unit symbol	Unit symbolized
C	Receiver-Transmitter RT–70/GRC.
D	AF Amplifier AM–65/GRC.
H	Mounting MT–300/GR.
M	Remote Control C–433/GRC.
N	Local Control C–434/GRC.
R	Control Box C–375/VRC.
T	Handset H–33/PT.
U	Power Supply PP–281/GRC, PP–282/GRC, or PP–448/GR.
W	Special Purpose Cable Assembly CX–1213/U.
Y	Chest Set Group AN/GSA–6.

c. To correlate the electrical interconnections with the physical interconnections, the following chart indicates the cable connections made between the mounting and other units:

Mounting cable	Cable termination	Receptacle	Mating connector	
			Unit	Receptacle designation
W–1	P–1	J–4	AF Amplifier AM–65/GRC.	REC–TR CONT.
W–2	P–2	J–2	AF Amplifier AM–65/GRC.	INT–CONT.
W–3	P–3	J–6	AF Amplifire AM–65/GRC.	POWER IN.
W–4	E–2 E–3	----------	Battery----	
WM–46/U	E–1	E–2	Control Box C–375/VRC.	(Terminal board.)

d. To facilitate location of parts discussed in the text, the system diagram incorporates a grid system similar to that used on maps. When a part is referred to, the grid index letter and number are included in parentheses after the part symbol. Through use of these indexes the reader can readily locate the part on the diagram. For example, to locate section 1A front of switch D/S–1 (E, 02) on figure 35:

(1) Find the index letter *E* at the left- or right-hand margin of the diagram.
(2) Find the index number *2* at the top or bottom margin of the diagram.
(3) Mentally project lines from the two indexes until the lines intersect. The switch is located at the point of intersection.

Section II. RECEIVING AND MONITORING CIRCUITS

61. Power Input Circuits (fig. 35)

When power cable W–3 is connected from the mounting to the interphone amplifier, battery voltage is applied through fuses H/F–1 and D/F–1 to section 2C front of the OF-INT-RT 70 switch, D/S–2 (B, 01). If the switch is placed in the INT or RT–70 position, the battery circuit from the mounting is completed through section 2C of the switch to the amplified filaments (B, 01) and to input connector U/X–1 (B, 04) of the plug-in power supply installed in the amplifier.

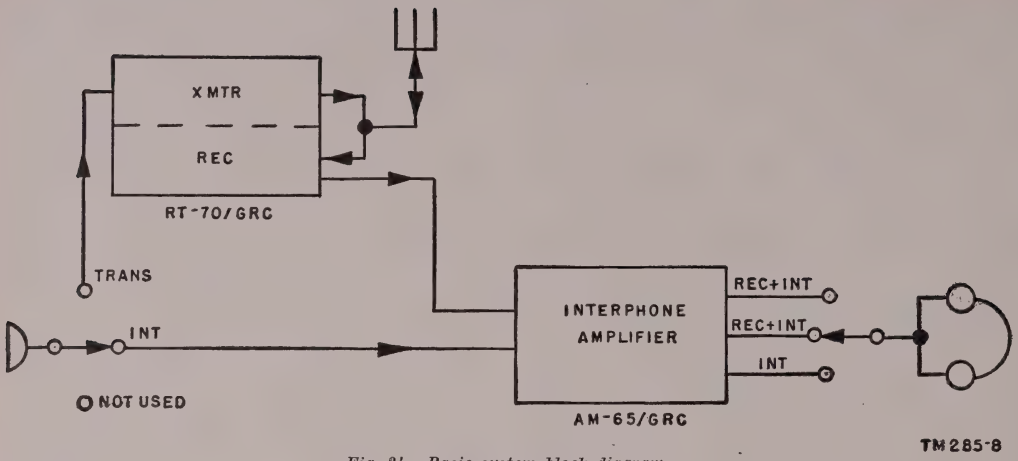


Fig. 34. Basic system block diagram.

62. Amplifier Filament Circuits
(fig. 35)

a. The filaments of amplifier tubes D/V–1 through D/V–5 (B, 01) are arranged in two groups. Tubes D/V–1 and D/V–4 are in parallel in one group; D/V–2, D/V–3, and D/V–5 are in parallel in the other group. When the 6V–12V–24V switch is set at 24V, the two groups are connected across the battery, in series with each other and the receiver-transmitter filament-protection circuit, by sections 1B front and 1A front of the switch (C, 02 and E, 02, respectively). The filament-protection circuit, D/R–32, D/K–1, and associated resistors, is discussed in more detail in conjunction with the receiver-transmitter circuits (par. 64). Resistor D/R–36 parallels the receiver-transmitter filament-protection circuit as a dummy load when section 1A rear of the OFF-INT-RT 70 switch (D, 03) is in the INT position.

b. For 12-volt operation, the two filament groups are connected in series with each other directly across the battery by section 1B front of D/S–1. The filament-protection circuit is connected in parallel with the amplifier filaments by sections 1D rear and 1A front of the same switch.

c. For 6-volt operation, the two filament groups are connected in parallel with each other across the battery by sections 1B front and 1C rear of switch D/S–1. The filament-protection and dummy load circuits are not connected, since the ground connection for the circuits is opened by section 1A front of D/S–1 (E, 02).

63. Amplifier Plate and Screen Supply
(figs. 35 and 66)

The power connection at U/X–1 (B, 04) supplies 6, 12, or 24 volts to the input of the vibrator power supply installed in the amplifier (B, 12). The 135-volt d-c output of the vibrator furnishes the plate and screen requirements of amplifier tubes D/V–1 through D/V–5 (C, 13). For details of the power supply and amplifier B-plus circuits, refer to figures 62, 63, 64, and 66.

64. Receiver Filaments
(fig. 35)

a. When the OFF-INT-RT–70 is placed in the RT–70 position and the 6V–12V–24V switch is placed in the 12V or 24V position, the battery circuit is completed to the receiver-transmitter filament-protection circuit as described for the amplifier (par. 61). During normal operation a regulated potential is available for the receiver-transmitter filaments at pin 7 of ballast tube D/R–32. Section 1A rear of the OFF-INT-RT–70 switch (D, 03) and normally closed contacts 7–3 of thermal relay K–1 connect the receiver-transmitter filament circuit to the regulated potential in place of dummy load D/R–36. For 6-volt operation, the battery voltage is made immediately

available to the receiver-transmitter filament circuit through section 1D rear of D/S–1 (C, 03) and section 1A rear of D/S–2 (D, 03).

b. Tubes C/V–2, C/V–4, C/V–106, and C/V–108 in the receiver-transmitter (G, 03 and G, 04) are energized directly. Tubes C/V–101 through C/V–105, C/V–107, and C/V–7 through C/V–11 (G, 04) are energized through normally closed contacts 2–1 of relay C/O–101 (F, 04).

c. Ballest tube D/R–32 in the filament-protection circuit maintains a constant voltage for the receiver-transmitter filaments, despite variation in battery voltage. (This constant potential is also utilized as bias for output stage D/V–5 of the interphone amplifier (C, 04). If the filament voltage rises because of a burned-out tube in one of the series-parallel filament strings (fig. 39), the increased voltage causes relay D/K–1 (D, 02) to operate. Contacts of the relay open and insert resistors D/R–33 and D/R–34 in series with the filaments to protect the remaining tubes from the overvoltage condition.

d. Dial LAMP C/E–201 (I, 03) parallels the receiver-transmitter filaments when the ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch (H, 03) is in any position but OFF. In the OFF position, a dummy resistor, C/R–137 (I, 03) is inserted in place of the lamp so that the regulation of the filament circuit will not be disturbed. The dummy load circuit is opened in the FIELD position of the FIELD-VEH-TANK switch, C/S–101 (J, 03), to avoid unnecessary drain on the dry batteries used in field applications. (See chapter 6 for field applications.)

65. Receiver Plate and Screen Supply
(fig. 35)

a. The output of the vibrator supply (B, 12) is also used for the receiver-transmitter. When the OFF-INT-RT–70 switch is in the RT–70 position, a voltage regulating circuit, utilizing tubes D/V–6 and D/V–7 (C, 14), is connected to the 135-volt supply through section 1B rear of the switch. A 90-volt potential is made available to the receiver-transmitter from the junction of resistors D/R–39 and D/R–40 in the regulating circuit (B/15).

b. The 90-volt potential is distributed to tubes C/V–108 (E, 15), C/V–6 (D, 16), C/V–1 through C/V–5 (C, 17), C/V–8 through C/V–11 (C, 17), C/V–101 through C/V–107 (C, 18), and to C/V–11 (C, 18). All plate and screen requirements are supplied in the above manner for tubes C/V–2 through C/V–5, C/V–8 through C/V–11, and C/V–101 through C/V–105. Only plate voltage is supplied, through the paths indicated above, to tubes C/V–1, C/V–6, and C/V–107; only screen voltage is supplied to C/V–106. Application of screen voltage for tubes C/V–1 and C/V–6 is a transmit-control function (par. 69). Screen voltage to squelch-oscillator tube C/V–107 (E, 18) is under control of the SQUELCH control (D, 18). If ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch C/S–202 (C, 17) is in the ANT ADJ position, the 90-volt potential is supplied also to calibrate-oscillator C/V–7; and when the switch is in the CAL position, the voltage is supplied to both the calibrate oscillator and to the plate of beat-oscillator C/V–106.

c. Bleeder resistor C/R–136 (C, 19) is connected across the 90-volt supply during the receiving condition through normally closed contacts 5–4 of relay C/O–101 and contacts of the FIELD-VEH-TANK switch, C/S–101 (E, 19). The bleeder serves as a dummy load during the receiving condition, in place of the load which the transmitter places on the regulated supply during transmit conditions. In field applications the bleeder is opened by switch C/S–101.

66. Monitoring
(figs. 35 and 36)

a. When filament, plate, and screen voltages are all available as described above, the receiver and interphone amplifier are operative. The signal path of received signals from antenna to audio output circuits can be traced on the block diagram (fig. 38). The output of the receiver is supplied to a panel-mounted AUDIO receptacle, C/J–202A (J, 19), and to the interphone amplifier.

b. Local Control C–434/GRC may be connected to the receiver transmitter AUDIO receptacle as shown in figures 35 and 36. The receiver monitoring circuit is then extended from C/J–202A to winding 7–9 of transformer N/T–1 (I, 17) through REMOTE switch N/S–2, when the switch is in any position but TEL ONLY. A handset connected to the panel AUDIO receptacle will monitor received signals; the earpiece being connected between terminal N/J–1A (I, 17) and ground.

c. Received signals developed across winding 7–9 of transformer N/T–1 are coupled through the transformer and a telephone line to winding 4–3 of transformer M/T–1 (H, 18) at Remote Control C–433/GRC. A handset connected to the panel AUDIO receptacle will monitor received signals, the earpiece being connected between terminals A and B of receptacle M/J–1 (H, 18).

d. The received signals which are supplied to the interphone amplifier (J, 19) are amplified and fed to output receptacles D/J–1 and D/J–2 (J, 20). The signal path through the interphone amplifier may be traced on the block diagram (fig. 37 and par. 77).

e. The amplified receiver output will be available at terminals F and H of receptacle D/J–2 (J, 20). When interphone operation is taking place (par. 67), the interphone signals will be present at these same terminals and at terminal D/J–2A also. Interphone signals at terminal F will have approximately double the volume of signals at terminals A and H. From D/J–2 the signals are coupled to the interphone boxes through the mounting and interconnecting cable. An operator at an interphone box can select either the interphone signals only, or the interphone and received signals, by means of Selector switch R/S–1 (J, 20). From the switch, the signals are supplied to VOL controls D/R–1 and D/R–2 which control the level applied to the audio receptacles and PHONE jacks on the interphone boxes.

f. When Control Group AN/GRA–6 is not connected to the amplifier (fig. 36), a headset, loudspeaker, or chest set (with headset-microphone) may be connected to the panel AUDIO receptacle D/J–1 for monitoring. Both received signals and interphone signals (par. 67) will be present at approximately equal levels at this receptacle.

g. If Control Group AN/GRA–6 is connected to both the amplifier and the receiver-transmitter

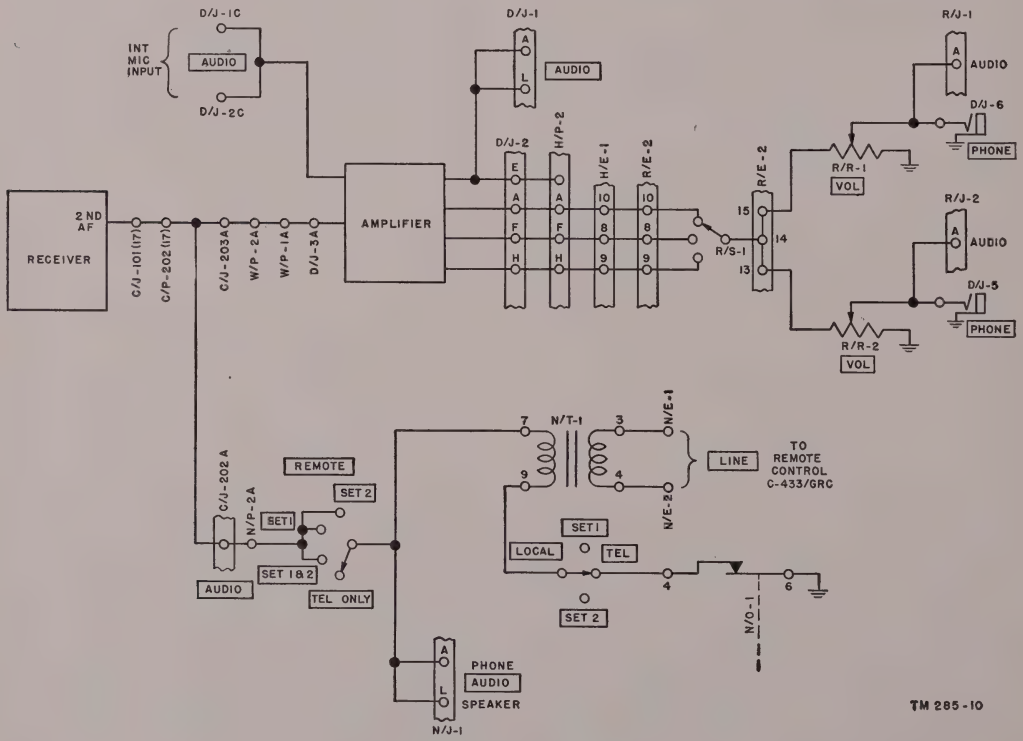


Figure 36. Monitoring circuit.

as indicated in figure 35, the VOLUME control on the amplifier panel (R–26 in figure 66) must be turned low to avoid feedback through the amplifier. Ordinarily the output level will be too low for monitoring at the local and remote control units, but interphone operation will be possible in the reverse direction, from remote or local control unit to the interphone box (par. 68).

h. If Control Group AN/GRA–6 is connected to the amplifier only, the VOLUME control on the amplifier may be turned up to allow complete duplex interphone communication among the interphone boxes, the local control unit, and the remote control unit. (Push-to-talk operation of the receiver-transmitter from the local or remote unit will not be possible with this type of connection.)

Section III. INTERPHONE AND PUSH-TO-TALK OPERATION FROM CONTROL BOX C–375/VRC

67. Power Input
(fig. 35)

Battery voltage from the mounting is supplied to terminal 3 of connector U/X–1 (B, 04) on the power supply unit installed in the amplifier (par. 61). In 24-volt systems this potential is applied to transmit control relay C/O–101 (E, 10), through dropping resistors D/R–29 and D/R–30, (D, 10), and to interphone-control relay D/O–1 (F, 11) through dropping resistors D/R–27 and D/R–28, (D, 11.) In 12-volt systems resistors D/R–29 and D/R–28 are short-circuited by jumpers on the input connector of the plug-in power supply. In 6-volt systems the four resistors are short-circuited by similar jumpers. Relays C/O–101 and D/O–1 are not energized, however, until their ground return lines have been completed.

68. Interphone Circuits
(fig. 35)

a. Operational Controls. The circuit for interphone-control relay D/O–1 (F, 11) is not completed to ground until normally open push-to-talk contacts of switch Y/S–2 (J, 11) on the chest set have been closed. The interphone circuit can also be completed through three paralleling circuits:

(1) Through the center position of RADIO TRANS switch R/S–2 (I, 10), the RADIO contacts of Y/S–1 (J, 11), and the push-to-talk contacts of Y/S–2 (J, 11).
(2) Through the center position of Selector switch R/S–1 (H, 09), RADIO TRANS contacts of R/S–2 (I, 10), RADIO contacts of Y/S–1 (J, 11), and push-to-talk contacts of Y/S–2.
(3) Through an audio accessory connected to the panel-mounted AUDIO connector D/J–1 (J, 20) on the amplifier.

b. Relay Operation. When push-to-talk switch Y/S–2 is pressed, relay D/O–1 is energized and the microphone circuit is completed through relay contacts 2–3 (G, 08) the microphone, and the push-to-talk contacts (J, 07). Polarizing voltage is connected to the microphone circuit from pin 1 of D/J–5 (D, 11) through resistor D/R–2 (F, 10), audio choke D/L–2 (F, 09), and microphone-transformer D/T–1 (F, 08).

c. Interphone Signal Path. When the push-to-talk switch is pressed, relay D/O–1 is energized and the microphone circuit is completed as described above. Microphone excitation current flows through the carbon element of the microphone and talking into the microphone develops voice signals across transformer D/T–1 (F, 08). The interphone signal is amplified and routed to the AUDIO receptacles for monitoring as described in paragraph 66.

69. Transmitting Circuits
(fig. 35)

a. Operational Controls. With relay voltage available for transmit-control relay C/O–101 (F, 10), four switches must be operated to complete the relay circuit. Selector switch R/S–1 on the interphone box (H, 09) must be in the right-hand position, the RADIO TRANS switch, R/S–2 (I, 10), should be locked in the RADIO TRANS position, and switches Y/S–1 and Y/S–2 should be operated to the RADIO and push-to-talk positions. When all these switches have been closed as described, relay C/O–101 will be energized.

b. Relay Operation. When the relay has been energized, it performs the following functions:

(1) Contacts 2–1 open and 2–3 close (F, 04) to switch filament voltage from receiver tubes to transmitter tubes C/V–1, C/V–3, C/V–5, and C/V–6, and to complete the polarizing voltage circuit through microphone transformer C/T (F, 06).

(2) Contacts 8–9 close (C, 18) to supply screen voltage for the microphone amplifier C/V–1 and power amplifier C/V–6.

(3) Contacts 5–4 open to remove bleeder resistor R–136 from across the 90-volt supply.

(4) Contacts 7–6 close to complete a sidetone circuit from the microphone transformer to the grid of audio amplifier C/V–106. Bleeder resistor C/R–138 across the sidetone circuit lowers the sidetone level when the FIELD-VEH-TANK switch is in either the FIELD or VEH position. In tanks which have a high noise level, the sidetone level is increased by opening the bleeder circuit.

c. Transmitter Signal Path. When the switching actions described above have taken place, the transmitter will be operative, and talking into the microphone (J, 07) will cause modulation of the transmitter. To trace the signal path through the transmitter, refer to the block diagram (fig. 38) and to the schematic diagram (fig. 65).

Section IV. OPERATION FROM CONTROL GROUP AN/GRA–6

70. Functions of Control Group AN/GRA–6

a. The functions of Control Group AN/GRA–6 are to provide local and remote push-to-talk facilities and duplex telephone facilities between local and remote units. The control group can also be used for remote interphone operation with the limitations indicated in paragraph 66.

b. The use of the control group for controlling transmission constitutes a substitution of relays and switches for the transmit-control and audio-input facilities of Control Box C–375/VRC (par. 69). Power distribution and over-all operation are essentially the same.

71. Ringing Circuits
(fig. 35)

a. It is always possible to ring from Local Control C–434/GRC to the Remote Control C–433/GRC or vice versa when the units are connected by a telephone pair as indicated in figure 35. If the control group is connected to the radio set, REMOTE switch N/S–2 (G, 11; G, 12; I, 15; and I, 16) should be in the TEL ONLY position. LOCAL switch N/S–3 (I, 13) should be in TEL position, and SELECTOR switch M/S–2 (H, 20) should be in the TEL position.

b. The ringing signal is generated by the hand generator at either unit and is transmitted in either direction through transformers N/T–1 (G, 17) and M/T–1 (F, 18) and the telephone line. The ringing signal operates either the CALL LIGHT on the panel of the receiving unit or a bell within the receiving unit (G, 15 or H, 19). An internal switch, N/S–1 or M/S–1, selects the lamp or bell in Local Control C–434/GRC and Remote Control C–433/GRC, respectively.

72. Telephone Circuit
(fig. 35)

a. Duplex telephone operation is possible provided the LOCAL switch (N/S–3) is left in the TEL position. Local batteries (BT–1 and BT–2) are supplied in each unit in series with the microphones (J, 12 and J, 21). If a push-to-talk switch on the handset or chest set at either unit is pressed, and the operator talks into the mouthpiece, the voice signals will be coupled through the transformers and telephone line to the earphones (J, 17 and H, 19) at the receiving end.

b. The TEL ONLY position of the REMOTE switch on Local Control C–434/GRC and the TEL position of the SELECTOR switch on Remote Control C–433/GRC provide for telephone operation only. For other positions of these switches radio operation is also possible (pars. 73, 74, and 75).

73. Monitoring and Local Push-To-Talk Operations

(fig. 35)

With Local Control C–434/GRC connected only to the receiver-transmitter AUDIO receptacle C/J–202A (J, 19), receiver monitoring and both local and remote push-to-talk operation of the transmitter are possible. The push-to-talk control circuits parallel the similar facilities in Control Box C–375/VRC.

a. Monitoring and local push-to-talk operations are described for a SET 1 & 2 or SET 2 position of REMOTE switch N/S–2 on Local Control C–434/GRC. The set is in a receiving condition, and any signals received may be monitored at Local Control C–434/GRC. Section 2F front of the REMOTE switch (J, 16) couples the signals to the monitoring devices and the line transformer in the Local Control C–434/GRC. The signals are also coupled through the line transformers and telephone line to the earphone at Remote Control C–433/GRC (par. 66).

b. If the LOCAL switch is turned to the SET 2 position, and the push-to-talk switch is pressed, sections 1A and 1B of the switch (J, 14) provide ground returns for the microphone and transmit-control lines of the receiver-transmitter at terminal C/J–202C and C/J–202F, respectively (G, 07 and F, 13). The transmitting circuits are energized as described in paragraph 69. Talking into the microphone at Local Control C–434/GRC will cause modulation of the transmitted signal.

74. Remote Push-To-Talk Operations

(fig. 35)

a. In remote push-to-talk operations, the ground returns for the transmitter audio-input and control lines are controlled by relays N/O–1 and N/O–2 which are in the Local Control C–434/GRC, but whose control voltage is obtained from Remote Control C–433/GRC through the telephone line. Relay N/O–2 is polarized so that it will operate its contacts to the position shown (G, 14) when the potential applied to it is positive at terminal 3 with respect to terminal 2. When the potential is reversed, the relay contacts will be operated to their opposite position. Relay N/O–1 (H, 15) will operate upon application of voltage and release upon removal of voltage, regardless of the polarity of the applied potential.

b. The polarity applied to relay N/O–2 is controlled by the REMOTE switch in Local Control C–434/GRC and the SELECTOR switch in Remote Control C–433/GRC. For remote push-to-talk operation, the REMOTE switch is left in the SET 1 & 2 or SET 2 position so that the SELECTOR switch has complete control of the relay operation.

c. When the SELECTOR switch at Remote Control C–433/GRC is placed in the left-hand write-in position and the remote push-to-talk switch is depressed, the battery connection to the telephone line is made so that the potential applied to relay N/O–2 causes contacts 6 and 4 to close in the transmitter control line. Relay N/O–1 also is energized and its contacts operate as follows: Contacts 6 and 4 open to break the ground connection for winding 7–9 of transformer N/T–1. This prevents the sidetone output of the receiver-transmitter from feeding back to the remote unit. Contacts 6 and 7 close to complete the ground return for the Set 2 control line; contacts 5 and 8 close to complete the a-f ground return for the Set 2 microphone line. When the remote operator talks into the microphone, the voice signals are coupled to the Set 2 microphone circuit.

Note. If the telephone line connections are reversed at either unit, or if the Set 1 cable is used instead of the Set 2 cable (fig. 27), the functions of the left-hand and right-hand write-in positions will be reversed. Operation is otherwise the same.

75. Interphone Operation

(fig. 35)

The interphone facilities available at the Control Group AN/GRA–6 units are dependent on whether the local control unit is connected to both the receiver-transmitter and the interphone amplifier, or to the interphone amplifier alone.

a. With the Set 1 and Set 2 cables at the local control unit (fig. 27) connected to the interphone amplifier and the receiver-transmitter, respectively, one-way interphone facilities are available from the units of Control Group AN/GRA–6 to the interphone boxes. There can be no signal reception at the control group units, except at an extremely low level, because it is necessary to reduce the signal level to avoid feedback (J, 19 on figure 35).

b. With the Set 1 cable of the local control unit connected to the amplifier and the Set 2 cable disconnected from the receiver-transmitter, two-way interphone communication is possible among the various interphone boxes, the local control unit, and the remote control unit. (With these connections, push-to-talk operation and monitoring of the receiver-transmitter is possible only at the interphone boxes and the panel of the receiver-transmitter.) For interphone communication from the remote unit to an interphone box, the REMOTE switch of the local unit should be in the SET 1 & 2 or SET 1 position, the SELECTOR switch at the remote unit should be in the right-hand write-in position, and the push-to-talk button should be pressed. Voice signals from the microphone are then coupled to the local control unit by means of transformer M/T–1 (F, 19), the telephone line, and transformer N/T–1 (G, 17). From transformer N/T–1 the signal is routed to transformer D/T–1 in the amplifier (F, 8) through contacts 8–5 of relay N/O–1 (H, 12), capacitor N/C–2B, REMOTE switch N/S–2, terminals N/P–1C and D/J–1C (G, 10), and contacts 2–3 of relay D/O–1. The signal is amplified and routed from the interphone amplifier as described in paragraph 66.

Section V. UNIT THEORY

76. General

The discussion of unit theory is limited to block diagram analyses of the major units. Although the maintenance information included in this manual is at an organizational level only, familiarity with the block diagrams of the units should be helpful in trouble shooting. A knowledge of which tubes are receiving tubes and which tubes are transmitting tubes, for example, will aid in the replacement of parts for which the operator has running spares. The block diagrams are shown in figures 37 and 38. Complete schematic diagrams for all units are also included (figs. 57 through 66) as additional information for maintenance personnel.

77. Interphone Amplifier (fig. 37)

Figure 37 is a functional block diagram of AF amplifier AM–65/GRC. The diagram shows the signal and power supply circuits which are provided by the amplifier.

a. General. The signal circuits consist of three input channels, a common amplifier, and three amplifying paths. The input circuit of the Set 2 channel is arranged to accept signals from the output of the receiver-transmitter, while the input circuit of the Interphone channel will accept signals from a microphone. Microphones at Control Box C–375/VRC, Local Control C–434/GRC, Remote Control C–433/GRC, and the panel of the amplifier may be switched into the Interphone channel. In Radio Set AN/VRC–7, which uses only one receiver-transmitter, there is no input to the Set 1 channel of the amplifier.

b. Common Channel Amplifier. Signals from the receiver and microphones are routed over separate paths to the common channel amplifier where they are amplified. When an operator presses the push-to-talk button on an interphone-connected microphone, relay O–1 in the amplifier is energized. Contacts of the relay close to complete the circuit to the external microphone and apply polarizing potential to the microphone from the power supply circuits. Speech signals from the microphone enter the amplifier through the closed contacts of relay O–1, are amplified by V–1, and appear in the output circuits of that stage. An audio mixing arrangement in the common amplifier stage distributes the signals appearing at its output to all three output channels, as described in *c* below.

c. Signal Distribution. The interphone signal is applied to the Set 1+Interphone, Set 1+Set 2+Interphone, and Set 2+Interphone channels. The receiver signals are applied to the Set 2+Interphone and Set 1+2+Interphone channels. Signals from Set 2 do not enter the Set 1+Interphone channel. The Set 1+Set 2+Interphone channel and Set 2+Interphone channel carry signals from both sources. The Set 1+Interphone channel carries only the interphone signals.

d. Output Circuits. The interphone signal passing through the Set 1+Interphone channel is amplified in amplifier V–2, and appears at the

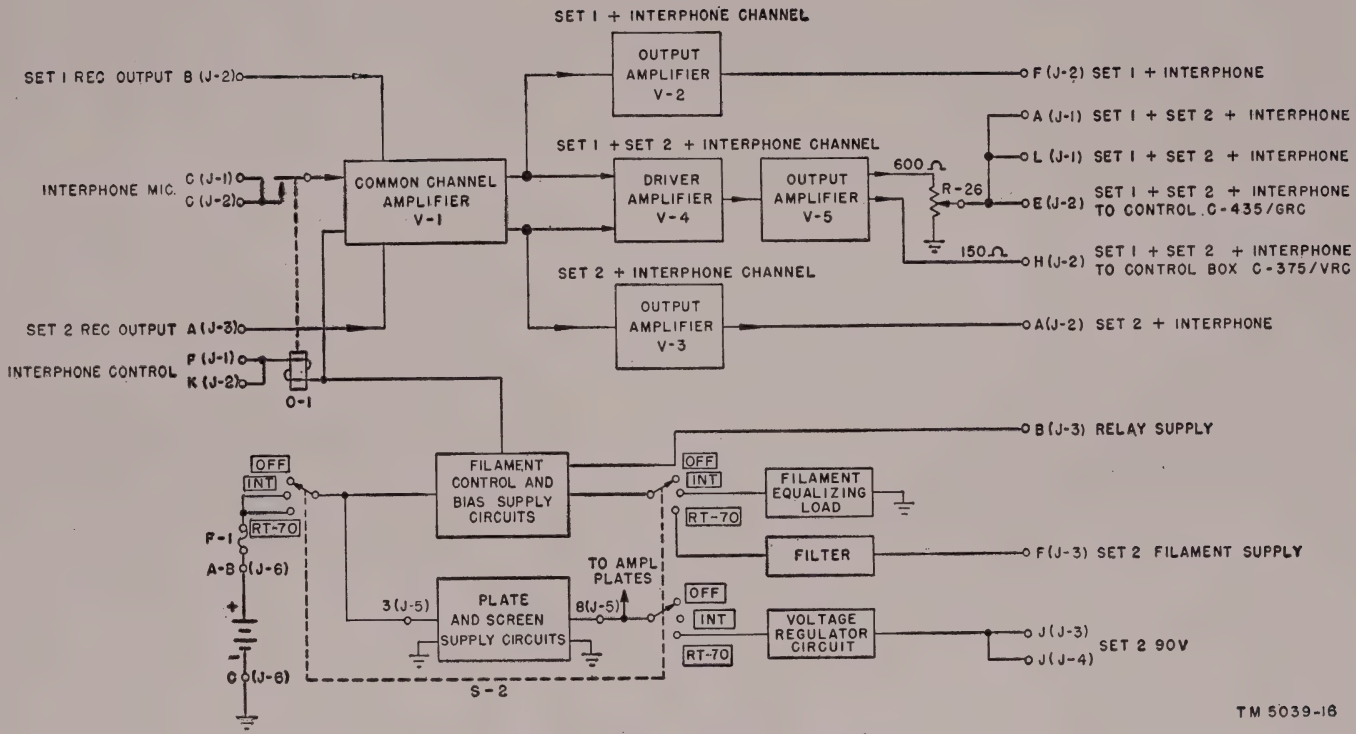


Figure 37. AF Amplifier AM-65/GRC, block diagram.

output terminal for that channel. Similarly, the interphone and receiver signals passing through the Set 2+Interphone channel are amplified in output amplifier V–3, and appear at the output terminals for that stage. Interphone and receiver signals passing through the Set 1+Set 2+Interphone channel are amplified by driver amplifier V–4 and output amplifier V–5 and are applied through a VOLUME control to a 600-ohm output connector for application to the AUDIO connector J–1. These signals are also applied to a 150-ohm output connection for application to Control Box C–375/VRC.

e. Power Supply Circuits. The battery input is connected through a panel-mounted connector J–6, through a fuse, and through contacts of the panel-mounted OFF-INT-RT–70 switch (S–2) to an h-v (high-voltage) and l-v (low-voltage) supply circuit. The switch serves as the power on-off switch for the amplifier and for Receiver-Transmitter RT–70/GRC. The h-v supply circuit includes a plug-in vibrator-type power-supply unit which converts the battery voltage into the required plate and screen voltages for the amplifier and for Receiver-Transmitter RT–70/GRC. The plate and screen voltages for the amplifier are taken directly from the output of the power supply unit. The voltages for the receiver-transmitter are routed through contacts of switch S–2 and through a voltage regulator circuit to terminals of panel-mounted connectors. The l-v supply circuit provides the filament, relay, microphone, and bias voltages for the amplifier. The control and filament voltages for Receiver-Transmitter RT–70/GRC are supplied to panel-mounted connector J–3. The filament supply circuit includes contacts of switch S–2 in the RT–70 position, and an a-f filter. When Receiver-Transmitter RT–70/GRC is not used, a filament equalizing load is substituted across the filament supply circuit by placing switch S–2 in the INT position.

78. Receiver-Transmitter RT–70/GRC
(fig. 38)

a. General. The signal path of the Set 2 receiver-transmitter is shown in the functional block diagram (fig. 38). A complete schematic diagram of the equipment is shown in figure 65. The block diagram shows that the equipment consists of a separate transmitter circuit and a separate receiver circuit. The two circuits are associated with each other through a common antenna circuit, a common 32- to 42.3-mc oscillator, and a common tuning control. Normally, the receiver is operative, while the transmitter is in a stand-by or inoperative condition. When the microphone button is closed, that is, when the operator desires to talk, the receiver is effectively turned off and the transmitter is turned on. This function is accomplished by a relay control circuit, also indicated on the block diagram. The frequency range of the transmitter and of the receiver is from 47 to 58.4 mc.

b. Transmitter Signal Path. The function of the transmitter is to convert speech signals from an external microphone, amplifier, telephone line, or another a-f source into f-m r-f signals. Voice signals from the external microphone, amplifier, or telephone line are amplified by microphone-amplifier stage V–1 to the proper value for modulation. Audio voltages are applied to modulator coils (L–2 and L–3) to vary the frequency generated by the variable oscillator, V–2, in accordance with the amplitude and frequency of the audio signal. The output of the oscillator and the second harmonic of the frequency generated by a fixed crystal oscillator, V–3, are combined in mixer stage V–4. The desired sum frequency at the output of the transmitter mixer is selected by a tuned circuit and is applied to the transmitter driver stage. The signal is again amplified and applied to the transmitter power-amplifier stage, V–6. The amplified output is then routed through a tuned antenna circuit to the antenna. No antenna switching is provided since the transmitter power output is low; the receiver is inoperative when the transmitter is energized; and an isolation network is used between the transmitter output and the receiver input.

c. Receiver Circuits.

(1) The function of the receiver is to accept f-m carrier signals and to convert them by a double conversion process and by means of an f-m discriminator into the originally transmitted audio signals. The audio signals are then applied to an external headset, an earpiece of a handset, audio amplifier, and/or a telephone line. (Monitoring circuits are shown in figure 36.)

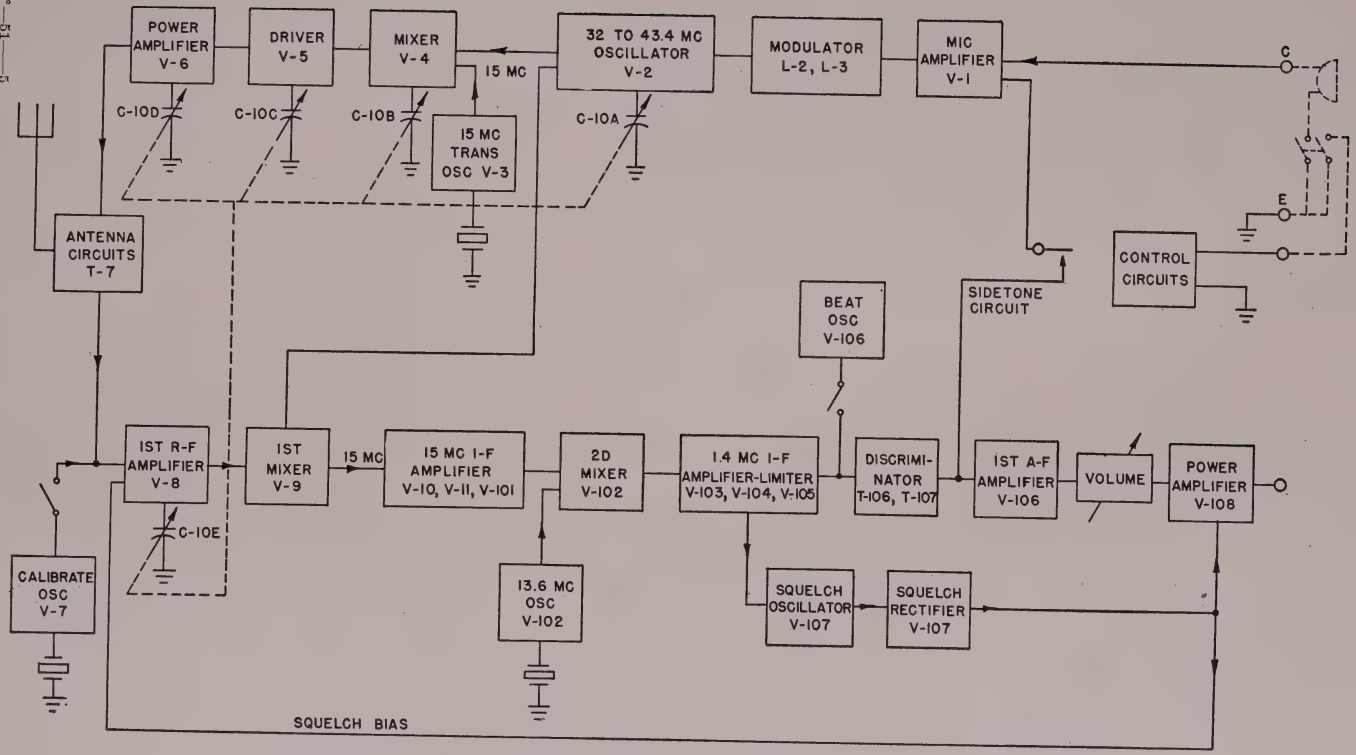


Figure 38. Receiver-Transmitter RT-70/GRC, block diagram.

(2) Carrier signals from the antenna are applied through the common antenna circuit to the first r-f amplifier stage, V–8, the output of which is tuned by a section of the variable gang capacitor. The amplified output of this stage and the output of the common variable oscillator, V–2, is applied to mixer stage V–9 which produces sum and difference frequencies. The difference frequency is selected by the tuning circuit of the mixer and is routed as a band of frequencies centered about 15 mc to a three-stage i-f amplifier, V–10, V–11, and V–101.

(3) The 15-mc output of V–101, in conjunction with the 13.6-mc output of a second crystal-controlled oscillator circuit (part of V–102) is combined in the receiver second mixer portion of V–102 to produce a second intermediate frequency centered about 1.4 mc. This signal is again amplified in a three-stage amplifier, V–103, V–104, and V–105. The first stage, V–103, is a conventional 1.4 -mc i-f amplifier. The second and third stages, V–104 and V–105, have the additional function of limiting (or eliminating) any amplitude variations of the signal. Such amplitude variations represent noise and are undesirable. In addition, the proper functioning of discriminator T–107, which follows the second limiter, V–105, requires that the level of the applied signal be fairly uniform for variations in the level of the incoming signal.

(4) The output of the second limiter stage is applied to the discriminator circuit, T–107, which functions to extract the intelligence or audio modulation from the incoming signal. The discriminator converts variations from the center frequency of the incoming signal into audio signals. These audio signals, appearing at the output of the discriminator, are amplified in the two-stage audio amplifier, V–106 and V–108, and are applied to the receiver output terminals of the panel-mounted **POWER** and **AUDIO** receptacles. The **VOLUME** control is located between the output of the first a-f amplifier and the input of the second a-f amplifier.

d. Sidetone. A portion of the audio signal applied to the transmitter is routed over a special path, called a sidetone path, to the receiver audio circuits. There it is amplified and becomes audible in the earpiece of the handset or in the headset of the operator. This signal is useful for two reasons; one, it permits monitoring the transmission; two, it imparts a natural effect in the earpiece of the handset. Without sidetone, the circuit would seem dead.

CHAPTER 5

ORGANIZATIONAL MAINTENANCE

Section I. TROUBLE SHOOTING

79. General

Trouble shooting at an organizational level is limited to the sectionalizing of troubles to defective units which must be replaced as a unit, or to the localizing of defective parts for which running spares are available. An equipment performance checklist (table III) is included primarily as a sectionalization aid. Localizing procedures for the various units are outlined in paragraphs 81 through 86.

80. Equipment Performance Checklist

a. Purpose. The equipment performance checklist provides a detailed logical procedure for checking the operation of the radio set. It should be practiced after the initial installation of the equipment before the equipment is placed in service, periodically thereafter, and as an aid in trouble shooting.

b. Use of the Checklist for Trouble Shooting.

(1) The checklist is arranged in the same sequence as the operator follows when initially applying power to the equipment. The simplest procedure when using the checklist is to perform the various items on the list in sequence until an abnormal indication is observed. When the operator has become familiar with the operation of the equipment, he can adapt the list to his own advantage, omitting those steps which do not pertain to the particular unit or function he wishes to check.

(2) The first five columns of the checklist show the items to be checked, the units which are involved, the action to be taken, and the normal indication to be expected. When an abnormal indication is observed, the operator is referred (in the sixth column) to the paragraph or paragraphs which outline localizing procedures for specific units.

Table III. Equipment Performance Checklist

Item No.	Unit	Item	Action or condition	Normal indications	Possible defective units
1	Interphone amplifier	OFF-INT-RT–70 switch.	Set at OFF		
2		Cabling	All connections properly made (fig. 24).		
3	Interphone amplifier	VOLUME control	Turn to approximate midpoint of range.		
4	Receiver-transmitter	VOLUME control	Turn to maximum clockwise position.		
5	Receiver-transmitter	SQUELCH control	Turn completely clockwise for maximum squelch operation.		
6	Receiver-transmitter	ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch.	Set at DIAL LIGHT-ON		
7	Each interphone box	Selector switch	Turn to center position		
8	Each interphone box	RADIO TRANS switch.	Lock in RADIO TRANS position.		
9	Each interphone box	VOL control	Turn to approximate midpoint of range.		
10	Each interphone box	Chest set and headset-microphone.	Connect chest set to audio receptacle; plug headset-microphone into chest set. Disable lock on push-to-talk switch (par. 33).		
11	Interphone amplifier	OFF-INT-RT–70 switch.	Turn to INT position		
12	Any interphone box	Push-to-talk switch on chest set.	Press switch and talk into microphone.	Hear output in headsets at each interhpone box.	Interphone box (par. 85), mounting (par. 84), interphone amplifier (par 83) or cables (par. 82).
13	Interphone amplifier	OFF-INT-RT–70 switch.	Turn to RT–70 position	LAMP on receiver-transmitter panel glows.	Cables (par. 82), interphone amplifier, power supply, or receiver-transmitter (par. 83).
14	Receiver-transmitter	SQUELCH and VOLUME controls.	Turn SQUELCH control to OFF. Turn VOLUME control to obtain a comfortable noise level at each headset. (If signal is received, tune to an open channel.)	Rushing noise or signal heard in headsets.	Interphone box (par. 85), mounting (par. 84), interphone amplifier (par. 83), receiver-transmitter (par. 83) or cables (par. 82).

15	Receiver-transmitter	ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch.	Set switch at CAL and tune dial over entire range. Tune for noise output when check is completed.	Zero-beat indications at each mc. Calibration should remain accurate, within 25 kc (¼ space either side of mark) throughout range.	Receiver-transmitter (par. 83).
16	Receiver-transmitter	SQUELCH control	Turn clockwise until receiver just squelches.	No output at headset	Squelch circuit.
17	Receiver-transmitter	Tuning knob	Tune in signal (par. 47)	Signal heard in headset	Receiver tuning circuits.
18	Any interphone box	Selector switch	Turn to clockwise position	Signal heard in headset	Interconnecting cables (par. 82), or mounting (par. 84).
19	Any interphone box	Push-to-talk and RADIO-INT switches on chest set.	Press switches and talk into microphone. (Monitor signal with a receiver if possible.)	Sidetone output in headset. Signal heard by monitor.	Mounting (par. 84), interphone amplifier (par. 83), receiver-transmitter (par. 83), or cables (par. 82).
20	Each interphone box	Selector switch and chest set.	Repeat steps 18 and 19 at each box.	Output heard in headset	Interphone box (par. 85) or cables (par. 82).
21	Control Group AN/GRA–6.	Installation	Connect as outlined in paragraph 36 *a* through *d*.		
22	Local and remote control units.	REMOTE and SELECTOR switches.	Set at TEL ONLY and TEL respectively.		
23	Local control unit	Ringing generator	Crank generator	Ringing signal should be heard or CALL LIGHT should glow at remote control unit.	Local or remote control unit (par. 86), or telephone line.
24	Remote control unit	Handset	Press push-to-talk switch, talk into mouthpiece, and acknowledge call.	Full-duplex conversation possible between local remote units.	Local or remote control unit (par. 86).
25	Remote control unit	Ringing generator	Crank generator	Ringing signal should be heard or CALL LIGHT should glow at local control unit.	Local or remote control unit (par. 86).
26	Local and remote control units.	Ringing generator	Repeat steps 23 and 25 with the internal LAMP and BELL switches set in their alternate positions.	Ringing signals should be heard or CALL LIGHTS should glow.	Local or remote control unit (par. 86).
27	Local control unit	REMOTE switch	Turn to SET 1 & 2 position		
28	Any interphone box	RADIO-INT and push-to-talk switch on chest set.	Press switches and talk into microphone.	Sidetone heard at local and remote units as well as at interphone boxes.	Mounting (par. 84) or local control unit (par. 86).
29	Local control unit	LOCAL switch	Hold at SET 2. Press push-to-talk switch. Talk into microphone. Release LOCAL switch to TEL when finished.	Sidetone should be heard at chest sets on interphone box and local unit.	Local control unit (par. 86), or mounting (par. 84).
30	Local control unit	LOCAL switch	Hold at SET 1, press push-to-talk switch and talk into microphone.	Interphone signal heard at all control boxes.	Local control unit (par. 86) or interphone amplifier (par. 83).

Table III. Equipment Performance Checklist—Continued

Item No.	Unit	Item	Action or condition	Normal indications	Possible defective units
31	Remote control unit	SELECTOR switch and handset.	Turn to left-hand write in position, press push-to-talk switch and talk into microphone.	Interphone signal heard at all interphone boxes.	Remote control unit (par. 86).
32	Remote control unit	SELECTOR switch and handset.	Turn to right-hand write-in position, close push-to-talk switch, and talk into mouth piece.	Sidetone heard at chest sets on interphone box and local unit.	Local or remote control unit (par. 86), or mounting (par. 84).
33	Interphone amplifier	OFF-INT-RT–70 switch	Set at OFF	Panel LAMP extinguishes	

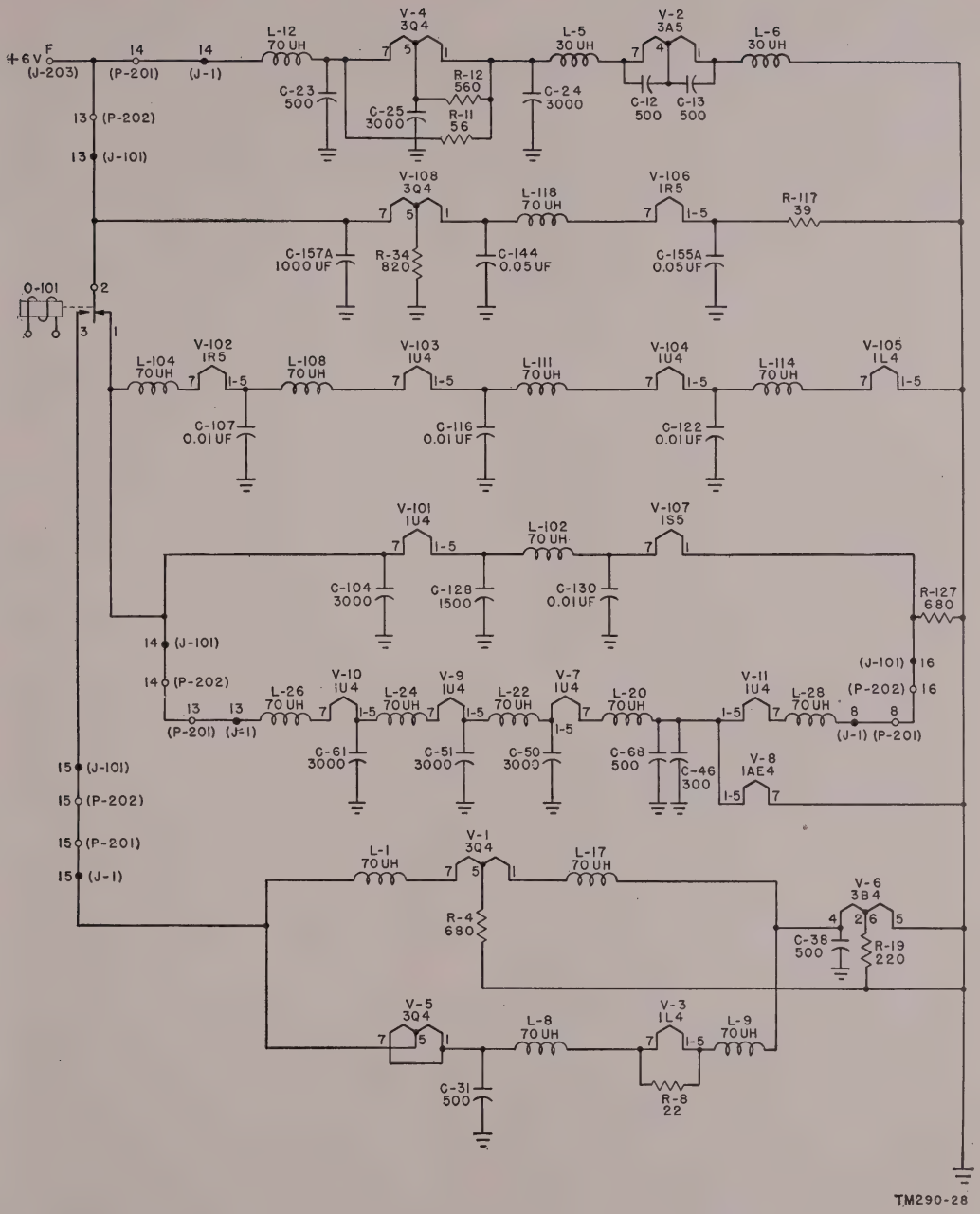


Figure 39. Receiver-Transmitter RT-70/GRC, filament schematic diagram.

81. Localizing Procedures

a. The following paragraphs include localizing procedures designed to isolate troubles to a particular unit, or to a specific part for which a running spare is available. These are the paragraphs referred to in the equipment performance checklist (table III). They are best used in conjunction with the checklist but may be used individually.

b. Whenever the procedure calls for checking a part, substitute an identical part, which is known to be good, for the part being checked. If no part is available, a visual and/or continuity check may disclose the trouble. Paragraphs 87 through 91 outline procedures for replacing parts.

82. Cables

When normal indications are obtained at a panel AUDIO connector, and abnormal indications are obtained at a control box, the trouble may be caused by a poor cable connection or an open lead within a cable. Continuity checks must be made to determine such faults. In some instances, the cables are terminated by solder connections on a terminal board within the mounting, control box, or intermediate junction boxes. To obtain access to these points it will be necessary to open the unit involved. Figures 17, 19, and 24, show an internal view of the junction box on the mounting, the system cordage diagram, and the mounting-control box interconnection diagram, respectively. The interior of the control box is shown in figure 21. The above-mentioned illustrations and the unit schematic diagram are to be used when making continuity checks.

83. Receiver-Transmitter and Interphone Amplifier

a. Equipment Set-Up. Operational checks of the receiver-transmitter and the interphone amplifier are best performed at the panels of the units themselves. Set up the equipment as follows:

(1) Place the OFF-INT-RT–70 switch in the OFF position and disconnect the REC-TR CONT cable from the panel of the amplifier. Connect terminals H and J of the receptacle, using the prefabricated jumper supplied within the amplifier. When all checks are made remove the jumper.

(2) Connect a handset to the AUDIO connector of the receiver-transmitter, and connect a chest set (with headset and microphone) to the AUDIO connector of the amplifier.

(3) Place ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch at the DIAL LIGHT-ON position.

(4) Turn the OFF-INT-RT–70 switch to the RT–70 position.

b. Lamp Check. If the dial LAMP does not light, or is unusually dim, make the following checks:

(1) Check the lamp (par. 90).

(2) Check fuse F–1 in the amplifier (par. 89).

(3) Check thermal relay K–1 and ballast tubes R–32 and R–33 in the amplifier (fig. 40 and par. 89).

(4) If a 24-volt source is used in the vehicle, check all of the amplifier tubes (fig. 40 and par. 89).

(5) If the above checks fail to reveal a defective component, check continuity on cable W–3 of the mounting and Special Purpose Cable Assembly CX–1213/U (fig. 24).

c. Interphone Amplifier Check. Press the RADIO-INT and push-to-talk switches on the chest set and talk into the microphone. If there is no output in the headset, check the amplifier tubes (fig. 40 and par. 89).

d. Receiver and Interphone Amplifier Check. Turn the SQUELCH control counterclockwise and listen for a rushing noise in the handset and headset. Interpret the results as follows:

(1) If no noise is heard in the handset (and the LAMP is lit), the trouble is probably in the receiver section or the plug-in power supply in the amplifier. Check the tubes (figs. 44 and 45 and par. 90), and check vibrator E–1 in the power supply unit (fig. 42 and par. 89).

(2) If there is a noise output in the handset but not in the headset, the trouble is probably in the amplifier or interconnecting cable. Check the tubes one at a time (fig. 40 and par. 89). If the tubes are good, check continuity on Special Purpose Cable Assembly CX–1213/U.

e. Calibration Check. Turn the ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch to the CAL position and tune the set over its entire range. Quieting, beat notes, and finally a zero beat should be noticeable in the handset as the dial passes each mc calibration. If no indication is heard, check tubes V–7 and V–106 in the receiver-transmitter. Assuming the amplifier is good (*c* above), the indications should also be audible in the headset. If no indications are observed at either audio accessory, check the cabling (par. 82).

f. Transmitter Check. Press the push-to-talk switch on the handset and talk into the mouthpiece. If possible, arrange for a monitor to check the transmission. If no monitor is available, hold a No. 331 lamp (the same type that is used for the dial LAMP) near the antenna.

(1) If the lamp does not light or the radio monitor does not respond, check the transmitter tubes (fig. 44 and par. 90).

(2) If the lamp lights but there is no sidetone in the earpiece, check the receiver tubes (*c*(1) above).

84. Mounting MT–300/GR

When normal indications are obtained in the component units, power is available to them. However, when the units do not have power, the trouble may be caused by faulty wiring in the mounting. Continuity checks of the mounting should reveal any troubles which should arise within the mounting. A schematic diagram of the mounting is shown in figure 60. Table IV lists continuity test points within the mounting. Resistance reading should be zero for all measurements.

Note. Battery connections should be removed when taking readings.

Table IV. Mounting Continuity Test

Points of measurement	
From—	To—
P–1K	E–1 (3).
P–1C	E–1 (7).
P–1B	E–1 (11).
P–1E	E–1 (14).
P–1H	P–1J.
P–1D	GND.
P–1F	E–1 (8).
P–1A	E–1 (8).
P–2F	E–1 (8).
P–2K	E–1 (2).
P–2D	E–1 (4), GND.
P–2C	E–1 (6).
P–2H	E–1 (9).
P–2A	E–1 (10).
P–2B	E–1 (12).
P–3B	Positive terminal of W–4.
P–3C	Negative terminal of W–4, GND.

85. Control Box C–375/VRC

a. When normal indications are obtained at a panel AUDIO receptacle, but not at a control box, the trouble must be in cable interconnections or in the control box itself.

b. If none of the control boxes are operative, the trouble is in either the mounting-control box interconnecting cable or in the internal wiring within the rack-mounted unit being checked.

c. If any one control box is operative and others are inoperative, the trouble is probably in the cables connecting the control boxes in parallel.

d. If trouble is isolated to a particular control box, continuity checks on the box should reveal the defect. Table V lists the measurements which should be taken to check the continuity of all parts and the wiring within the control box. A schematic diagram is shown in figure 57.

86. Control Group AN/GRA–6

To check the operation of Local Control C–434/GRC or Remote Control C–433/GRC, perform the applicable items of the equipment performance checklist (table III), and check for normal indications as listed. If abnormal indications are observed, refer to the schematic diagrams (figs. 58 and 59) and make continuity checks of the units.

Table V. Continuity Measurements At Control Box C–375/VRC

Points of measurement	Position of RADIO TRANS switch S–2	Position of Selector switch S–1	Resistance reading
Terminal 1 of E–2 to tips of jacks J–3 and J–4 and to F contacts of connectors J–1 and J–2.	Center		Infinity.
	RADIO TRANS	Counterclockwise	0.
		Center	Infinity.
		Clockwise	Infinity.
Terminal 2 of E–2 to J contacts of connectors J–1 and J–2.			0.
Terminal 2 of E–2 to tips of jacks J–3 and J–4 and to F contacts of connectors J–1 and J–2.	Center		0.
	RADIO TRANS	Counterclockwise	Infinity.
		Center	0.
		Clockwise	Infinity.
Terminal 3 of E–2 to tips of jacks J–3 and J–4 and to F contacts of connectors J–1 and J–2.	Center		Infinity.
	RADIO TRANS	Counterclockwise	Infinity.
		Center	Infinity.
		Clockwise	0.
Terminal 4 of E–2 to B, E, and H contacts of connectors J–1 and J–2.			0.
Terminal 5 of E–2 to rings of jacks J–3 and J–4 and to C contacts of connectors J–1 and J–2.	Center		Infinity.
	RADIO TRANS	Counterclockwise	0.
		Center	Infinity.
		Clockwise	Infinity.
Terminal 6 of E–2 to K contacts of connectors J–1 and J–2.			0.
Terminal 6 of E–2 to rings of jacks J–3 and J–4 and to C contacts of connectors J–1 and J–2.	Center		0.
	RADIO TRANS	Counterclockwise	Infinity.
		Center	0.
		Clockwise	Infinity.
Terminal 7 of E–2 to rings of jacks J–3 and J–4 and to C contacts of connectors J–1 and J–2.	Center		Infinity.
	RADIO TRANS	Counterclockwise	Infinity.
		Center	Infinity.
		Clockwise	0.
Terminal 8 of E–2 to tips of jacks J–5 and J–6 and to A contacts of connectors J–1 and J–2.		Counterclockwise	0 to 10K, depending on position of VOL controls R–1 and R–2.
Terminal 9 of E–2 to tips of jacks J–5 and J–6 and A contacts of connectors J–1 and J–2.		Center	0 to 10K, depending on position of VOL controls R–1 and R–2.
Terminal 10 of E–2 to tips of jacks J–5 and J–6 and to A contacts of connectors J–1 and J–2.		Clockwise	0 to 10K, depending on position of VOL controls R–1 and R–2.
Terminals 11 and 12 of E–2 to chassis			Infinity.
Terminals 13 of E–2 to terminals 14 and 15 of E–2.			0.

Section II. REPLACEMENT OF PARTS

87. General

The following paragraphs list procedures for the replacement of parts for which running spares are provided. Running spares for each unit are listed in paragraph 18. The procedures described will be necessary as a result of sectionalizing trouble to a particular unit and as an aid to localizing trouble to a particular component part.

Note. No lubrication is required for Radio Set AN/VRC–7.

88. Removing Immersionproof Cases

Replacement of pluck-out parts (except fuses) necessitates the removal of the immersionproof cases which house the panel-chassis assemblies of the various units. To remove the case of the receiver-transmitter or the interphone amplifier, perform the following steps:

a. Remove all the external connections from the unit involved.

b. Remove the unit from the mounting.

c. Loosen the Dzus fasteners located at the edges of the unit.

d. Slide the panel-chassis assembly out of the case. Take care not to damage any wiring or components while removing and handling the panel-chassis assembly.

89. AF Amplifier AM–65/GRC

The replacement of pluck-out parts for which spares are available is described in the following subparagraphs:

a. Fuse. The panel-mounted fuse may be removed by unscrewing the fuse cap which serves as a fuse extractor. A spare fuse is located in a fuse clip on the amplifier chassis (fig. 40).

b. Thermal Relay and Ballast Tube. Thermal relay K–1 and ballast tube R–32 are mounted in a horizontal position at the rear of the amplifier chassis (fig. 40). After removing the panel chassis assembly from the case (par. 88), remove the relay or ballast tube with a horizontal pull. Do not rock or jiggle the component in its socket; the socket prongs may be damaged.

c. Tubes. All tubes are accessible from the top of the chassis when the case has been removed (fig. 40 and par. 88). To remove any tube, first remove the tube shield and then use a tube puller. Do not rock or jiggle a tube in its socket; the tubes are easily damaged by careless handling.

d. Plug-in Power Supply. Although it can be replaced as a single unit, the plug-in power supply is not furnished as a running spare. However, a spare is provided for the vibrator within the power supply (fig. 42). Remove the amplifier case (par. 88) and replace the vibrator as follows:

(1) Loosen the clamp at the rear of the power supply compartment and swing it out of the way.

(2) Grasp the handle at the rear of the power supply unit and pull straight out.

(3) Remove the three green screws which fasten the top cover on the power supply chassis (fig. 41).

(4) Using the handle on the cover, lift the cover with a straight upward movement. If the cover sticks, use a small screw driver and pry the cover gently.

(5) Pull the vibrator (fig. 42) out of its socket with a straight upward movement. Do not rock or jiggle the vibrator while removing it from its socket. If necessary, use a small screw driver to pry the vibrator gently from its socket, but take care not to enlarge the ring clip which holds the vibrator near the base.

90. Receiver-Transmitter RT–70/GRC

The dial lamp and the tubes are the only replaceable parts in the receiver-transmitter. The tubes are located on the vertical r-f and i-f chassis (fig. 43).

a. To gain access to the tubes, remove the panel-chassis assembly from the case (par. 88). To remove any tube, first remove the tube shield and then use a tube puller. Do not rock or jiggle the tube; a tube may be easily damaged by careless handling. Tube locations are shown on figures 44 and 45.

b. The lamp is accessible from the front panel. Remove the screw which is located just below the tuning dial and which holds the lamp in its socket against a spring tension. When replacing the lamp, insert it glass forward in the socket so that the retaining screw supplies a contact at the base of the bulb.

91. Control Group AN/GRA–6

The lamps are the only pluck-out parts in either the local or remote control unit for which running spares are supplied. The lamps are accessible from the rear of the front panels after the panel-chassis assemblies have been removed from the cases.

a. To gain access to the lamp in the local control unit, unscrew the two wing-nut fasteners at the edge of the front panel and slide the unit out of its

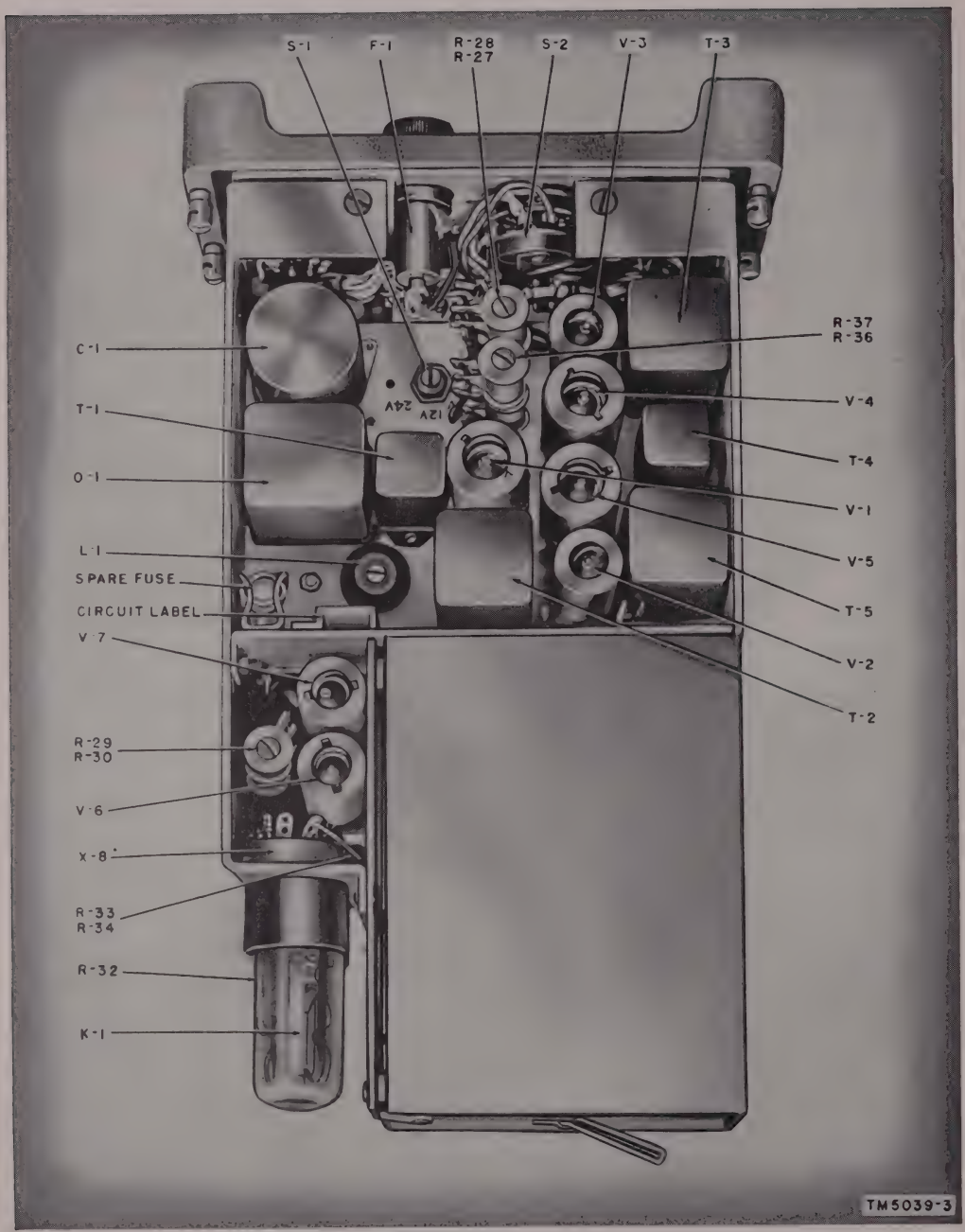


Figure 40. AF Amplifier AM–65/GRC, top view of chassis.

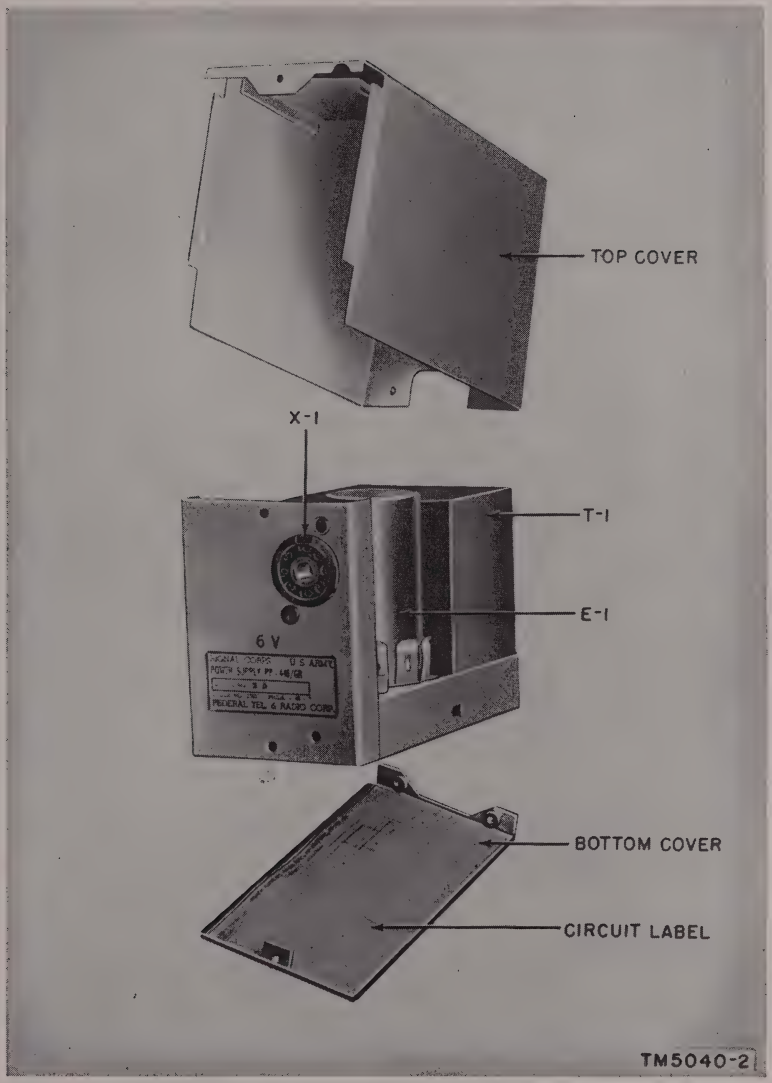


Figure 41. Power Supply PP-448/GR, disassembled view.

case. Slide the lamp socket (with lamp) out of the bakelite sleeve (fig. 26). The lamp then may be replaced.

b. To gain access to the lamps in the remote control unit, loosen the spring clips which secure the panel-chassis assembly in the case. Slide the unit out of its case, and replace lamp E–3 (fig. 28) as in *a* above.

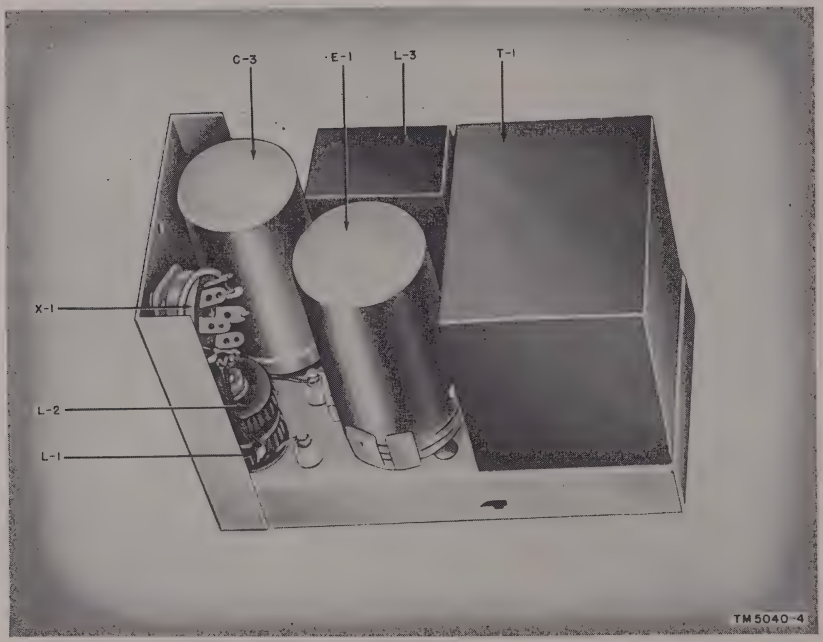


Figure 42. Power Supply PP–282/GRC, top view of chassis.

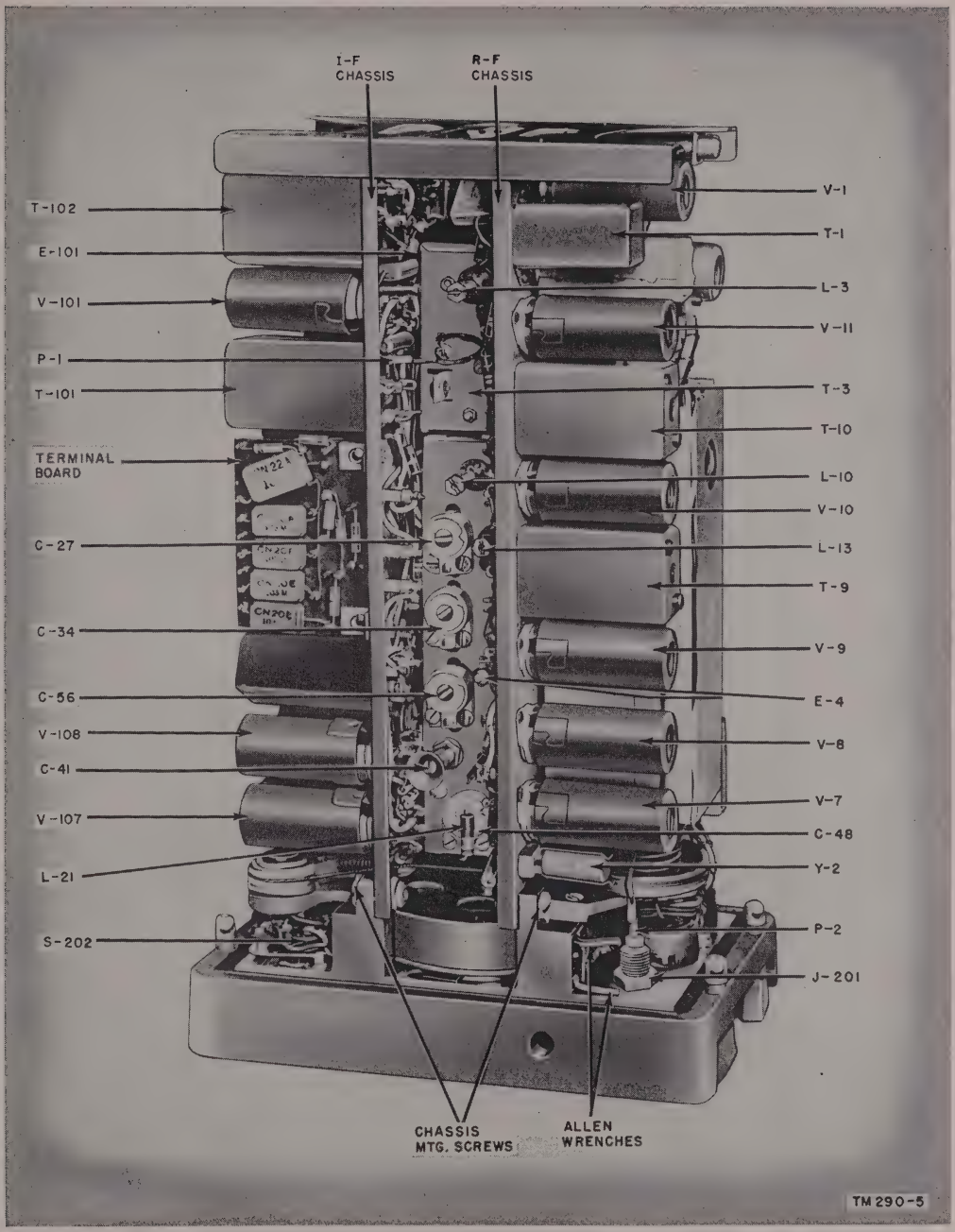


Figure 43. Receiver-Transmitter RT-70/GRC, top view of panel-chassis assembly.

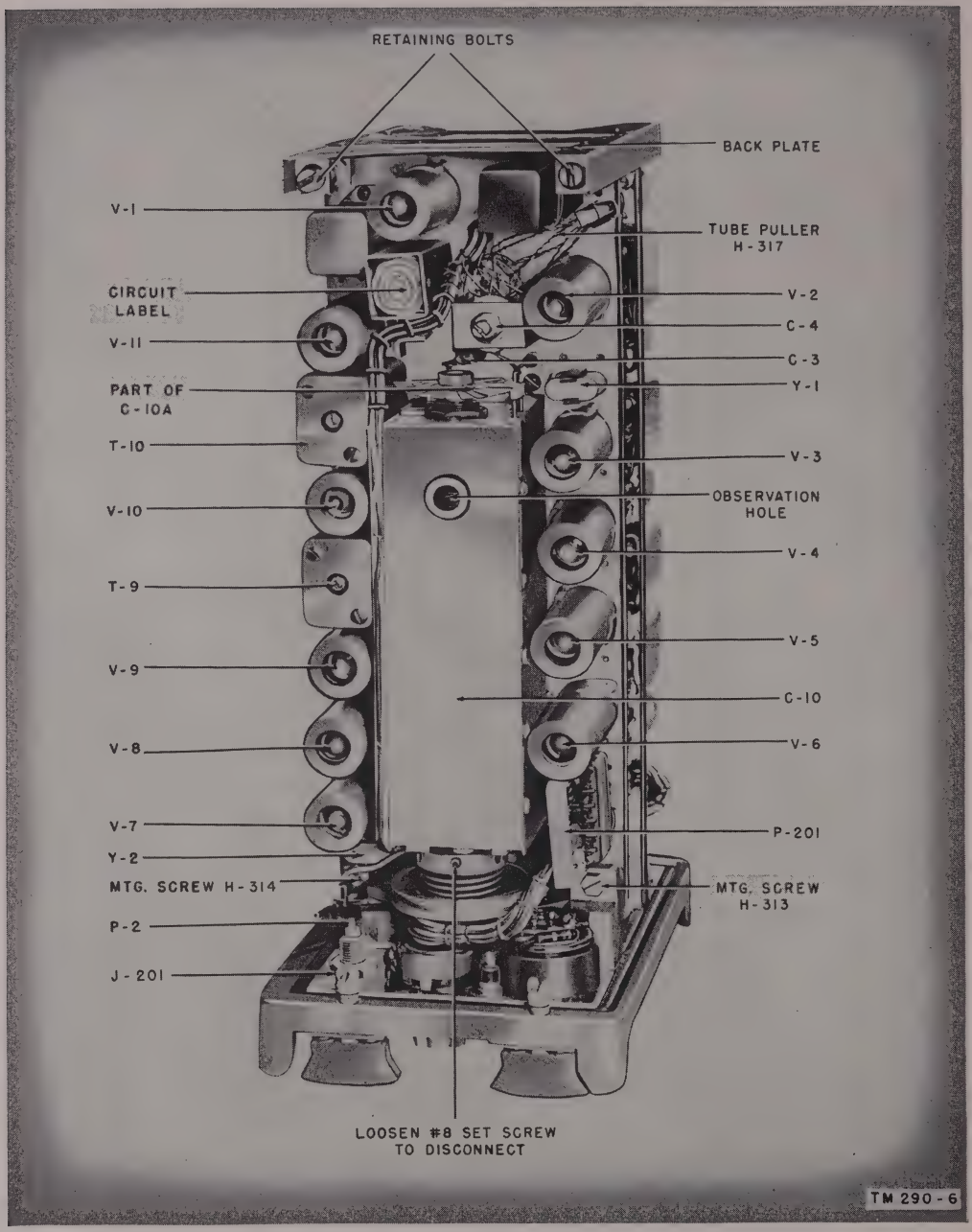


Figure 44. Receiver-Transmitter RT–70/GRC, view of r-f chassis.

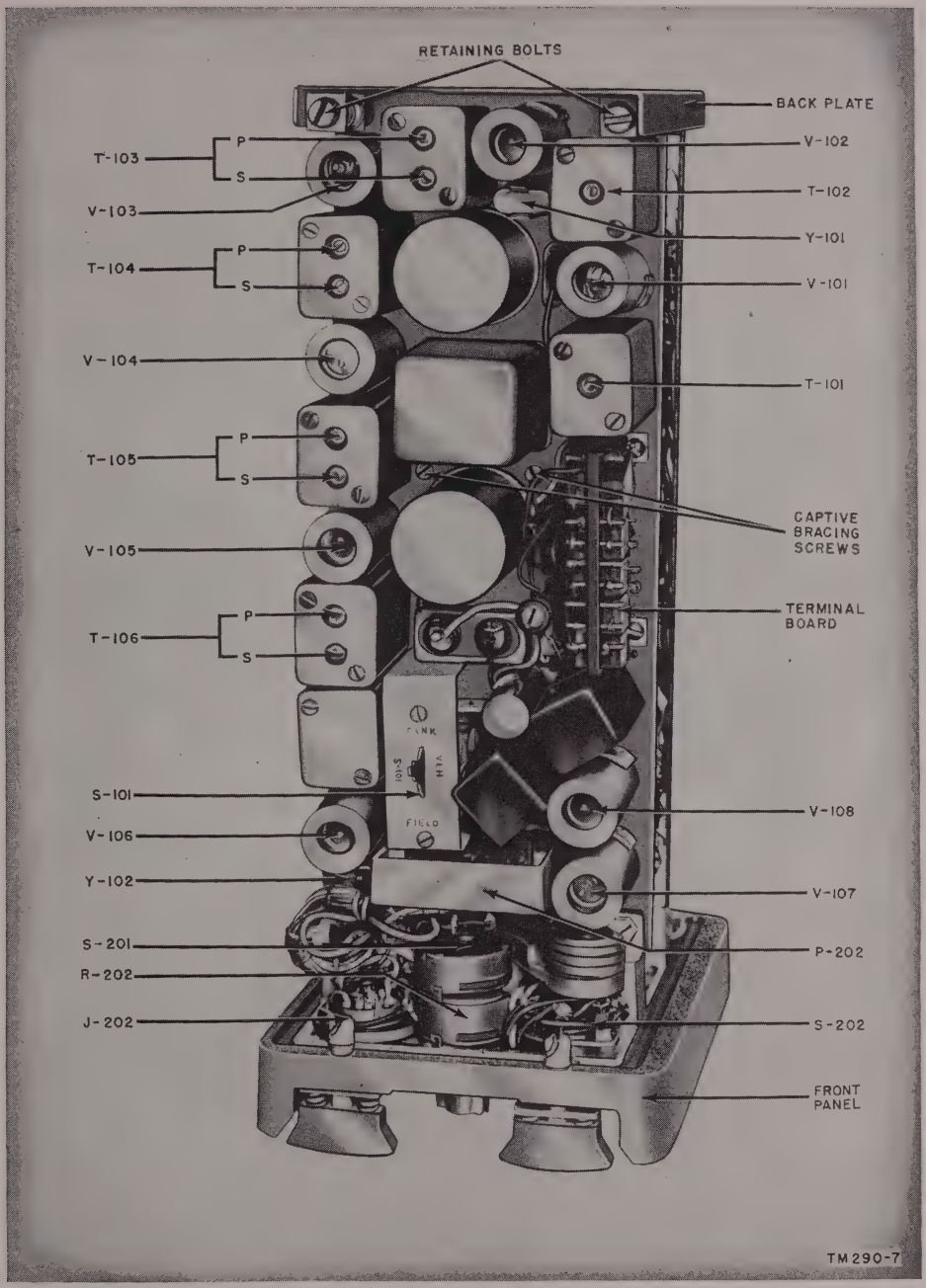


Figure 45.—Receiver-Transmitter RT-70/GRC, view of i-f chassis.

CHAPTER 6

AUXILIARY EQUIPMENT

Section I. MODIFICATION KIT MX–898/GR

92. Introduction

a. Auxiliary equipment is equipment which is not supplied as part of the basic radio set (par. 6), but which extends the application of the radio set in some manner. The auxiliary units described in this section are included in Modification Kit MX–898/GR but are also procurable as separate items. It may not be desirable to get the complete modification kit, since some of the equipment included in the kit has no value without its components, that is, Radio Set AN/VRC–7. (For procurement information consult appropriate Army Supply Catalog.)

b. The remaining paragraphs of this section are written with the assumption that the auxiliary units have been procured in Modification Kit MX–898/GR. For this reason, there are references to items which will not be available if procurement is made on a unit basis. If the complete kit is not procured, disregard any instructions which are not relative to the equipment on hand.

93. Purpose and Use

The auxiliary equipment is used to provide temporary operation of an individual receiver-transmitter when it is transferred from a vehicle to a field location, or when vehicular power is not available. If Control Group AN/GRA–6 is used in conjunction with the auxiliary equipment, remote as well as local operation of Receiver-transmitter RT–70/GRC is possible, when operated from batteries as described in paragraphs 99 and 100. Battery life limits the operation period to about 6 hours.

94. Components of Modification Kit MX–898/GR

The components listed below are included in Modification Kit MX–898/GR. However, only those components which are marked with an asterisk (*) can be used in conjunction with Radio Set AN/VRC–7.

a. Generator G–8/GRC.
b. Case CY–590/GRC.*
c. Power Cable Assembly CX–1210/U.
d. Power Cable Assembly CX–1209/U.*
e. Mounting MT–652/GR.*
f. Mast Sections AB–22/GR, AB–23/GR, and AB–24/GR.*
g. Handset H–33/PT.*
h. Bag CW–187/GR.*
i. Bag CW–188/GR.*

95. Components Used With Radio Set AN/VRC–7

The components described in the following paragraphs are those supplied with Modification Kit MX–898/GR which can be used in conjunction with Radio Set AN/VRC–7.

a. Case CY–590/GRC. Case CY–590/GRC is a battery box which can hold five 1.5-volt Batteries BA–403/U connected in series and one 90-volt Battery BA–419/U. The batteries must be procured separately. Two receptacles and a switch are mounted on the front panel of the battery box (fig. 46). Receptacle J–1 is used for interconnecting the battery box with Receiver-Transmitter RT–70/GRC. Receptacle J–2 is not used when the battery box is used with this receiver-transmitter. The switch is used to make or break the

battery circuits to the receiver-transmitter for either local or remote operation (pars. 98 through 100).

b. Power Cable Assembly CX–1209/U. This cable is used to connect the battery box to Receiver-Transmitter RT–70/GRC.

c. Mounting MT–652/GR. Mounting MT–652/GR holds the antenna masts used in field installations. The overhanging flange of the receiver-transmitter front panel has a raised section which will fit the base of Mounting MT–652/GR.

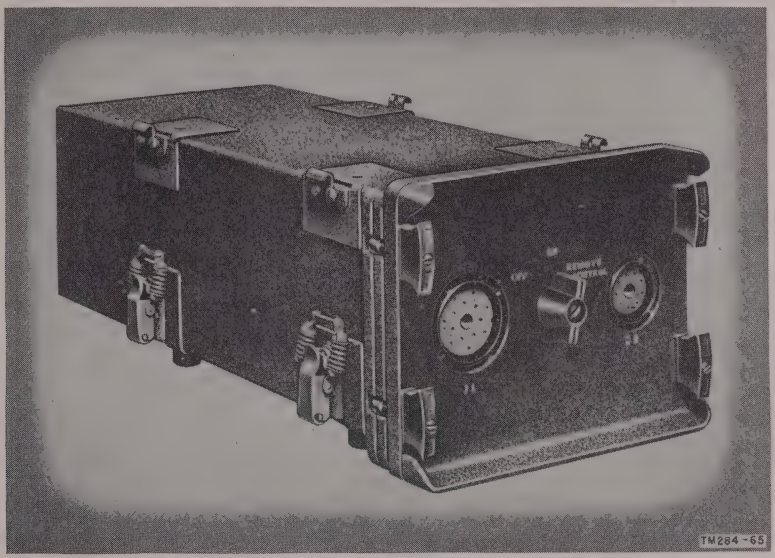


Figure 46. Case CY–590/GRC, front view.

Two sockets are provided at right angles to allow alternate methods of securing the mast, depending upon the more convenient position for the receiver-transmitter (right-side up or panel up). When the mounting is secured, the mast sections supplied with the modification kit can be screwed into the mounting. A rubber-covered lead-in wire, which is part of the mounting, is used to connect the antenna to the ANT post on the receiver-transmitter.

d. Handset H–33/PT. This handset is to be used as the audio device for the receiver-transmitter. A cord is permanently attached to the handset at one end, and is terminated at the other end by a plug which will connect to the audio receptacle on the receiver-transmitter. A description of the handset is given in paragraph 17.

e. Mast Sections AB–22/GR, AB–23/GR, and AB–24/GR. These antenna sections fit into Mounting MT–652/GR to provide an antenna for field operation. Only two of the sections are required for Receiver-Transmitter RT–70/GRC. Each section is approximately 23 inches long, and can fit into any of the other sections.

96. Unpacking

The components of Modification Kit MX–898/GR are individually packed in cardboard containers but are shipped collectively in a single wooden case. Unpack as follows:

a. Remove the components from the case and remove the wrappings from all items except Generator G–8/GRC and Power Cable Assembly CX–1210/U.

b. Loosen the Dzus fasteners on the panel of the battery case and remove the battery tray from the case (fig. 47).

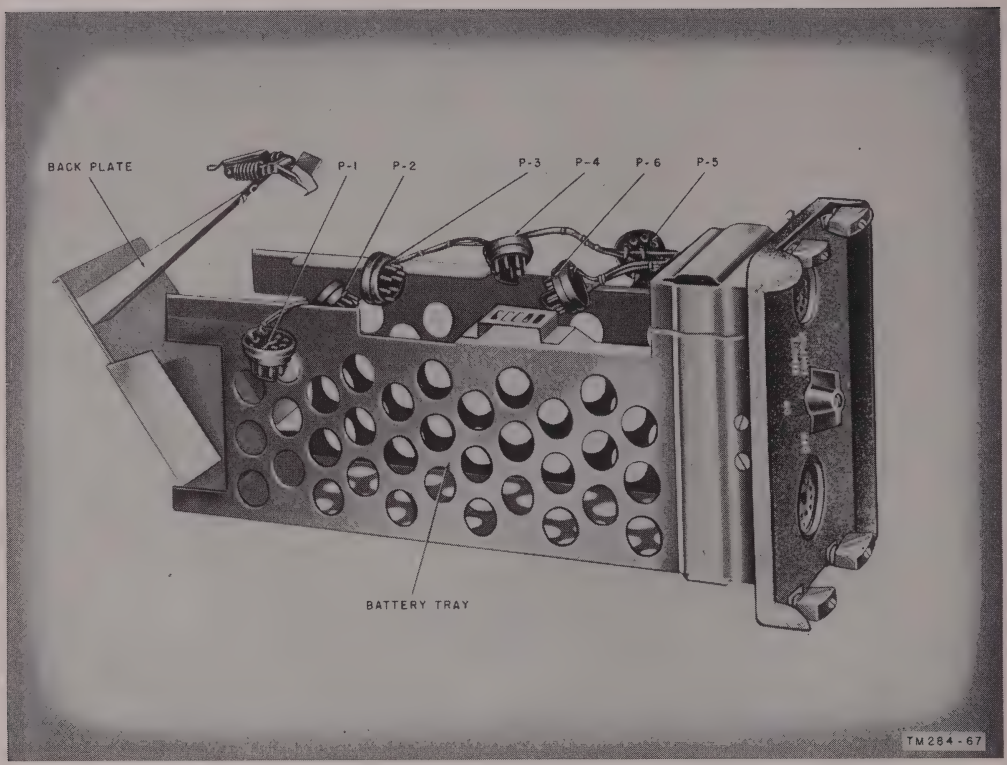


Figure 47. Case CY–590/GRC, case and batteries removed.

c. Install five 1.5-volt Batteries BA–403/U and one 90-volt Battery BA–419/U in the case. Connect the batteries as indicated in figure 48. Replace the battery tray in the case.

d. Store the handset, antenna mounting, mast sections, and Power Cable Assembly CX–1209/U in Bag CW–187/GR. Store the bag in any convenient location in the vehicle.

e. Store the battery case and one Bag CW–188/GR in the other Bag CW–188/GR. Store the packed bag in some convenient location in the vehicle.

97. Modes of Operation

The auxiliary equipment allows operation of the receiver-transmitter as a temporary, portable ground station. The following modes of operation are possible:

a. Local push-to-talk operation and monitoring from the panel of the receiver-transmitter.

b. Remote push-to-talk operation, monitoring, and power control, if Control Group AN/GRA–6 is used with the receiver-transmitter and battery box.

98. Controls
(fig. 49)

The only operational controls for the field set-up (exclusive of controls on Control Group AN/GRA–6) are the OFF-ON-REMOTE CONTROL switch of the battery box (fig. 49) and the push-to-talk switch of the handset.

a. Off-On-Remote Control Switch. In the OFF position both the 7.5-volt and the 90-volt battery circuits are not connected to the ground. In the ON position, the circuits are completed to the

ground through the switch contacts and battery power is available to the receiver-transmitter. The REMOTE CONTROL position provides for remote power control when Control Group AN/GRA–6 is used with the battery box to control Receiver-Transmitter RT–70/GRC.

b. Push-to-Talk Button in Handset H–33/PT. When the handset is plugged into one of the receptacles on the receiver-transmitter, the push-to-talk button is pressed by the operator to put the carrier of the transmitter on the air. Speaking into the mouthpiece of the handset when the button is pressed causes modulation of the carrier.

99. Local Field Operation

a. Remove Receiver-Transmitter RT–70/GRC from the vehicular mounting and pack it in the unused Bag CW–188/GR. Carry the three bags containing the equipment (two Bags CW–188/GR and one Bag CW–187/GR) to the site selected for field operations.

b. Unpack the bags, remove the receiver-transmitter from the case, and set the FIELD-VEH-TANK switch (fig. 43) in the FIELD position. Replace the unit in its case.

c. Set up the battery box and the receiver-transmitter in the desired location. Turn the OFF-ON-REMOTE CONTROL switch to OFF. Unite the 14-pin connector of Power Cable Assembly CX–1209/U with the 14-pin connector on the battery box; connect the 9-pin connector of the cable to the POWER-IN receptacle on the receiver-transmitter.

d. Insert the antenna mount into the boss at the top right-hand corner of the receiver-transmitter case and turn the mounting 90° to lock it in

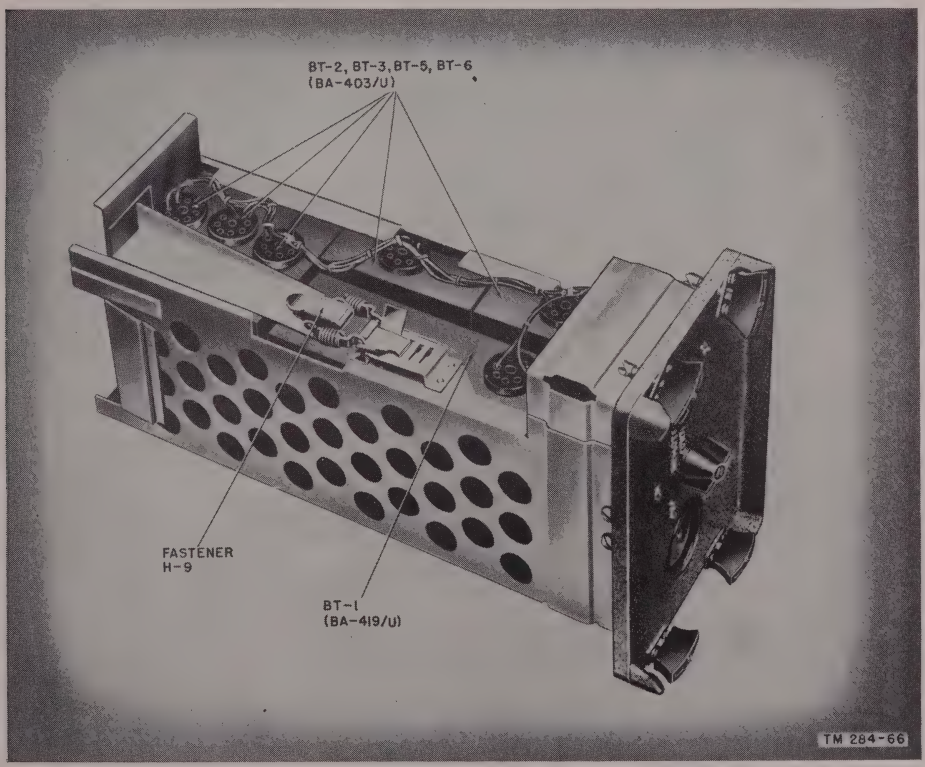


Figure 48. Case CY–590/GRC, case removed, batteries installed.

place. Connect the lead-in wire to the ANT connector on the panel. Assemble Mast Sections AB–24/GR and AB–22/GR and screw the assembly into the antenna mount.

e. Connect the handset to the AUDIO receptacle on the front of the receiver-transmitter.

f. Turn the ANT ADJ-DIAL LIGHT (OFF-ON)-CAL switch to DIAL-LIGHT-OFF.

100. Remote Field Operation

a. Perform steps *a* through *d* paragraph 99, but include Control Group AN/GRA–6 with the equipment. Use Bag CW–189/GR for packing the control group.

b. Connect Local Control C–434/GRC to the AUDIO receptacle on the receiver-transmitter by

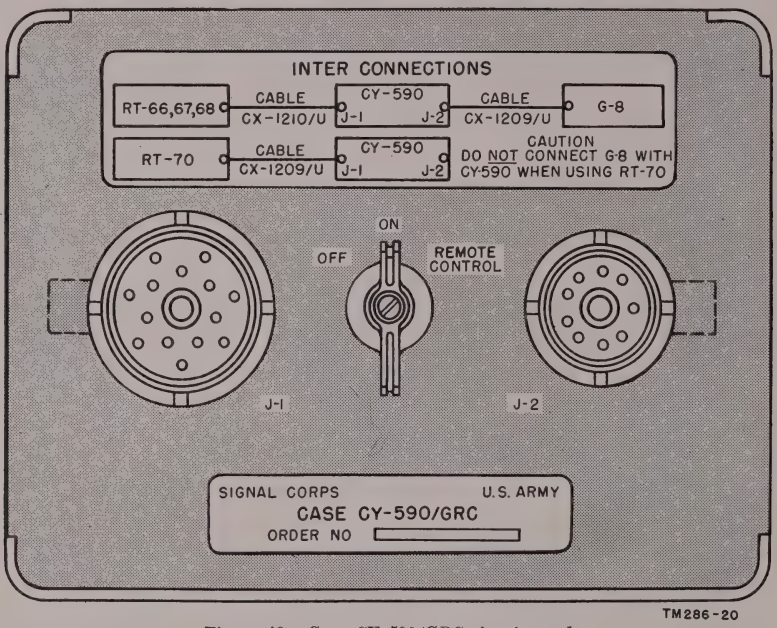


Figure 49. Case CY–590/GRC, front panel.

g. Turn the OFF-ON-REMOTE CONTROL switch to ON. Tune the antenna circuit and select the operating frequency as outlined in paragraphs 34 and 47. The receiver-transmitter is then ready for operation.

h. To transmit, press the push-to-talk switch and talk into the mouthpiece. Release the switch to listen.

i. To remove power from the unit, turn the OFF-ON-REMOTE CONTROL switch to the OFF position.

Caution: Do not leave the above switch in the REMOTE CONTROL position; otherwise the battery life will be shortened.

means of the Set 2 cable in the plug-in compartment at the rear of the unit (fig. 27).

c. Connect the local and remote units by telephone wire as outlined in paragraph 36.

d. Place the REMOTE switch of the local unit in the SET 2 position and place the OFF-ON-REMOTE CONTROL switch of the battery case in the REMOTE CONTROL position.

e. Connect the handset into the AUDIO connector at the remote unit.

f. To apply power to the receiver-transmitter, turn the SELECTOR switch at the remote unit to the left-hand write-in position and press the push-to-talk switch. Push-to-talk operation is then possible.

g. To remove power from the receiver-transmitter, turn the SELECTOR switch to the right-hand write-in position and press the push-to-talk switch.

Note. Reversal of the telephone line connection will also reverse the functions of the write-in positions on the SELECTOR switch.

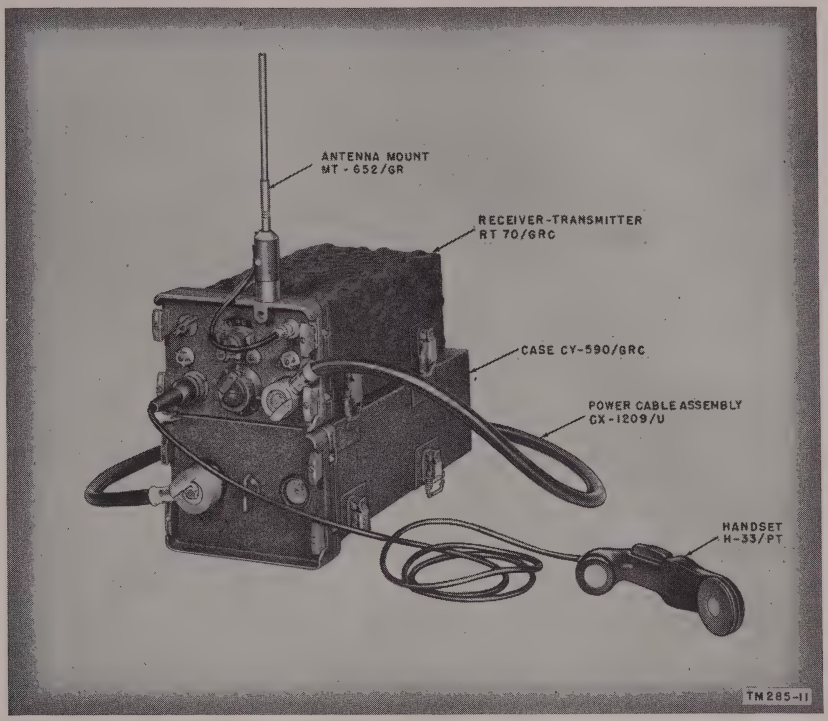


Figure 50.—Field operation of Receiver-Transmitter RT–70/GRC, with Case CY–590/GRC.

Section II. THEORY OF AUXILIARY OPERATION

101. General

The theoretical treatment of auxiliary operation is limited to a discussion of system interconnections and circuit details, which differ from the standard vehicular mode of operation (ch. 4). The schematic diagram for the auxiliary set-up incorporates the same type of legend and index discussed in paragraph 60.

102. Local Operation
(fig. 52)

a. Power Application. When the OFF-ON-REMOTE CONTROL switch (F, 01) is placed in the ON position, the circuits of the 90-volt and 7.5-volt batteries are completed both to the ground and to the receiver-transmitter POWER receptacle, C/J–203, through Power Cable Assembly CX/1209/U. From C/J–203 the 90-volt potential is supplied to the plate and screen circuits, and the 7.5-volt potential is supplied to the lamp and filament circuits of the receiver-transmitter as described in paragraphs 64, 65, and 69.

b. Monitoring and Push-to-Talk Operation. If a handset is connected to the receiver-transmitter AUDIO receptacle, the receiver output will be fed to the earpiece through the connection at terminal C/J–202A (I, 10). (The handset cir-

cuit is shown in the inset at location B, 15 on figure 52.) The microphone and control lines of the handset connect to terminals C/J–202C and C/J–202F (F, 07 and F, 09, respectively). When the push-to-talk switch is pressed, the microphone and control circuits are completed, as described for vehicular operation in paragraph 69*b*.

103. Remote Operation
(fig. 52)

When Control Group AN/GRA–6 is connected to the receiver-transmitter, push-to-talk operation is possible from the panel of either the local or remote control unit. Power control can be extended to the remote unit also. Ringing and telephone facilities are the same as described in paragraphs 71 and 72.

a. Push-to-Talk Operation From Local Unit.

(1) The equipment may be operated from the local unit with the OFF-ON-REMOTE CONTROL switch in either the ON or REMOTE CONTROL position. If the switch is at ON, the power circuits are exactly as described in paragraph 102. If the switch is at REMOTE CONTROL, the ground return for the 7.5-volt batteries is completed through the REMOTE CONTROL position of S/S–1 (F, 01), Power Cable Assembly CX–1209/U, and the SET 1 and 2 position of N/S–2.

Note. Ordinarily the REMOTE CONTROL position will not be used for operation from the local control unit.

(2) The receiver output is supplied to the earpiece of a headset at the local unit (J, 14) through terminals C/J–202A, and N/P–2A, and section 2F front of switch N/S–2 (I, 10). The monitoring circuit is broken when the switch is placed in the TEL ONLY position.

(3) The transmit-control and microphone lines are completed when the LOCAL switch (H, 08) is held in the SET 2 position and the push-to-talk switch of the handset (J, 07) is pressed. The circuit for transmit-control relay C/O–101 (E, 09) is completed through section 1B of the LOCAL switch (H, 09). The circuit to microphone transformer C/T–1, (E, 07) is completed through section 1C of the LOCAL switch (H, 08) and the push-to-talk switch (J, 08). Talking into the microphone causes modulation of the receiver-transmitter as described for standard operation.

b. Operation From Remote Control Unit.

(1) Field operation from the remote control unit includes power control as well as push-to-talk control. The OFF-ON-REMOTE CONTROL switch of the battery box (F, 01) is set in the REMOTE CONTROL position, and the REMOTE switch (I, 02, G, 07, and H, 11) is placed in the SET 2 position. Power and push-to-talk circuits are then under control of relays N/O–1, N/O–2, and N/O–3 (G, 11 G, 10, and I, 11, respectively). The SELECTOR switch (E, 11) and push-to-talk switch (D, 11) at the remote unit controls operation of the relays.

(2) When the SELECTOR switch is placed in the left-hand write-in position and the push-to-talk switch is pressed, relays N/O–1, N/O–2 and N/O–3 will be energized. Contacts 4–6 of relay N/O–3 (I, 02) will close to complete the ground line for the 7.5-volt filament batteries. When the push-to-talk button is released, the contacts will remain closed and the receiver will be completely operative. Power distribution to plate and filament circuits is the same as described for vehicular operation. The position of contacts 7–6 of relay N/O–2 (G, 10) is not changed, since the potential applied to the relay is of the wrong polarity to cause operation of the contacts. Contacts of relay N/O–1 will operate as long as the push-to-talk switch is closed. Their function is discussed under transmission in (4) below.

(3) The receiver output is coupled through section 2F front of the REMOTE switch (I, 11), transformer M/T–1 (I, 15), the telephone line, and transformer M/T–1 (F, 15) to the earpiece of the handset at the remote unit.

(4) When the push-to-talk switch is held, contacts 7–6 of relay N/O–1 (H, 09) complete the ground return for transmit-control relay C/O–101; contacts 4–6 open to prevent feedback from the receiver to the remote unit; contacts 5–8 of the relay (G, 07) and the push-to-talk switch (I, 07) complete the microphone circuit to ground. Talking into the microphone causes modulation of the transmitter as previously described.

(5) To remove power from the receiver-transmitter it is necessary to place the SELECTOR switch in the right-hand write-in position and momentarily press the push-to-talk switch. Contacts 4–6 of relay N/O–3 (I, 02) will then open the ground line for the 7.5-volt battery.

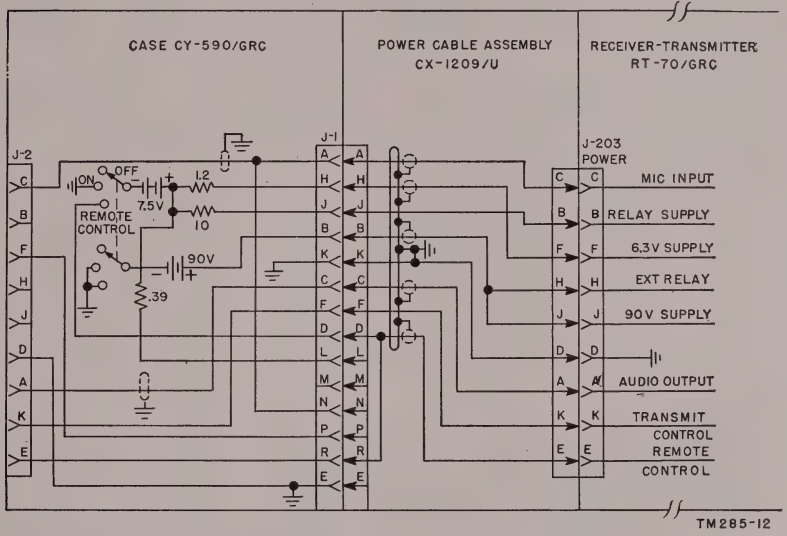


Figure 51. Field operation, interconnection diagram.

Section III. MISCELLANEOUS AUXILIARY FACILITIES

104. Radio Sets AN/VRC–8, –9, and –10

Radio Set AN/VRC–7 can be interconnected to Radio Set AN/VRC–8, –9, or –10 to provide all of the facilities, except retransmission, of Radio Set AN/GRC–4, AN/GRC–6, or AN/GRC–8, respectively (fig. 54). Refer to appendix III for the complete list of components for the related radio sets.

105. Radio Sets AN/VRC–16, –17, and –18

Radio Set AN/VRC–7 can be interconnected to Radio Set AN/VRC–16, –17, or –18 to provide all of the facilities, except retransmission of Radio Sets AN/GRC–3, –5, or –7, respectively (fig. 54). Refer to appendix III for the complete list of components for the related radio sets.

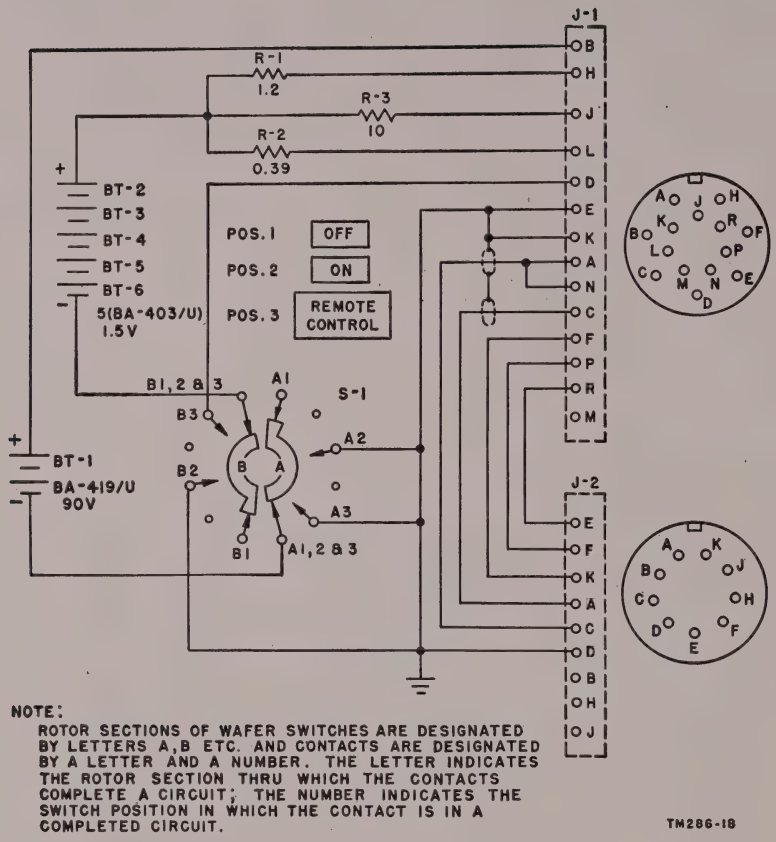


Figure 53. Case CY–590/GRC, schematic diagram.

CHAPTER 7

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

106. Disassembly

The following instructions are recommended as a guide for preparing the radio set for transportation and storage.

a. Control Group AN/GRA–6.

(1) Disconnect the telephone line and wind it on a reel.

(2) Disconnect Local Control C–434/GRC from the receiver-transmitter and interphone amplifier and store the cords in the compartment provided for it at the rear of the unit (fig. 27).

b. Disconnection of Cables.

(1) Disconnect all audio accessories from their receptacles on the units and coil the cords neatly.

(2) Disconnect all of the interconnecting cables between the units (fig. 24).

(3) Disconnect the battery cable (cable W–4 of Mounting MT–300/GR) from the battery or the vehicular junction box, whichever the case may be (fig. 24).

(4) Disconnect the antenna cable from the receiver-transmitter, remove the cable from its installation, and coil it neatly (fig. 24).

c. Removal of Units.

(1) Remove the receiver-transmitter from the amplifier.

(2) Remove the amplifier from the mounting.

(3) Remove the power supply from the interphone amplifier.

(4) Remove Control Boxes C–375/VRC from their mounting surfaces on the vehicle.

(5) Remove Mounting MT–300/GR from its vehicular installation.

d. Removal of Antenna.

(1) Remove the antenna mast sections from the mast base.

(2) Remove the antenna mast base from its mounting surface.

107. Repacking for Shipment or Limited Storage

a. The exact procedure in repacking for shipment or limited storage depends upon the material available and the conditions under which the equipment is to be shipped or stored. Refer to paragraph 8 for a description of the original packaging.

b. Whenever practicable, package each component separately in a case or carton, and place a dehydrating agent such as silica gel inside the individual cases or cartons. Protect the cartons with a waterproof paper barrier. Seal the seams of the paper barrier with waterproof sealing compound or tape. Pack the protected cartons in a padded wooden box, providing at least 3 inches of excelsior padding or some similar material between the paper barrier and the packing case.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

108. General

The demolition procedures outlined in paragraph 109 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished only upon order of the commander.

109. Methods of Destruction

a. Smash. Smash the crystals, controls, tubes, coils, switches, capacitors, transformers, microphones, and headsets, using sledges, axes, handaxes, pickaxes, hammers, crowbars, or heavy tools.

b. Cut. Cut cords, cables, headsets, and wiring, using axes, handaxes, machetes, or bayonets.

c. Burn. Burn cords, cables, resistors, capacitors, coils, wiring, and technical manuals, using gasoline, kerosene, oil, flame throwers, or incendiary grenades.

d. Bend. Bend panels, cases, chassis, mounting, and antenna mast sections.

e. Explosives. If explosives are necessary, use firearms, grenades, or TNT.

f. Disposal. Bury or scatter the destroyed parts in slit trenches, fox holes, or other holes, or throw them into streams.

g. Destroy Everything.

APPENDIX I

REFERENCES

Note. For availability of items listed, check SR 310–20–3 and SR 310–20–4. Check Department of the Army Supply Catalog SIG 1 for Signal Corps supply catalog.

1. Army Regulations

AR 380–5	Safeguarding Military Information.

2. Supply Publications

SIG 1	Introduction and Index.
Sig 3	List of Items for Troop Issue.
SB 11–6	Dry Battery Supply Data.
SB 11–47	Preparation and Submission of Requisitions for Signal Corps Supplies.
SB 11–76	Signal Corps Kit and Materials for Moisture- and Fungi-Resistant Treatment.

3. Publications on Components, Auxiliary Equipment, and Test Equipment

TM 11–300	Frequency Meter Sets SCR–211–(*).
TM 11–303	Test Sets I–56–C, I–56–D, I–56–H, I–56–J.
TM 11–307	Signal Generators I–72–G, H, J, and K.
TM 11–321	Test Sets I–56–E.
TM 11–472	Repair and Calibration of Electrical Measuring Instruments.
TM 11–2613	Voltohmmeter I–166.
TM 11–2626	Test Unit I–176.
TM 11–2627	Tube Tester I–177.
TM 11–5039	AF Amplifier AM–65/GRC.
TM 11–5040	Power Supplies PP–281/GRC, PP – 282/GRC, and PP – 448/GR.

4. Painting, Preserving, and Lubrication

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TM 9–2851	Painting Instructions for Field Use.

5. Camouflage

FM 5–20	Camouflage, Basic Principles.

6. Decontamination

TM 3–220	Decontamination.

7. Demolition

FM 5–25	Explosives and Demolitions.

8. Other Publications

FM 24–19	Field Radio Techniques.
FM 72–20	Jungle Warfare.
SR 310–20–3	Index of Training Publications (Field Manuals, Training Circulars, Firing Tables and Charts, Army Training Programs, Mobilization Training Programs, Graphic Training Aids, Joint Army-Navy-Air Force Publications, and Combined Communications Board Publications).

SR 310–20–4 Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, Modification Work Orders, Tables of Organization and Equipment, Reduction Tables, Tables of Allowances, Tables of Organization, and Tables of Equipment.

SR 700–45–5 Unsatisfactory Equipment Report (Reports Control Symbol CSGLD–247).

SR 745–45–5 Report of Damaged or Improper Shipment (Reports Control Symbols CSGLD–66) (Army).

TB SIG 4 Methods for Improving the Effectiveness of Jungle Radio Communication.

TB SIG 5 Defense Against Radio Jamming.

TB SIG 25 Preventive Maintenance of Power Cords.

TB SIG 54 Working Through Jamming with Frequency Modulated Radio Sets.

TB SIG 66 Winter Maintenance of Signal Equipment.

TB SIG 72 Tropical Maintenance of Ground Signal Equipment.

TB SIG 75 Desert Maintenance of Ground Signal Equipment.

TB SIG 123 Preventive Maintenance Practices for Ground Signal Equipment.

TB SIG 178 Preventive Maintenance Guide for Radio Communication Equipment.

TB SIG 223 Field Expedients for Wire and Radio.

TB 11–499–( )* Basic Radio Propagation Predictions.

TM 9–2857 Storage Batteries Lead-Acid Type.

TM 11–310 Schematic Diagrams for Maintenance of Ground Radio Communication Sets.

TM 11–314 Antennas and Antenna Systems.

TM 11–415 Dry Batteries.

TM 11–430 Batteries for Signal Communication. Except those pertaining to Aircraft.

TM 11–453 Shop Work.

TM 11–455 Radio Fundamentals.

TM 11–466 Radar Electronic Fundamentals.

TM 11–476 Radio Direction Finding.

TM 11–483 Suppression of Radio Noises.

TM 11–486 Electrical Communication Systems Engineering.

TM 11–499 Radio Propagation Handbook.

TM 11–660 Introduction to Electronics.

TM 11–4000 Trouble Shooting and Repair of Radio Equipment.

TM 38–650 Basic Maintenance Manual.

9. Abbreviations

ac	alternating current.
af	audio frequency.
afc	automatic frequency control.
C	centigrade.
db	decibel(s).
dc	direct current.
F	Fahrenheit.
f-m	frequency-modulation.
hf	high frequency.
hv	high voltage.
i. f.	intermediate frequency.
lv	low voltage.
kc	kilocycle.
ma	milliampere.
mc	megacycle.
mw	milliwatt.
rf	radio frequency.
ua	microampere.
uf, uuf	microfarad, micromicrofarad.
uv	microvolt.

10. Glossary

For explanation of terms used in this manual, refer to TM 11–455.

*A new TB in this series is issued monthly which gives propagation predictions 3 months in advance.

APPENDIX II

IDENTIFICATION TABLE OF PARTS

Note. The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as a T/O & E, T/A, SIG 7 & 8, SIG 7–8–10, SIG 10, or list of allowances of expendable material. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1, Introduction and Index.

1. Scope of Identification Table of Parts

Only those units that are not covered in separate technical manuals are covered in the following identification table of parts. These units are Mounting MT–300/GR, Case CY–590/GRC, and Control Box C–375/VRC. For the other units refer to the individual technical manuals.

2. Identification Table of Parts for Mounting MT–300/GR

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	MOUNTING MT–300/GR: mtg for radio equip.	Mounting base for Radio Set AN/VRC–7 and Intercommunication Set AN/UIC–1.	2Z6763–300
	Technical Manuals (TM 11–285 and TM 11–2643).		(Order through AGO channels)
E–1	BOARD ASSEMBLY, terminal	Terminal board for system interconnections.	3Z772–1
H–9, H–10	BUTTON, plug: for .828″ diam hole; 1⅛″ diam x ½″ thk o/a.	Waterproof plugs for unused connector holes in junction box.	4Z3152–1
H–7, H–8	BUTTON, plug: fits 19/32″ diam hole; .587″ diam x 1⅜″ lg o/a.	Plugs for unused cable clamps	4Z3152
W–3	CABLE ASSEMBLY, power: Cordage CO–212; 16″ lg excluding terminations.	Transfers battery power from mounting to amplifier.	3E7350.1–16
W–4	CABLE ASSEMBLY, power: Cordage CO–212; 18½″ lg excluding terminations.	Transfers power from the battery to the mounting.	3E7350.1–18.2
W–2	CABLE ASSEMBLY, special purpose: Special Purpose Cable WM–46/U; 14″ lg excluding terminations; plug marked "INT CONT".	INT CONT cable for connecting the amplifier audio and control circuits to mounting.	3E7350–1.14.2
W–1	CABLE ASSEMBLY, special purpose: Special Purpose Cable WM–46/U; 14″ lg excluding terminations; plug marked "REC-TR CONT."	REC-TR CONT cable for connecting audio and control circuits of Receiver Transmitter RT–70/GRC to the mounting.	3E7350–1.14.1
O–1, O–2	CAM: mtg plate locking cam	Locks amplifier to mounting	4Z3185–1
H–5, H–6	CLAMP: cable clamp; accom .516″ diam cable	Entry clamps for Special Purpose Cables WM–46/U which are used to connect the mounting to control boxes.	2Z2642.300

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
H–1, H–2, H–3, H–4	CLAMP: cable clamp; accom .61″ diam cable	Entry clamps for connecting-cables between mounting and amplifier, and mounting and battery.	2Z2642.305
F–1	FUSE, cartridge: 50 amp	Overload protection for battery line	3Z2650
E–2	FUSEHOLDER: block type; for single type 5AG cartridge fuse.	Holder for fuse F–1	3Z3282–1.1
O–5	GASKET: neoprene; single hole; rectangular, 6⅞″ lg x 4½″ wd x ⅛″ thk o/a.	Cover seal for junction box	2Z4868.709
H–33, H–34	HANDLE: mtg strip locking handle; steel, zinc pl and olive drab iridite finish.	Move locking strips which secure amplifier on mounting.	4Z4691
E–6	JUNCTION BOX: cable terminating and term board mtg box; eight .828″ diam outlets.	Junction point for system interconnections.	6Z6512–1
N–1	LABEL: 2⅞″ wd x 5⅝″ lg x .007″ thk	Circuit label	6D16777–8
E–3	POST, binding: compression screw type	Grounding terminal	3Z741–2
H–11 through H–14	SCREW, cap: slot drive; hex head, unfinished; ¼–28 NF–2 thd; 7/16″ lg.	Bracket mounting screws	6L4904–7.28S
H–25 through H–28	SCREW, captive: slot drive; finished, fillister Bind H; #10–24 NC–2 thd; .937″ lg.	Mounting screws for junction box cover.	6L4770–15.21SF
H–29, H–30	SCREW, dowel	Handle, cam, and locking strip assembly screws.	
H–31, H–32	SCREW, dowel	Handle and cam assembly screws	6L5014–6–1
A–1, A–2, A–3, A–4	SHOCK MOUNT M–449: sq mtg; 2⅜″ sq o/a	Absorb vibration	2Z8415–449
O–3, O–4	SPRING: helical extension type: locking strip tension spring; 1.86″ lg x .375″ diam o/a; 27½ turns close wnd.	Locking strip tension springs	2Z8879–323
E–4, E–5	TERMINAL, lug: ring type; for #8 AWG wire	Battery cable terminals	3Z12073–53
W–5, W–6	WIRE BRAID: copper braid; ⅝″ wd x .125″ thk; ft.	Grounding straps	1F6B1–10

3. Identification Table of Parts for Control Box C–375/VRC

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	CONTROL BOX C–375/VRC: interphone and radio push to talk operation.	Remote control for Radio Sets AN/GRC–3 through AN/GRC–8, AN/VRC–7 through AN/VRC–10, AN/VRC–13 through AN/VRC–15, and Intercommunication Set AN/UIC–1.	2C666–375
	Technical manuals (TM 11–284 and TM 11–287)		(Order through AGO Channels)
E–2	BOARD, terminal: general purpose; 2 solder lug term, copper silver pl; 15/16″ lg x 29/32″ h x 5/16″ thk o/a.	Junction point for interunit connections.	3Z770–2.49
H–1, H–2	CLAMP: used to hold cable and wp cable entrance; wp.	Secure interconnecting Special Purpose Cables WM–46/U.	2Z2642.241
J–1, J–2	CONNECTOR, receptacle: AN Receptacle Connector U–79/U; 10 cont, pol; straight.	Connectors for audio input, output, and control circuits.	2Z7250–79

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
A–2	COVER	Used to waterproof Jacks J–3, J–4, J–5, and J–6.	2Z3352.224
J–3, J–4	JACK JK–33–C: for 3 cond plug .2065″ diam x 1.093″ lg.	Connect microphone to audio input circuit.	2Z5533C
J–5, J–6	JACK JK–34–C: for 2 cond plug .250″ diam x 1 7/32″ lg.	Connect headset to output of audio circuit.	2Z5534C
	KNOB: bar; aluminum, olive drab finish; for 1/4″ diam double flatted shaft; luminous ctr line; 1 3/16″ lg x 7/8″ wd x 15/32″ thk.	Control for shaft of volume controls R–1 and R–2.	2Z5821–147
	KNOB: bar; aluminum, olive drab finish; for 1/4″ diam double flatted shaft; luminous ctr line; 1 15/16″ lg x 7/8″ wd x 15/32″ thk.	Control for shaft of switch S–2 (RADIO TRANS).	2Z5821–148
	KNOB: bar; aluminum, olive drab finish; for 1/4″ diam double flatted shaft; luminous ctr line; 2 15/16″ lg x 7/8″ wd x 7/16″ thk.	Control for shaft of selector switch S–1.	2Z5821–149
R–1, R–2	RESISTOR, variable: comp; 10,000 ohms ±10%; 2.25 w.	VOL (volume) controls for audio output.	3Z7410–149
S–2	SWITCH, rotary: 2 pole, 3 position	Selects interphone amplifier and radio sets for transmitting.	3Z9825–34.2
S–1	SWITCH, rotary: 3 pole, 3 position	Selects interphone amplifier and radio sets for monitoring and transmitting.	3Z9825–34.1

4. Identification Table of Parts for Case CY–590/GRC

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	ARMY-NAVY CASE CY–590/GRC: battery; aluminum, olive drab finish; 15 3/8″ lg x 7 1/4″ wd x 5 3/8″ h o/a; removable front panel has metal battery holder which slides into case; immersion and fungus resistant; 2 lock strikes on upper, 2 spring catches on lower edge of ea side; 4 positioning studs on bottom side, 4 positioning holes on top side of case; p/o Army-Navy Radio Set AN/PRC–16; Fed Tele & Rad dwg #GA–2415–14; U. S. Army spec #71–3331.		2Z1891–590
H–5 through H–8, H–9	CATCH, fastener: p/o Army-Navy AF Amplifier AM–65/GRC and Army-Navy Case CY–590/GRC; c/o back plate, lever, 2 ea outside and inside links, 2 pins, and 2 springs; steel, zinc pl and olive drab iridite; 2 1/16″ lg x 1 1/16″ wd x 1/2″ d in locked position; two .144″ diam mtg holes on back plate, .437″ c to c; Fed Tele & Rad part/dwg #SC–D–20648; Sig C dwg #SC–D–20648.	H–5 through H–8: Mounting catches. H–9: Battery tray fastener catch.	6Z1747–36
	Technical Manuals (TM 11–284, 285, 286, 287 and 291).		(Order through AGO channels.)
P–6	CONNECTOR, plug: 8 round male cont; straight; 5 5/64″ lg x 1 5/32″ diam o/a; round black phenolic body; mts by means of keyed ctr locating pin and cont; 2 square keys on ctr locating pin 135 deg apart; Fed Tele & Rad part/dwg #ES–A–83778; Sig C dwg #ES–A–83778.	B battery connector	2Z3028–56

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
P–1 through P–5	CONNECTOR, plug: 8 round male cont; straight; $^{55}/_{64}$'' lg x $1^{5}/_{32}$'' diam o/a; round black phenolic body; mts by means of keyed ctr locating pin and cont; 2 rounded keys on ctr locating pin 90 deg apart; Fed Tele & Rad part/dwg #ES–A–83777; Sig C dwg #ES–A–83777.	A Battery connectors	2Z3028–57
J–2	CONNECTOR, receptacle: 9 round female cont; cont rated 10 amp at 800 v AC; Amphenol dwg #164.3; Fed Tele & Rad part/dwg #GH–2082–12.	Generator input connector	2Z3070–49
J–1	CONNECTOR, receptacle: 14 round female cont; cont rated 10 amp at 800 v AC; Amphenol dwg #164–5; Fed Tele & Rad part/dwg #GH–2083–12.	Output connector	2Z3075–26
H–1 through H–4	FASTENER, Dzus: die cast zinc and steel, olive drab finish; $1^{5}/_{8}$'' lg x $1^{5}/_{16}$'' wd x $^{5}/_{16}$'' thk o/a; mts by shaft thru $^{1}/_{4}$'' diam clearance hole; preloaded spring pressure, unlocked approx 32 lb, locked 45 lb; Dzus dwg #X–486; Fed Tele & Rad part/dwg #GA–2178–2.	Panel-to-case fasteners	6Z3809–27
O–5	GASKET: Buna N or neoprene; single hole; rectangular, 6.6'' lg x 4.85'' wd x .187'' thk; hole 6.12'' lg x 4.37'' wd; Fed Tele & Rad part/dwg #GR–1443–12–5.	Panel-to-case waterproofed gasket	2Z4867–691
H–16 through H–19	INSERT, threaded: steel, cad pl and olive drab iridited; generally rectangular w/2 rounded corners; $^{29}/_{32}$'' lg x $1^{1}/_{32}$'' wd x .1196'' thk; two #6–32 NC–2 tapped holes on .531'' ctr; Fed Tele & Red part/dwg #GB–1171–2.	Strike mounting screws, retaining inserts (nuts).	2Z5400–52
H–20 through H–23	INSERT, threaded: steel, cad pl and olive drab iridited; generally rectangular w/1 rounded end; $1^{5}/_{16}$'' lg x $^{3}/_{8}$'' wd x .1196'' thk; two #6–32 NC–2 tapped holes on .437'' ctr; Fed Tele & Rad part/dwg #GB–1172–2.	Catch mounting screws, retaining inserts (nuts).	2Z5400–56
E–1, E–2	INSULATOR, standoff: round post shape; natural or black grade LTS–E–4 phenolic w/electro tin pl brass term lug, and cad pl and clear iridited hex brass mtg base and stud; $^{13}/_{16}$'' lg o/a; 600 v RMS breakdown; $^{5}/_{16}$'' diam o/a; single #6–32 NC–2 x $^{1}/_{4}$'' lg mtg stud; Fed Tele & Rad part/dwg #GN–2198–2.	Wiring terminal posts	3G350–106
E–3	KNOB: round; w/bar; olive drab zinc alloy; for $^{1}/_{4}$'' diam double flatted shaft; single #6–32 screw through hole in face of knob screws into tapped axial hole in end of shaft; 2 white luminous lines on bar portion; $1^{7}/_{16}$'' lg x $^{7}/_{8}$'' wd x $^{15}/_{32}$'' h o/a; shaft hole .359'' d from bottom surface; luminous markings; Fed Tele & Rad part/dwg #GC–1690–2.	Switch knob	2Z5822–401
N–1	LABEL: decalcomania; $4^{5}/_{8}$'' lg x $2^{7}/_{8}$'' wd x .007'' thk; white print on black background; individually packed; Meyer cord type G; Fed Tele & Rad part/dwg #GD–2424–12; Sig C dwg #SC–C–40596–A.	Circuit label	6D16777–11

Ref symbol	Name of port and description	Function of part	Signal Corps stock No.
H–10	NUT, castellated: steel, cad pl and olive drab iridited; finished per dwg; 3/8″–32 NS–2; 1/8″ thk, 9/16″ OD; 4 slots 3/32″ wd x 3/64″ d spaced 90 deg apart; Fed Tele & Rad part/dwg #GB–1106–2.	Switch mounting nut	6L3006–32S
R–2	RESISTOR, fixed: WW; 39 ohms ±10%; ½ w; JAN type RU3BR39K.	Set 2 filament-dropping resistor	3RU02400
R–3	RESISTOR, fixed: 10 ohms ±10%; 2 w; IRC #BW–2.	Set 2 relay dropping resistor	3Z6001–146
R–1	RESISTOR, fixed: WW; 1.2 ohms ±10%; 2 w; IRC #BW–2.	Set 1 filament-dropping resistor	3Z5991B2
O–1 through O–4	SPRING: loop type; strike for Dzus fastener; .08″ diam olive drab iridited music wire; 1 3/8″ lg x 5/32″ wd x .08″ thk o/a; 2 ends turned perpendicular at 90 deg angle to straight portion on 1/16″ rad; Dzus dwg #X–487; Fed Tele & Rad part/dwg #GB–2414–2.	Fastener strikes	6Z8377–10
H–11 through H–14	STRIKE, fastener: steel, cad pl and olive drab iridited; 7/8″ lg x 9/16″ wd x 11/32″ h o/a; two .169″ diam mtg holes, .531″ c to c; 1 edge shaped into hook on 1/16″ inside rad x 19/32″ wd to provide catch action; Fed Tele & Rad part/dwg #GB–3035–2.	Mounting fastener strikes	6Z8569–4
H–15	STRIKE, fastener: steel, electro tin pl; rectangular; 4″ lg x 1″ wd x 3/8″ h o/a; four .136″ diam mtg holes, 2 on ea end on 9/16″ x 3 5/8″ mtg/c; ctr portion raised and has five 1/8″ x 9/16″ slots; Fed Tele & Rad part/dwg #GB–1762–2.	Battery tray fastener strike	6Z8569–6
S–1	SWITCH, rotary: 2 pole, 3 position; single sect; silver pl brass cont; ceramic wafer; 1 7/8″ lg x 1 5/8″ wd x 29/32″ d from mtg surface; nonshorting cont; locking action; solder lug term; single hole mtg, 3/8″–32 x 3/8″ lg mtg bushing, shaft 1/4″ diam x 11/16″ lg from mtg surface; Oak type #HIC; Fed Tele & Rad part/dwg #GH–2097–2.	OFF-ON REMOTE CONTROL switch.	3Z9825–62.531

APPENDIX III

RELATED RADIO SETS

1. Basis of Relationship

The major components of the radio set discussed in this manual are common to numerous other sets which utilize common or overlapping frequency ranges. The frequency spectrum chart (fig. 2) indicates how the sets are related so far as frequency coverage is concerned. Physical similarities among the sets are indicated in the comparison chart which follows and in figure 54.

2. Comparison Chart

The following chart lists the components of the radio sets discussed in this manual and the components of related radio sets. Analysis of the chart and figure 54 will reveal the high degree of similarity which exists among the sets.

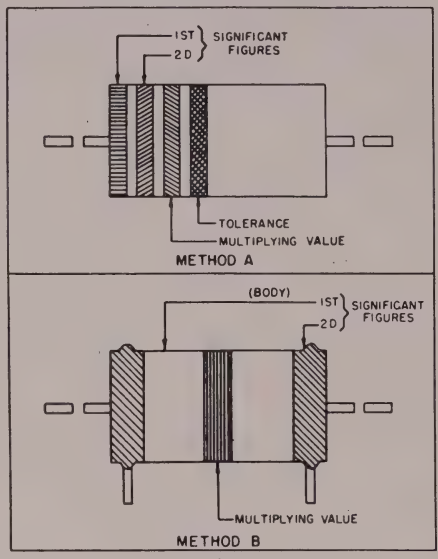
Radio Sets

Components	AN/GRC-3	AN/GRC-5	AN/GRC-7	AN/GRC-4	AN/GRC-6	AN/GRC-8	AN/VRC-8	AN/VRC-9	AN/VRC-10	AN/VRC-13	AN/VRC-14	AN/VRC-15	AN/VRQ-1	AN/VRQ-2	AN/VRQ-3	AN/VRC-7	AN/PRC-16	Intercommunication Set AN/UIC-1	Modification Kit MX-988/GR
Case CY-684/GR	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1			
Case CY-590/GRC																	1		1
Mounting MT-297/GR	1	1	1	1	1	1				1	1	1							
Mounting MT-299/GR							1	1	1										
Mounting MT-298/GR													1	1	1				
Mounting MT-300/GR																1		1	
Mounting MT-673/GR																	1		
Antenna Mounting MT-652/GR																	1		1
Receiver-Transmitter RT-66/GRC	1			1			1			1			2						
Receiver-Transmitter RT-67/GRC		1			1			1			1			2					
Receiver-Transmitter RT-68/GRC			1			1			1			1			2				
Receiver-Transmitter RT-70/GRC	1	1	1	1	1	1										1	1		
Radio Receiver R-109/GRC		1																	
Radio Receiver R-110/GRC			1																
Power Supply {PP-109/GR or PP-112/GR}	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2				
Control Group AN/GRA-6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

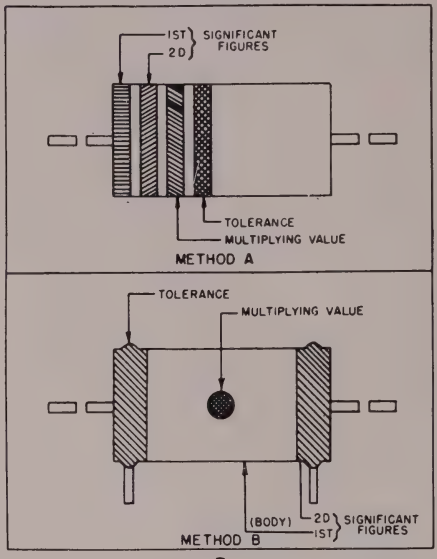
Components	AN/GRC-3	AN/GRC-5	AN/GRC-7	AN/GRC-4	AN/GRC-6	AN/GRC-8	AN/VRC-8	AN/VRC-9	AN/VRC-10	AN/VRC-13	AN/VRC-14	AN/VRC-15	AN/VRQ-1	AN/VRQ-2	AN/VRQ-3	AN/VRC-7	AN/PRC-16	Intercommunication Set AN/UIC-1	Modification Kit MX-898/GR
Control C-435/GRC	1	1	1	1	1	1							1	1	1				
Control Box C-375/VRC	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		2	
Mast Base AB-15/GR	2	2	2	2	2	2	1	1	1	1	1	1	2	2	2	1			
Mast Section MS-116-A	2	2		2	2		2	2		2	2		4	4					
Mast Section MS-117-A	2	2	2	2	2	2	2	2	2	2	2	2	4	4	4				
Mast Section MS-118-A	2	2		2	2		2	2		2	2		4	4					
Mast Section AB-22/GR	2	2	2	2	2	2										2	2		1
Mast Section AB-24/GR	2	2	4	2	2	4			2			2			4	2	2		1
Mast Section AB-23/GR																			3
Generator G-8/GRC																			1
Handset H-33/PT																	1		1
Special Purpose Cable Assembly CX-1211/U	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2				
Special Purpose Cable Assembly CX-1213/U	1	1	1	1	1	1										1			
Special Purpose Cable WM-46/U	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	
RF Cable Assembly CG-568/U	1			1			1			1			2						
RF Cable Assembly CG-530/U	1	2	2	1	2	2		1	1		1	1		2	2	1			
Power Cable Assembly CX-1209/U																	1		1
Power Cable Assembly CX-1210/U																			1
Bag CW-187/GR																			1
Bag CW-188/GR																			1
Adapter UG-273/U	2	2	2	2	2	2	1	1	1	1	1	1	2	2	2	1			
Installation kit	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	
Wire W-142	1	1	1																
Adapter UG-306/U	2	2	2	2	2	2	1	1	1	1	1	1	2	2	2	1			
Bag CW-206/GR	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	
Connector and bond-nut (Appleton)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	
AF Amplifier AM-65/GRC	1	1	1	1	1	1				1	1	1				1		1	
Power Supply { PP-282/GRC or PP-281/GRC }	2	2	2	1	1	1				1	1	1				1		1	
Power Supply PP-448/GR																1			
Radio Receiver R-108/GRC	1																		

RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS*



JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS/



COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE	TOLERANCE (%)
BLACK	0	1	± –
BROWN	1	10	± 1
RED	2	100	± 2
ORANGE	3	1,000	± 3
YELLOW	4	10,000	± 4
GREEN	5	100,000	± 5
BLUE	6	1,000,000	± 6
VIOLET	7	10,000,000	± 7
GRAY	8	100,000,000	± 8
WHITE	9	1,000,000,000	± 9
GOLD	–	0.1	± 5
SILVER	–	0.01	± 10
NO COLOR	–	–	± 20

NOTES

* INSULATED FIXED COMPOSITION RESISTORS WITH AXIAL LEADS ARE DESIGNATED BY A NATURAL TAN BACKGROUND COLOR. NON-INSULATED FIXED COMPOSITION RESISTORS WITH AXIAL LEADS ARE DESIGNATED BY A BLACK BACKGROUND.

/ RESISTORS WITH AXIAL LEADS ARE INSULATED. RESISTORS WITH RADIAL LEADS ARE NON-INSULATED.

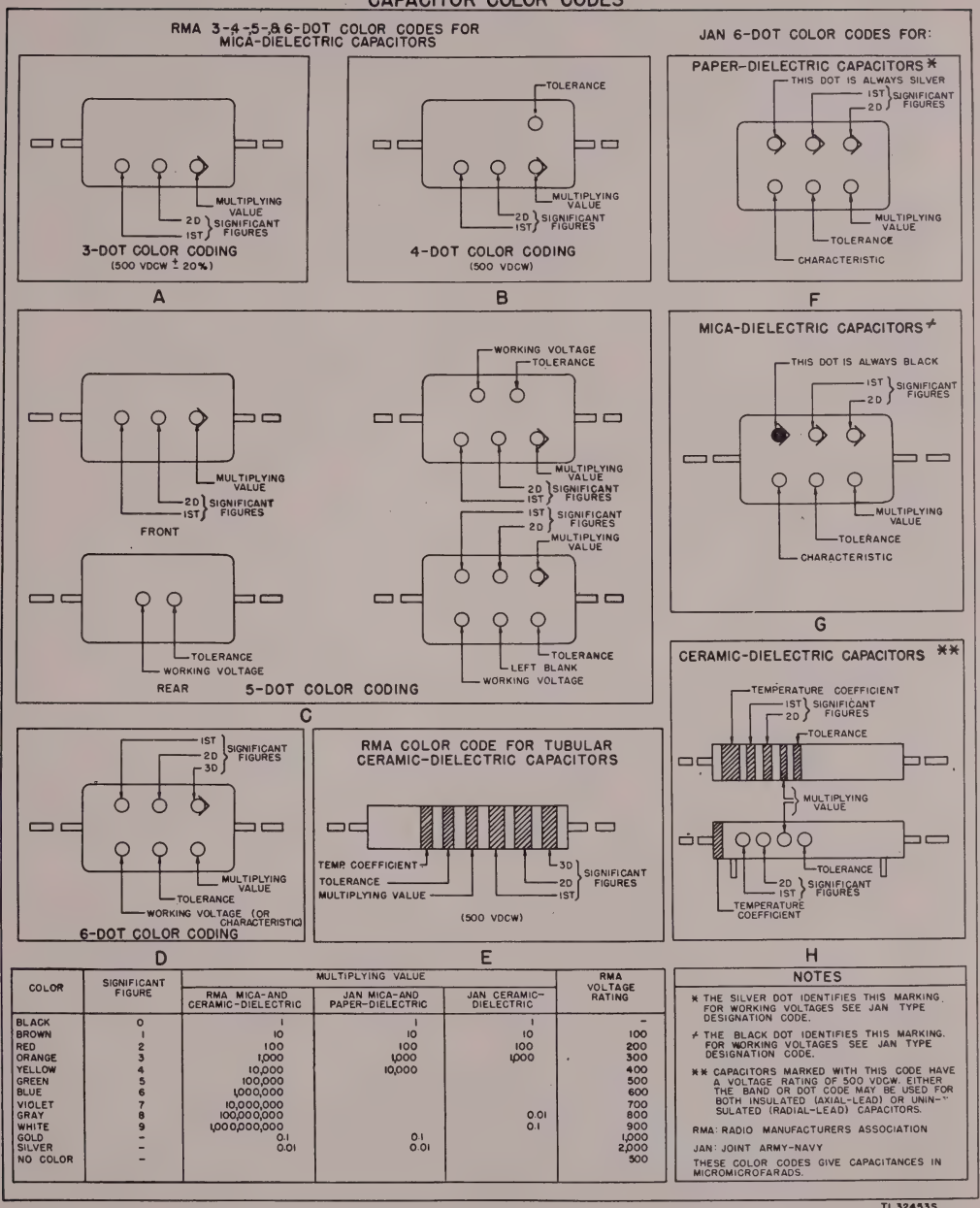
RMA RADIO MANUFACTURERS ASSOCIATION

JAN JOINT ARMY-NAVY

THESE COLOR CODES GIVE ALL RESISTANCE VALUES IN OHMS.

TL 32454S

Figure 55. Resistor color codes.



COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE			RMA VOLTAGE RATING
		RMA MICA-AND CERAMIC-DIELECTRIC	JAN MICA-AND PAPER-DIELECTRIC	JAN CERAMIC-DIELECTRIC	
BLACK	0	1	1	1	-
BROWN	1	10	10	10	100
RED	2	100	100	100	200
ORANGE	3	1,000	1,000	1,000	300
YELLOW	4	10,000	10,000		400
GREEN	5	100,000			500
BLUE	6	1,000,000			600
VIOLET	7	10,000,000			700
GRAY	8	100,000,000		0.01	800
WHITE	9	1,000,000,000		0.1	900
GOLD	-	0.1	0.1		1,000
SILVER	-	0.01	0.01		2,000
NO COLOR	-				500

NOTES

* THE SILVER DOT IDENTIFIES THIS MARKING. FOR WORKING VOLTAGES SEE JAN TYPE DESIGNATION CODE.

≠ THE BLACK DOT IDENTIFIES THIS MARKING. FOR WORKING VOLTAGES SEE JAN TYPE DESIGNATION CODE.

** CAPACITORS MARKED WITH THIS CODE HAVE A VOLTAGE RATING OF 500 VDCW. EITHER THE BAND OR DOT CODE MAY BE USED FOR BOTH INSULATED (AXIAL-LEAD) OR UNINSULATED (RADIAL-LEAD) CAPACITORS.

RMA: RADIO MANUFACTURERS ASSOCIATION

JAN: JOINT ARMY-NAVY

THESE COLOR CODES GIVE CAPACITANCES IN MICROMICROFARADS.

TL 32453S

Figure 56. Capacitor color codes.

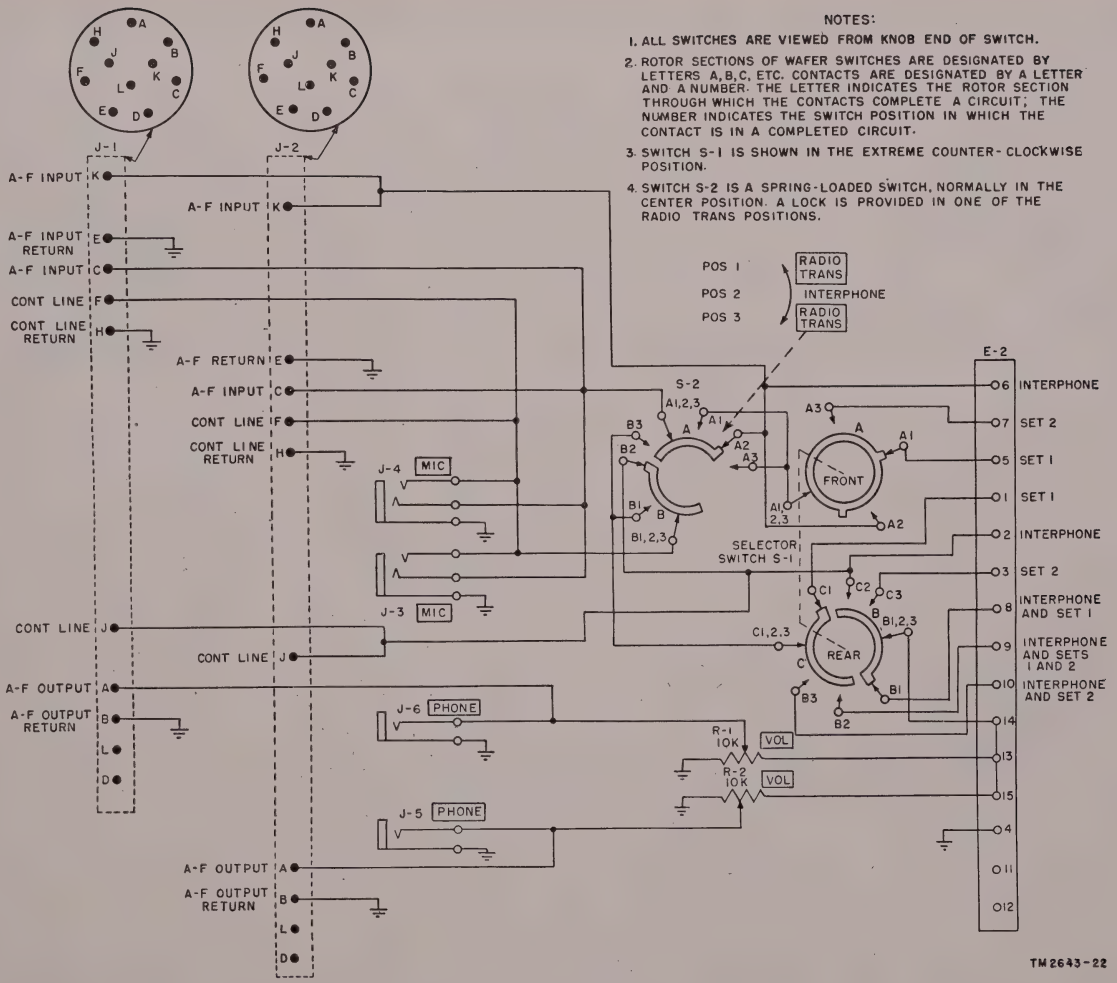
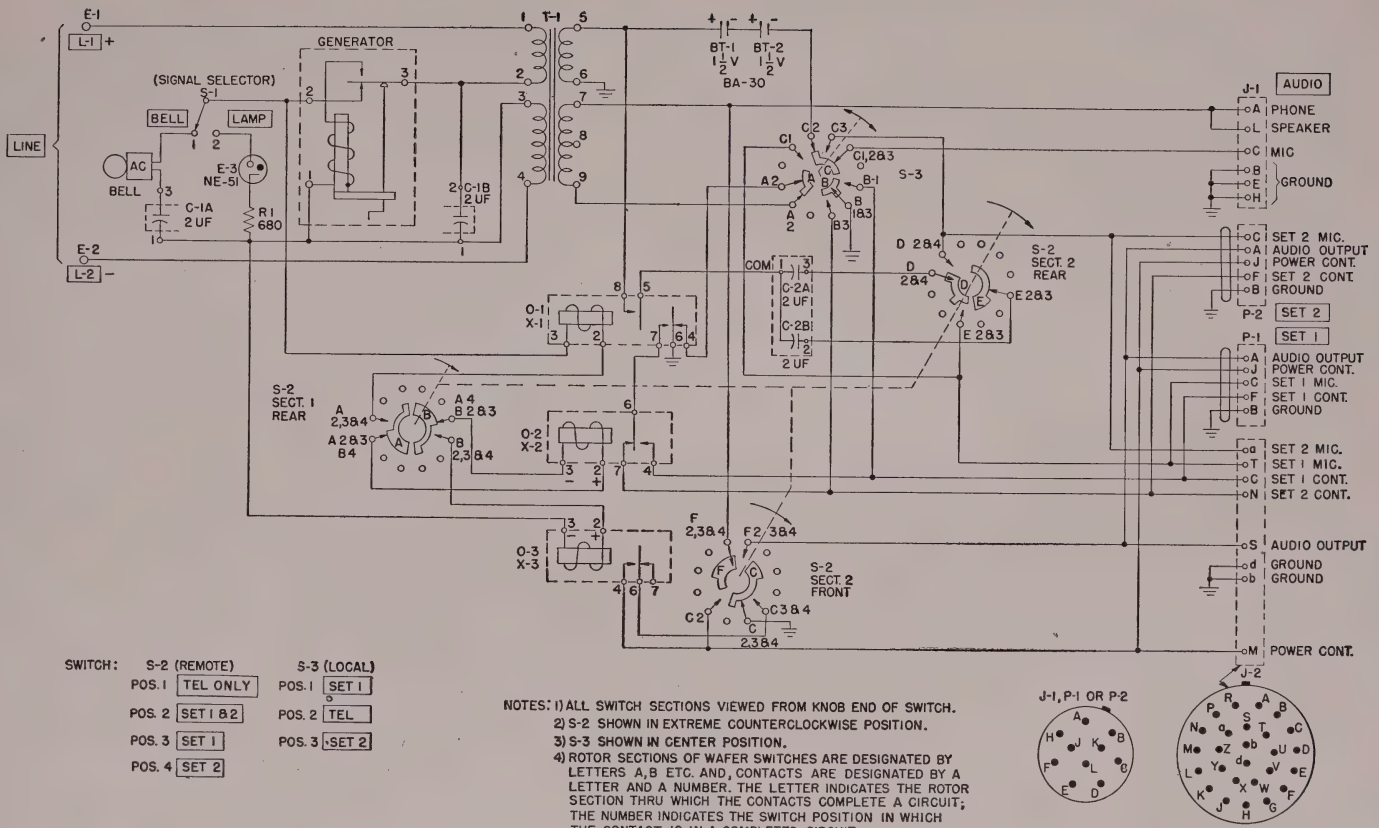


Figure 57. Control Box C-375/VRC, schematic diagram.



SWITCH: S-2 (REMOTE) S-3 (LOCAL)

	S-2 (REMOTE)	S-3 (LOCAL)
POS. 1	TEL ONLY	SET 1
POS. 2	SET 1 &2	TEL
POS. 3	SET 1	SET 2
POS. 4	SET 2	

NOTES:
1) ALL SWITCH SECTIONS VIEWED FROM KNOB END OF SWITCH.
2) S-2 SHOWN IN EXTREME COUNTERCLOCKWISE POSITION.
3) S-3 SHOWN IN CENTER POSITION.
4) ROTOR SECTIONS OF WAFER SWITCHES ARE DESIGNATED BY LETTERS A,B ETC. AND, CONTACTS ARE DESIGNATED BY A LETTER AND A NUMBER. THE LETTER INDICATES THE ROTOR SECTION THRU WHICH THE CONTACTS COMPLETE A CIRCUIT; THE NUMBER INDICATES THE SWITCH POSITION IN WHICH THE CONTACT IS IN A COMPLETED CIRCUIT.
5) RELAY O-1 SHOWN DE-ENERGIZED
6) RELAYS O-2 AND O-3 SHOWN WITH NO OPERATING VOLTAGE APPLIED, AND LATCHED BY THE PREVIOUS APPLICATION OF A VOLTAGE OPPOSITE IN POLARITY TO THAT SHOWN ON COIL. COIL MARKINGS (+ AND −) REFER TO VOLTAGE POLARITY REQUIRED TO SWING ARMATURE TO OPEN CONTACT.

TM 284-91

Figure 58. Local Control C–434/GRC, schematic diagram.

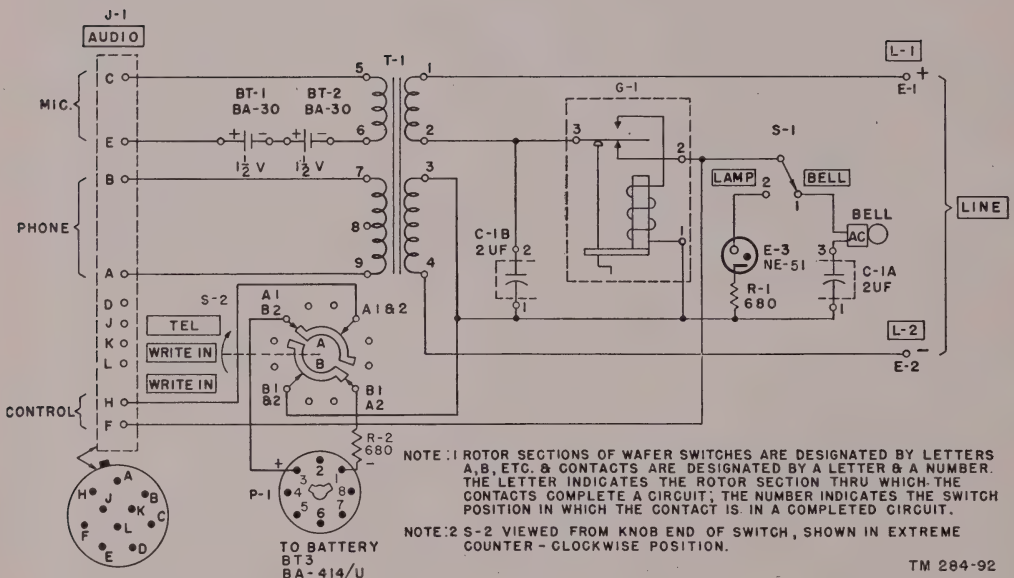


Figure 59. Remote Control C-433/GRC, schematic diagram.

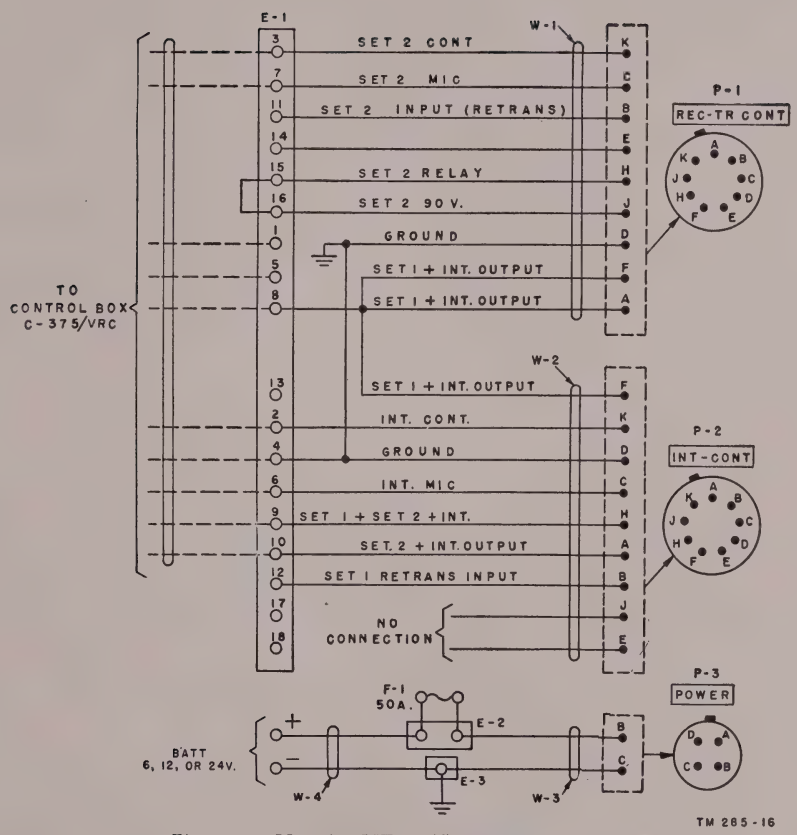


Figure 60. Mounting MT-300/GR, schematic diagram.

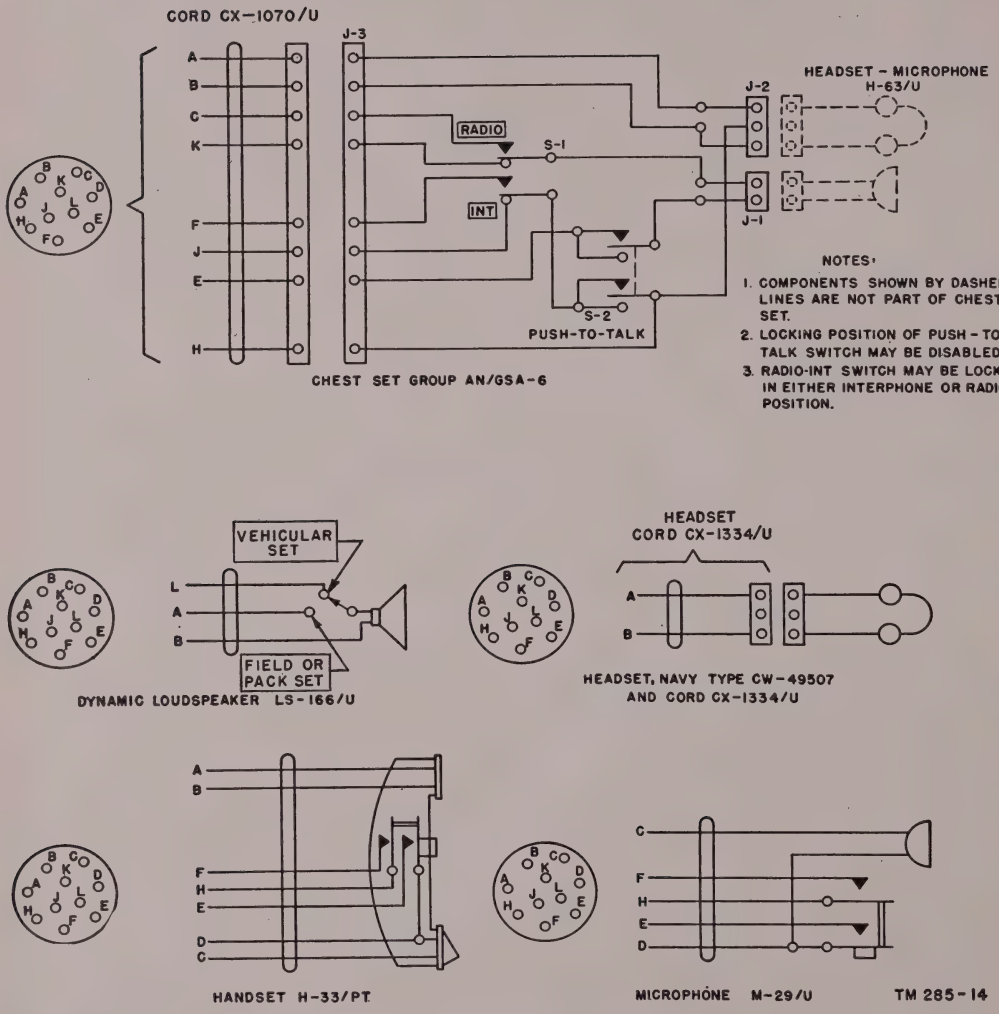


Figure 61. Audio accessories, schematic diagram.

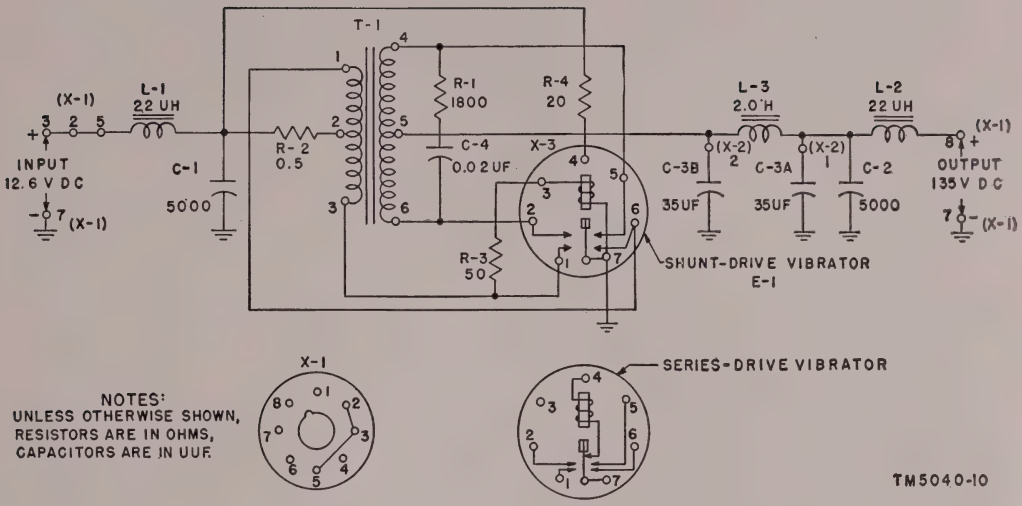


Figure 62. Power Supply PP–281/GRC, schematic diagram.

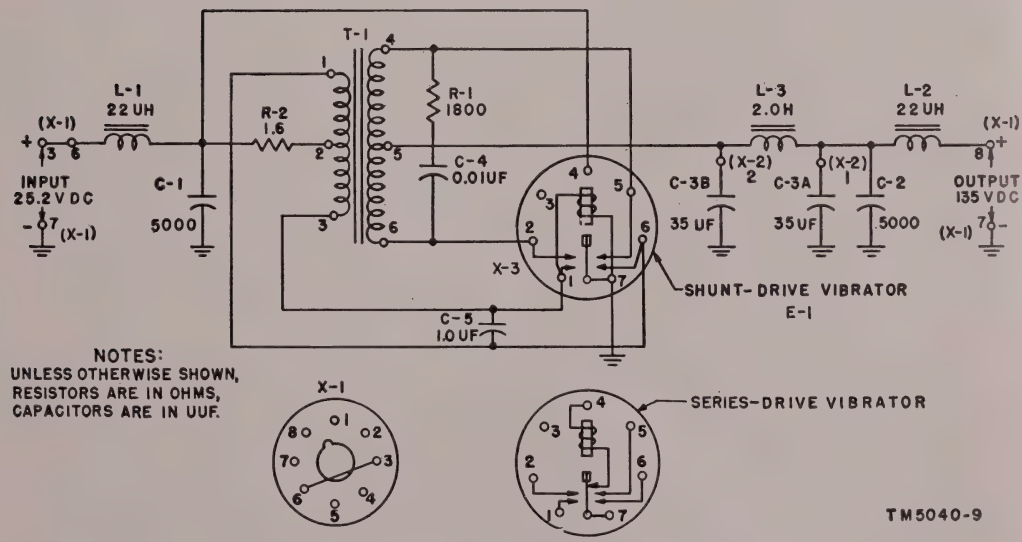


Figure 63. Power Supply PP–282/GRC, schematic diagram.

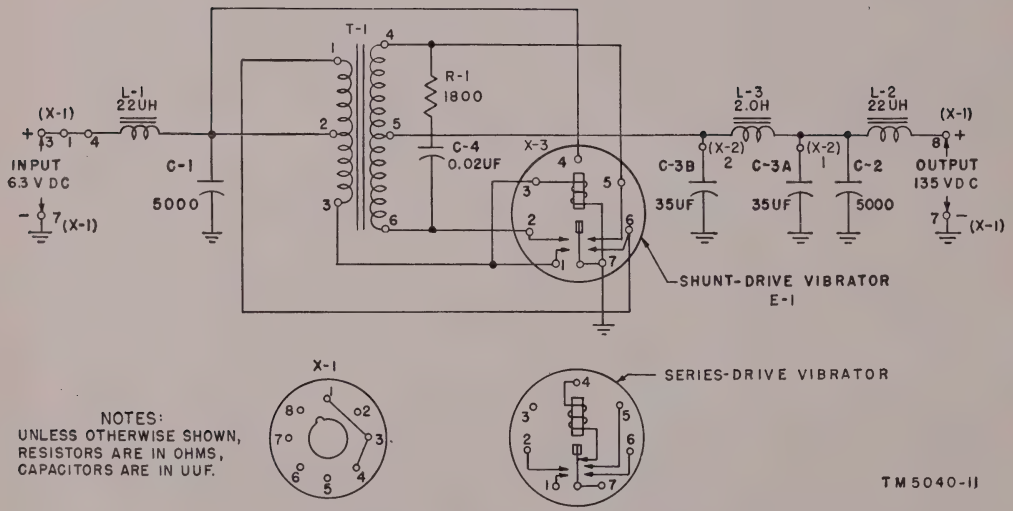


Figure 64. Power Supply PP–448/GR, schematic diagram.

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Schematics

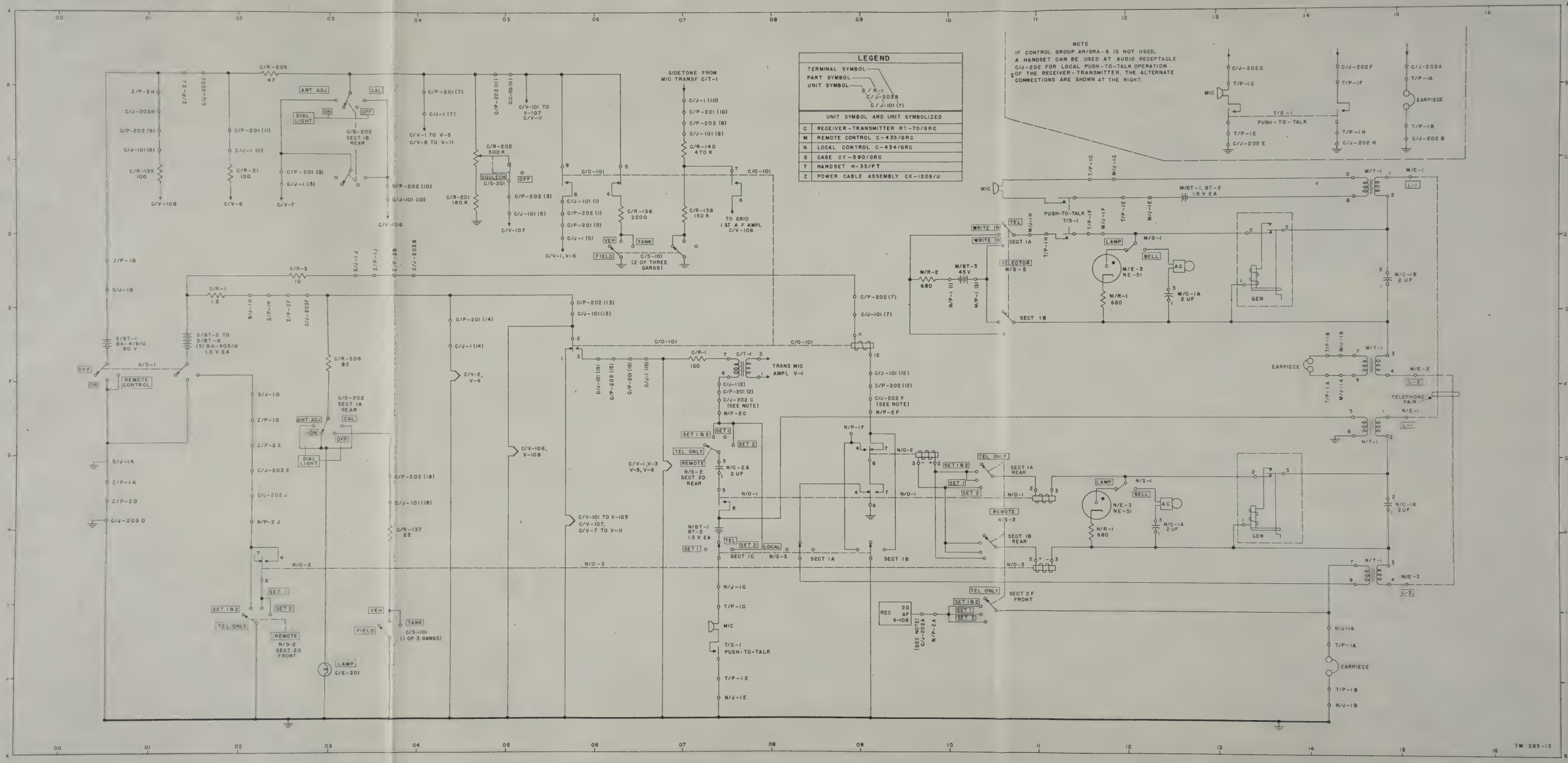


FIGURE 52.—*Control and power distribution circuits for receiver-transmitter and battery box.*

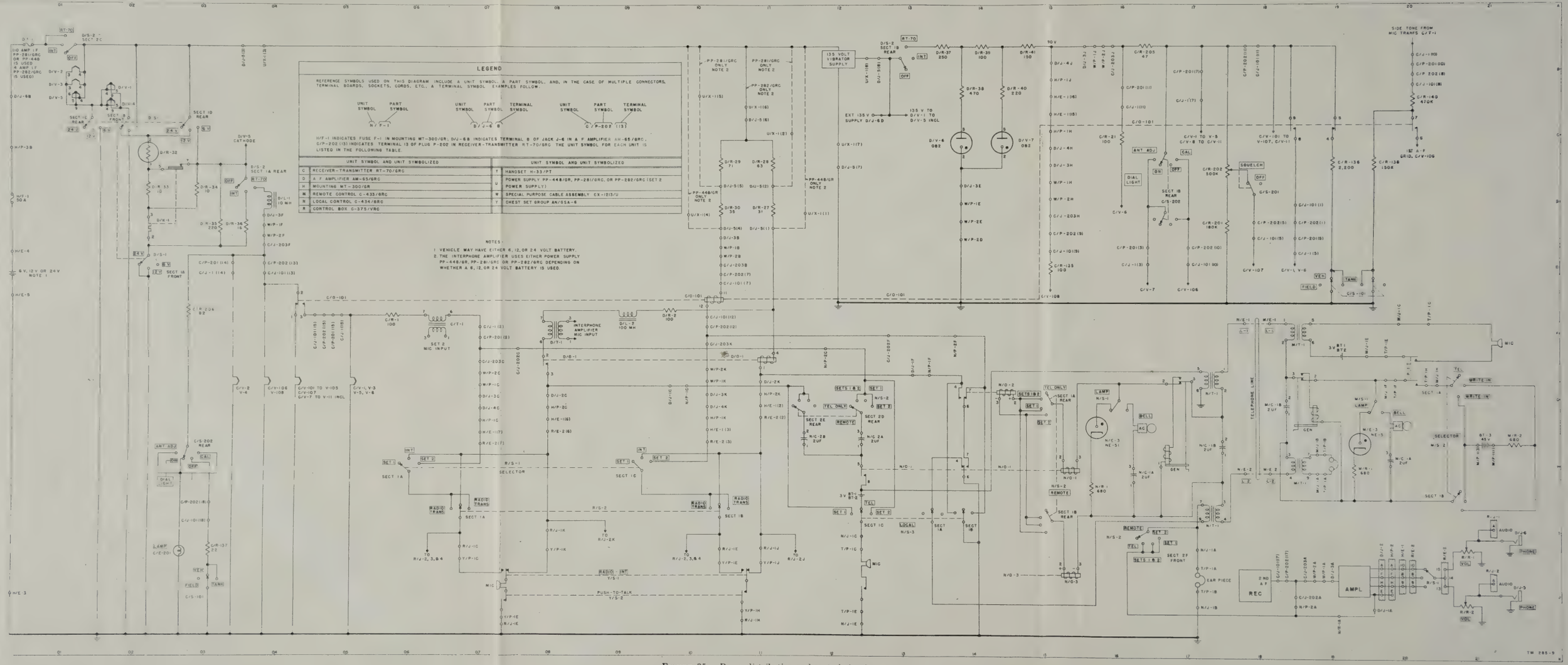


FIGURE 35.—*Power distribution and control circuits.*

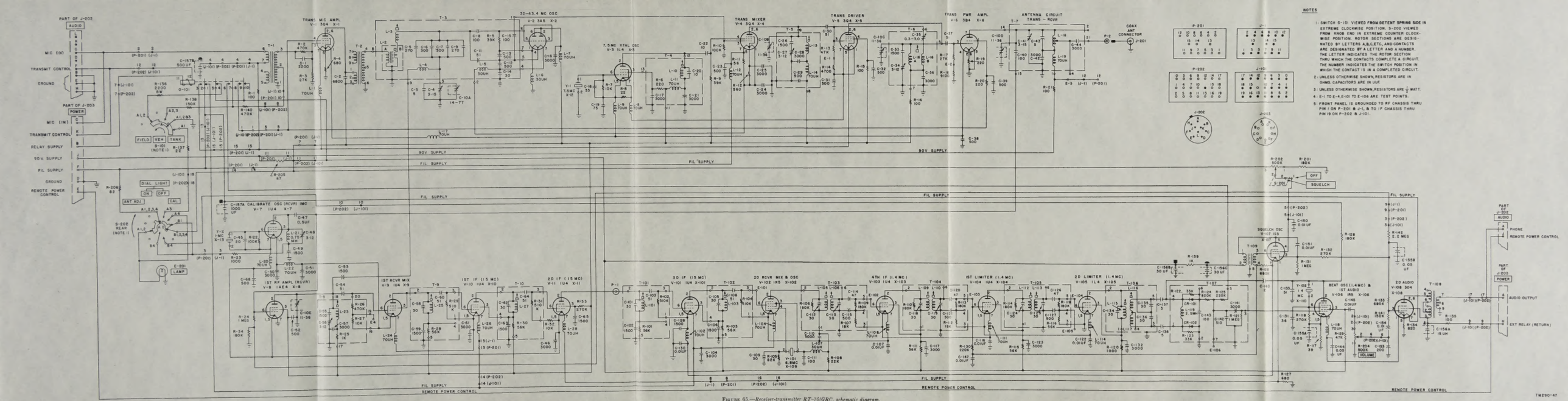


FIGURE 65.—*Receiver-transmitter RT-70(GRC, schematic diagram.*

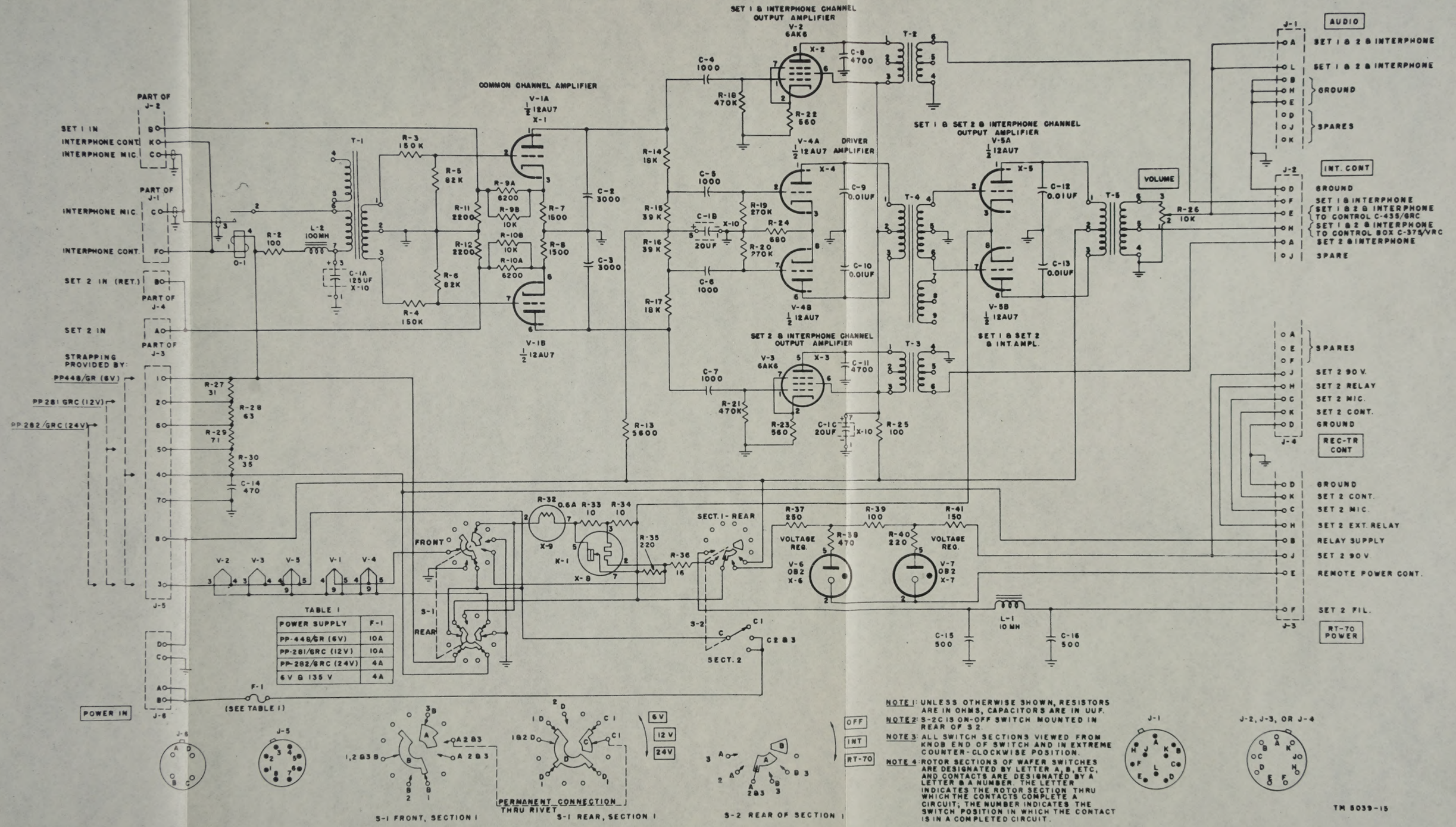


FIGURE 66.—*AF amplifier AM-65/GRC, schematic diagram.*

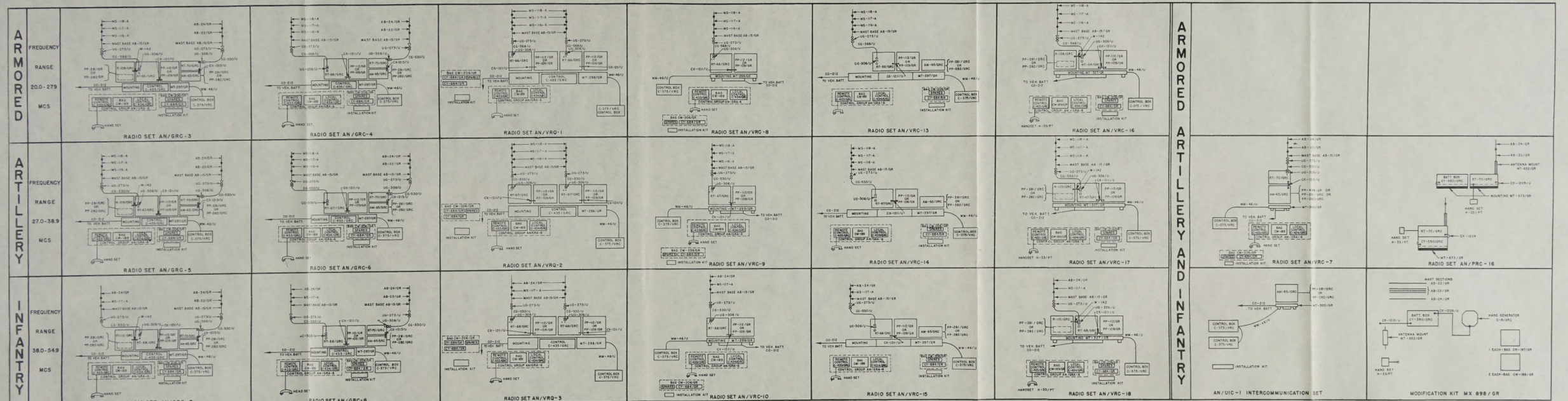


FIGURE 54.—*Standardized series of f-m sets.*

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