T. O. 31R2-2VRC2-11

TM 11-607/TO 16-30VRC2-5

This manual supersedes TM 11-607, 7 January 1946, including C 1, 5 November 1948; C 2, 27 November 1950; and C 3, 19 October 1951

RADIO SETS AN/VRC-2 AND AN/VRC-2X

United States Government Printing Office
Washington: 1953

DEPARTMENTS OF THE ARMY AND
THE AIR FORCE
WASHINGTON 25, D. C., *14 May 1953*

TM 11–607/TO 16–30VRC2–5 is published for the information and guidance of all concerned.

[AG 413.44 (28 Apr 53)]

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For explanation of distribution formula, see SR 310–90–1.

DEPARTMENT OF THE ARMY TECHNICAL MANUAL **C 1, TM 11-607**
DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER **TO 16-30VRC2-5**

RADIO SETS AN/VRC-2 AND AN/VRC-2X

C 1, TM 11-607
TO 16-30VRC2-5

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
WASHINGTON 25, D. C., *23 July 1954*

TM 11-607/TO 16-30VRC2-5, 14 May 1953, is changed as follows:

The date on the cover is changed to read **May 1953.**

22.1. Antijamming Procedures

(Added)

When the radio receiver is being jammed by unwanted signals, the immediate superior officer should be notified. However, the operator must not cease operating the equipment under any condition. The radio receiver operates on a fixed frequency, therefore it does not have tuning controls. One or more of the following procedures may be used for obtaining the maximum intelligibility from the desired signals during the jamming process.

a. Operate the VOLUME control, on the control head, fully clockwise for maximum volume. This procedure may cause the speaker or headphones to become overloaded and provide a degree of desired signal copy.

b. Vary the SQUELCH control, on the control head, until the best desired signal copy is made possible. If various settings of the control fail to permit copy, operate the control fully counterclockwise to the off position. A degree of signal copy may be possible.

c. If the antenna is installed vertically, gradually vary its position until it is horizontal. The jamming signal may be lessened in intensity or completely eliminated.

d. Change the height and location of the antenna. Locate the antenna so that a truck, jeep, tank, or mound of dirt is between the antenna and the source of the jamming signal. The strength of the jamming signal may be decreased or eliminated entirely and permit copy of the desired signal.

e. If the above procedures fail to give the desired results, request a change of frequency and call sign.

f. If the jamming process is so effective and complete that changing to alternate frequencies does not permit communication, use another means to get the message through, but continue to operate the equipment.

[AG 413.44 (12 Jul 54)]

BY ORDER OF THE SECRETARIES OF THE ARMY AND THE AIR FORCE:

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DISTRIBUTION:
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SigC Sch (25)
Gen Depots (2)
SigC Sec, Gen Depots (10)
SigC Depots (20)
POE (2)
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11-127, Sig Rep Co (2)
11-128A, Sig Depot Co (2)
11-500A (AA through AE), Sig Admin Teams (2)
11-587A, Sig Base Maint Co (2)
11-592A, Hq & Hq Co, Sig Base Depot (2)
11-597, Sig Base Depot Co (2)
19-217A, MP Co (2)
19-500A (AA through AC), MP Admin Teams (2)

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For explanation of abbreviations used, see SR 320-50-1.

U. S. GOVERNMENT PRINTING OFFICE: 1954

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ASA	Gen & Br Svc Sch	Units organized under following TOE's:
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Hq CONARC	Sig Depots	11–57
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CONARC Bd Test Sec	US Army Tng Cen	11–128
Army AA Comd	AMS	11–500
OS Maj Comd	POE (OS)	11–557
OS Base Comd	Trans Terminal Comd	11–587
Log Comd	Army Terminals	11–592
MDW	OS Sup Agencies	11–597
Armies	Army Elct PG	19–217
Corps	Sig Fld Maint Shops	19–500
Div	Sig Lab	(AA–AE)
Ft & Cp	ACS	30–500
Sp Wpn Comd	Mil Dist	

NG: State AG; units—same as Active Army.
USAR: None.
For explanation of abbreviations used, see SR 320–50–1.

U. S. GOVERNMENT PRINTING OFFICE: 1957

DEPARTMENT OF THE ARMY TECHNICAL MANUAL
DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER

RADIO SETS AN/VRC-2, -2A, -2B, -2C, AND -2X

TM 11-607
TO 31R2-2VRC2-11
CHANGES No. 3

DEPARTMENTS OF THE ARMY AND
THE AIR FORCE
WASHINGTON 25, D. C., *2 April 1957*

TM 11-607/TO 31R2-2VRC2-11, 14 May 1953, is changed as follows:

The following information changes TM 11-607/TO 31R2-2VRC2-11 so that the manual also applies to the following equipment:

Nomenclature	*Order No.*	*Serial No.*
Radio Set AN/VRC-2C.	3349-Phila-52	1 through 957.

Page 1, paragraph 1*b*, line 4. Change "20591-Phila-49 and No. 21756-Phila-50" to: **20591-Phila-49, 21756-Phila-50, and 3349-Phila-52.**

Page 4, paragraph 5.

d. (Added) *Radio Transmitter T-193C/VRC-2 (Order No. 3349-Phila-52).*

Power output----------30 watts

Page 10, paragraph 10. Make the following changes:

Line 6: Change "6K6OT" to: **6K6GT**
Line 7: Change "6K8CT" to: **6K8GT**
Line 8: Change "68G7GT" to: **6SG7GT**

c. (Added) The running spares for Radio Set AN/VRC-2 (Order No. 3349-Phila-52) are the same as those listed in *b* above, except for the following substitutions:

Electron tube, type 6H6 for 6H6GT
Electron tube, type 6K8 for 6K8GT
Electron tube, type 6SG7Y for 6SG7GT
Electron tube, type 6V6Y for 6V6GT

Page 13, paragraph 12*b*.

(10) (Added) Radio Receiver R-237B/VR (part of Radio Set AN/VRC-2C Order No. 3349-Phila-52) has two added resistors in the discriminator circuit.

Page 17, figure 20. Add the following to the caption: and Antenna AT-532/VR.

Page 23, paragraph 15*c*. Add the following caution beneath the heading:

Caution: Be very careful when removing or installing Radio Transmitter T-193/VRC-2. Do not damage the parts located under the chassis. Use the following procedure:

1. When removing the transmitter from the mounting base, raise the front edge of the transmitter high enough to clear the screw lugs. Lift it up and pull it out from the mounting.
2. When installing the transmitter, keep the front end up to clear the screw lug. Engage the lip on the rear edge of the chassis with the corresponding lip on the mounting. Then, lower and secure the front edge.

Page 25, paragraph 15*f*. Add the following note beneath the heading:

Note. Under severe field conditions Antenna AT-129B/VR becomes rusty and corroded. Revised requirements specify the use of corrosion-resistant steel on all future procurements of this antenna. The improved antenna is nomenclatured Antenna AT-532/VR. To retard the effects of corrosion caused by moisture on Antenna AT-129B/VR, wrap the sliding joint and stud base with Biseal self-binding tape (Signal Corps stock No. 6N9201-14). All remaining surfaces (except the points of electrical contact) should be primed and painted in accordance with the United States Army Specification 72-53.

Page 53, paragraph 52*d*. Add the following after the last sentence: Radio Receiver R-237B/VR (Order No. 3349-Phila-52) has two additional resistors in the discriminator circuit of V9.

Page 53, figure 50. Make the following changes: Change "NOTE" to: **NOTES.** Place the numeral 1 before the existing note. Add the following:

2. IN RADIO RECEIVER R-237B/VR (ORDER NO. 3349-PHILA-52) RESISTOR R55 (2.2 MEG) IS CONNECTED BETWEEN PIN 4 OF V9 AND THE JUNCTION OF R39 AND R50. RESISTOR R56 (470 K) IS CONNECTED BETWEEN PIN 4 OF V9 AND GROUND.

Page 59, figure 57. Make the following changes: Change "NOTE" to: **NOTES.** Place the numeral 1 before the existing note. Add the following notes:

2. IN POWER SUPPLIES (ORDER NO. 3349–PHILA–52) THE CONNECTION FROM PIN 6 ON THE POWER MALE RECEPTACLE TO THE SPARK PLATE IS OMITTED.
3. A 100-$\mu\mu$F CAPACITOR IS CONNECTED IN PARALLEL WITH C1.
4. THE VALUE OF R1 AND R2 IS 47 OHMS EACH.
5. THE VALUE OF C4 IS 20 μF FOR EACH SECTION.

Page 62, figure 60. Make the following changes: Change "NOTE" to: **NOTES.** Place the numeral 1 before the existing note. Add the following:

2. IN RADIO TRANSMITTER T–193C/VRC–2 (ORDER NO 3349–PHILA–52) C12 IS 2,200 $\mu\mu$F.

Page 63, paragraph 59*e*(2), line 4. After "322/VRC–2X" insert the following: In Radio Transmitter T–193C/VRC–2 (Order No. 3349–Phila–52), the value of C12 is 2,200 $\mu\mu$f.

Page 66, paragraph 62*b*(2) and page 7, C 2. After "output circuit" insert the following sentence: On Order No. 3349–Phila–52 (Radio Transmitter T–193C/VRC–2) the value of C29 differs from the value shown in figure 67.

[AG 413.44 (22 Mar 57)]

Page 69, figure 67. Make the following changes: Change "NOTE" to: **NOTES.** Place numerals 1 and 2 before the existing notes. Add the following:

3. IN RADIO TRANSMITTER T–193C/VRC–2 (ORDER NO. 3349–PHILA–52) THE VALUE OF C29 IS 12 TO 175 $\mu\mu$F.

Page 74, paragraph 66, line 3. Change "Nos. 20591–P–49 and 21756–P–50" to: **No. 20591–Phila–49, 21756–Phila–52 and 3349–Phila–52.**

Figure 124 (fold-out). Add the following note:

3. EQUIPMENTS PROCURED ON ORDER NO. 3349–PHILA–52 HAVE TWO ADDED RESISTORS IN THE DISCRIMINATOR CIRCUIT: R55 (2.2 MEG) IS ADDED BETWEEN PIN 4 (V9) AND JUNCTION OF R39 AND R50; R56 (470 K) IS CONNECTED BETWEEN PIN 4 (V9) AND GROUND.

Figure 125 (fold-out). Make the following changes: Change the caption to: **Radio Transmitters T–193B/VRC–2 and T–193C/VRC–2, overall schematic diagram.**

Add the following note:

4. IN EQUIPMENT ON ORDER NO. 3349–PHILA–52, C12 IS 2,200 $\mu\mu$F AND C29 IS 12 TO 175 $\mu\mu$F.

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This manual supersedes TM 11-607, 7 January 1946; including C 1, 5 November 1948; C 2, 27 November 1950; and C 3, 19 October 1951

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

a. This technical manual contains the necessary instructions for the installation, operation, maintenance, and repair of Radio Set AN/VRC–2X (fig. 1), and Radio Set AN/VRC–2 (figs. 6, 7, and 8) In addition to these instructions there are two appendixes covering a list of references and an identification table of parts.

b. Radio Set AN/VRC–2X is very similar in structure, function, and mechanical layout to Radio Set AN/VRC–2 delivered on Orders No. 20591–Phila–49 and No. 21756–Phila–50. The equipments differ only in that the X model requires a 24-volt primary power source for operation, while the unlettered model operates from a 6-volt source.

c. Official nomenclature followed by (*) is used to indicate all models of the item of equipment covered by this technical manual. Thus Radio Set AN/VRC–2(*) represents Radio Sets AN/VRC–2 and AN/VRC–2X. When the text applies equally to all the receivers or transmitters described in this manual, the terms *receiver* or *transmitter* will be used

2. Forms and Records

The following forms will be used for reporting unsatisfactory conditions of Army materiel 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 (Army), Navy Shipping Guide, Article 1850–4, and AFR 71–4 (Air Force).

b. DA Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700–45–5.

c. AF Form 54, Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700–45–5 and AFR 65–26.

d. DA AGO Form 11–238, Operator First Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with instructions on the back of the form (fig. 36)

e. DA AGO Form 11–239, Second and Third Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with instructions on the back of the form (fig. 37).

f. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Purpose and Use

a. Radio Set AN/VRC–2(*) is a complete radio set, less primary power source, designed for vehicular operation. It provides two-way voice communication with similar fixed or mobile equipment operating at the same frequency (fig. 3). The set operates in the fre-

quency range of 30 to 40 mc (megacycles), utilizing fm (frequency modulation). Reliable communications up to a distance of 15 miles may be obtained in open terrain.

b. The communication circuit (fig. 2) is of *single-frequency* (receiver and transmitter tuned to same frequency), *push-to-talk* type (fig. 4). The receiver and transmitter are crystal-controlled, and other crystals must be substituted in order to change frequency. The transmitter must be retuned before signals at another frequency can be received or transmitted. Operation of a push-to-talk button disables the receiver and turns on the transmitter. Conversation can proceed in only one direction at a time. A single antenna is used for transmitting and receiving, and it is switched by an antenna relay located in the transmitter. Control of the relay and of the power to the transmitter and receiver is accomplished at the control head, which is located at the operator's position.

c. The complete radio set consists of a receiver, a transmitter, a control head, and associated operating and installation components.

4. Technical Characteristics of Radio Set AN/VRC–2X

a. Radio Receiver R–435/VRC–2X.

Power input	24 volts at 3 amperes.
Frequency range	30 to 40 mc.
Receiver type	Dual conversion superheterodyne with two crystal oscillator circuits.
Number of tubes	13 in receiver, 2 in vibrator power supply.
Type of signal received	F-m voice.
Antenna	¼-wave telescopic whip.

b. Radio Transmitter T–322/VRC–2X.

Power input	24 volts at 10 amperes.
H-v (high-voltage) power supply.	Dynamotor.
Power output	30 watts.
Frequency range	30 to 40 mc in 3 bands.
Transmitter type	Crystal-controlled, fm.
Type of modulation	Fm resulting from phase modulation.
Frequency deviation	±15 kc (kilocycles) for full modulation.
Number of tubes	7.
Antenna	Same as receiver.

Note. **A frequency band is selected by installing the proper plate coil for antenna loading in its socket on the transmitter chassis (fig. 92). Selection of the proper coil is explained in paragraph 84*c*.**

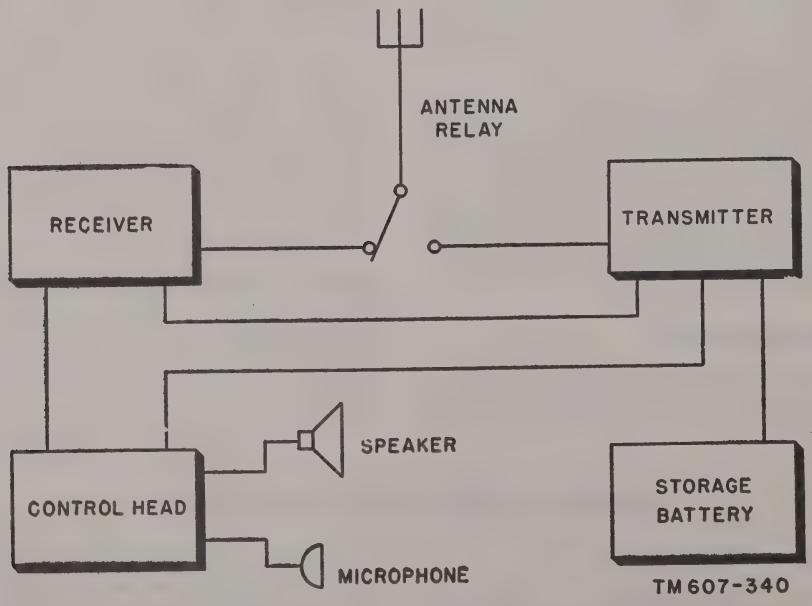


Figure 2. Radio Set AN/VRC–2(*), system block diagram.

WARNING

HIGH VOLTAGE

is used in the operation of
this equipment.

DEATH ON CONTACT

may result if operating personnel
fail to observe safety precautions.

ARTIFICIAL RESPIRATION

GENERAL PRINCIPLES

1. Seconds count! Begin at once! Don't take time to move the victim unless you must. Don't loosen clothes, apply stimulants or try to warm the victim. Start resuscitation! Get air in the lungs! You may save a life!

2. Place the victim's body in a prone position, so that any fluids will drain from the respiratory passages. The head should be extended and turned sideward *never flexed forward;* the chin shouldn't sag, since obstruction of the respiratory passages may occur.

3. Remove any froth or debris from the mouth with your fingers. Draw the victim's tongue forward.

4. Begin artificial respiration. Continue it rhythmically and without any interruption until natural breathing starts or the victim is pronounced dead. Try to keep the rhythm smooth. Split-second timing is not absolutely essential.

5. When the victim starts breathing, or when additional help is available loosen the clothing; remove it, if it's wet; keep the victim warm. Shock should receive adequate attention. Don't interrupt the rhythmical artificial technique for these measures. Do them only when you have help or when natural breathing has started.

6. When the victim is breathing, adjust your timing to assist him. Don't fight his efforts to breathe. Synchronize your efforts with his. After resuscitation, keep him lying down until seen by a physician or until recovery seems certain.

7. Don't wait for mechanical resuscitation! If an approved model is available, use it, but, since mechanical resuscitators are only slightly more effective than properly performed "push-pull" manual technique, *never* delay manual resuscitation for it.

BACK-PRESSURE ARM LIFT METHOD

1. *Position of Victim.* Place the victim in the prone (face-down) position. Bend his elbows; place one hand upon the other. Turn his face to one side, placing his cheek upon his hands.

2. *Position of Operator.* Kneel on your left or right knee, at the victim's head, facing him. Your knee should be at the side of the victim's head close to his forearm, your foot should be near his elbow. Kneel on both knees if you find it more comfortable, with one knee on each side of the head. Place your hands on the flat of the victim's back so that their heels are just below the lower tip of his shoulder blades. With the tip of your thumbs touching spread your fingers downward and outward. (See A)

3. *Compression Phase.* Rock forward until your arms are approximately vertical and allow the weight of the upper part of your body to exert a slow, steady, even, downward pressure upon your hands. This forces air out of the lungs. Keep your elbows straight and press almost directly downward on the back. (See B)

4. *Expansion Phase.* Release the pressure, avoid any finish thrust, and commence to rock backward slowly. Place your arms upon the victim's arms just above the elbows, and draw his arms upward and toward you. Apply just enough lift to feel resistance and tension at the victim's shoulders.

Don't bend your elbows. As you rock backward, the victim's arms will be drawn toward you. (The arm lift expands the chest by pulling on the chest muscles, arching the back and relieving the weight on the chest.) Drop the arms gently to the ground or floor. This completes the cycle. (See C and D). Now repeat the cycle.

5. *Cycle Timing and Rhythm.* Repeat the cycle 10 to 12 times per minute. Use a steady uniform rate of Press, Release, Lift, Release. Longer counts of about equal length should be given to the "Press" and "Lift" steps of the compression and expansion phases. Make the "Release" periods of minimum duration.

6. *Changing Position or Operator.*

(*a*) Remember that you can use either or both knees or can shift knees during the procedure, provided you don't break the rhythm. Observe how you rock forward with the back-pressure and backward with the arm-lift. The rocking motion helps to sustain the rhythm and adds to the ease of operation.

(*b*) If you tire and another person is available, you can "take turns." Be careful not to break the rhythm in changing. Move to one side and let your replacement come in from the other side. Your replacement begins the "Press-Release" after one of the "Lift-Release" phases, as you move away.

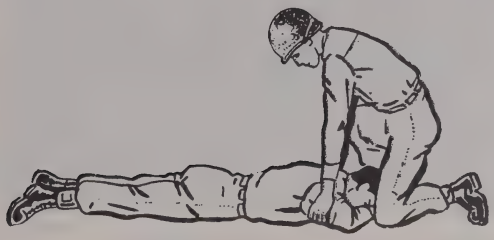
TM AR-3



A Position of operator and victim



B Compression phase



C Expansion phase (arm lift)



D Expansion phase (arm release)

TM AR-4

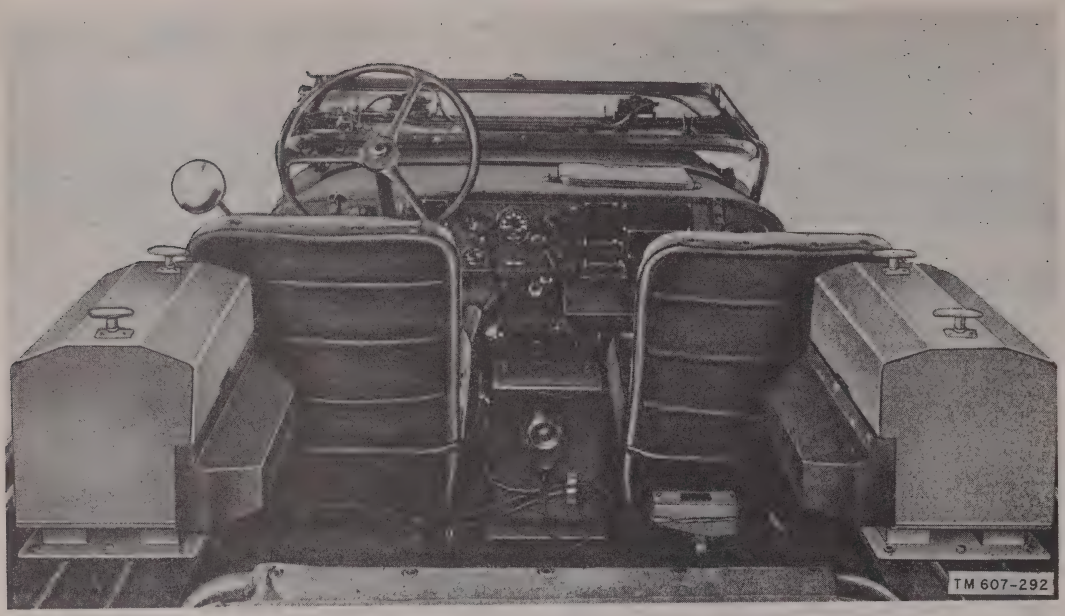


Figure 1. Radio Set AN/VRC–2X installed in truck, ¼ ton, 4x4, utility, M38 (24-volt).

DEPARTMENT OF THE ARMY TECHNICAL MANUAL
DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER

RADIO SETS AN/VRC-2, -2A, -2B, AND -2X

TM 11-607
TO 31R2-2VRC2-11
CHANGES No. 2

DEPARTMENTS OF THE ARMY AND
THE AIR FORCE
WASHINGTON 25, D. C., *11 May 1955*

TM 11-607/TO 16-30VRC2-5, 14 May 1953, is changed as follows:

The title of the manual is changed to read: RADIO SETS AN/VRC-2, **-2A, -2B, -2C, AND -2X.**

1. Scope

* * * * *

c. (Superseded) Official nomenclatures followed by (*) are used to indicate all models of the items of equipment covered by this manual. Thus, Radio Set AN/VRC-2(*) represents Radio Sets AN/VRC-2, -2A, -2B, -2C, and -2X; Radio Receiver R-237(*)/VR represents Radio Receivers R-237/VR, R-237A/VR, and R-237B/VR; Radio Transmitter T-193(*)/VRC-2 represents Radio Transmitters T-193/VRC-2, T-193A/VRC-2, T-193B/VRC-2, and T-193C/VRC-2; Radio Set Control C-493(*)/VRC-2 represents Radio Set Controls C-493/VRC-2, C-493A/VRC-2, and C-493B/VRC-2; Antenna AT-129(*)/VR represents Antennas AT-129/VR, AT-129A/VR, and AT-129B/VR.

d. (Added) When the text applies equally to all the receivers or to all the transmitters described in this manual, the terms **receiver** or **transmitter,** respectively, will be used.

3. Purpose and Use

a. Radio Set AN/VRC-2(*) * * * same frequency (fig. 3). **The radio set is preset for a single output frequency (crystal controlled) in the range between 30 and 40 megacycles (mc). Frequency modulation (fm) is used.** Reliable communications * * * in open terrain.

* * * * *

8 Description of Major Components

* * * * *

f. Antenna AT-129(*)/VR. (Superseded) Antenna AT-129(*)/VR (or its commercial equivalent) was procured on Order No. 16816-Phila-51 and all previous orders (figs. 5 through 8). The AT-129(*)/VR is a whip type antenna designed for vehicular mounting. It is adjusted to approximately ¼ wavelength at operating frequencies from 30 to 40 megacycles.

g. Antenna AT-532/VR. (Added) Antenna AT-532/VR was procured on Orders No. 3349-Phila-52 and 37214-Phila-53. The AT-532/VR will operate from 25 to 50 megacycles. Except for mounting holes, the AT-532/VR is similar to the AT-129(*)/VR.

9. Description of Minor Components

a. Cabling. (Superseded)

(1) *General.* Cabling supplied with initial procurements provide all necessary interconnections with the receiver, transmitter, and control head. In addition, there are provided a coaxial cable for connecting the antenna to the transmitter and another cable to connect the transmitter to the battery (figs. 5 through 8). Authorized data on replacement cables are contained in SIG 7 & 8 AN/VRC-2.

(2) *Unlettered and model A components* (figs. 6 and 7). The unlettered model

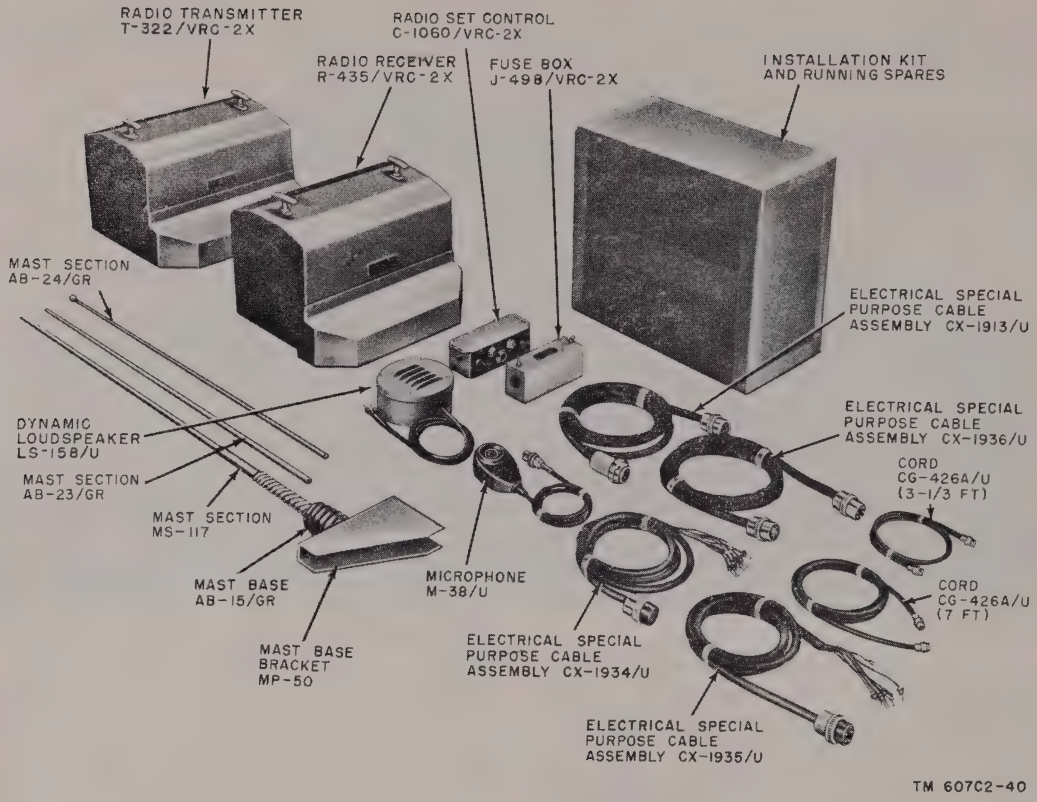


Figure 5. (Superseded) *Radio Set AN/VRC–2X components.*

components were procured on orders prior to 1947. The model A *components* were procured on Order No. 12732–Phila–47. On these models, the receiver control cable is now replaceable with Electrical Power Cable Assembly CX–1261/VRC–2 (17 feet long); the replacement for the transmitter control cable is Electrical Special Purpose Cable Assembly CX–1170/U (16 feet long).

(3) *Model B components* (fig. 8). The model B *components* were procured on Orders No. 20591–Phila–49 and 21576–Phila–50. On these models, the transmitter control cable is now replaceable with Electrical Special Purpose Cable Assembly CX–1935/U; the replacement for the receiver control cable is Electrical Special Purpose Cable Assembly CX–1934/U (16¾ feet long); the replacement for the power interconnector cable is Electrical Special Purpose Cable Assembly CX–1936/U.

(4) *Model X components.* The replacement cables for these models have nomenclature as shown in figure 5.

* * * * *

10. Running Spares

Note. (Added) Carefully check the packing list for correct listing of running spares.

a. Running spares for * * * of running spares.

* * * * *

1 resistor, thermal, **35-ohm nominal resistance, 450 ma, 7.16 watts at nominal operating current.**

1 resistor, thermal, **20-ohm nominal resistance, 580 ma, 6.38 watts at nominal operating current.**

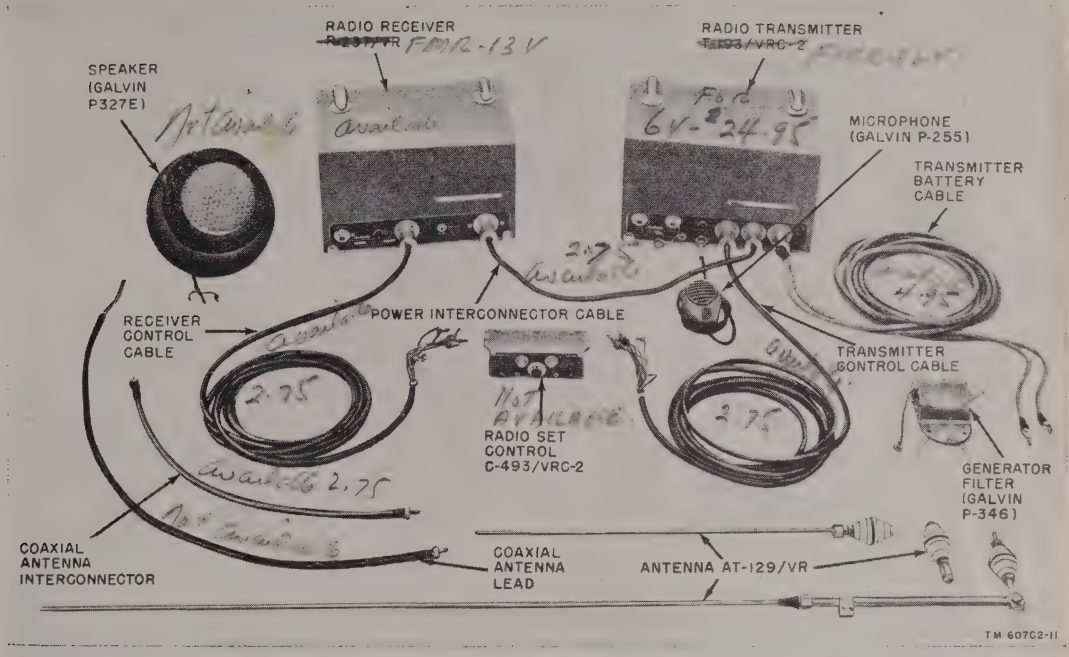


Figure 6. (Superseded) *Radio Set AN/VRC–2 (Galvin type FMTR–25–VM) components.*

1 resistor, thermal, **10-ohm nominal resistance, 860 ma, .688 watt at nominal operating current.**

* * * * *

4 lamp, incandescent, 28 volts, .17 ampere, **miniature bayonet base.**

5 fuse, cartridge, 5 amperes, **1½ inches long by ⅜-inch diameter.**

5 fuse, cartridge, 10 amperes, **32 volts, 1½ inches long by $^{13}/_{32}$-inch diameter.**

b. (Superseded) A complete list of running spares and accessories authorized for Radio Set AN/VRC–2 can be found in SIG 7 & 8 AN/VRC–2. In most cases, they are similar to the list for the AN/VRC–2X given in *a* above. For convenience, the following exceptions are noted:

(1) The three thermal resistors are not used with the AN/VRC–2.

(2) 1 Lamp LM–52 is used in place of the 28-volt incandescent lamps of the AN/VRC–2X (*a* above).

(3) The following fuses are authorized spares for Radio Set AN/VRC–2:

3 cartridge fuses, 50 amperes, 3 inches long by $^{13}/_{16}$ inch diameter (supplied on Order No. 20591–Phila–49)

5 cartridge fuses, 15 amperes, 1½ inches long by $^{13}/_{32}$ inch diameter (supplied on all orders prior to 1947 and Order No. 12732–Phila–47)

10 Fuses FU–11 (supplied on all orders prior to 1947 and Order No. 12732–Phila–47)

5 Fuses FU–41 (supplied on all orders prior to 1947 and Order No. 12732–Phila–47)

12. Differences in Models

* * * * *

b. Differences in Models of ***Radio Set*** *AN/VRC–2.*

* * * * *

(6) (Added) Procurements of Radio Set AN/VRC–2 on some orders prior to 1947 used speaker Galvin P327E (fig. 6). When a replacement is necessary, use Dynamic Loudspeaker LS–158/U.

(7) (Added) Procurements of Radio Set AN/VRC–2 on Order No. 12732–Phila–47 used speaker Quam-Nichols #55 PM (fig. 7). When a replacement

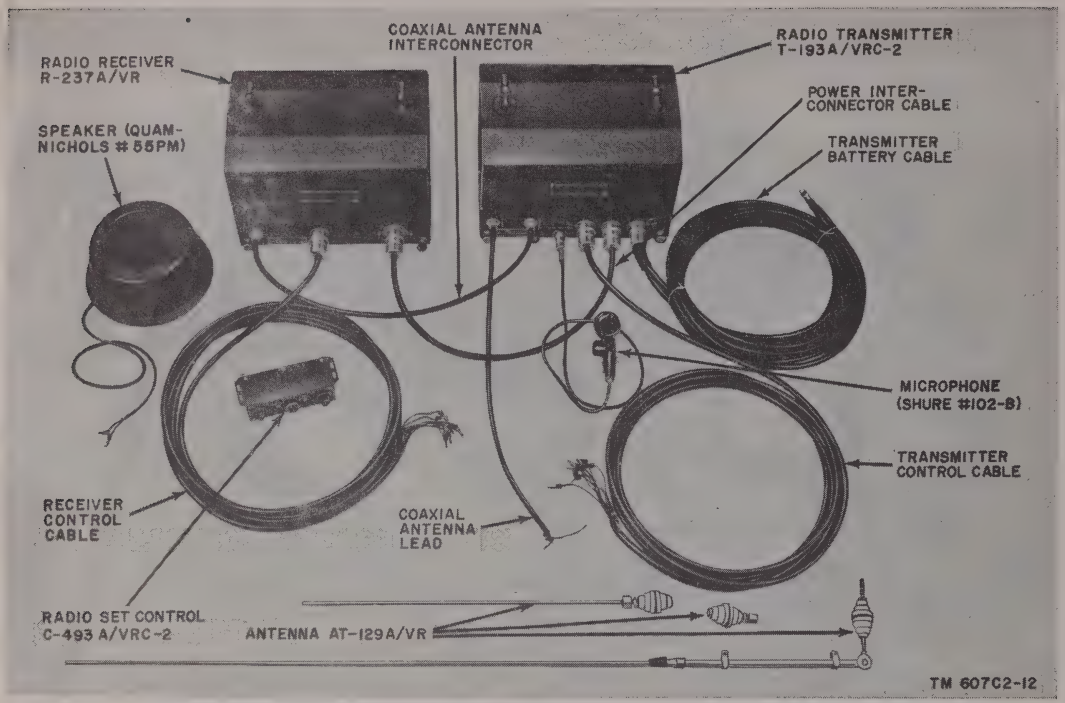


Figure 7. (Superseded) *Components of Radio Set AN/VRC–2 procured on Order No. 12732–Phila–47.*

is necessary, use Dynamic Loudspeaker LS–158/U.

(8) (Added) Procurements of Radio Set AN/VRC–2 on some orders prior to 1947 used microphone Galvin P–255; procurements of the AN/VRC–2 on Order No. 12732–Phila–47 used microphone Shure #102–B. When replacements are necessary, use Microphone M–27/U.

(9) (Added) Equipments procured on Orders No. 3349–Phila–52 and 37214–Phila–53 differ from previous orders in the following respects:

(*a*) Antenna AT–532/VR is used in place of Antenna AT–129(*)/VR on all previous orders.

(*b*) RF Cable Assembly CG–598/U connects the transmitter to the antenna.

(*c*) Radio Transmitter T–193C/VRC–2 differs in maintenance parts lists from the T–193B/VRC–2.

(*d*) Dynamotor DY–65A/VRC–2 is used in Radio Transmitter T–193C/VRC–2. Unlettered model of the dynamotor was used with the transmitters on Orders No. 20591–Phila–49 and 21576–Phila–50.

(*e*) Power Supply PP–491/VRC–2 is for Radio Receiver R–237(*)/VR. Orders previous to 3349–Phila–52 had no nomenclature assigned to these power supplies.

c. Modification Work Orders. (Added) Radio Sets AN/VRC–2 and AN/VRC–2X may not exactly match the equipments described in this manual because of improvement changes authorized by the following Department of the Army Modification Work Orders (MWO):

(1) MWO SIG 11–607–1, Modification of Radio Set AN/VRC–2 to Eliminate Instability of the First R-F Stage in Radio Receiver R–237B/VR.

(2) MWO SIG 11–607–2, Modification of Radio Set AN/VRC–2 to Eliminate Excessive Transmitter Loading.

(3) MWO SIG 11–607–3, Modification of Radio Set AN/VRC–2 to Permit In-

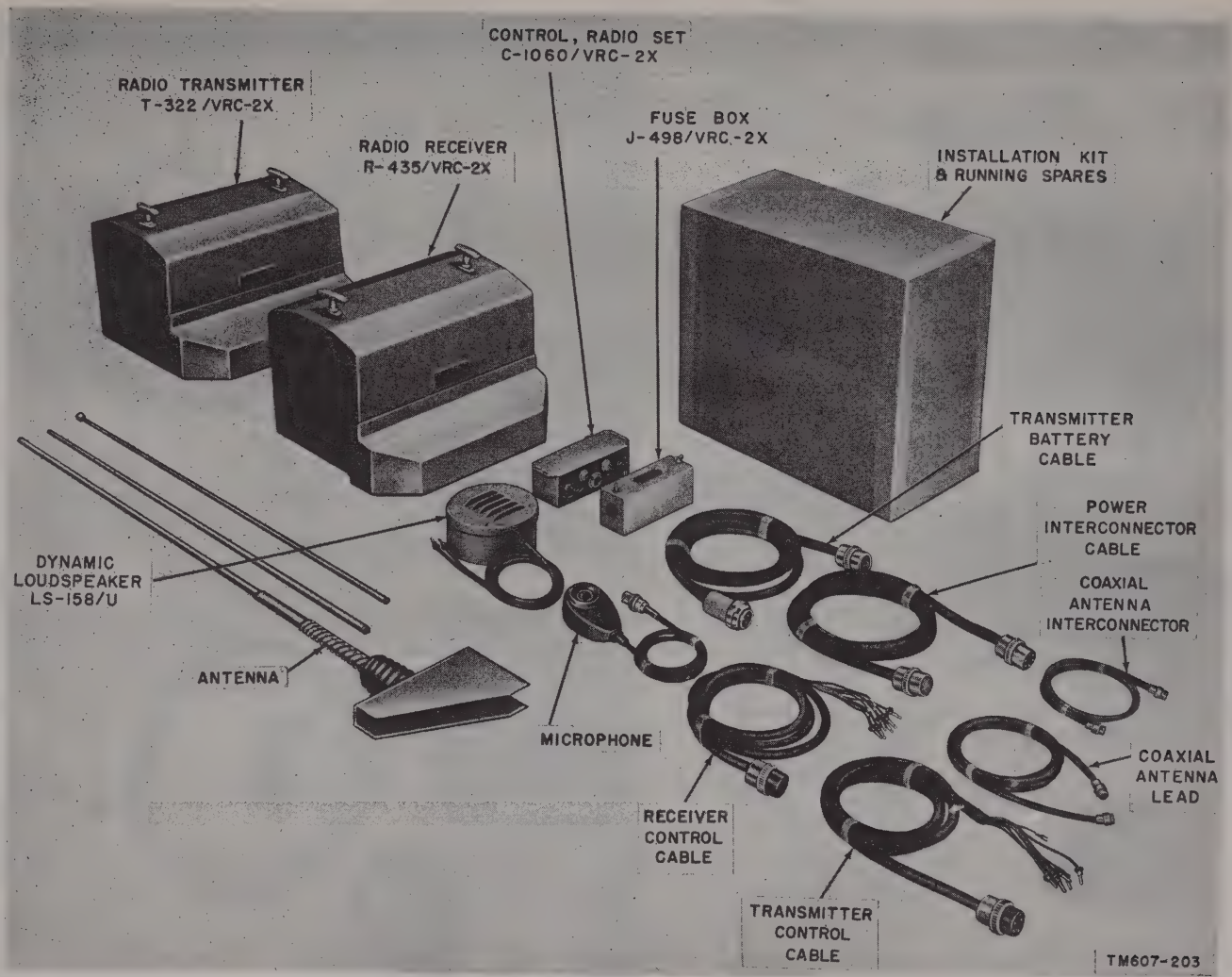


Figure 5. Radio Set AN/VRC–2X, components.

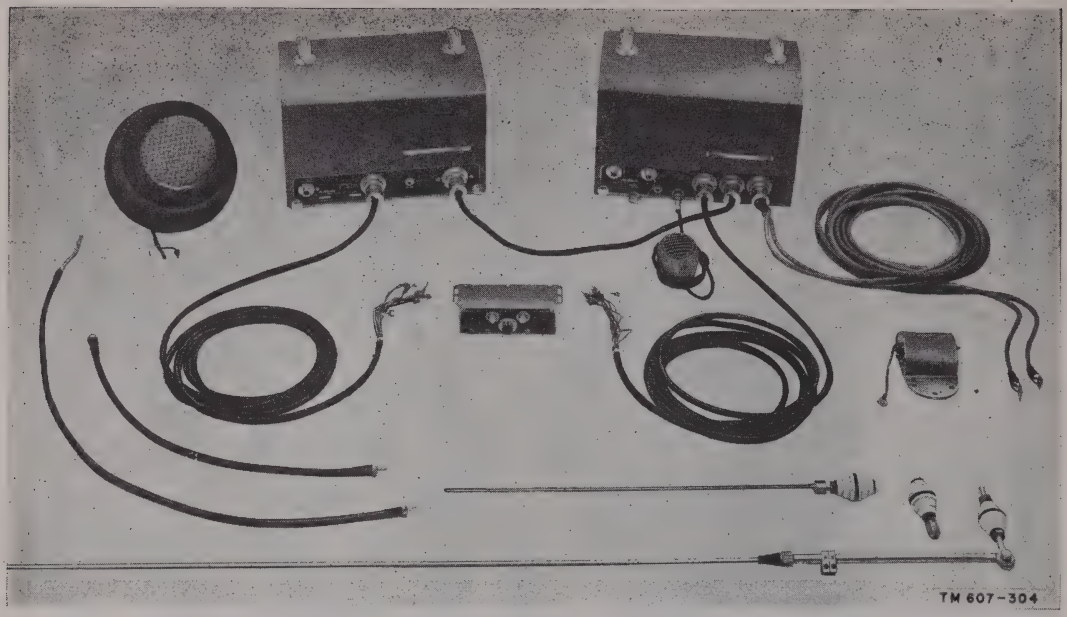


Figure 6. Radio Set AN/VRC–2 (Galvin type FMTR–25–VM), components.

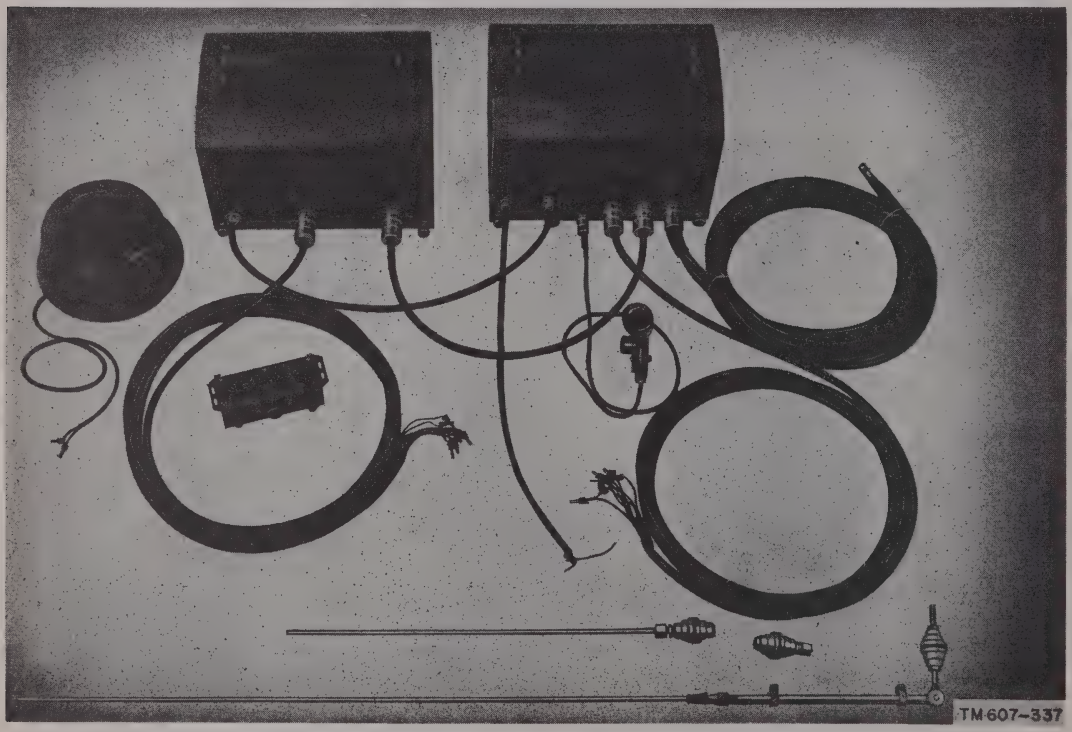


Figure 7. Radio Set AN/VRC–2 (Order No. 12732–Phila–47).

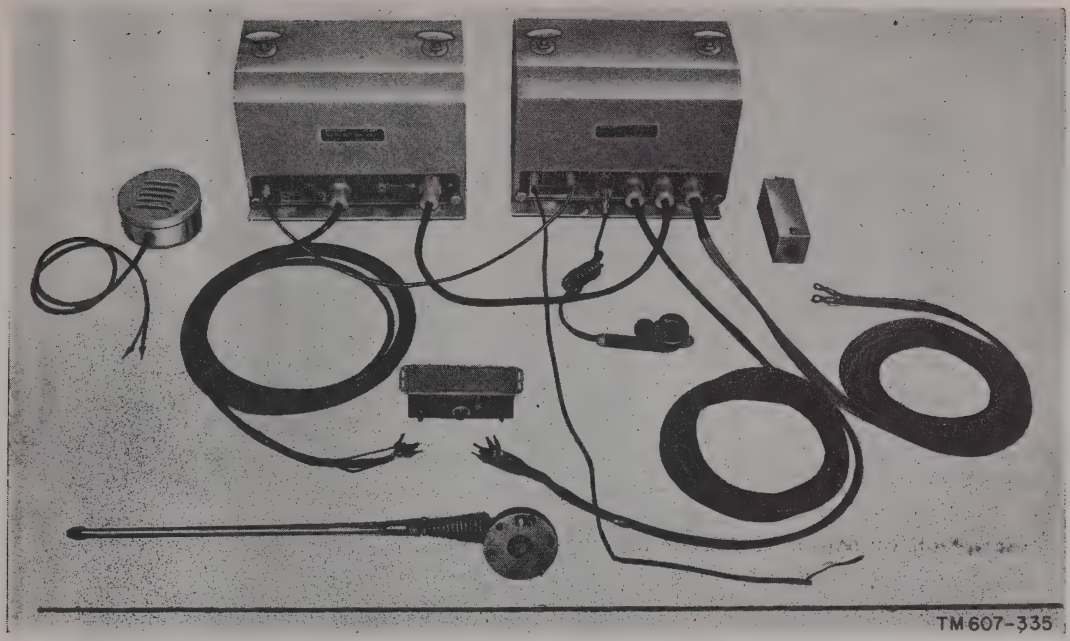


Figure 8. Radio Set AN/VRC–2 (Order No. 20591-Phila–49).

7. Tables of Components

(figs. 5, 6, 7, and 8)

a. Components of Radio Set AN/VRC–2X.

Component	Required No.	Length (in.)	Width (in.)	Height (in.)	Volume (cu ft)	Weight (lb)
Packing box	1				12.3	205
Radio Transmitter T–322/VRC–2X	1	15	10	11½	1	41
Radio Set Control C–1060/VRC–2X	1	7¼	3¼	2¼	1/32	1½
Microphone M–38/U	1	3¾	3½	5	1/25	1.25
Cable group	1	11	11	5	1/3	13.
Transmitter plate coils (set of 3)	1	2¼	1½	4	1/100	1.
Installation components (box)	1	4	3	4½	1/25	1.75
Radio Receiver R–435/VRC–2X	1	15	10	11½	1	35.
Dynamic Loudspeaker LS–158/U	1	dia 9½	4¼		1/6	5.0
Fuse Box J–498/VRC–2X	1	6½	2⅜	2½	1/50	.5
Switch Guard MX–1368/VRC–2X	2	14⅞	3¾	4¼	1/7	.5
Spare parts group	1	8	5	6	1/7	10.
Technical manual	2	8	10½	½	.03	.5
Antenna	1	78	1½	1½		3¼

Note. This list is for general information only. See appropriate supply publications for information pertaining to requisition of spare parts.

b. Components of Radio Set AN/VRC–2. The weight, dimensions, and required number of each component of Radio Set AN/VRC–2 are identical with similar items in Radio Set AN/VRC–2X. These are listed below.

Radio Receiver R–237(*)/VR
Radio Transmitter T–193(*)/VRC–2
Radio Set Control C–493(*)/VRC–2
Microphone
Cable group
Transmitter plate coils (set of 3)
Installation components (box)
Dynamic Loudspeaker LS–158/U
Fuse box
Switch guards
Spare parts group
Instruction book
Antenna AT–129(*)/VR

8. Description of Major Components

a. Radio Receiver R–435/VRC–2X (fig. 9). Radio Receiver R–435/VRC–2X is a 13-tube f-m receiver mounted on the same chassis with its vibrator power supply. All jacks and receptacles are mounted on the front panel. There are no tuning controls on the receiver chassis, since operation of the receiver is accomplished through the control head which is part of the equipment.

b. Radio Transmitter T–322/VRC–2X (fig. 12). Radio Transmitter T–322/VRC–2X is a seven-tube f-m transmitter and dynamotor power supply mounted on a single chassis. (Radio Transmitters T–193/VRC–2 and T–193A/VRC–2 have a vibrator power supply.) All connectors and jacks are mounted on the front panel of the transmitter. Operation of the transmitter is accomplished through the same control head used in the operation of Radio Receiver R–435/VRC–2X.

c. Radio Set Control C–1060/VRC–2X (fig. 15). Radio Set Control C–1060/VRC–2X is a control head which contains all controls necessary for the normal operation of the receiver

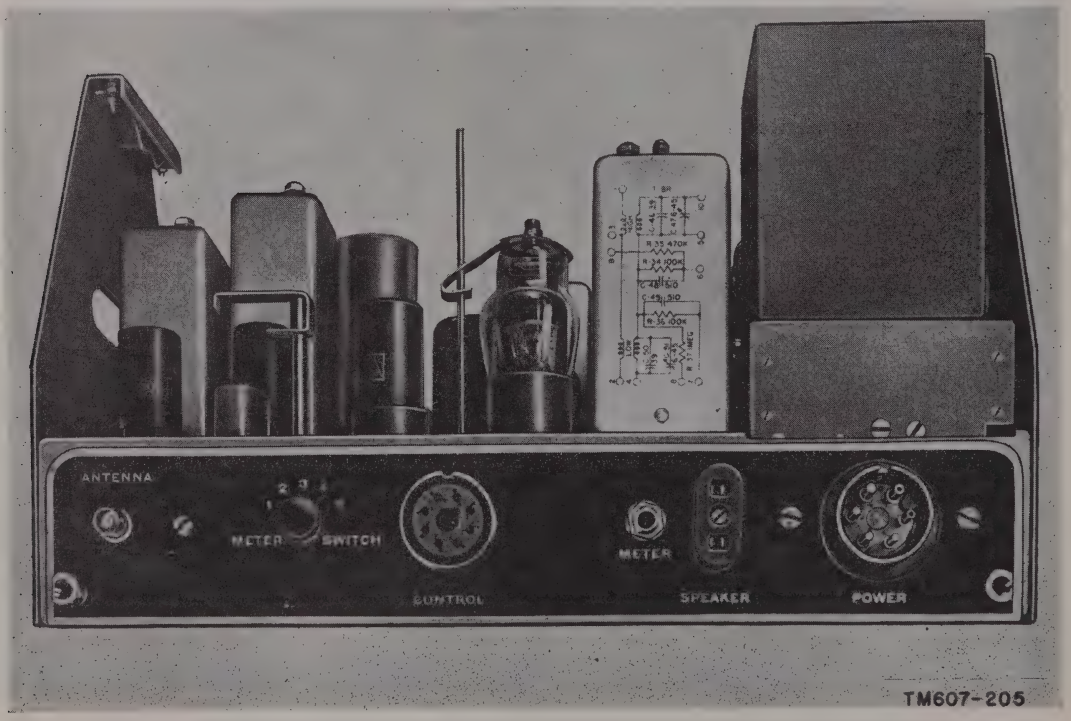


Figure 9. Radio Receiver R–435/VRC–2X, with cover and switch guard removed.

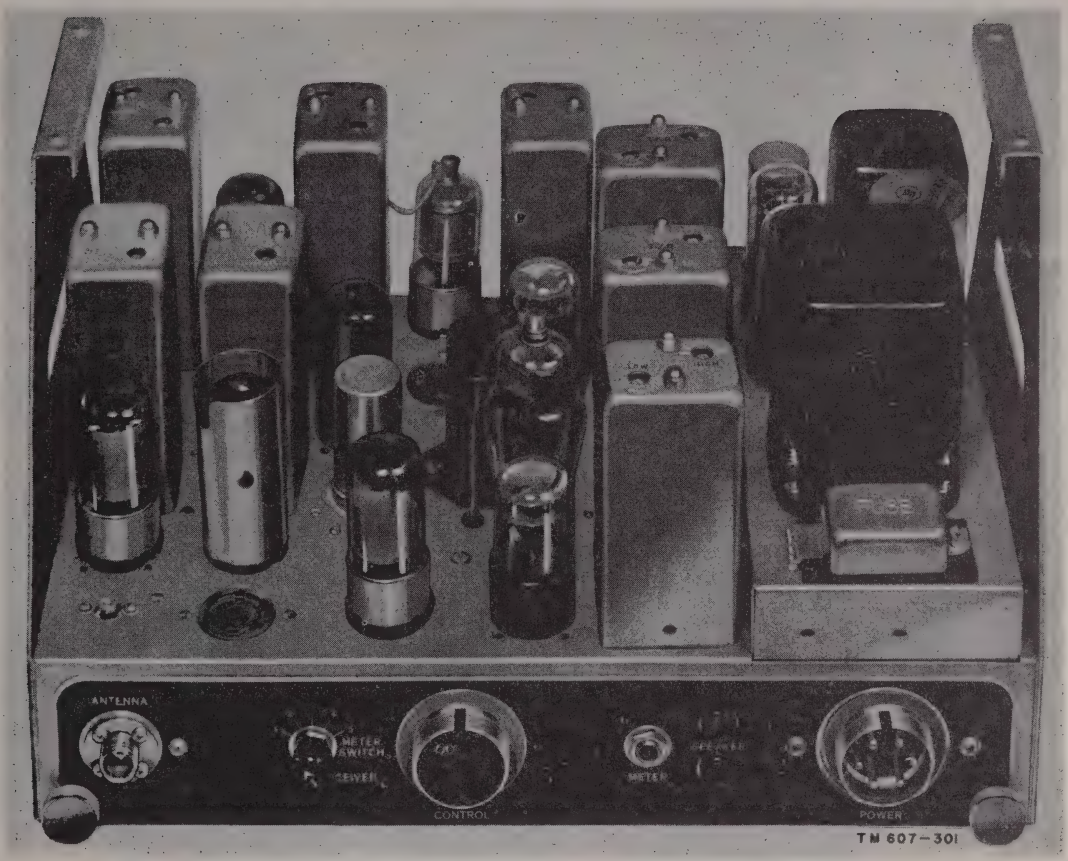


Figure 10. Radio Receiver R–237/VR (Galvin type PA–8033), with cover removed.

and transmitter. The control head also contains pilot lights which indicate the application of power to the receiver or transmitter.

d. Microphone (fig. 16). The microphone is a carbon type with a push-to-talk button. It may be connected to the front panel of the transmitter or to the control head.

e. Speaker LS–158/U (fig. 17). Speaker LS–158/U is a 5-inch (permanent-magnet) speaker with a 3-ohm voice coil. It is plugged into the receiver or into the control head.

f. Antenna (figs. 18 and 19). An adjustable whip type antenna designed for vehicular mounting is used. It is adjusted to approximately ¼ wavelength at the operating frequency of the equipment.

9. Description of Minor Components

a. Cable Group (fig. 5). Cables necessary for interconnecting the receiver, transmitter, and control head as supplied. In addition, a coaxial cable for connecting the antenna to the transmitter and a cable for connection to the battery are provided.

b. Fuse Box (fig. 22). A fuse box is provided for mounting the fuse in the cable connecting the battery to the equipment. The fuse box is mounted on the vehicle wall.

c. Installation Components (fig. 23). Mounting plates and hardware are provided to effect proper installation of the equipment, thereby preventing needless breakdown. General installation instructions are given in paragraph 15.

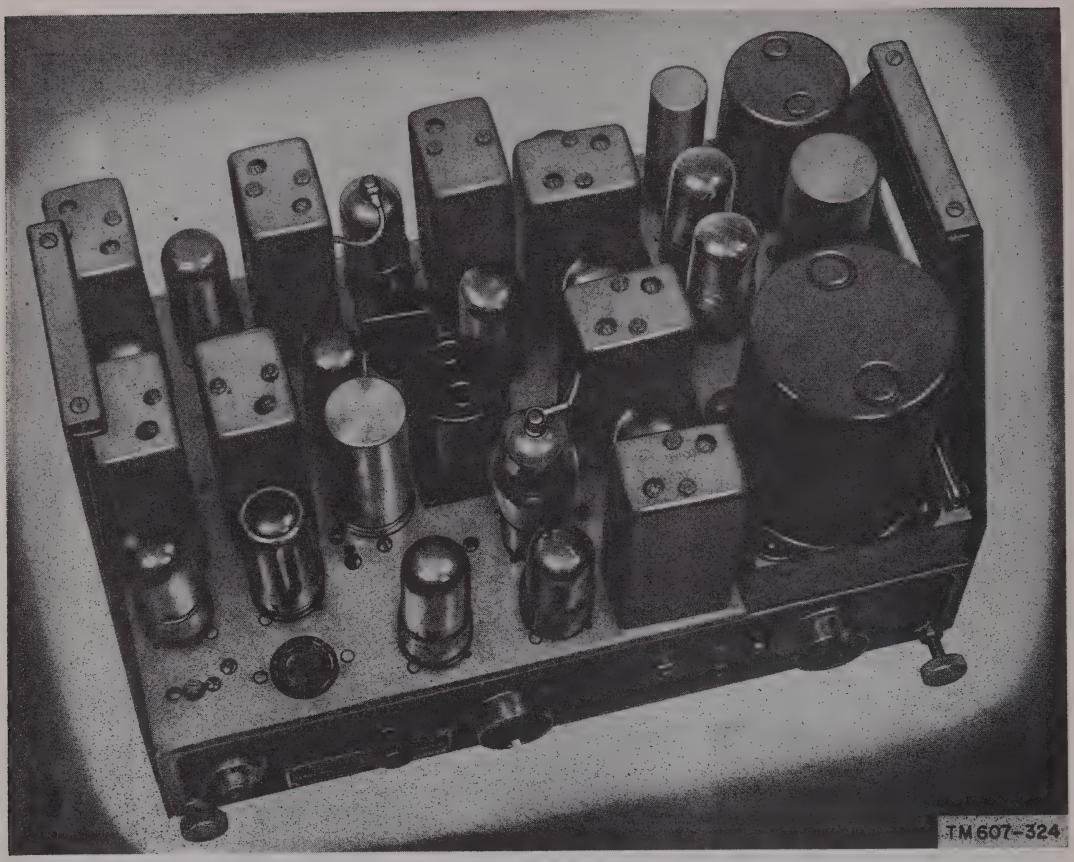


Figure 11. Radio Receiver R–237A/VR, with cover removed.

d. Crystals (fig. 21). One crystal is mounted on the transmitter chassis and two are mounted on the receiver chassis. Crystals are pictured in figure 21. Only the receiver i-f (intermediate-frequency) crystal is supplied with the equipment.

10. Running Spares

a. Running spares for Radio Set AN/VRC–2X are packed in a carton included in Box No. 1. Following is a list of running spares:

1	electron tube, type 6C8G
1	electron tube, type 6H6GT
1	electron tube, type 6K60T
1	electron tube, type 6K8CT
3	electron tube, type 68G7GT
1	electron tube, type 6X5GT
1	electron tube, type 807
1	electron tube, type 6C8G
1	electron tube, type 7C7
1	electron tube, type 7A8
1	electron tube, type 6V6GT
1	resistor, thermal, amperite #4H12
1	resistor, thermal, amperite #6–13
1	resistor, thermal, amperite #9–8
2	vibrator, nonsynchronous
4	lamp, incandescent, 28 volts, .17 ampere
5	fuse, cartridge, 5 amperes
5	fuse, cartridge, 10 amperes

b. Running spares for Radio Set AN/VRC–2 are the same as those for Radio Set AN/VRC–2X, with the following exceptions.

(1) The three thermal resistors are not used with Radio Set AN/VRC–2.
(2) Lamps supplied are rated at 6 volts.
(3) 20-ampere cartridge fuses are supplied with Radio Set AN/VRC–2.

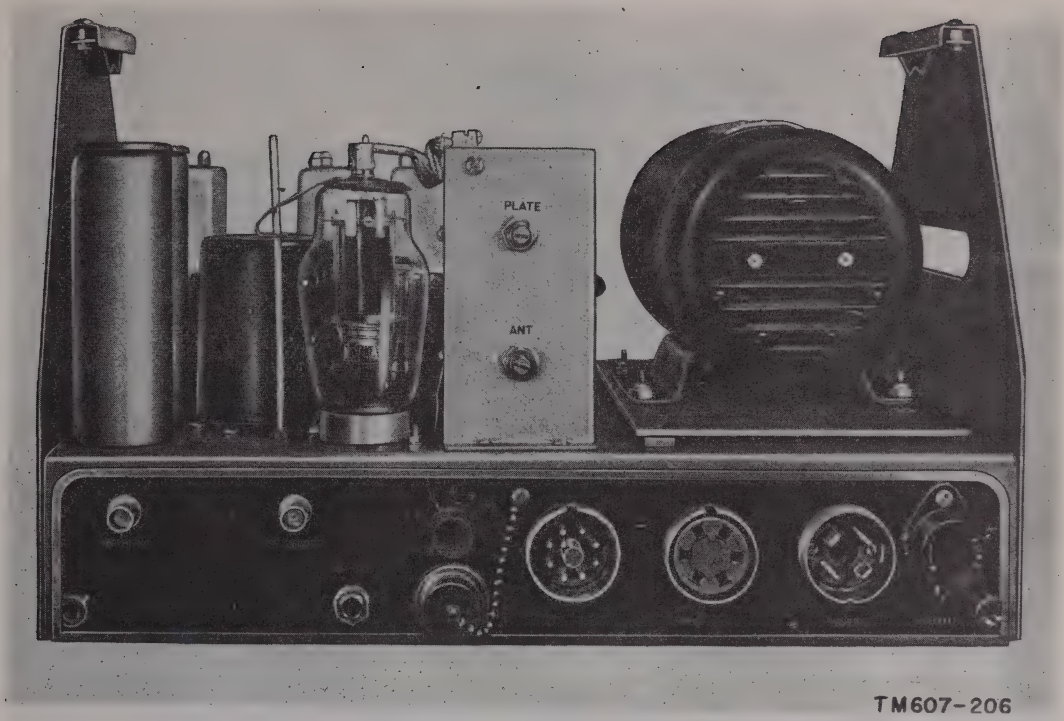


Figure 12. Radio Transmitter T–322/VRC–2X, with cover and switch guard removed.

11. Additional Equipment Required

All equipment necessary for the normal installation and operation of Radio Set AN/VRC–2X is supplied. However, it may be necessary to secure additional mounting hardware and materials for special types of installations.

12. Differences in Models

a. Differences Between Radio Sets AN/VRC –2 and AN/VRC–2X. Radio Set AN/VRC–2X is essentially a 24-volt version of Radio Set AN/VRC–2 (which operates from a 6-volt primary power source). The principal difference is in the arrangement of the filament circuits. A dynamotor is used for transmitter plate power in Radio Set AN/VRC–2X, and two vibrator power supplies are used in all models of the transmitters used with Radio Set AN/VRC–2 except Radio Transmitter T–193B/VRC–2, which also uses a dynamotor. Other differences are as follows:

(1) The receiver and transmitter filaments of Radio Set AN/VRC–2X are connected in series-parallel (figs. 72 and 73) across a 24-volt power source, and the receiver and transmitter filaments of Radio Set AN/VRC–2 are connected in parallel across a 6-volt power source.

(2) There are minor differences in the values of some of the circuit elements (resistors, capacitors, etc.).

(3) Power Supply PP–721/VRC–2X (fig. 56), designed to operate on 24 volts, is used in Radio Receiver R–435/VRC –2X. It is similar in design and appearance to the 6-volt vibrator power supply (fig. 57) which is a part of Radio Receiver R–237(*)/VR.

(4) Radio Set AN/VRC–2X is supplied with Microphone M–38/U, and Radio Set AN/VRC–2 is supplied with Microphone M–27/U (these are carbon

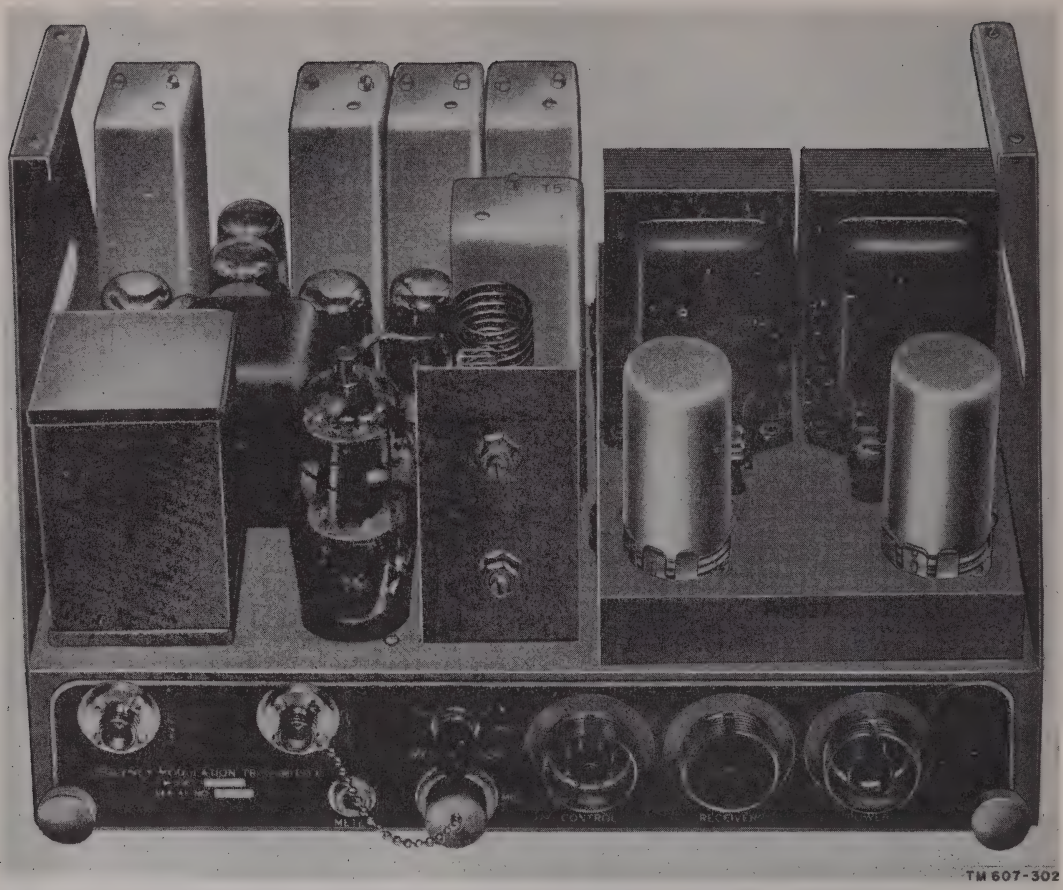


Figure 13. Radio Transmitter T–193/VRC–2 (Galvin type PA–8026) with cover removed.

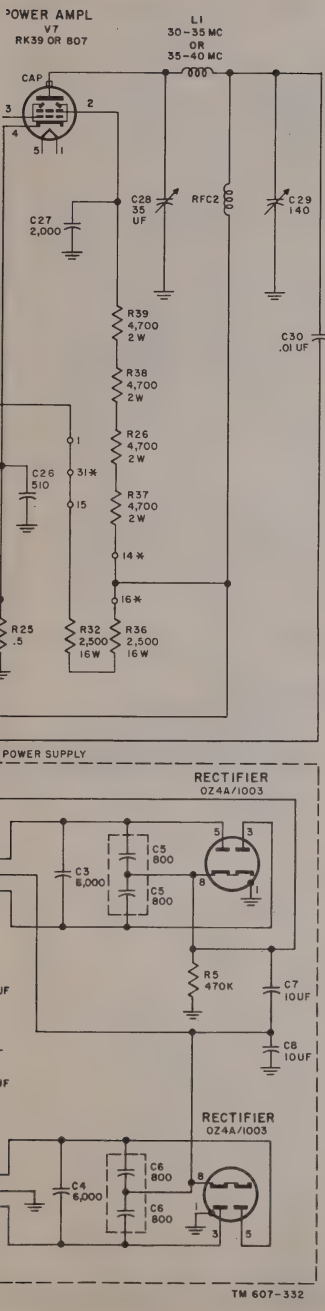
types). Other similar types of carbon microphones have been issued with the various procurements of Radio Set AN/VRC–2. All are functionally the same and are interchangeable in operation.

(5) Radio Set AN/VRC–2X is supplied with Radio Set Control C–1060/VRC–2X, which employs 24-volt indicating lamps with a 68-ohm voltage-dropping resistor. Radio Set Control C–493(*)/VRC–2 contains 6-volt indicating lamps with a 22-ohm dropping resistor.

(6) Radio Sets AN/VRC–2X and late models of Radio Set AN/VRC–2 are supplied with Dynamic Loudspeaker LS–158/U (fig. 17). Early procurements of Radio Set AN/VRC–2 were supplied with different (commercial type) loudspeakers of similar size and design.

(7) A generator filter (ng. 24) is supplied only with early procurements of Radio Set AN/VRC–2.

(8) Fuse boxes and switch guards are not supplied with Radio Sets AN/VRC–2 bearing Order No. 12732–Phila–47 or earlier procurements.


POWER AMPL
V7
RK39 OR 807
L1
30-35 MC
OR
35-40 MC
CAP
C28
35
UF
RFC2
C29
140
C27
2,000
R39
4,700
2W
C30
.01 UF
R38
4,700
2W
R26
4,700
2W
C26
510
R37
4,700
2W
R25
.5
R32
2,500
16W
R36
2,500
16W
POWER SUPPLY
RECTIFIER
0Z4A/1003
C5
800
C3
6,000
R5
470K
C7
10UF
C8
10UF
RECTIFIER
0Z4A/1003
C6
800
C4
6,000
TM 607-332

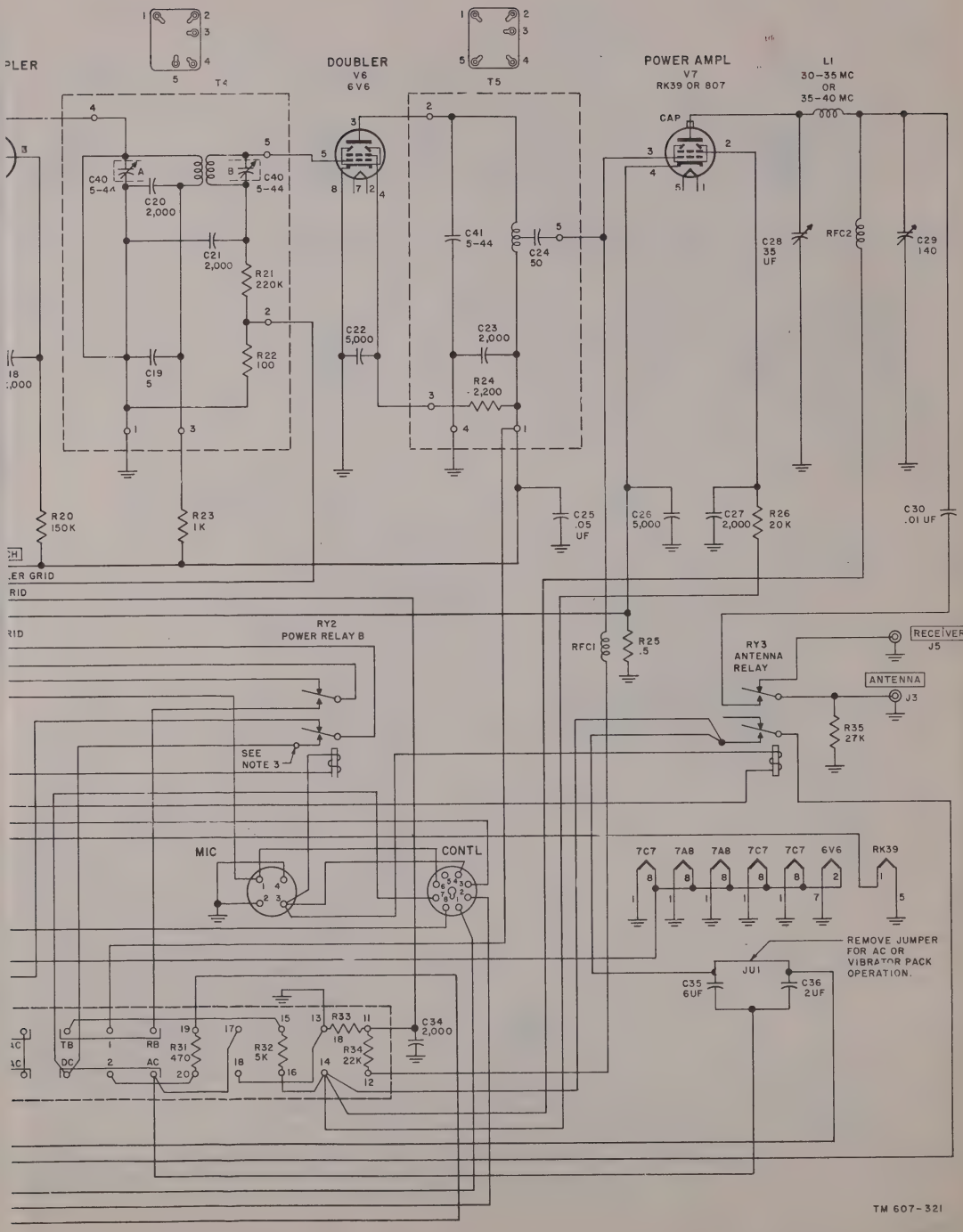

DOUBLER
V6
6V6
POWER AMPL
V7
RK39 OR 807
CAP
L1
30-35 MC
OR
35-40 MC
T4
T5
C40
5-44
C20
2,000
C21
2,000
R21
220K
R22
100
C19
5
C22
5,000
C41
5-44
C24
50
C23
2,000
R24
2,200
C28
35
UF
RFC2
C29
140
C30
.01 UF
R20
150K
R23
1K
C25
.05
UF
C26
5,000
C27
2,000
R26
20K
RFC1
R25
.5
RY2
POWER RELAY B
RY3
ANTENNA
RELAY
RECEIVER
J5
ANTENNA
J3
R35
27K
SEE
NOTE 3
MIC
CONTL
7C7
7A8
7A8
7C7
7C7
6V6
RK39
REMOVE JUMPER
FOR AC OR
VIBRATOR PACK
OPERATION.
JU1
C35
6UF
C36
2UF
TB
RB
DC
AC
R31
470
R32
5K
R33
18
R34
22K
C34
2,000
TM 607-321



Figure 14. Radio Transmitter T–193A/VRC–2, with cover removed.

b. Differences in Models of AN/VRC–2. The following differences exist among the various procurements of Radio Set AN/VRC–2.

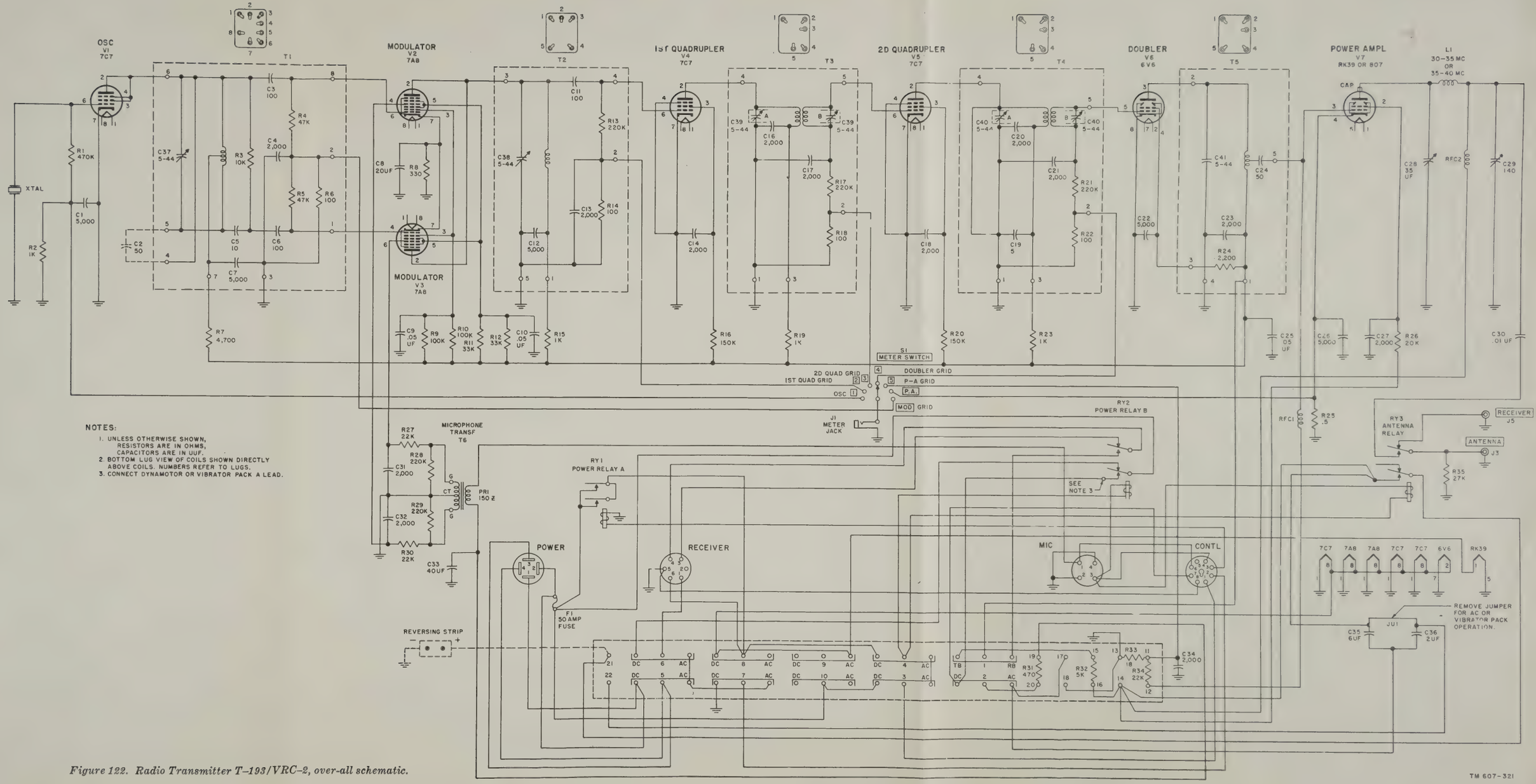
(1) Component values and design of later models have been altered to improve performance.

(2) Radio Transmitters T–193/VRC–2 and T–193A/VRC–2 have vibrator power supplies and the later models (Radio Transmitter T–193B/VRC–2) have dynamotor power supplies.

(3) Models of Radio Set AN/VRC–2 bearing order No. 12732–Phila–47 and later procurements are supplied without a generator filter.

(4) Radio Set AN/VRC–2 procured on Order No. 20591–Phila–49 and subsequent orders is supplied with special mounting plates for shock insulation. A fuse box for the battery lead is also provided.

(5) Procurements of Radio Set AN/VRC –2(*) on orders dated after 1949 include switch guards (fig. 1).



NOTES:

1. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
2. BOTTOM LUG VIEW OF COILS SHOWN DIRECTLY ABOVE COILS. NUMBERS REFER TO LUGS.
3. CONNECT DYNAMOTOR OR VIBRATOR PACK A LEAD.

Figure 122. Radio Transmitter T–193/VRC–2, over-all schematic.

TM 607-321

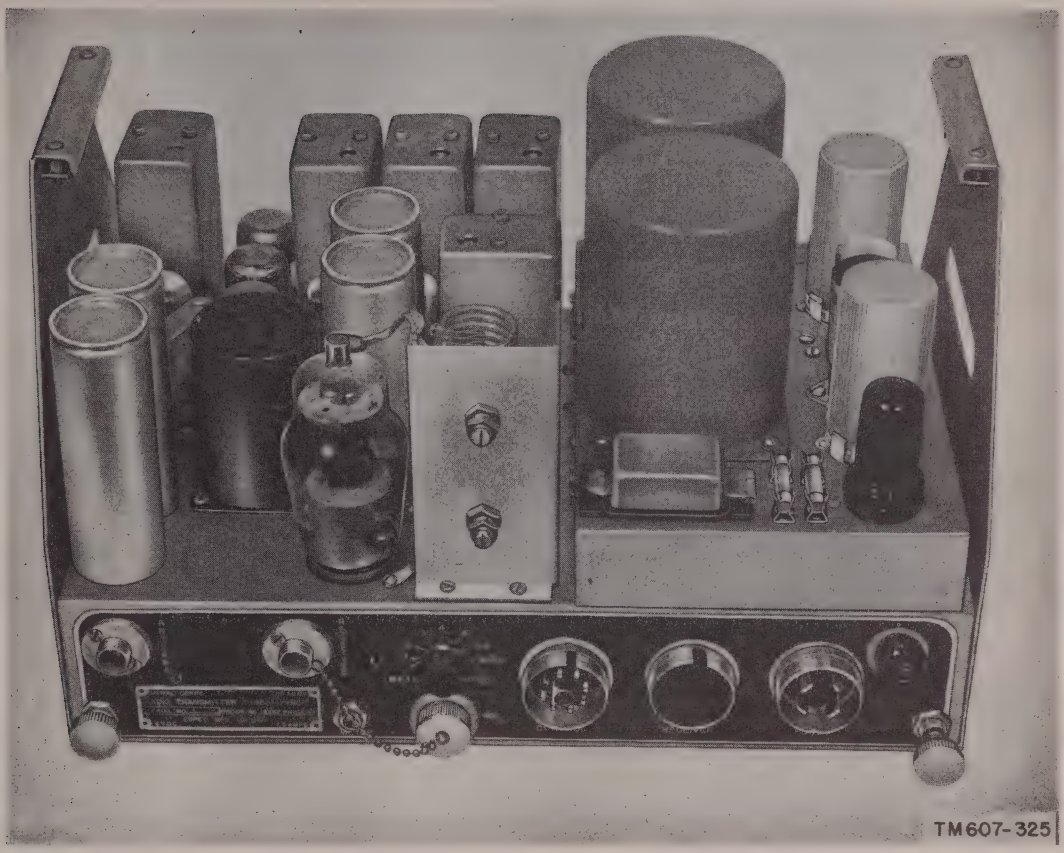


Figure 14. Radio Transmitter T–193A/VRC–2, with cover removed.

b. Differences in Models of AN/VRC–2. The following differences exist among the various procurements of Radio Set AN/VRC–2.

(1) Component values and design of later models have been altered to improve performance.

(2) Radio Transmitters T–193/VRC–2 and T–193A/VRC–2 have vibrator power supplies and the later models (Radio Transmitter T–193B/VRC–2) have dynamotor power supplies.

(3) Models of Radio Set AN/VRC–2 bearing order No. 12732–Phila–47 and later procurements are supplied without a generator filter.

(4) Radio Set AN/VRC–2 procured on Order No. 20591–Phila–49 and subsequent orders is supplied with special mounting plates for shock insulation. A fuse box for the battery lead is also provided.

(5) Procurements of Radio Set AN/VRC –2(*) on orders dated after 1949 include switch guards (fig. 1).

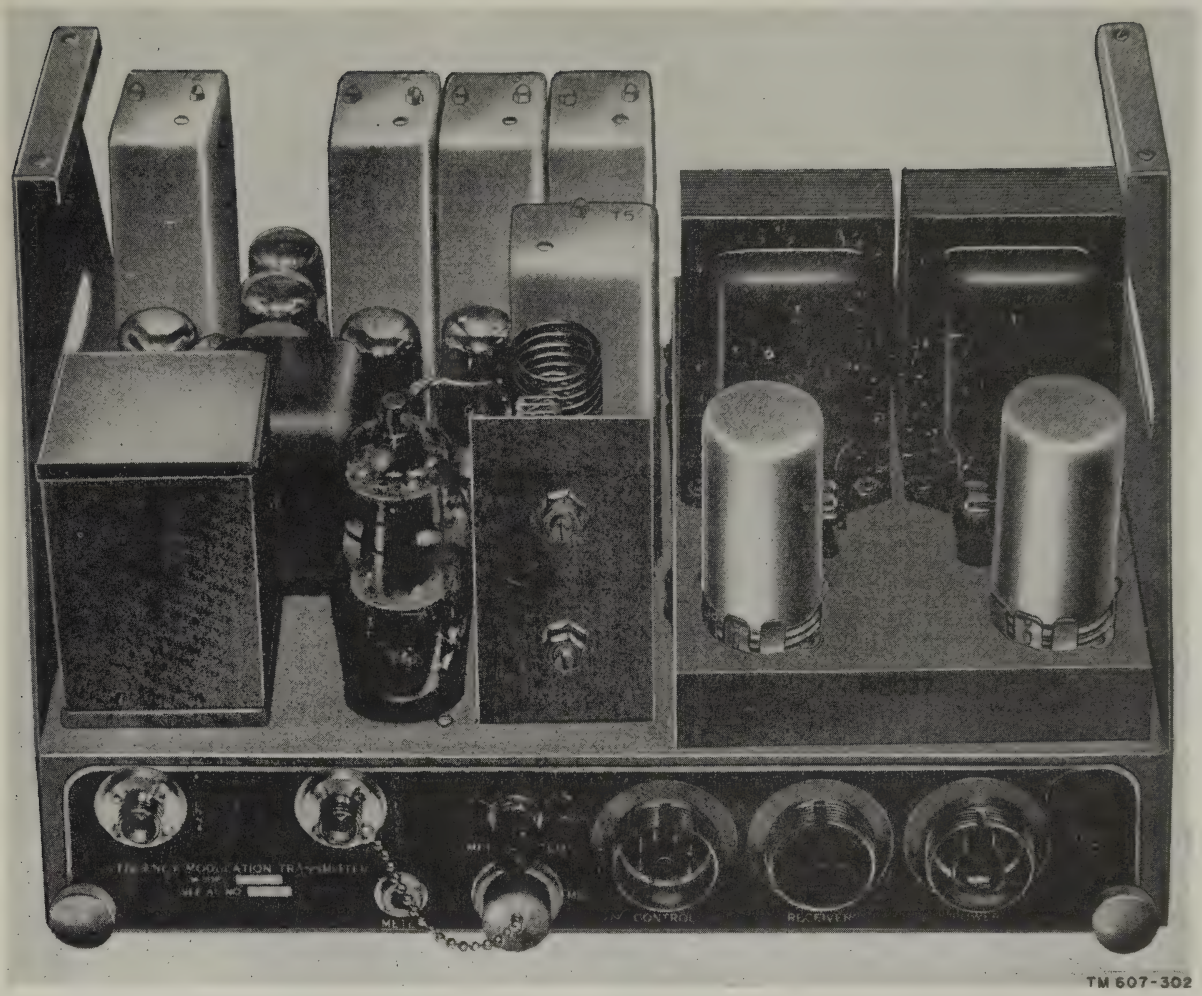


Figure 13. Radio Transmitter T–193/VRC–2 (Galvin type PA–8026) with cover removed.

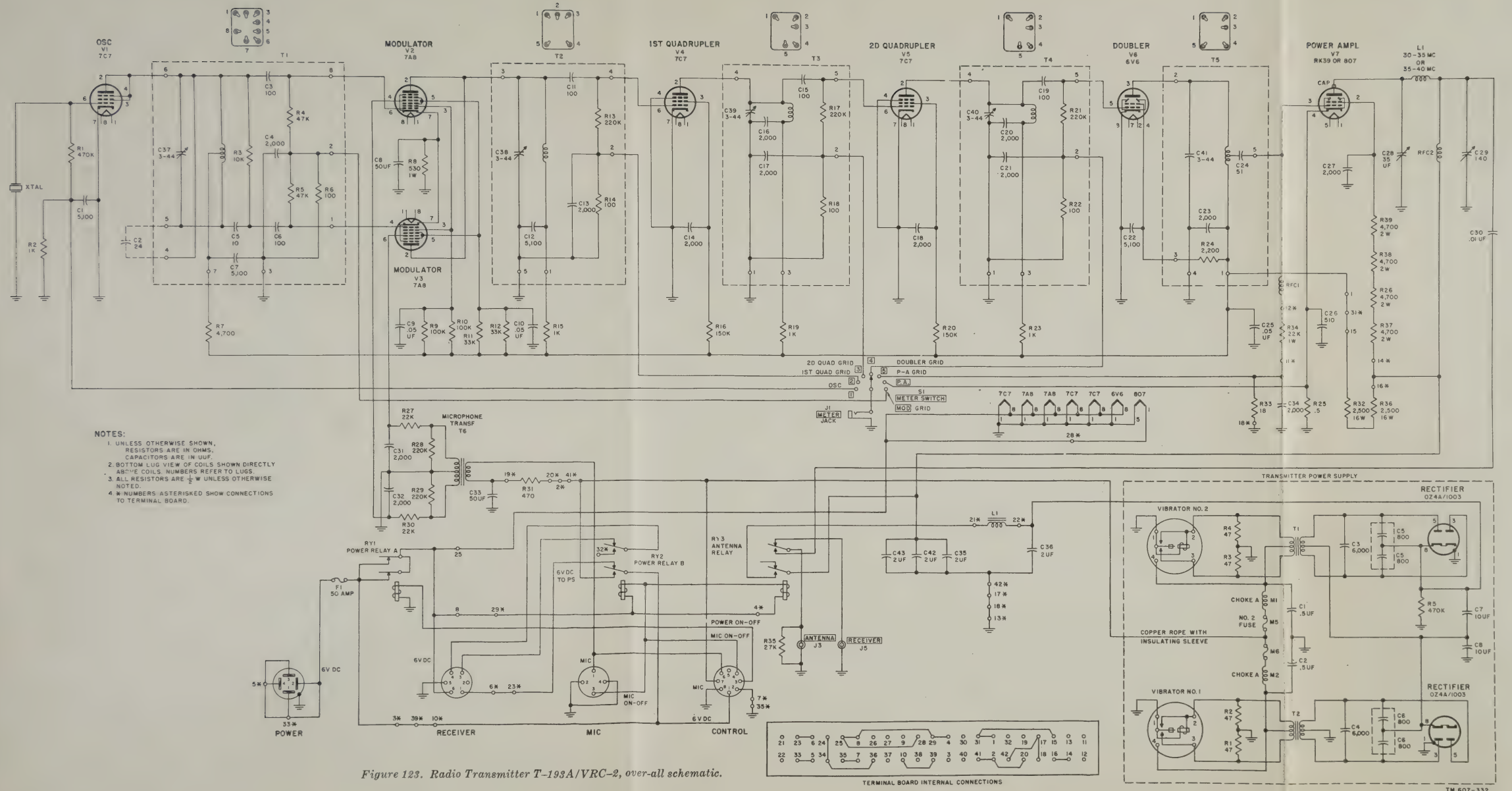
types). Other similar types of carbon microphones have been issued with the various procurements of Radio Set AN/VRC–2. All are functionally the same and are interchangeable in operation.

(5) Radio Set AN/VRC–2X is supplied with Radio Set Control C–1060/VRC–2X, which employs 24-volt indicating lamps with a 68-ohm voltage-dropping resistor. Radio Set Control C–493(*)/VRC–2 contains 6-volt indicating lamps with a 22-ohm dropping resistor.

(6) Radio Sets AN/VRC–2X and late models of Radio Set AN/VRC–2 are supplied with Dynamic Loudspeaker LS–158/U (fig. 17). Early procurements of Radio Set AN/VRC–2 were supplied with different (commercial type) loudspeakers of similar size and design.

(7) A generator filter (ng. 24) is supplied only with early procurements of Radio Set AN/VRC–2.

(8) Fuse boxes and switch guards are not supplied with Radio Sets AN/VRC–2 bearing Order No. 12732–Phila–47 or earlier procurements.



NOTES:
1. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
2. BOTTOM LUG VIEW OF COILS SHOWN DIRECTLY ABOVE COILS. NUMBERS REFER TO LUGS.
3. ALL RESISTORS ARE ½ W UNLESS OTHERWISE NOTED.
4. * NUMBERS ASTERISKED SHOW CONNECTIONS TO TERMINAL BOARD.

Figure 123. Radio Transmitter T-193A/VRC-2, over-all schematic.

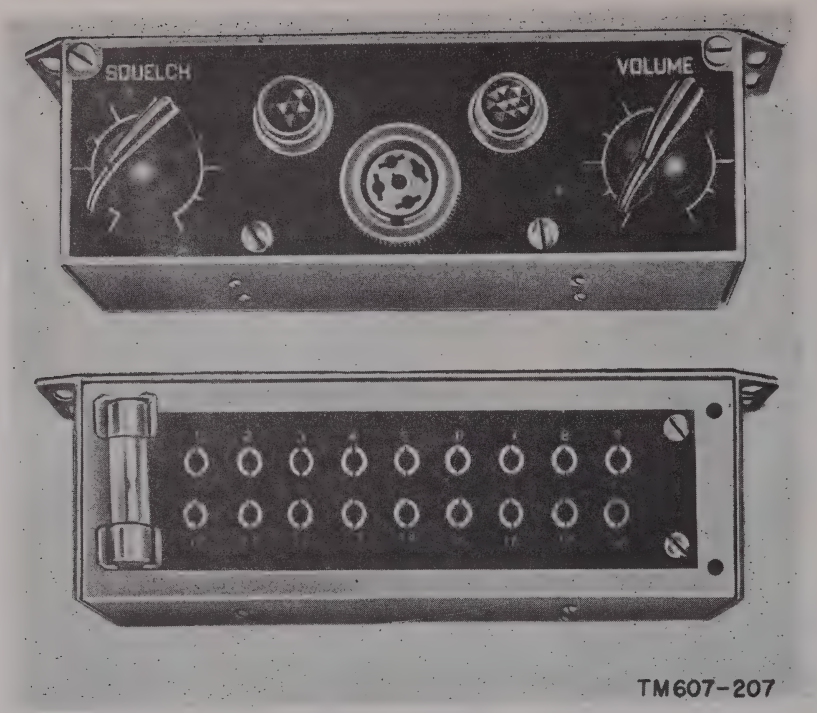


Figure 15. Radio Set AN/VRC-2(*), control head, front and rear views.

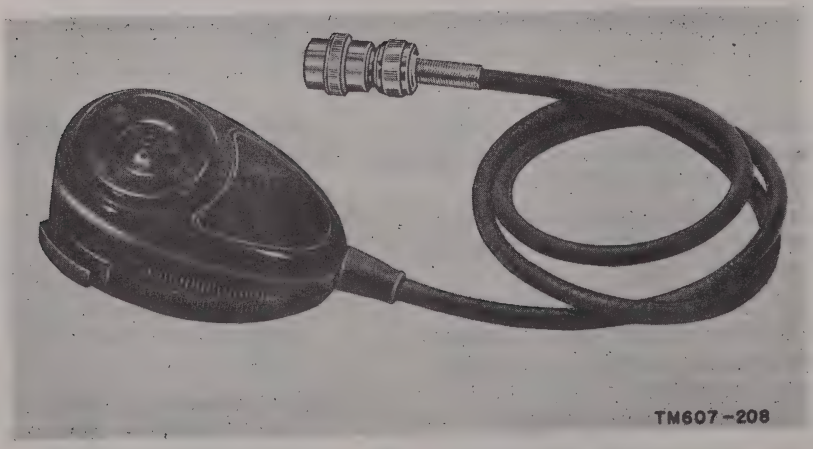


Figure 16. Microphone M-38/U.

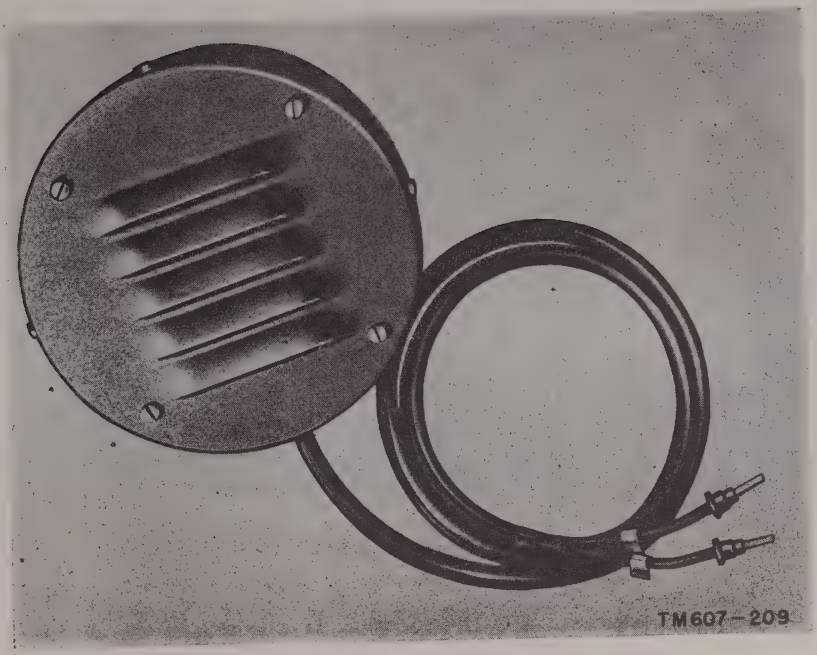
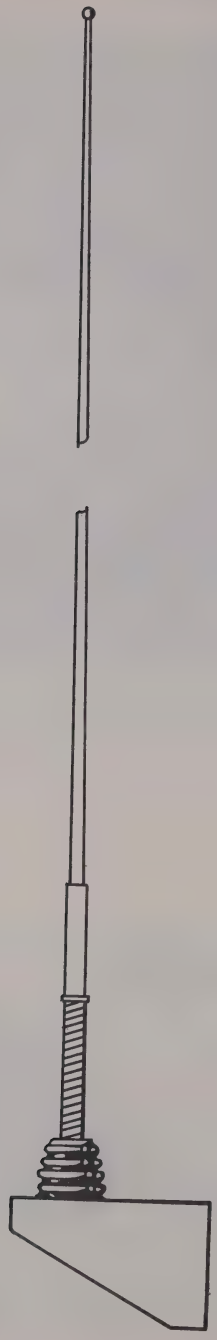


Figure 17. Speaker LS-158/U.



TM 607-210

Figure 18. Radio Set AN/VRC-2X, antenna.

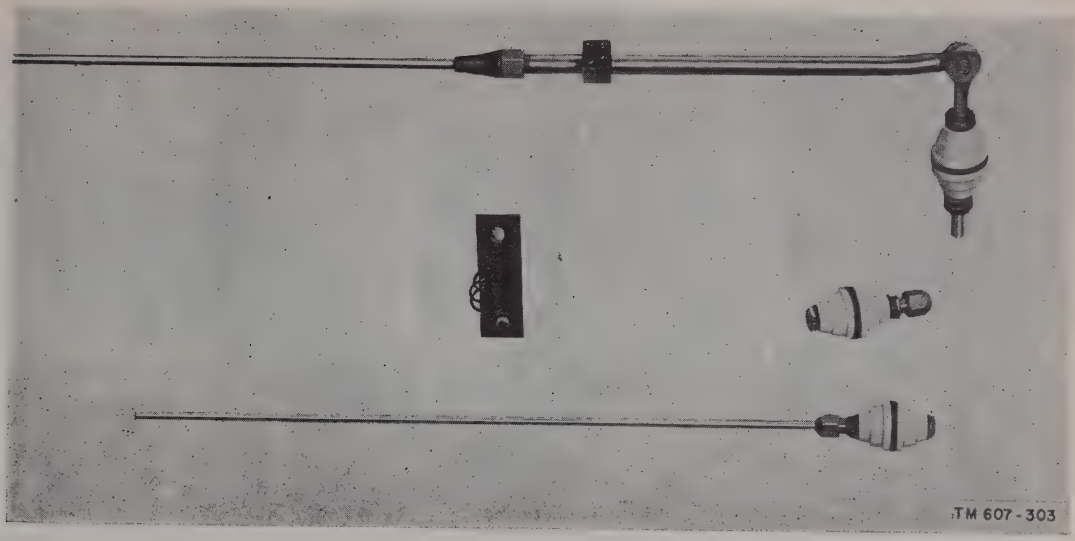


Figure 19. Components of Antenna AT–129/VR.

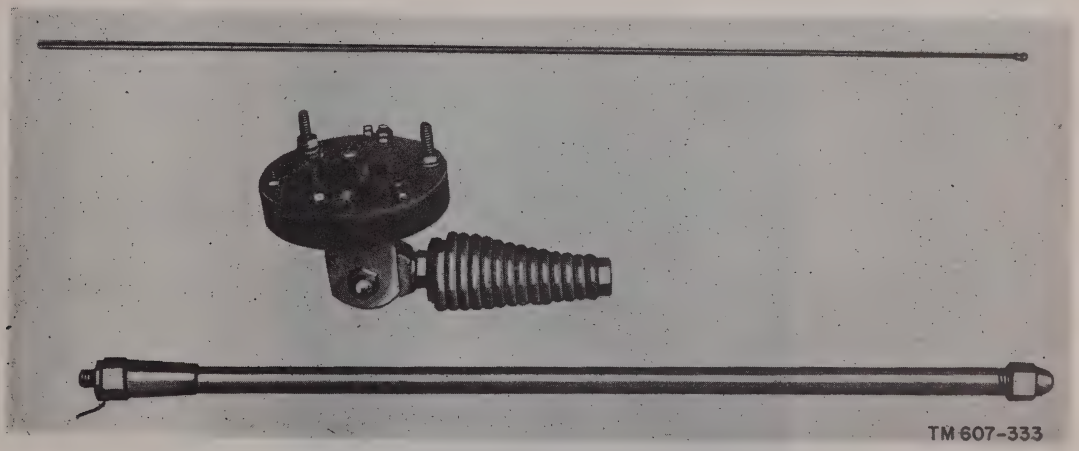


Figure 20. Components of Antenna AT–129B/VR.

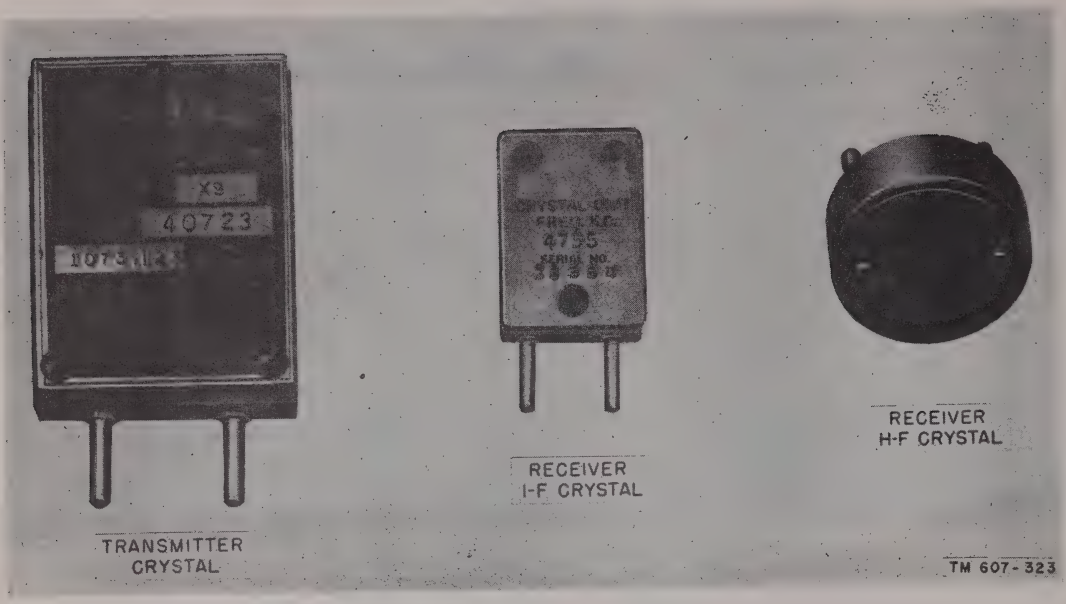


Figure 21. Transmitter and receiver crystals.

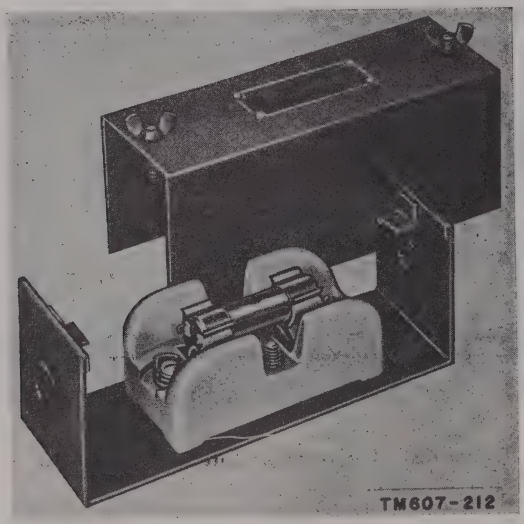


Figure 22. Fuse Box J-498/VRC-2X.

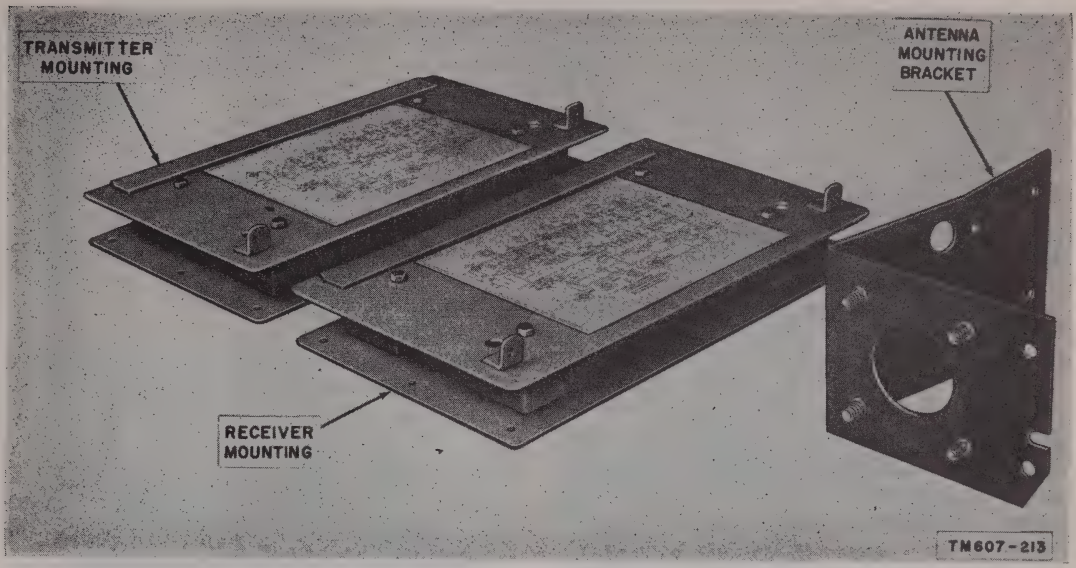


Figure 23. Transmitter, receiver, and antenna mountings.

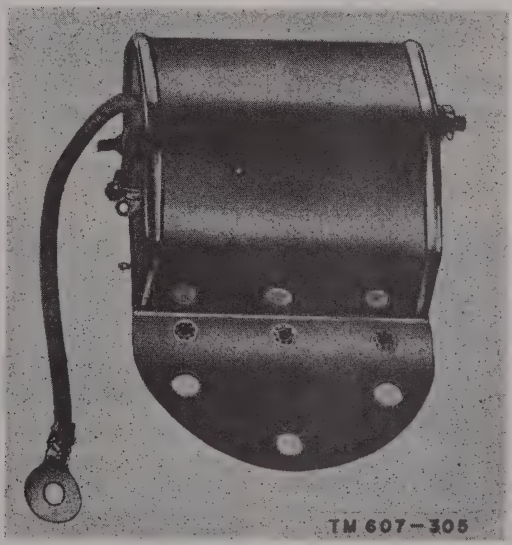


Figure 24. Generator filter.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

13. Siting

Because of the frequencies involved, transmissions and reception with Radio Set AN/VRC–2X are most successful over line-of-sight paths. The equipment should be located, during periods of transmission and reception, in areas without intervening obstacles such as hills, reinforced concrete structures, steel buildings, bridges, or other obstruction. These obstacles make communication difficult or impossible. Also avoid locating equipment near telephone lines, power lines, hospitals, or power units. The best sites are high locations which command an unimpeded view of the surrounding terrain. See figure 25.

14. Uncrating, Unpacking, and Checking New Equipment
(fig. 26)

Note. For used or reconditioned equipment, refer to paragraph 17.

a. General. Equipment may be shipped in oversea packing cases (*b* below) or in domestic packing cases (*c* below) and, sometimes, in its own carrying cases. When new equipment is received, select a location where the equipment may be unpacked without exposure to the elements, and which is convenient to the permanent or semipermanent installation of the equipment.

Caution: Be careful when uncrating, unpacking, and handling the equipment; it becomes damaged easily. If it becomes damaged or exposed, a complete overhaul might be required or the equipment might be rendered useless.

b. Step-By-Step Instructions for Uncrating and Unpacking Export Shipments.

(1) Cut and fold back the steel straps.

(2) Remove the nails with a nail puller. Remove the top. Do not attempt to pry off the sides and top; the equipment might become damaged.

(3) Remove the moistureproof barrier and any excelsior or corrugated paper covering the equipment inside the case.

(4) Remove the equipment from its inner case and place it near its final location.

(5) Inspect the equipment for possible damage incurred during shipment.

c. Unpacking Domestic Packing Cases. Radio equipment may be received in domestic packing cases. The instructions in *b* above apply also to unpacking domestic shipments. No metal straps are used. Open the cartons that protect the equipment; or if heavy wrapping paper has been used, remove it carefully and take out the components. Check the contents of the packing case against the master packing list.

Note. Save the original packing cases and containers for both export and domestic shipments. They can be used again when the equipment is repacked for storage or shipment.

15. Installation of Equipment
(figs. 27 and 28)

a. General. Study the information provided with the equipment before attempting the installation. Make sure that the vehicle has a 24-volt electrical system when installing Radio Set AN/VRC–2X, and a 6-volt system when installing Radio Set AN/VRC–2. Using the information provided in figures 27 and 28, lay out a plan for the exact location of the various components. Be sure that the plan provides for a short lead between the transmitter and the



Figure 25. Good and bad siting.

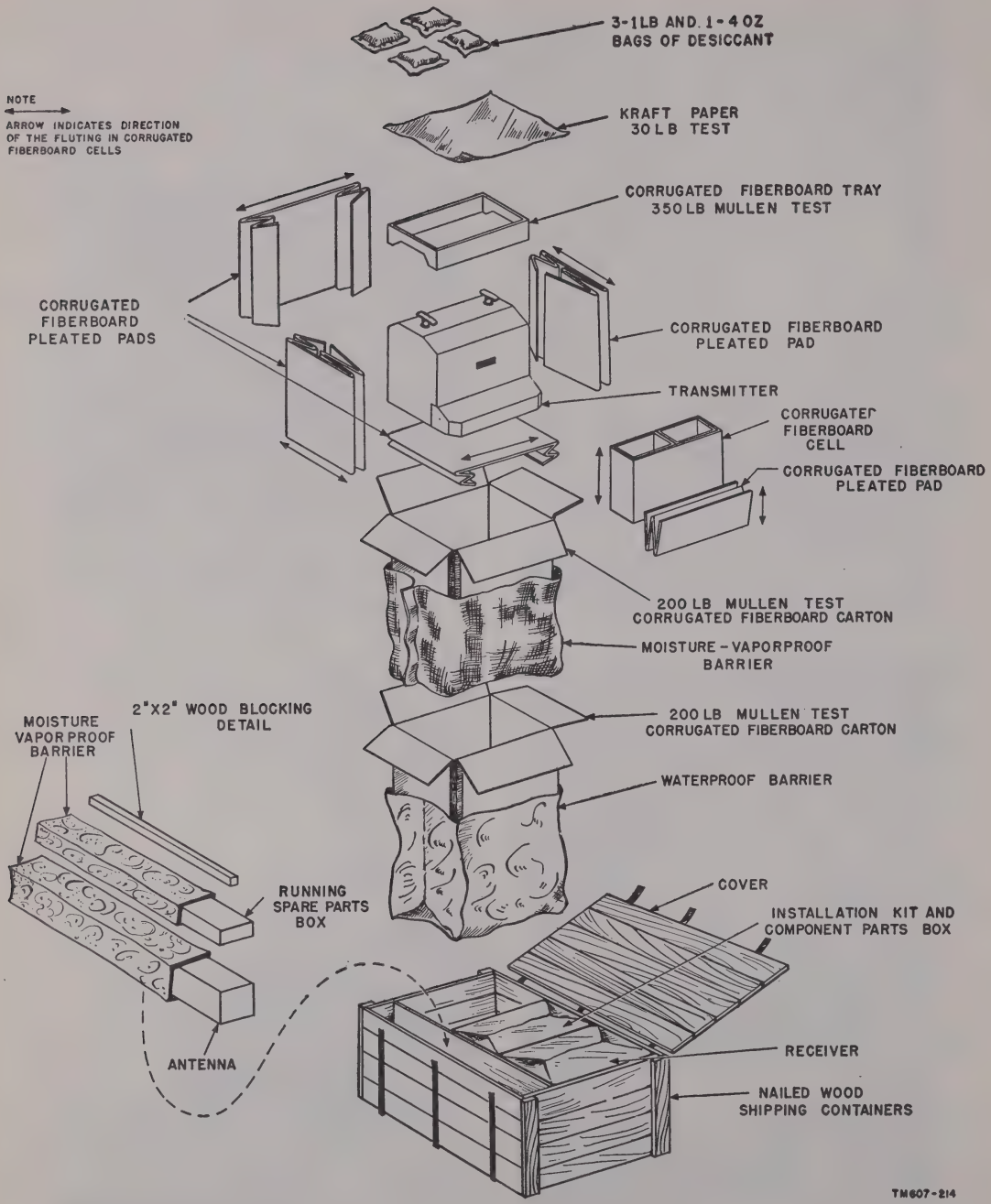


Figure 26. Radio Set AN/VRC-2X, packaging.

antenna. Specific installation instructions for each type of vehicle are supplied with the mounting hardware. Radio Set AN/VRC–2X usually is supplied without the h-f (high-frequency) crystals for the receiver and the transmitter. It will be necessary to requisition the proper crystals for operation on the desired channel. Receiver and transmitter crystals for Radio Set AN/VRC–2X are mounted in Crystal Holder HC–1/U. Early models of Radio Set AN/VRC–2 use a Motorola type FMT–X9 (part #48B82527) crystal in the transmitter and a Motorola type 800 crystal for the receiver i.f. Locations of the crystal sockets are shown in figures 75 and 92. Information for selecting the proper crystal for a specific frequency is given in paragraph 84. The proper crystal must be installed in each socket or the set will be inoperative.

b. Mounting Receiver.

(1) Secure the shock mounting to the vehicle; use the hardware that is supplied. Loosen the thumbscrews on the front panel of the radio receiver and push the unit back on its base plate about ½ inch. This will unlock the rear edge of the chassis from the base plate. Lift the chassis off its base plate. Secure the base plate to the shock mounting with the ¼-inch screws and lockwashers. Ground the base plate to the shock mounting with a bond strap.

(2) Replace the chassis on the base plate. The base locking screws must be removed or unscrewed about ¾ inch, and the chassis must be squarely over the base plate and about ½ inch to the rear before it is lowered into position. The base plate locking screws will pull the chassis forward and lock it in place.

c. Mounting Transmitter.

(1) Before attempting installation of the transmitter, it is important to note whether the vehicle has a positive or a negative ground and whether the l-v (low-voltage) leads from the dynamotor agree with this polarity. Radio Transmitter T–322/VRC–2X is

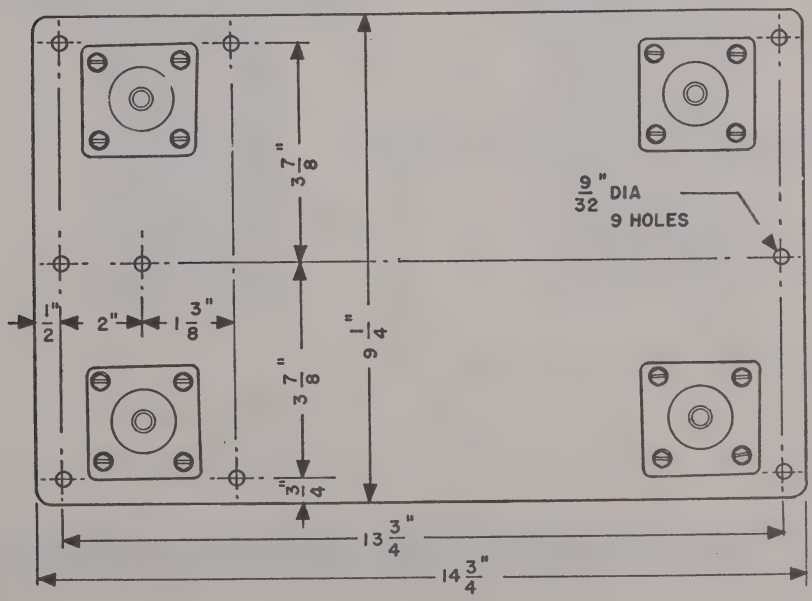


Figure 27. Mounting details for shock plates.

wired for installation in a vehicle with a negative ground. For a vehicle with a positive ground, it will be necessary to reverse the power connections to the l-v winding of the dynamotor. This is done by reversing the leads on either side of terminal block E23 (fig. 93) so that the positive side of the power source is connected to the positive (red) lead of the dynamotor primary winding. In Radio Transmitter T–193B/VRC–2, a terminal strip for reversing the leads is connected to the h-v terminals only.

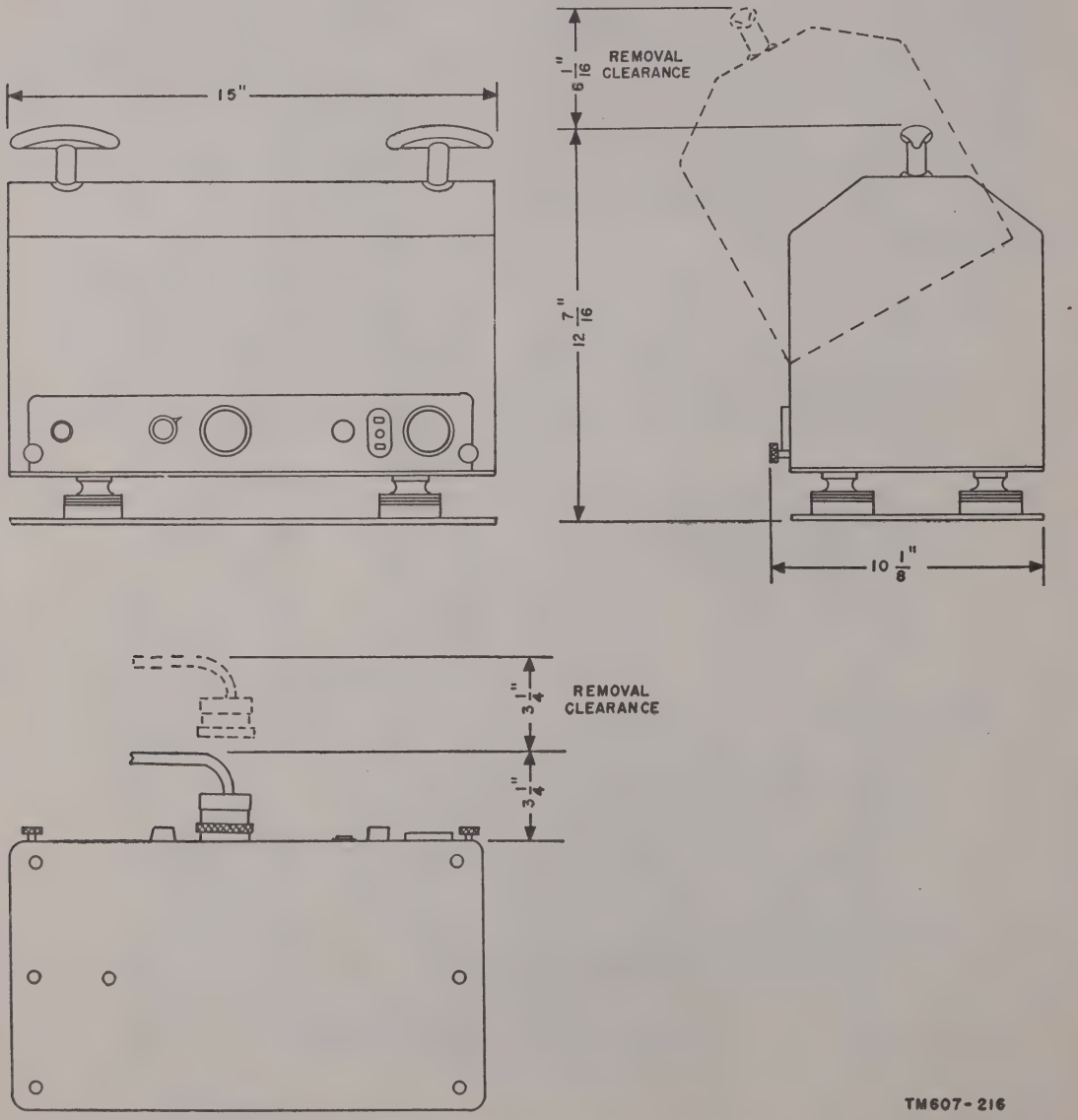


Figure 28. Outline dimensions for receiver and transmitter.

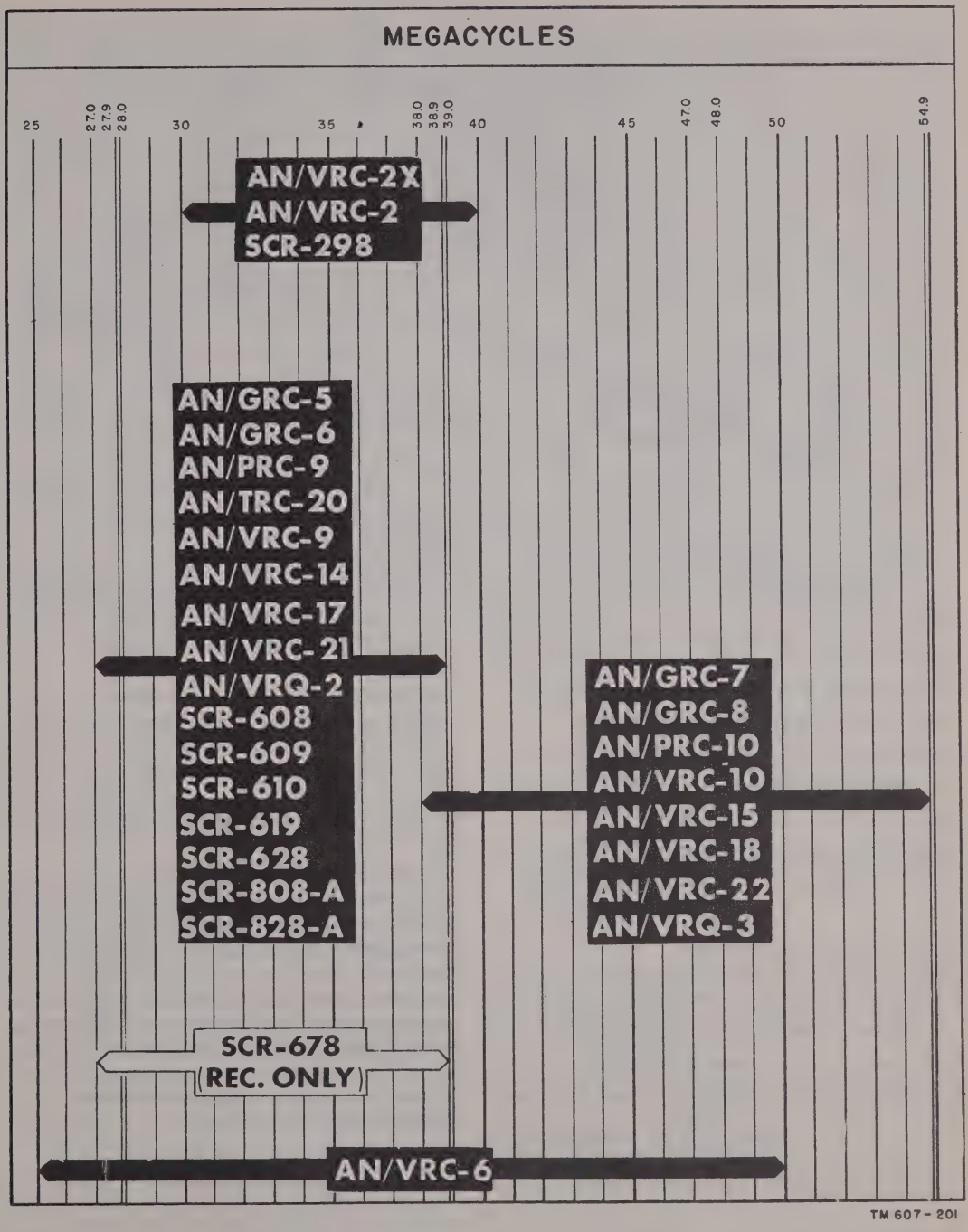


Figure 3. Frequency spectrum chart.

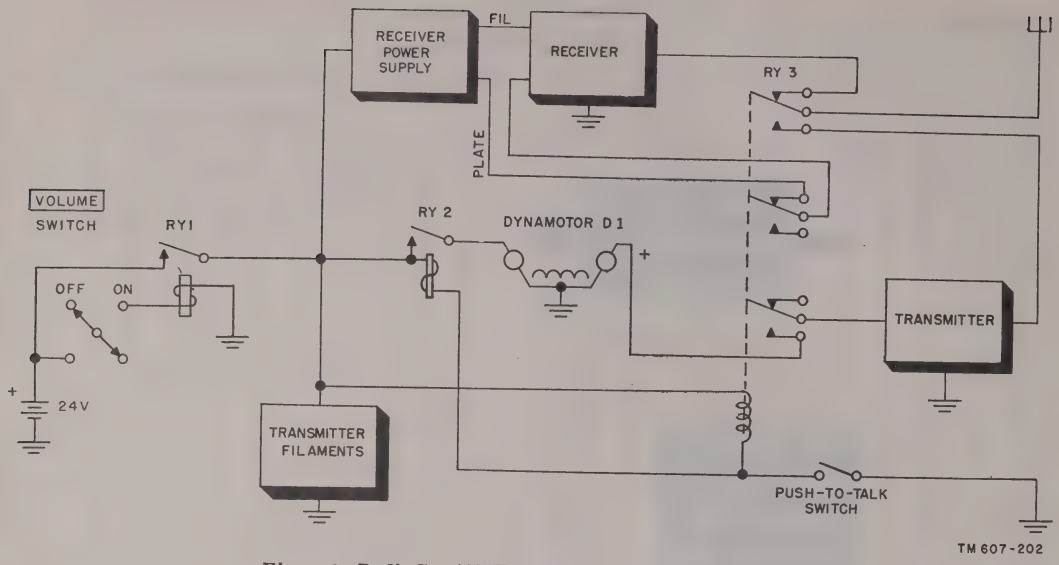


Figure 4. Radio Set AN/VRC–2X, over-all block diagram.

5. Technical Characteristics of Radio Set AN/VRC–2

The technical characteristics of Radio Set AN/VRC–2 are the same as those of Radio Set AN/VRC–2X, with the following exceptions:

a. Radio Receiver R–237(*)/VR.

Power input——6 volts at 14.5 amperes.

b. Radio Transmitters T–193/VRC–2 and T–193A/VRC–2.

Power input——6 volts at 25 amperes.

H-v power supply——2 vibrator units; output 540 volts at 150 ma (milliamperes).

Power output——25 watts.

Number of tubes——7 in transmitter; 2 in vibrator power supply.

c. Radio Transmitter T–193B/VRC–2.

Power input——6 volts at 25 amperes.

H-v power supply——Dynamotor; output 600 volts a 175 ma.

6. Packaging Data

a. Radio Set AN/VRC–2(*) is packed in one box which contains all components and accessories. It weighs 205 pounds and has a volume of 12.3 cubic feet.

b. Early procurements of Radio Set AN/VRC–2 are packed in two boxes. Box No. 1 contains the transmitter, receiver, and accessories. It weighs 156 pounds and has a volume of 7 cubic feet. Box No. 2 contains the antenna. It weighs 12 pounds and has a volume of 1 cubic foot.

c. Inner packaging of all parts is in waterproof, moisture-vaporproof, sealed wrappers containing a dehydrating agent. The equipment is wrapped first in greaseproof paper wrapping. Moisture-vaporproof bags are placed over the cushioned parts and assemblies. Cartons containing materiel are inclosed in moisture-vaporproof bags and these sealed packages are placed in tight-fitting outer unit containers.

Note. **Items may be packaged in a different manner, depending on the supply channel.**

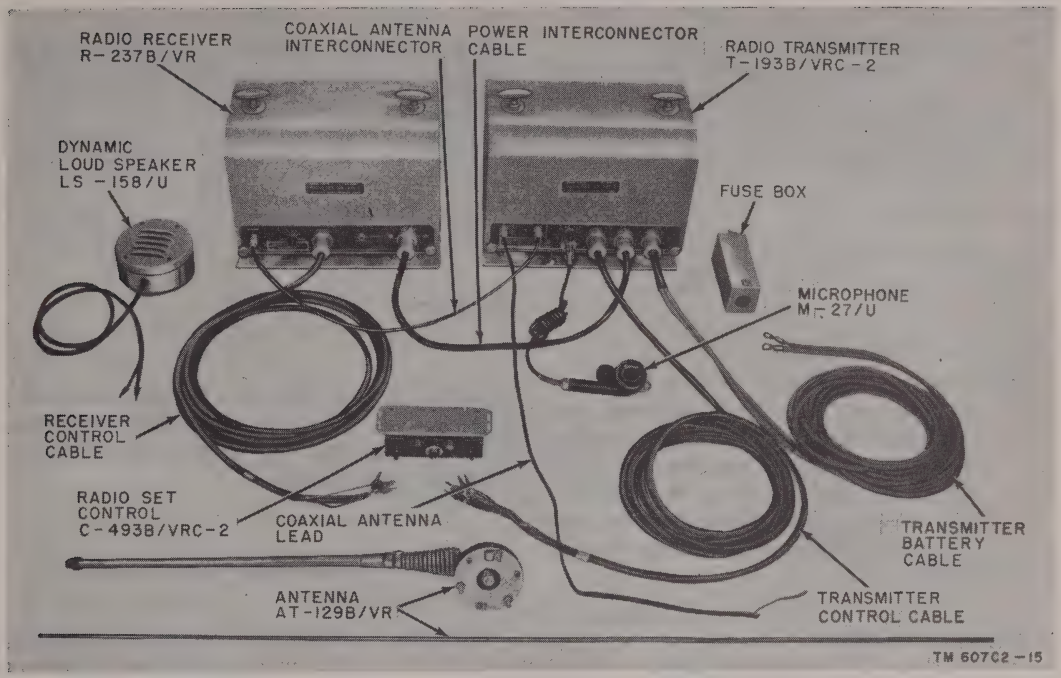


Figure 8. (Superseded) *Components of Radio Set AN/VRC–2 procured on Order No. 20591–Phila–49.*

terchangeability of Radio Receiver R–237(*)/VR with Radio Receiver R–237B/VR and Radio Transmitter T–193(*)/VRC–2 with Radio Transmitter T–193B/VRC–2 and to Provide Improved Antenna Connectors, Cables and Receptacles.

(4) MWO SIG 11–607–4, Modification of Radio Set AN/VRC–2 to Replace the Vibrator Power Supply with a Dynamotor Power Supply Upon Failure of Major Component in the Vibrator Power Supply.

(5) MWO SIG 11–607–5, Modification of Radio Sets AN/VRC–2 and AN/VRC–2X to Provide an Improved Chassis Fastener.

(6) MWO SIG 11–607–6, Modification of Radio Set AN/VRC–2 to Increase Its Sensitivity.

(7) MWO SIG 11–607–7, Modification of Power Supply of Radio Receivers R–237/VR, R–237A/VR, and R–237B/VR to Provide for Suppression of R-F Noise Radiation from Power Supply.

(8) MWO SIG 11–607–8, Modification of Radio Set AN/VRC–2X to Provide Suppression of R-F Noise Radiation from the Receiver Power Supply.

Figure 15. (Superseded) *Radio Set Control C–1060/VRC–2X, front and rear view.*

14. Uncrating, Unpacking, and Checking New Equipment

(fig. 26)

Note. For used * * * to paragraph 17.

a. General. Equipment may be shipped in oversea packing cases (*b* below) or in domestic packing cases (*c* below). When new equipment * * * of the equipment.

* * * * *

15. Installation of Equipment

(figs. 27 and 28)

* * * * *

h. Installation Kits. (Added). Installation kits designed for particular vehicles are listed in SB 11–131, Distribution of Vehicular Radio

Sets. Power cord size and length, noise suppression components, and antenna bracket mounting may vary in different vehicles.

Figure 29. "FUSE GUARD" is changed to read: **FUSE BOX** J–498/VRC–2X. The arrow on Electrical Power Cable Assembly CX–1913/U is changed to point to cable.

16. Connections

(figs. 32 and 33)

Details of the * * * securely in place.

* * * * *

b. Antenna Connections.

(1) Select the shorter * * * of the antenna. **Adapter UG–273/U is used with the AN/VRC–2X (fig. 32). Other models generally use solder lugs that are bolted to the antenna base. In addition, the adapter type connection to the transmitter differs slightly in the earlier models.**

* * * * *

c. Power Connections.

* * * * *

(2) Select the transmitter * * * of the battery.

Note. (Added) In Radio Sets AN/VRC–2C bearing Orders No. 3349–Phila–52, and 37214–Phila–53, connect the white lead to the ungrounded terminal of the battery.

* * * * *

Figure 32. The following note is added:

Note. THE FUSE BOX IS CONNECTED IN ELECTRICAL SPECIAL PURPOSE CABLE ASSEMBLY CX–1913/U BETWEEN THE TRANSMITTER AND THE ADAPTER END OF THE CABLE ASSEMBLY.

Figure 36. In item 5 PAR. 33*a*(4) is changed to read: PAR. 33*a*(5). In item 6 PAR. 24, PAR. 33*a*(5) is changed to read: PAR. 22.

Figure 37. In item 5 PAR. 33*a*(4) is changed to read: PAR. 33*a*(5). In item 6 PAR. 24,33*a*(5) is changed to read: PAR. 22. In item 21 PAR. 33*b*(3),38 is changed to read: PAR. 33*b*(3). In item 25 PAR. 33*b*(8),38 is changed to read: PAR. 33*b*(8). In item 27 PAR. 33*b*(5),38 is changed to read: PAR. 33*b*(5). In item 32 PAR. 33*b*(4),38 is changed to read: PAR. 33*b*(4).

42.1. Tube Symbols

(fig. 37.1) (Added)

Corrected tube symbols as shown in figure 37.1 apply to the following figures:

6K6GT	Figures 54, 55, 119, and 124.
6K8	Figures 46, 119, 121, and 124.
6SG7GT	Figures 40, 42, 44, 45, 47, 48, 49, 52, 119, and 124.
7A8	Figures 60, 120, 122, 123, and 125.

49. 455–kc I–f Amplifier

(fig. 47)

* * * * *

b. Avc Circuit. The avc voltage is developed in the grid circuit of **V6,** which is contained in coupling unit T5R (fig. 47). With a strong * * * the meter switch.

* * * * *

53. Noise Amplifier and Noise Rectifier

(fig. 52)

The noise amplifier * * * of signal reception.

* * * * *

b. Noise Rectifier. The noise rectifier * * * ground across C57. Capacitors C57 and **C58** discharge through R41 when the noise component is removed. The negative voltage * * * operating the squelch (fig. 119).

* * * * *

Figure 57. "NOTE" is changed to read:

NOTES. The existing note is designated "1". The following note is added:

2. IN MODELS BEARING ORDERS NO. 3349–PHILA–52 AND 37214–PHILA–53:
THE CONNECTION FROM PIN 6 OF THE POWER MALE RECEPTACLE TO SPARK PLATE IS OMITTED, AND 100-UUF CAPACITOR IS CONNECTED IN PARALLEL WITH C1.
THE VALUES OF R1 AND R2 ARE 47 OHMS.
THE VALUE OF C4 IS 20 UF, EACH SECTION.

58. Oscillator

(fig. 59)

a. Oscillator. The oscillator, (V1), * * * crystal oscillator circuit. **The oscillator frequency is 1/32 of the output resting frequency.** This stage consists * * * the meter circuit.

* * * * *

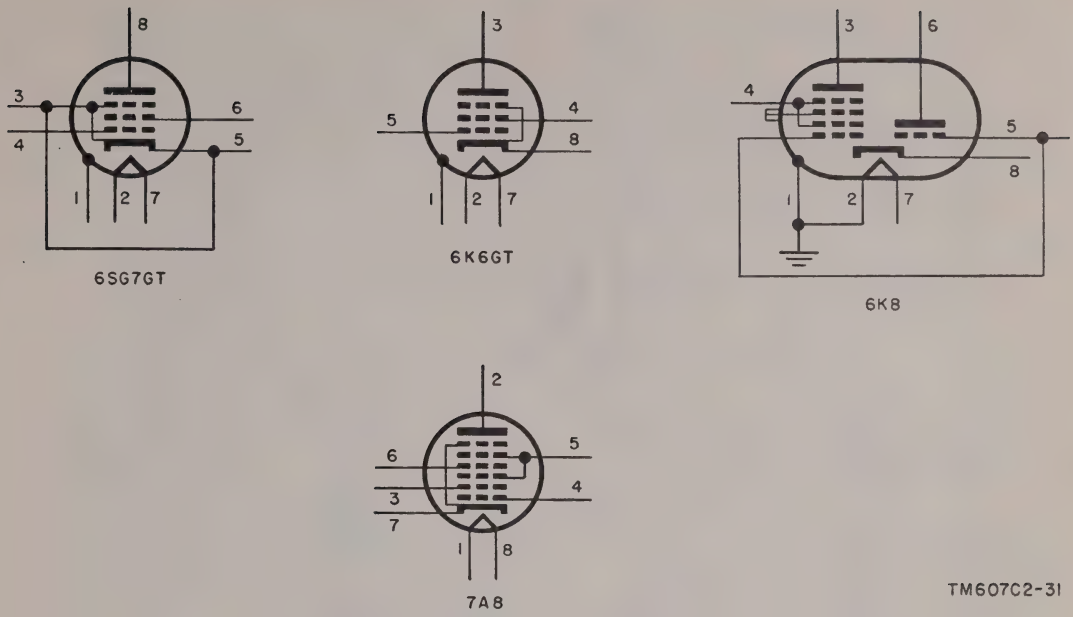


Figure 37.1 (Added) *Corrected tube symbols.*

59. Modulator Stage

(fig. 60)

To produce the * * * the audio signal.

* * * * *

d. Output Vectors. In figure 61 * * * the audio frequency. OC_1 represents the output of V2 when the transconductance is at maximum and the transconductance of V3 is at minimum. **OC_2 represents the output of V3.** The phase-modulated output * * * the crystal oscillator.

* * * * *

62. Power Amplifier

(fig. 67)

* * * * *

b. Circuit Differences.

* * * * *

(2) (Superseded) The power amplifier circuit of Radio Transmitters T–193B/VRC–2 and T–193C/VRC–2 differs from the T–322/VRC–2X in the filament connections. For filament differences, refer to figures 72, 120, and 125. Capacitor C42 is not used in Radio Transmitter T–193/VRC–2. Radio Transmitters T–193A/VRC–2, T–193B/VRC–2, T–193C/VRC–2, and T–322/VRC–2X differ in their use of C42 in the power amplifier output circuit. For exact differences, refer to figures 120, 123, and 125.

64. Control Head

(fig. 70)

a. Operation. All operating controls * * * the control head. Located on the VOLUME control is the main power switch which completes the circuit from the battery to the coil of relay RY1 on the transmitter, and supplies current to the green indicator lamp–M4–*M2* through dropping resistor R1. Resistor R4 is * * * voltage is off.

* * * * *

65.1. Radio Set AN/VRC–2X Power Circuits

(Added)

(fig. 70.1)

a. Radio Receiver R–435/VRC–2X.

(1) *Low voltage.*

(*a*) Battery current flows from ground to the vibrator and then through the center-tapped primary of T1 through L1 and receiver fuse F1.

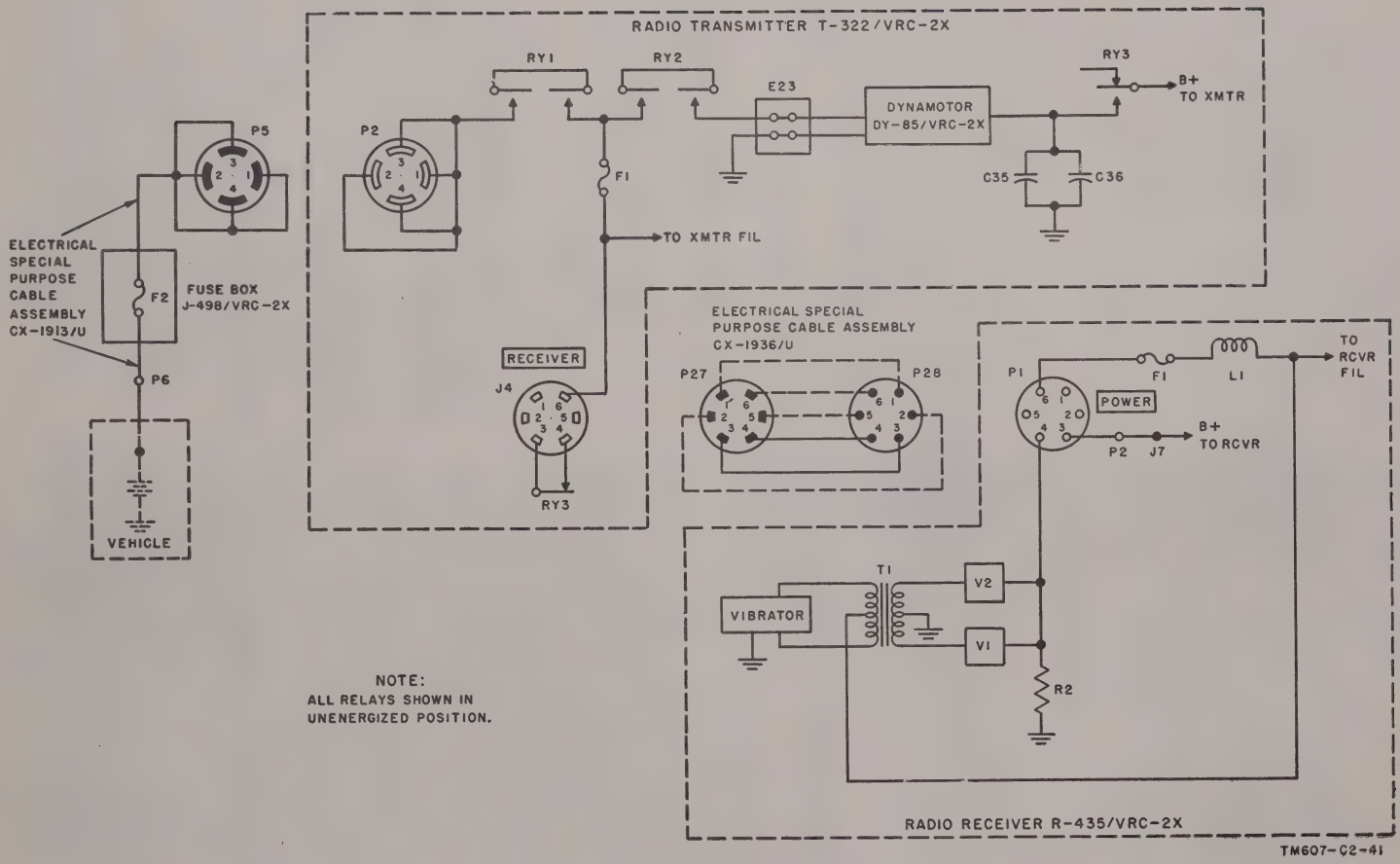


Figure 70.1. (Added) *Radio Set AN/VRC-2X, power control circuits.*

Current then passes to pins 6 of P1, P28, and P27, respectively. Current path is now through pin 6 of J4, transmitter fuse F1, and the closed contacts of RY1 to P2. (RY1 is energized when the VOLUME control on the radio set control is turned *on*.) From here, current flows through P5, F2 in the fuse box, P6, the vehicle battery jack (installed on the vehicle chassis), and finally to the battery.

(*b*) Receiver filament current is tapped off at the junction of L1 and the center tap on the primary of T1.

(2) **B+ voltage.** B+ voltage from V1 and V2 is applied to pin 4 of P1, then through pins 4 of P28, P27, and J4, respectively; through the unenergized position of RY3 to pins 3 of J4, P27, P28, and P1, respectively. From pin 3 of P1, B+ is applied to all the appropriate receiver stages (fig. 119).

b. Radio Transmitter T–322/VRC–2X.

(1) *Low voltage.*

(*a*) When the push-to-talk switch on the microphone is held down, the contacts on RY2 close. Battery current then will flow from ground through E23 and the low voltage windings of the dynamotor, through the closed contracts of RY2 and RY1; through P2, P5, F2 in the fuse box, and P6 to the vehicular battery.

(*b*) Transmitter filament voltage is constantly applied through F1 when RY1 is closed. (RY1 closes immediately when the set is turned on.)

(2) **B+ voltage.** B+ from the hv winding of the vibrator is applied through the closed contacts of RY3 to all appropriate transmitter stages (fig. 120).

c. Circuit Differences. Power circuits for all earlier models of Radio Set AN/VRC–2 are generally similar to that of the AN/VRC–2X given in *a* and *b* above. In Radio Transmitters T–193/VRC–2 and T–193A/VRC–2, fuse F1 is installed between power receptacle P2 and relay RY1 (figs. 122 and 123). Circuit differences are described in paragraphs 56, 63, and 65.

Figure 71. The following notes are added:

NOTES:

1. Change D/P6 TO CONNECT BETWEEN BATTERY AND FUSE.
2. P6 CONNECTS TO JACK INSTALLED ON VEHICLE (NOT SHOWN).

Figure 74. On V12, the grid cap reading of "—75V" is changed to read **—.75V.**

69. Test Equipment Required for Troubleshooting

* * * * *

34–ohm dummy antenna

* * *

Figure 76. The following not is added:

NOTE: C39, C52, C55, C57, C58, C62, C63, C64, AND C72 ARE SHOWN MOUNTED ON TERMINAL STRIP TS1.

Figure 82. On V5, the grid cap reading of "O" is changed to read: 6.8K. On V3, pin 3 reading of "36" is changed to read: **36K.**

Figure 83. The following note is added:

NOTE: C37, C52, C55, C57, C58, C62, C63, C72, AND C74 ARE SHOWN MOUNTED ON TERMINAL STRIP TS1.

Figure 89. Change "G1" to read: **C1.**

Figure 90. "NOTE" is changed to read: **NOTES.** The existing note is designated "1". The following note is added:

2. THE JACK TO THE RIGHT OF J8 IS P1.

Figure 92. The following note is added:

NOTE: L1 IS THE REFERENCE SYMBOL FOR ANT TANK COIL.

Figure 93. The following notes are added:

NOTES:

1. C31 AND C32 ARE SHOWN MOUNTED ON TERMINAL STRIP TS1.
2. C14, C18, AND C22 ARE SHOWN MOUNTED ON TERMINAL STRIP TS2.
3. R37 IS SHOWN MOUNTED ON TERMINAL STRIP TS3.
4. C1 IS SHOWN MOUNTED ON TERMINAL STRIP TS4.
5. C27, C30, C34, R34, AND RFC2 ARE SHOWN MOUNTED ON TERMINAL STRIP TS5.

Figure 101. The following note is added:

6. RESISTANCES ARE READ WITH A SHORTING WIRE CONNECTED FROM THE PLATE CAP OF V7 TO CHASSIS GROUND. BE SURE TO REMOVE THIS WIRE AFTEF MAKING RESISTANCE MEASUREMENTS.

Figure 103. The following note is added:

7. RESISTANCES ARE READ WITH A SHORTING WIRE CONNECTED FROM THE PLATE CAP OF V7 TO CHASSIS GROUND. BE SURE TO REMOVE THIS WIRE AFTER MAKING RESISTANCE MEASUREMENTS.

83. Transmitter Alinement

The transmitter must * * * the alinement procedure.

* * * * * *

b. Oscillator. Set the Meter * * * approximately 45 μa.

Note. (Added) For Radio Set AN/VRC–2 bearing Orders No. 3349–Phila–52 and 37214–Phila–53, with the METER SWITCH in the MOD position, the meter reading should be approximately 30 μa.

* * * * * *

d. First Quadrupler. Set the METER * * * the desired frequency.

Note. In Radio Transmitter T–193A/VRC–2, transformer T3 is single-tuned. **For models of Radio Set AN/VRC–2C bearing Orders No. 3349–Phila–52 and 37214–Phila–53, the normal meter reading with the METER SWITCH in position 3, is 25 μa.**

e. Second Quadrupler. The second quadrupler * * * read 20 μa.

Note. (Added) For Radio Set AN/VRC–2C bearing Orders No. 3349–Phila–52 and 37214–Phila–53, the normal meter reading with the METER SWITCH in position 4, is 10 μa.

94.1. Final Test on Transmitter

(Added)

a. Radio Transmitter T–193(*)/VRC–2. After repair, the T–193(*)/VRC–2 should be checked as follows:

(1) *General test conditions.*

(*a*) Use a 6-volt battery for input power.

(*b*) Insert the four-prong female connector of the transmitter battery cable into the POWER receptacle on the transmitter, and connect the red lead on the other end of the cable to the positive terminal of the 6-volt battery. Connect the other lead to the negative terminals of the battery.

(*c*) Insert the eight-prong female connector of the transmitter control cable into the CONTROL receptacle on the transmitter, and insert the cable plugs on the other ends of the cable into the jacks on the control head.

(*d*) Make power output and deviation tests at 30 mc, 35 mc, and 40 mc. Make the operational test at 35 mc.

(*e*) Insert one of the following crystals into the crystal socket:

Output frequency	*Crystal frequency*
30 mc	937.5 kc
35 mc	1093.75 kc
40 mc	1250.0 kc

Caution: for each crystal change, realinement of the transmitter (pars. 83 and 84) is necessary.

(*f*) Insert the microphone connector into the jack on the front of the control head.

(2) *Power output tests.* Perform the following tests at frequencies of 30 mc, 35 mc, and 40 mc:

(*a*) Connect a dummy antenna as shown in figure 116.

(*b*) Measure the power output of the aligned transmitter. The rf meter reading should exceed .9 ampere.

(3) *Deviation test.* Perform the following test at frequencies of 30 mc, 35 mc, and 40 mc.

(*a*) Set Audio Oscillator TS–382A/U or equivalent to 2,715 cycles at zero output.

(*b*) Increase the audio input signal gradually from zero until the carrier reaches zero on Panoramic Indicator IP–173/U (see TM 11–5086) for the second time. Be sure to keep the audio input below .1 volt (as measured with Electronic Multimeter ME–6A/U).

(4) *Operational test.* Perform the following test at a frequency of 35 mc:

(*a*) Aline the transmitter at a frequency of 35 mc.

(*b*) Tune the receiver to 35 mc.

(*c*) Listen at the receiver for a clear and intelligible transmitted signal.

b. Radio Transmitter T–322/VRC–2X. After repair, the T–322/VRC–2X can be tested in a manner similar to that for the T–193(*)/VRC–2 (subpar. *a* above). The power input of the T–322/VRC–2X requires a 24-volt battery in place of the 6-volt battery used in the T–193-(*)/VRC–2.

APPENDIX II. IDENTIFICATION TABLE OF PARTS

Rescinded

Figure 125. The following note is added:

3. IN EQUIPMENTS PROCURED ON ORDERS NO. 3349–PHILA–52 AND 37214–PHILA–53, THE VALUE OF C29 IS 12 TO 175 UUF.

[AG 413.44 (18 Apr 55)]

BY ORDER OF THE SECRETARIES OF THE ARMY AND THE AIR FORCE:

M. B. RIDGWAY,
General, United States Army,
Chief of Staff.

OFFICIAL:

JOHN A. KLEIN,
Major General, United States Army,
The Adjutant General.

N. F. TWINING,
Chief of Staff, United States Air Force.

OFFICIAL:

E. E. TORD,
Colonel, United States Air Force,
Air Adjutant General.

DISTRIBUTION:

Active Army:

CNGB (1)
Tec Svc, DA (1)
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CONARC Bd (Incl ea Test Sec) (1)
Army AA Comd (2)
OS Maj Comd (5)
OS Base Comd (5)
Log Comd (5)
MDW (1)
Armies (5)
Corps (2)
Tng Div (2)
Ft & Cp (2)
Gen & Br Svc Sch (5)
SigC Sch (25)
Gen Depots (2)
SigC Sec, Gen Depots (10)
SigC Depots (20)
POE (2)
OS Sup Agencies (2)
SigC Fld Maint Shops (3)
SigC Lab (5)
Mil Dist (1)

Units organized under following TOE:

11–7, Sig Co Inf Div (2)
11–16A, Hq&Hq Co, Sig Bn, Corps or Abn Corps (2)
11–57, Armd Sig Co (2)
11–127, Sig Rep Co (2)
11–128A, Sig Depot Co (2)
11–500A (AA thru AE), Sig Svc Org (2)
11–557A, Abn Sig Co (2)
11–587A, Sig Base Maint Co (2)
11–592A, Hq&Hq Co, Sig Base Depot (2)
11–597A, Sig Base Depot Co (2)

NG: State AG (6); Units—same as Active Army except allowance is one copy to each unit.
USAR: None.
For explanation of abbreviations used, see SR 320–50–1.

☆ U. S. Government Printing Office: 1955—310511

(2) Mount the transmitter in the manner outlined for mounting the receiver.

d. Mounting Control Head. A standard installation of the control head and speaker of Radio Set AN/VRC–2X in truck, ¼-ton, M38 (24 volt), is shown in figure 29. The control head of Radio Set AN/VRC–2 usually is mounted below the instrument panel with the two mounting brackets which are fastened at the ends. See figure 31.

e. Mounting Speaker. The speaker is attached to the vehicle by bolting the speaker mounting bracket to the vehicle body at the desired location. See figures 29, 30, and 31.

f. Installation of Antenna.

(1) Locate the antenna at the left rear of the vehicle (fig. 30). The base insulator should be so mounted that it is near the transmitter antenna connector and high enough to allow sufficient antenna height.

(2) Drill the required holes in the vehicle body and attach the antenna with the hardware supplied.

g. Installation of Fuse Box J–498/VRC–2X. The fuse box is inserted in the ungrounded lead to the battery. Proper installation of the fuse box in truck ¼-ton, 4x4, M38 is shown in figure 29. In other vehicles, secure the fuse guard to the dash board under the hood and as close to the battery as possible. Use the hardware furnished.

16. Connections

(figs. 32 and 33)

Details of the necessary interconnections are illustrated in figures 32 and 33. To make the cable connections, it will be necessary to remove

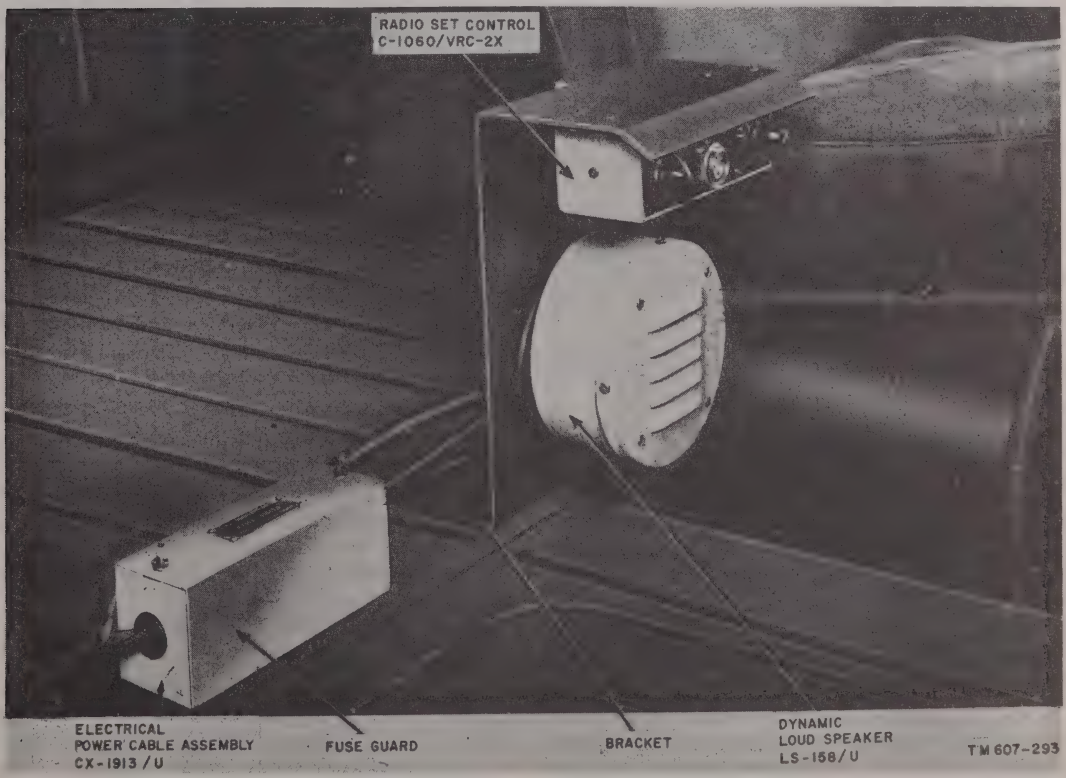


Figure 29. Radio Set AN/VRC–2X, accessories installed in truck. ¼-ton, 4x4, utility, M38 (24-volt).

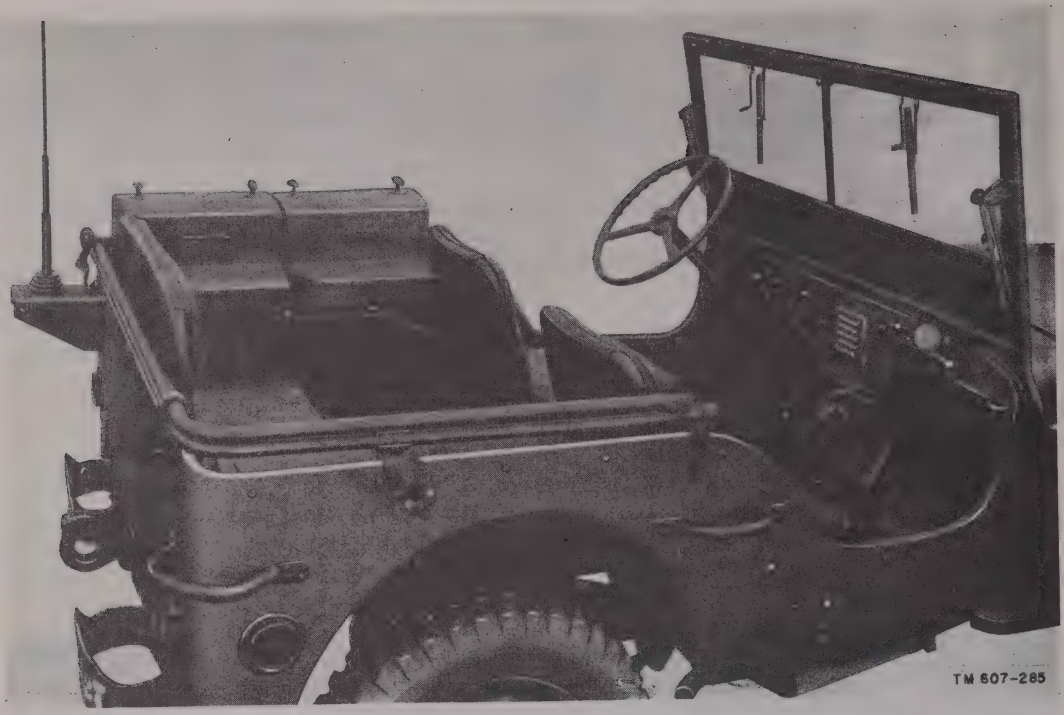


Figure 30. Radio Set AN/VRC–2 installed in truck, ¼-ton, 4x4.

the covers with the switch guards attached. Be sure that all jacks and connectors make positive contact with the proper receptacles. Avoid sharp bends in any of the cables. Dress them in such a way that there are no loose sections to sway or vibrate. Use the clamps supplied with the equipment to hold the cables securely in place.

a. Receiver and Transmitter Control Cables. The control cables have eight-prong connectors on one end and banana jacks on the other. Insert the female connector into the CONTROL socket of the transmitter and the male connector into the CONTROL socket of the receiver. Lock them with the screw rings. Insert the cable plugs on the other ends of the cables into the pin jacks on the rear of the control head. Follow the color coding as shown in figure 33. In some procurements, the plugs of the control cables are numbered according to their corresponding pin jack on the control head, and are not color-coded.

b. Antenna Connections.

(1) Select the shorter (3-foot length) of the two coaxial antenna leads and plug one end into the ANTENNA jack on the transmitter. Insert the other end into the connector on the feedthrough insulator at the base of the antenna.

(2) Select the coaxial antenna interconnector (7-foot long) and plug one end into the RECEIVER jack on the transmitter and the other end into the ANTENNA jack on the receiver.

Note. The antenna lead-in and antenna interconnector cables supplied with Radio Set AN/VRC–2 are 20 inches and 27 inches long, respectively.

c. Power Connections.

(1) Select the power interconnector cable, which is terminated in two six-prong connectors. Plug the male connector into the socket marked RECEIVER on the transmitter. Plug the female

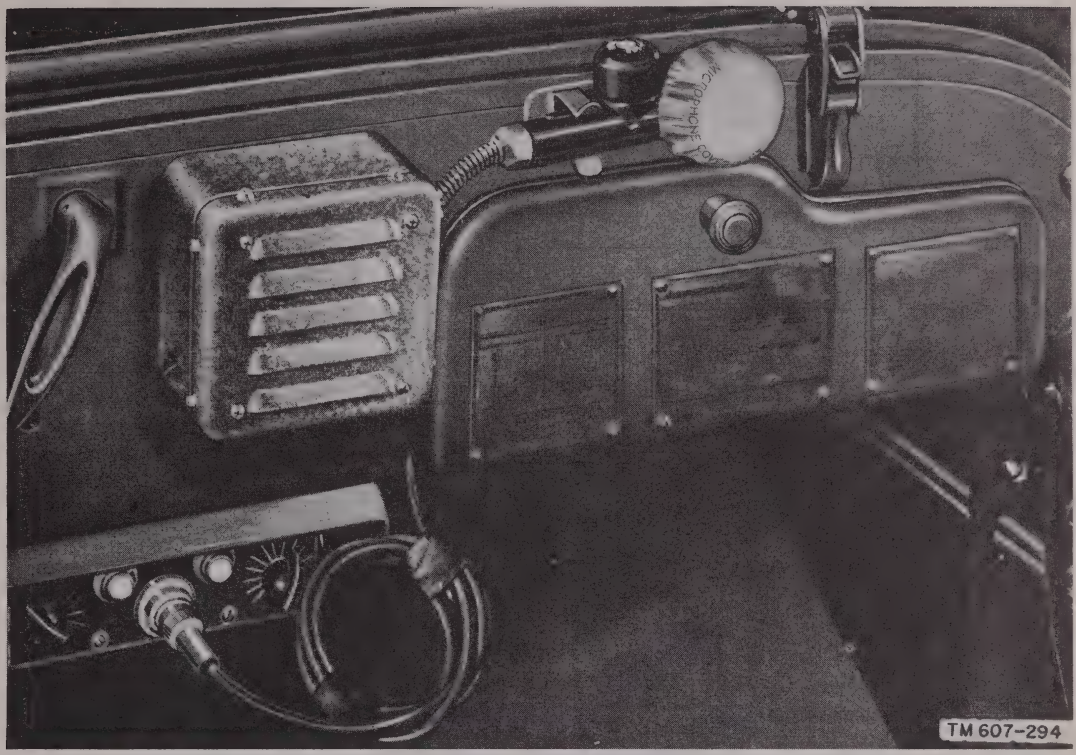


Figure 31. Radio Set AN/VRC–2, accessories installed on panel of truck, ¼-ton, 4x4.

connector into the receptacle marked POWER on the receiver.

(2) Select the transmitter battery cable and plug the four-prong female connector into the POWER receptacle of the transmitter. Plug the other end into the connector on Fuse Box J–498/VRC–2X. Battery cable supplied with Radio Set AN/VRC–2 terminates in two battery connectors. Proper polarity must be observed when connecting this cable to a 6-volt battery system. Connect the red lead to the *ungrounded* terminal of the battery. Connect the other lead, which is grounded to the chassis of the equipment, to the grounded terminal of the battery.

d. Speaker. Connect the loudspeaker terminals to the control head as indicated in figure 33.

e. Microphone. Insert the microphone connector into the receptacle on the front of the control head, and lock it with the locking ring. Be sure the dust cover is screwed tightly onto the alternate MIC. receptacle on the transmitter.

17. Service upon Receipt of Used or Reconditioned Equipment

a. Follow the instructions in paragraph 14 for uncrating, unpacking, and checking the equipment.

b. Check the used or reconditioned equipment for tags or other indications pertaining to changes in the wiring of the equipment. If any changes in wiring have been made, note the change in this manual, preferably on the overall schematic and stage diagrams.

c. Check the operating controls for ease of rotation.

d. Perform the installation and connection procedures given in paragraphs 15 and 16.

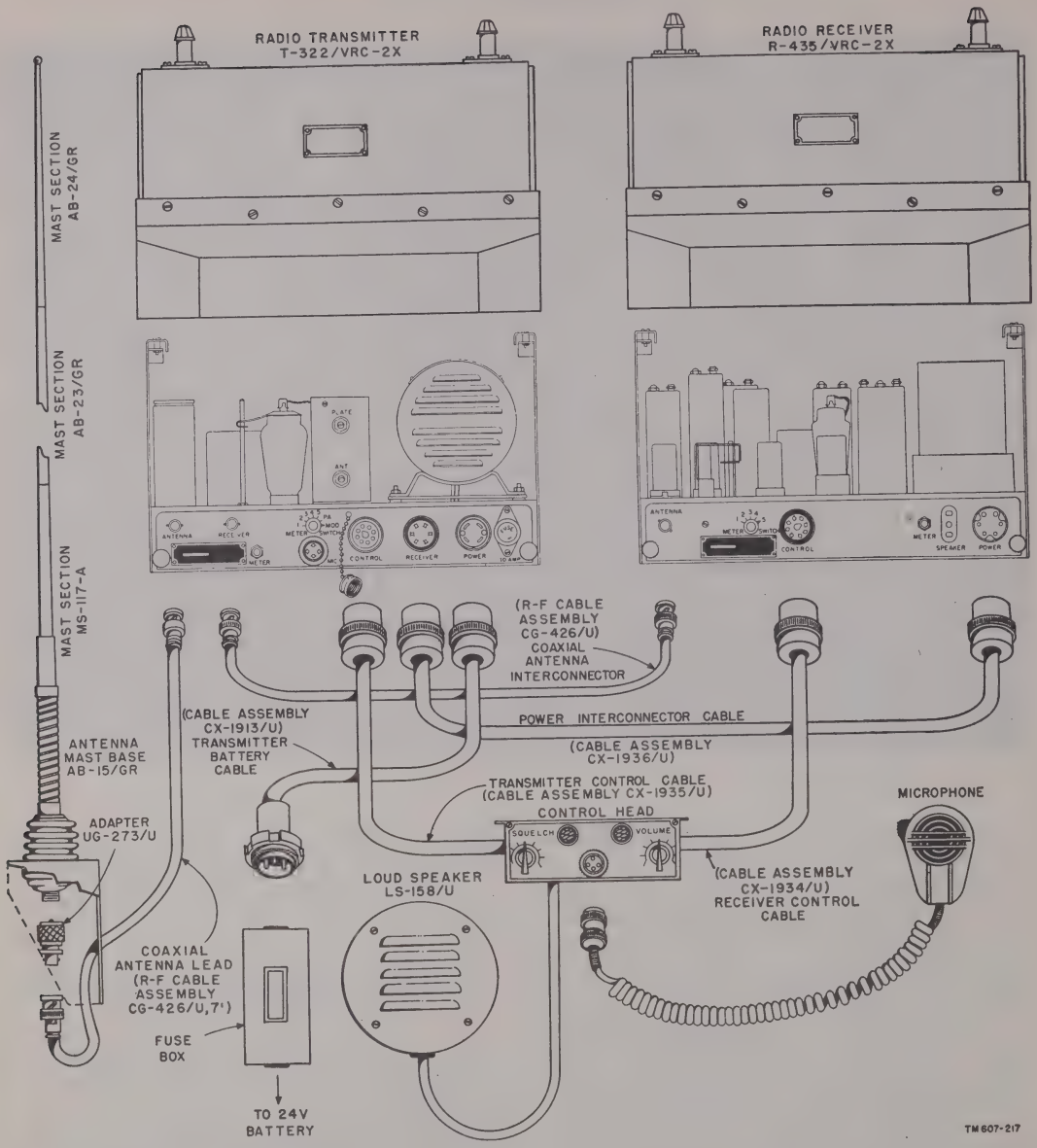


Figure 32. Radio Set AN/VRC-2X, component interconnections.

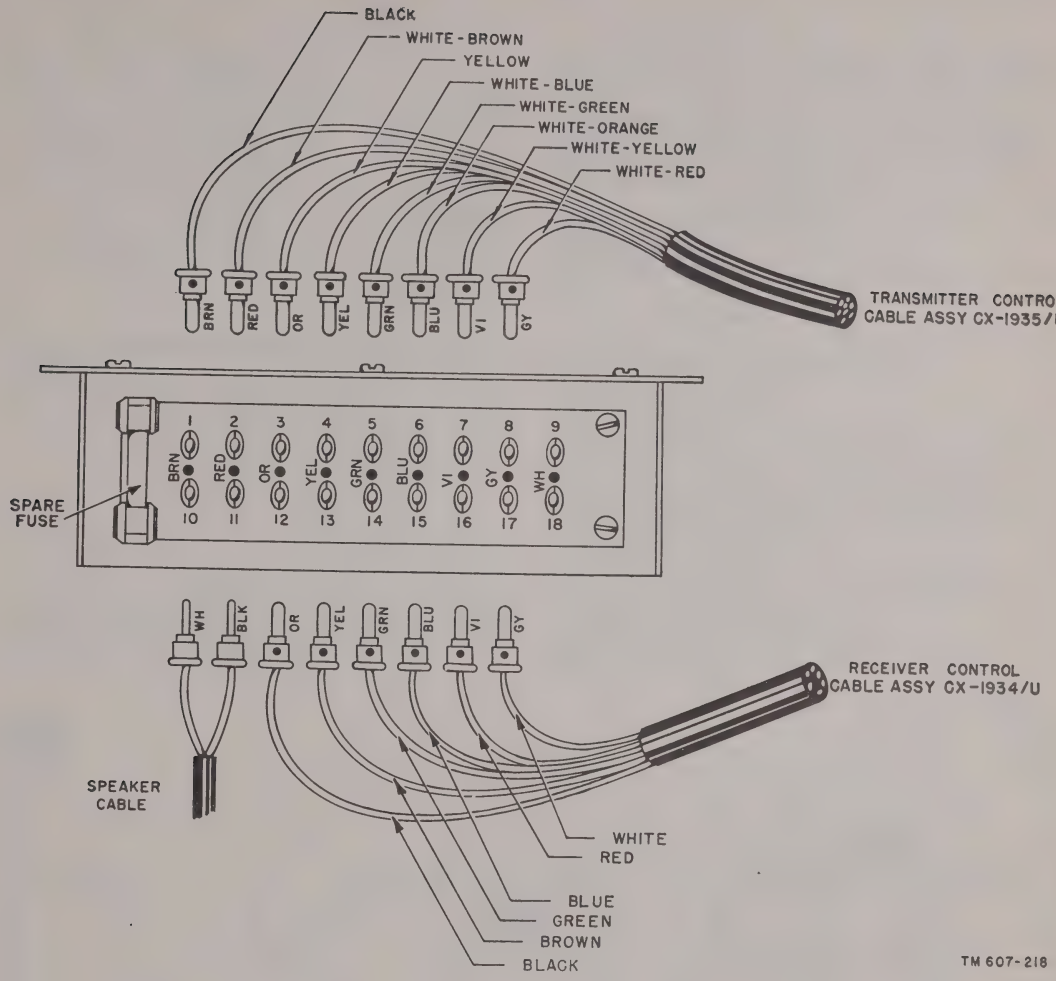


Figure 33. Radio Set Control C–1060/VRC–2X, showing pin jack connections.

Section II. CONTROLS

18. General

Haphazard operation or improper setting of the controls can cause damage to electronic equipment as well as inefficient performance. For this reason, it is important to know the function of every control and connector. The actual operation of the equipment is discussed in paragraphs 22 and 23.

19. Receiver Controls and Connectors

The following table lists the controls and connectors on the panel (fig. 34) of the receiver and describes their functions:

Control	Function
ANTENNA receptacle (J6).	Connector for coaxial cable from the receiver to transmitter connector.
METER SWITCH (SWL).	Switches the tip of METER jack J1 to the following parts of circuit during tuning procedure.
	Position — *Function* 1 — L-f (low-frequency) i-f amplifier grid circuit. 2 — First limiter grid circuit. 3 — Second limiter grid circuit. 4 — Discriminator output circuit. 5 — Discriminator output circuit.
CONTROL connector (J5).	An eight-pin female connector for the eight-pin male plug on receiver control cable.
METER jack (J1)	For connecting an external meter through a standard Plug PL–55 while tuning the receiver. Tip of plug is connected to negative meter terminal; sleeve to positive terminal.
SPEAKER jack (J8)	To connect speaker while tuning radio set. Connected in parallel with speaker jacks 10 and 11 on the control head.
POWER connector (P1).	A six-pin male connector for cable to RECEIVER connector on transmitter.

20. Transmitter Controls and Connectors

The following table lists the controls and connectors on the panel (fig. 35) of the transmitter and describes their function:

Control	Function
ANTENNA connector (J3).	Connector for coaxial cable to antenna.
RECEIVER connector (J5).	Connector for coaxial cable to receiver ANTENNA receptacle.

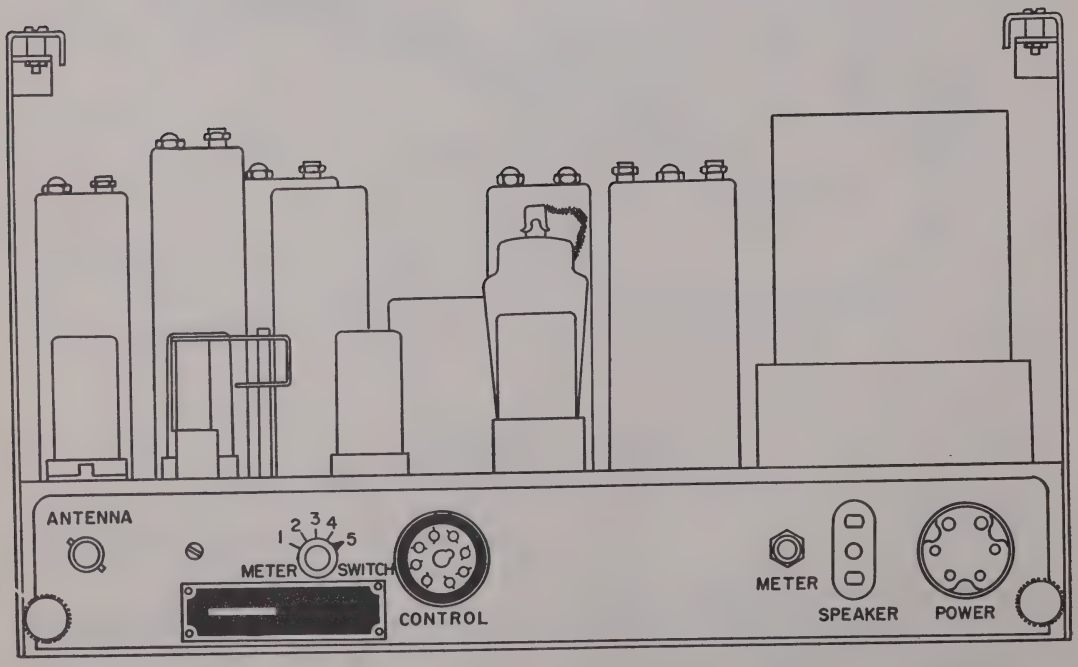


Figure 34. Radio Receiver R–435/VRC–2X, panel.

Control	Function
METER jack (J1)	For connecting an external meter through a standard Plug PL–55 while tuning the transmitter. Connect the tip of the plug to the negative meter terminal and the sleeve to the positive terminal for all METER SWITCH positions except P.A. (power amplifier), where the meter leads should be reversed.
METER SWITCH (S1).	Connects external meter to the following circuits in transmitter: *Position* 1 Oscillator grid. 2 First quadrupler grid. 3 Second quadrupler grid. 4 Doubler grid. 5 Power amplifier grid. P.A. Power amplifier cathode. MOD. Modulator grid.
MIC connector (J2)	For microphone plug, while tuning transmitter.
CONTROL connector (P1).	An eight-pin male connector for the 8-pin female plug on the transmitter control cable.
RECEIVER connector (J4).	A six-pin female receptacle for the cable which leads to the POWER connector in receiver.
POWER connector (P2).	Connector for battery cable (power input).
FUSE receptacle (F1).	Holds transmitter fuse.

21. Control Head Controls and Connectors

The operation of the radio set, once it has been set on frequency, is handled entirely from the control head. The controls (fig. 15) and connectors are listed in the following table:

Control	Function
Microphone receptacle (J1).	Receptacle for microphone cable.

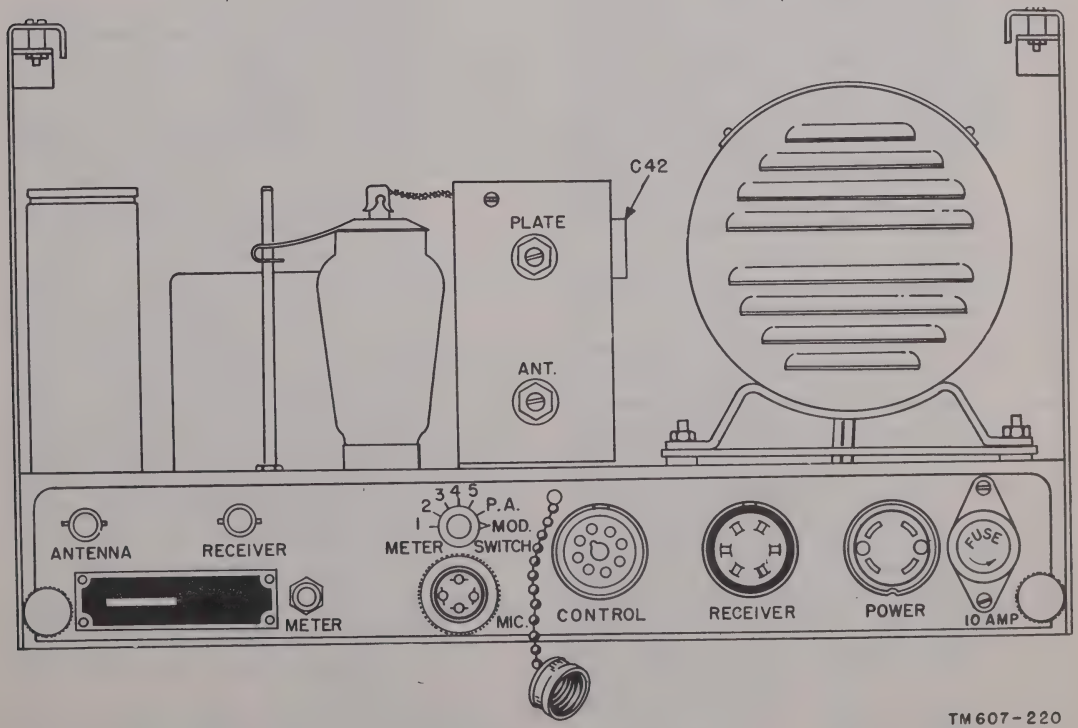


Figure 35. Radio Transmitter T–322/VRC–2X, panel.

Control	Function
Lamp (M2)	Green lamp which indicates that receiver is energized.
Lamp (M3)	Red lamp which indicates that transmitter is energized.
VOLUME control (R4).	Combined power on-off switch and volume control.
SQUELCH control (R3).	Determines noise level at which squelch action will start.

Section III. OPERATION UNDER USUAL CONDITIONS

22. Operating Procedure

a. Preliminary Checks. Before applying power to the equipment, check the following:

(1) *Cables.* See that all cables are attached securely to their proper receptacles.

(2) *Fuses.* Check the values of all fuses so that, if a short is present, the equipment will not be damaged. In Radio Set AN/VRC–2X there should be a 10-ampere fuse in the receptacle on the transmitter panel, a 5-ampere fuse in the receiver power supply, and a 25-ampere fuse in the fuse guard located in the power line to the battery. A spare 10-ampere fuse is mounted at the rear of the control head. For Radio Set AN/VRC–2, there should be a 50-ampere fuse in the transmitter panel and 20-ampere fuses on both the transmitter and receiver chassis. If the set is supplied with Radio Transmitter T–193B/VRC–2, a 20-ampere fuse is required on the panel of the transmitter and a 50-ampere fuse is required in the fuse box.

(3) *Crystals.* Check whether the h-f crystals have been installed in the transmitter and receiver. Crystal locations for the receiver and transmitter are shown in figures 75 and 92, respectively.

Caution: If the transmitter is energized without the oscillator crystal having been installed, or if the crystal goes out of oscillation, the loss of excitation resulting therefrom may cause damage to power amplifier tube V7 (fig. 120) because of excessive values of plate and screen currents being drawn.

(4) *Polarity of battery.* Check to verify that the equipment is wired to agree with the polarity of the battery installation in the vehicle (par. 15*c*).

b. Receiving.

(1) Turn VOLUME control in a clockwise direction until a click is heard. This closes the power line switch, and the receiver and transmitter filaments are energized. The green lamp on the control head should light.

(2) Wait 30 seconds for the tubes to become warm.

(3) Turn the VOLUME control in a clockwise direction to three-fourths of its working distance. A rushing noise should be heard.

(4) With no signal being received, turn the SQUELCH control in a clockwise direction until the rushing sound is just eliminated. Do not turn the control farther or weak signals may be missed.

(5) As the vehicle moves from one location to another (which has a different noise level), it may become necessary to readjust the SQUELCH control until the rushing sound is just eliminated with no signal being received.

(6) Keep the VOLUME control adjusted so that the received signal can be heard clearly.

c. Transmitting.

(1) Press the microphone push-to-talk button. The red lamp on the control head should light. The green lamp remains lit.

(2) Hold the microphone close to the

mouth and talk directly into it. Speak distinctly and in a normal tone.

(3) When transmission has been completed, release the push-to-talk button. The red lamp should go out.

Caution: Do not allow the dynamotor to run more than 5 minutes out of every 10 minutes.

Caution: Do not start the vehicle engine when the equipment is in operation. The heavy current drawn by the starting motor reduces battery voltage, and the power supply vibrators may stick and be damaged.

23. Stopping Procedure

To turn the equipment off, turn the VOLUME control in a counterclockwise direction as far as it will go. The green lamp on the control head should go off. When starting the equipment again, it may be necessary to readjust the SQUELCH control.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

24. General

The operation of Radio Set AN/VRC–2(*) may be difficult in regions where extreme cold, heat, humidity and moisture, sand conditions, etc., prevail. In paragraphs 25, 26, and 27, instructions are given on procedures for minimizing the effects of unusual operating conditions.

25. Operation in Arctic Climates

Subzero temperatures and climatic conditions associated with cold weather affect the efficient operation of the equipment. Instructions and precautions for operation under such adverse conditions follow:

a. Handle the equipment carefully.

b. Keep the equipment warm and dry. If possible, construct an insulated box for the receiver and transmitter.

c. Heavy coatings of frost will gather on mouth-type microphones in extreme cold weather when the microphones are used in the open air. Frost will form in the small holes of the microphone and will affect the clarity of the input signal. Rubber and plastic diaphragms have been designed to protect some types of microphones; use them when available. Try to have a spare microphone.

d. When equipment which has been exposed to the cold is brought into a warm room it will sweat until it reaches room temperature. This condition also arises when the equipment warms up during the day, after exposure during a cold night. When the equipment has reached room temperature, dry it thoroughly.

26. Operation in Tropical Climates

In tropical climates, the high relative humidity causes condensation of moisture on the equipment whenever the temperature of the equipment becomes lower than that of the surrounding air. To minimize this condition, place lighted electric bulbs under the equipment to keep the filaments lit. Make sure that the equipment is moisture-fungiproofed.

27. Operation in Desert Climates

a. Conditions similar to those encountered in tropical climates often prevail in desert areas. Use the same precautions to insure proper operation of the equipment.

b. The main problem that arises with operation in desert areas is the large amount of sand and dirt which enters the controls and the dynamotor. Keep the equipment as free from dust and dirt as possible.

c. Make frequent preventive maintenance checks. Pay particular attention to the lubrication of the dynamotor. Sand or dirt that come in contact with oil and grease result in grit which will damage the dynamotor.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. PREVENTIVE MAINTENANCE SERVICES

28. Tools and Materials Required

Since no tools and materials are supplied with Radio Set AN/VRC–2(*), it will be necessary to secure the following in order to perform proper preventive maintenance.

Common hand tools.
Clean cloth.
Sandpaper, No. 0000.
Crocus cloth.
Fine file or relay burnishing tool.
Paste metal polish (Sig C Stock No. 6G1516).
Solvent, Dry Cleaning (SD).
Contact burnishing tool.

Note. Gasoline will not be used as a cleaning fluid for any purpose. Solvent (SD) is available as a cleaning fluid through established supply channels. Oil, fuel, Diesel, may be used for cleaning purposes when solvent (SD) is not at hand. Carbon tetrachloride will be used as a cleaning fluid only in the following cases: where inflammable solvents cannot be used because of the fire hazard, and for cleaning electrical contacts, including relay contacts, plugs, commutators, etc.

Caution: Repeated contact of carbon tetrachloride with the skin or prolonged breathing of the fumes is dangerous. Make sure adequate ventilation is provided.

29. Special Tools Issued for Radio Set AN/VRC–2(*)

No special tools are issued with Radio Set AN/VRC–2(*).

30. Definition of Preventive Maintenance

Preventive maintenance is work performed on equipment (usually when the equipment is not in use) to keep it in good working order so that breakdowns and needless interruptions in service will be kept to a minimum. Preventive maintenance differs from trouble shooting and repair since its object is to prevent certain troubles from occurring. See AR 750–5.

31. General Preventive Maintenance Techniques

a. Use No. 0000 sandpaper to remove corrosion.

b. Use a clean, dry, lint-free cloth or a dry brush for cleaning.

(1) If necessary, except for electrical contacts, moisten the cloth or brush with solvent (SD); then wipe the parts dry with a cloth.

(2) Clean electrical contacts with a cloth moistened with carbon tetrachloride; then wipe them dry with a dry cloth.

c. If available, dry compressed air may be used at a line pressure not exceeding 60 psi (pounds per square inch) to remove dust from inaccessible places; be careful, however, or mechanical damage from the air blast may result. Do not use the air hose on speaker cones or meter movements.

d. For further information on preventive maintenance techniques, refer to TB SIG 178.

32. Use of Preventive Maintenance Forms

(figs. 36 and 37)

a. The decision as to which items on DA AGO Forms 11–238 and 11–239 are applicable to this equipment is a tactical decision to be made in the case of First Echelon maintenance

OPERATOR FIRST ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT
RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE | EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; (X) Defect corrected.
NOTE: Strike out items not applicable.

DAILY

NO.	ITEM	CONDITION S	M	T	W	T	F	S
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT *(receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories).* PAR. 33a(1)							
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR. 33a(2)							
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS. PAR. 33a(3)							
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS. PAR. 33b(7)							
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION. PAR. 33a(4)							
6	CHECK FOR NORMAL OPERATION. PAR. 24, PAR. 33a(5)							

WEEKLY

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS. PAR. 33a(3)		13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.	
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE. PAR. 33b(6)		14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES.	
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 33a(6)		15	INSPECT METERS FOR DAMAGED GLASS AND CASES.	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS. PAR. 33b(6)		16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHER-PROOFING. PAR. 33a(2)	
11	INSPECT CANVAS ITEMS, LEATHER, AND CARLING FOR MILDEW, TEARS, AND FRAYING.		17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES.		18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE.	

19 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

DA AGO FORM 1 MAY 51 11-238 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

TM 607-295

Figure 36. DA AGO Form 11-238.

SECOND AND THIRD ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT
RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE | EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; Ⓧ Defect corrected.
NOTE: Strike out items not applicable.

NO.	ITEM	COND.
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT (*receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories*). PAR. 33a (1)	
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR. 33a (2)	
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS. PAR. 33a (3)	
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS. PAR. 33b (7)	
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION. PAR. 33a (4)	
6	CHECK FOR NORMAL OPERATION. PAR. 24, 33a (5)	
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS. PAR. 33a (3)	
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE. PAR. 33b (6)	
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 33a (6)	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS. PAR. 33b (6)	
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES.	
13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES. PAR. 33b (8)	
14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES.	
15	INSPECT METERS FOR DAMAGED GLASS AND CASES.	
16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHERPROOFING. PAR. 33a (2)	
17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.	
18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE.	

NO.	ITEM	COND.
19	ELECTRON TUBES - INSPECT FOR LOOSE ENVELOPES, CAP CONNECTORS, CRACKED SOCKETS: INSUFFICIENT SOCKET SPRING TENSION; CLEAN DUST AND DIRT CAREFULLY; CHECK EMISSION OF RECEIVER TYPE TUBES. PAR. 33b (7)	
20	INSPECT FILM CUT-OUTS FOR LOOSE PARTS, DIRT, MISALIGNMENT AND CORROSION.	
21	INSPECT FIXED CAPACITORS FOR LEAKS, BULGES, AND DISCOLORATION. PAR. 33b (3), 38	
22	INSPECT RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR LOOSE MOUNTINGS; BURNED, PITTED, CORRODED CONTACTS; MISALIGNMENT OF CONTACTS AND SPRINGS; INSUFFICIENT SPRING TENSION; BINDING OF PLUNGERS AND HINGE PARTS.	
23	INSPECT VARIABLE CAPACITORS FOR DIRT, MOISTURE, MISALIGNMENT OF PLATES, AND LOOSE MOUNTINGS. PAR. 33b (2)	
24	INSPECT RESISTORS, BUSHINGS, AND INSULATORS, FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE.	
25	INSPECT TERMINALS OF LARGE FIXED CAPACITORS AND RESISTORS FOR CORROSION, DIRT AND LOOSE CONTACTS. PAR. 33b (8), 38	
26	CLEAN AND TIGHTEN SWITCHES, TERMINAL BLOCKS, BLOWERS, RELAY CASES, AND INTERIORS OF CHASSIS AND CABINETS NOT READILY ACCESSIBLE. PAR. 33b (6)	
27	INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS. PAR. 33b (5), 38	
28	CHECK SETTINGS OF ADJUSTABLE RELAYS.	
29	LUBRICATE EQUIPMENT IN ACCORDANCE WITH APPLICABLE DEPARTMENT OF THE ARMY LUBRICATION ORDER.	
30	INSPECT GENERATORS, AMPLIDYNES, DYNAMOTORS, FOR BRUSH WEAR, SPRING TENSION, ARCING, AND FITTING OF COMMUTATOR. PAR. 33b (10), 78	
31	CLEAN AND TIGHTEN CONNECTIONS AND MOUNTINGS FOR TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS. PAR. 33b (8)	
32	INSPECT TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS FOR OVERHEATING AND OIL-LEAKAGE. PAR. 33b (4), 38	
33	BEFORE SHIPPING OR STORING - REMOVE BATTERIES.	
34	INSPECT CATHODE RAY TUBES FOR BURNT SCREEN SPOTS.	
35	INSPECT BATTERIES FOR SHORTS AND DEAD CELLS.	
36	INSPECT FOR LEAKING WATERPROOF GASKETS, WORN OR LOOSE PARTS.	
37	MOISTURE AND FUNGIPROOF.	

38 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

DA AGO FORM 1 MAY 51 11-239 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

TM607-296

Figure 37. DA AGO Form 11-239.

by the Communication Officer/Chief or his designated representative, and in the case of Second and Third Echelon maintenance, by the individual making the inspection. Instructions for the use of each form appear on the reverse side of the form.

b. Circled items in figures 36 and 37 are partially or totally applicable to Radio Set AN/VRC–2(*). References in the ITEM block refer to paragraphs in text which contain additional maintenance information.

33. Performing Preventive Maintenance

a. Performing Exterior Preventive Maintenance. Perform the following preventive maintenance operations at the intervals indicated on maintenance checklists (figs. 36 and 37), unless these intervals are reduced by the local commander.

Caution: Tighten screws, bolts, and nuts carefully. Fittings tightened beyond the pressure for which they are designed may become damaged or broken.

(1) Check for completeness and satisfactory condition of the radio set. The components of the radio set are listed in paragraph 7 and are illustrated in figures 5, 6, 7, and 8.

(2) Check suitability of location and installation for normal operation (par. 22).

(3) Clean exterior of cases of components.

(4) Check operation of panel lights.

(5) Inspect all controls for binding, scraping, excessive looseness, worn or chipped parts, misalinement, and positive action.

(6) Inspect cords, cables, wires, and shock mounts for cuts, breaks, fraying, deterioration, kinks, and strain.

b. Performing Interior Preventive Maintenance.

Caution: Disconnect all power before performing the following operations. Upon completion, turn power on and check for satisfactory operation.

(1) Remove the covers from receiver and transmitter and thoroughly dust the chassis.

(2) Inspect variable capacitors for dirt, moisture, misalinement of plates, and loose mountings.

(3) Inspect resistors, bushings, capacitors, and insulators for cracks, chipping, blistering, discoloration, and moisture.

(4) Inspect transformers, chokes, potentiometers, and rheostats for overheating and oil leakage.

(5) Inspect fuses, fuseholders, and cable terminals for corrosion, cracks, and lack of tension sufficient to insure good contact.

(6) Inspect cases, mountings, antenna, and exposed metal surfaces for rust, corrosion, and moisture.

(7) Inspect electron tubes for loose envelopes, loose cap connectors, cracked sockets, and insufficient socket spring tension; clean away dust and dirt carefully; check emission of receiver type tubes.

(8) Clean dirt, corrosion, and moisture from all connections.

(9) Inspect moistureproof-fungiproof coating.

(10) Inspect dynamotor for brush wear, spring tension, arcing, and fitting of commutator.

(11) Correct all deficiencies noted.

Section II. LUBRICATION AND WEATHERPROOFING

34. Lubrication

The dynamotor is the only part of Radio Set AN/VRC–2X which may require lubrication. Under normal operating conditions, the ball bearings of the dynamotor have a sufficient quantity of grease for the average life of the dynamotor. However, under some severe or abnormal operating conditions, the grease thins out. If additional lubrication is needed, remove the end caps and grease retainers of the dynamotor and apply only Grease, Aircraft and Instruments (GL), or Standard Oil Beacon No.

325 grease, directly into the race of the bearings. Cover but do not pack the bearings. Avoid getting grease on the commutators and brushes.

35. Weatherproofing

a. General. Signal Corps equipment, when operated under severe climatic conditions, such as prevail in tropical, arctic, and desert regions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

b. Tropical Maintenance. A special moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. This treatment is explained in TB SIG 13 and TB SIG 72.

c. Winter Maintenance. Special precautions necessary to prevent poor performance or total operational failure of equipment in extremely low temperatures are explained in TB SIG 66 and TB SIG 219.

d. Desert Maintenance. Special precautions necessary to prevent equipment failure in areas subject to extremely high temperatures, low humidity, and excessive sand and dust are explained in SB SIG 75.

e. Lubrication. The effects of extreme cold and heat on materials and lubricants are explained in TB SIG 69. Observe all precautions outlined in TB SIG 69. Refer to paragraph 34 for detailed instructions.

36. Rustproofing and Painting

a. When the finish on the case has been badly scarred or damaged, rust and corrosion can be prevented by touching up bared surfaces. Use No. 00 or No. 000 sandpaper to clean the surface down to the bare metal; obtain a bright smooth finish.

Caution: Do not use steel wool. Minute particles frequently enter the case and cause harmful internal shorting or grounding of circuits.

b. When a touch-up job is necessary, apply paint with a small brush. Remove rust from the case by cleaning corroded metal with solvent (SD). In severe cases it may be necessary to use solvent (SD) to soften the rust and to use sandpaper to complete the preparation for painting. Paint used should be authorized and consistent with existing regulations. Refer to TM 9–2851.

Section III. TROUBLE SHOOTING AT ORGANIZATIONAL MAINTENANCE LEVEL

37. Scope

The trouble shooting and repair work that can be performed at the organizational maintenance level (operators and repairmen) is necessarily limited in scope by the tools, test equipment, and replaceable parts issued, and by the existing tactical situation. Accordingly, trouble shooting is based on the performance of the equipment and the use of the senses in determining which of the components is at fault, and in localizing the fault in that component to the defective stage or item, such as a tube or a fuse.

38. Visual Inspection

a. Failure of this equipment to operate properly usually will be caused by one or more of the following faults:

(1) Improperly connected battery cable.
(2) Worn, broken, or disconnected cords or plugs.
(3) Burned-out fuses.
(4) Relay contacts burned because of overloads.
(5) Wires broken because of excessive vibration.
(6) Defective tubes.
(7) Inactive (dirty or cracked) crystal.
(8) Defective primary power source.

b. When failure is encountered and the cause is not immediately apparent, check as many of the items listed above as is practicable before starting a detailed examination of the component parts of the system. If possible, obtain information from the operator of the equipment

regarding performance at the time trouble occurred.

c. Inspect the antenna system for obvious defects.

39. System Sectionalization of Trouble to a Component

System sectionalization consists of determining whether the trouble is in the transmitter, receiver, control head, antenna, power source, microphone, or loudspeaker.

a. Operate the radio set and observe its performance. See equipment performance checklist (par. 41) for normal operating indications.

b. If the entire radio set is dead, the trouble probably is in the battery or the main fuse.

c. If only one component is dead, the trouble is in that component and it is probably a fuse. Check the fuses at an early stage in trouble shooting. Do not continue to burn out fuses before looking elsewhere to determine the basic source of the trouble.

d. The over-all operation of the transmitter r-f (radio-frequency) stages can be checked by the antenna current reading (par. 93).

e. If the receiver exhibits unsatisfactory performance, such as excessive noise, howling, or weak signals, replace it with a good receiver, if available. If the trouble disappears, the replaced receiver is defective. If the trouble persists, the trouble is not in the receiver. It is probably in the vehicle or is due to conditions external to the vehicle.

f. Disconnect the antenna. If the symptoms persist, the trouble is in the installation or in the vehicle, and it may be ignition noise. If removal of the antenna causes the symptoms to become less pronounced or to disappear entirely, the trouble is in the antenna or it is external to the vehicle.

g. By the use of procedures similar to the simple checks given above, the trouble can be isolated to a particular unit.

40. Trouble Shooting, Using Equipment Performance Checklist

a. General. The equipment performance checklist (par. 41) will help the operator to locate trouble in the equipment. The list gives the item to be checked, the conditions under which the item is checked, the normal indications of correct operation, and the corrective measures the operator can take. *When using this list, perform the checks in the sequence indicated.*

b. Action or Condition. For some items, the information given in the action or condition column consists of various switch and control settings under which the item is to be checked. For other items it represents an action that must be taken to check the normal indication given in the normal indications column.

c. Normal Indications. The normal indications listed include the visible and audible signs that the operator should perceive when he checks the items. If the indications are not normal, the operator should apply the recommended corrective measures.

d. Corrective Measures. The corrective measures listed are those the operator can make without turning in the equipment for repairs. If the set is completely inoperative or if the recommended corrective measures do not yield results, trouble shooting is necessary. However, if the tactical situation requires that communication be maintained, and if the set is not completely inoperative, the operator must maintain the set in operation as long as it is possible to do so.

41. Equipment Performance Checklist

	Item No.	Item	Action or condition	Normal indications	Corrective measures
S T A R T	1	VOLUME control.	Turn control clockwise.	Click is heard as switch is closed. Green lamp on control head lights.	Tighten VOLUME control knob on shaft. Check battery and cable connections. Replace lamp, check fuses.
			Turn control clockwise three-fourths of total working distance, with SQUELCH control in extreme counterclockwise position.	Rushing noise is heard in loudspeaker after 30-second warmup period.	Check SQUELCH control to make sure it is in extreme counterclockwise position.
	2	SQUELCH control.	Turn control clockwise.	Rushing noise in loudspeaker ceases abruptly as control reaches point to start squelch action.	Tighten SQUELCH control knob on shaft.
E Q U I P. P E R F.	3	VOLUME control.	Signal being received. Turn control clockwise.	Volume of signal increases.	Tighten VOLUME control knob on shaft.
	4	SQUELCH control.	Control set at proper operating point.	No noise heard in loudspeaker when no signal is being received.	Advance setting of SQUELCH control in clockwise direction to point where noise stops.
				Weak signals are received clearly.	Retard setting of SQUELCH in counterclockwise direction until weak signal is heard clearly.
	5	Push-to-talk switch on microphone.	Press switch button.	No noise or signal heard.	Check microphone connections.
				Red lamp on control head lights.	Replace lamp.
			Release push-to-talk button.	Noise or signal heard. Red lamp on control head is extinguished.	
S T O P	6	VOLUME control.	Turn control to extreme counterclockwise position.	Click is heard as power switch opens. Green lamp on control head is extinguished.	Tighten VOLUME control knob on shaft.

c. The output of the first limiter is coupled to the second limiter tube V8 where further limiting action takes place to insure a constant amplitude signal to discriminator tube V9.

d. The discriminator demodulates the signal which is now an audio output and which is applied directly to first a-f amplifier V12.

e. The output of the discriminator is tapped and filtered, and the noise component is fed to noise amplifier tube V10, where it is amplified. The amplified noise signal then is rectified by tube V11 and applied to the squelch section of tube V12 (*e* above).

f. The rectified noise voltage is used to vary the grid bias of the first audio and squelch tube V12. When no signal is received, tube V12 is biased to cutoff, power amplifier tube V13 receives no excitation, and the speaker is quiet.

44. R-f Amplifier
(fig. 40)

The first stage of the receiver is an r-f amplifier which uses a type 6SG7GT (or 6SD7GT) tube and increases the sensitivity and selectivity of the receiver.

a. Operation. The signal input is coupled to the r-f amplifier stage through the antenna transformer composed of coils L1 and L2. This voltage is applied to the grid of V1, amplified, and impressed across the tuned primary of T2R. The signal is coupled to the mixer stage through the secondary of T2R and capacitor C10. Grid bias for V1 is developed across cathode resistor R2 which is bypassed by capacitor C3. Capacitor C1 is used to tune L2 to the desired frequency. Screen voltage is applied through dropping resistor R3, and rf on the screen is bypassed to ground by capacitor C4. Capacitor C9 resonates the plate coil of V1 to the desired frequency. Resistor R4 and capacitor C11 form a decoupling network for the plate circuit of V1. The tertiary winding of T2R, resonated by C75, forms a 4.3-mc wave trap for any undesired signals at the first i-f frequency. Capacitor C76 tunes the secondary of T2R to the desired frequency. Resistor R54 is used to lower the impedance of the antenna input circuit. This will prevent oscillation when the antenna is removed for alinement purposes.

b. Circuit Differences.

(1) Radio Receivers R–237/VR and R–237A/VR use a 6SD7GT tube in the r-f amplifier stage (fig. 41). Resistor R1 is in series in the grid circuit to protect tube V1. If a strong signal from a nearby transmitter causes the r-f voltage on the control grid to become greater than the bias voltage, the grid will draw current and the result will be a voltage drop across R1. This voltage drop biases the tube and limits the amount of plate current. Capacitor C2 is a grid-return bypass. Resistor R54 is not included. Transformer T2R is single-tuned and does not include the 4.3-mc wave trap.

(2) Radio Receiver R–237B/VR has the same r-f circuit as Radio Receiver R–435/VRC–2X (fig. 40) except that resistor R54 is not used in first few units procured. For equipment procured on Order No. 20591–Phila–49 and bearing serial numbers 108, 163, 165, 167, to 170, 172, and higher, R54 is added (fig. 40).

45. H-f Oscillator
(fig. 42)

a. Operation. The h-f oscillator tube (a type 6SG7GT or 6SD7GT) generates a signal which beats with the received signal to produce a 4.3-mc i.f. The tube is used in a *modified tri-tet* oscillator circuit and the frequency of the circuit is determined by crystal XTAL 1. See paragraph 84 for selecting proper crystal to produce the 4.3-mc i-f signal. The cathode coil is resonant to a frequency slightly lower than the lowest crystal frequency used. The plate circuit is tuned to the fourth or fifth harmonic, depending on the frequency of the received signal and the frequency of the crystal, by the primary of T1R and C7. Plate voltage is applied through R53, which is bypassed by C8. R7 is the screen voltage-dropping resistor and is bypassed by C6. The output of the oscillator is coupled to the mixer input by the secondary of T1R, which is tuned by C77, and then is coupled through C5 to the mixer. R6 functions as a grid leak resistor, across which oscillator bias is developed when grid current flows.

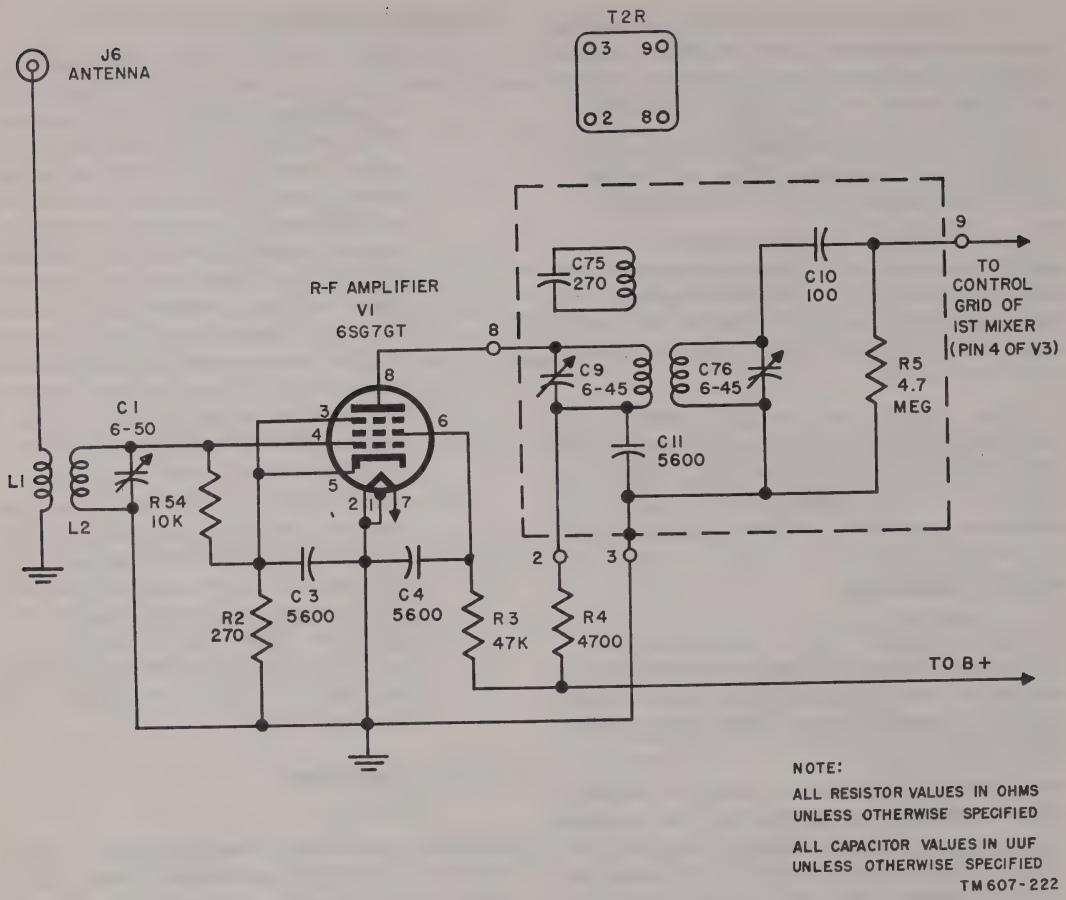


Figure 40. Radio Receiver R–435/VRC–2X, r-f amplifier, functional diagram.

b. Circuit Differences.

(1) In Radio Receivers R–237/VR and R–237A/VR, the h-f oscillator (fig. 43) is a 6SD7GT type tube. The output is taken directly from the plate of V2 to mixer tube V3. The values of R6 and C6 are 47,000 ohms and 2,000 $\mu\mu f$ (micromicrofarads), respectively. Single-tuned output transformer T1R is used. If it becomes necessary to replace transformer T1R, the double-tuned type shown in figure 42 is supplied and connections are made as shown.

(2) In Radio Receiver R–237B/VR the h-f oscillator circuit is identical with that shown in figure 42 except for filament connections.

46. Mixer
(fig. 44)

a. Operation. Both the signal frequency voltages and the h-f oscillator output voltages are fed into the control grid of mixer V3. The difference frequency (4.3 mc) is produced in the plate circuit and fed into the resonant circuits in transformer T3R. Capacitors C12 and C13 are used to tune the primary coil to 4.3 mc. Resistor R9 is directly across the resonant circuit and broadens the frequency response. Bias for the mixer is developed by the grid current through resistor R5. Resistor R8 is

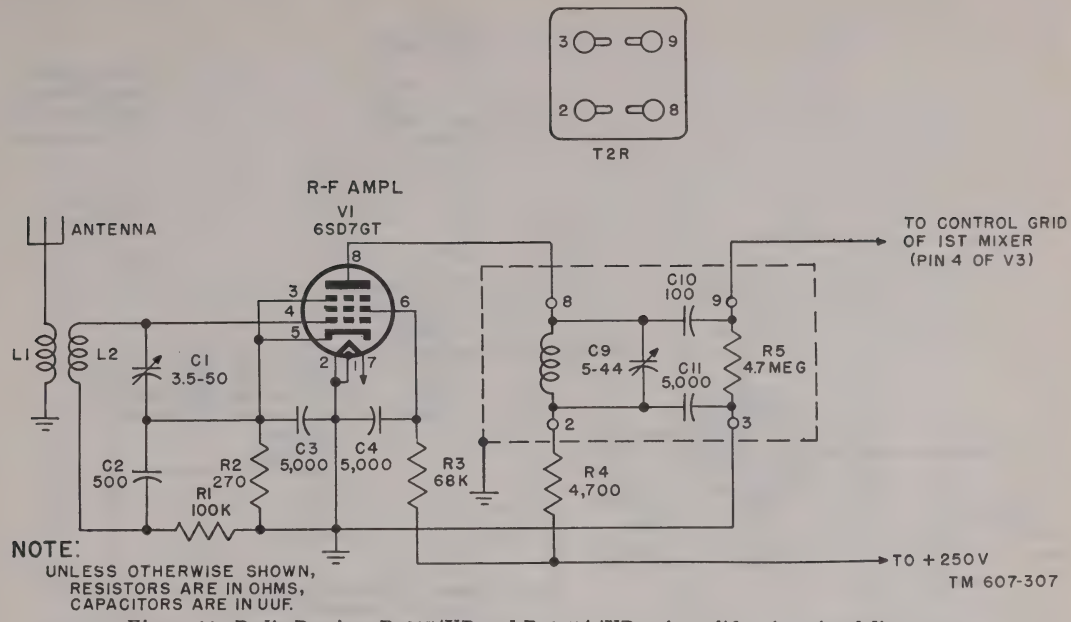


Figure 41. Radio Receiver R–237/VR and R–237A/VR, r-f amplifier, functional diagram.

used to decouple both the plate circuit and screen grid and is bypassed by the capacitor C17.

b. Circuit Differences.

(1) In Radio Receivers R–237/VR and R–237A/VR, the mixer V3 is a 6SD7GT type tube, and capacitor C17 has a value of 5,000 $\mu\mu$f (fig. 121).

(2) The mixer circuit of Radio Receiver R–237B/VR is identical with that shown in figure 44.

47. 4.3-mc I-f Amplifier
(fig. 45)

a. Operation. This stage uses a 6SG7GT tube in a conventional amplifier circuit arrangement. The i-f frequency provides good image rejection because of the wide separation between the desired and image frequencies. Tube V4 is a straight amplifier stage, with input at a frequency of 4.3 mc and output at the same frequency. Capacitors C14 and C15 (fig. 45) tune the secondary of T3R to 4.3 mc. The output circuit and coupling circuit to the next stage are contained in transformer T4R. The primary of the coupling transformer is tuned by fixed capacitor C20 and variable trimmer capacitor C19 which is used in alinement. Resistor R13 across the primary tuned circuit broadens the frequency response of the i-f transformer. R11 is the cathode bias resistor, which is bypassed by capacitor C18. R12 is the screen and plate voltage-dropping resistor, and C24 is the screen and plate circuit bypass capacitor. The grid return for V4 to the avc (automatic volume control) line is made through decoupling resistor R10 and bypassed by capacitor C16.

b. Circuit Differences.

(1) In Radio Receivers R–237/VR and R–237A/VR, the amplifier is a 6SD7GT type tube. Capacitors C18 and C24 have a value of 5,000 $\mu\mu$f, resistor R11 is 10 ohms, and R12 is 47K ohms. Capacitor C19 in transformer T4R has a range of 5 to 44 $\mu\mu$f.

(2) In Radio Receiver R–237B/VR, the circuit of the 4.3-mc i-f amplifier is identical with that in figure 45.

48. Converter
(fig. 46)

The converter stage uses a 6K8GT type triode-hexode converter tube (V5) in which the

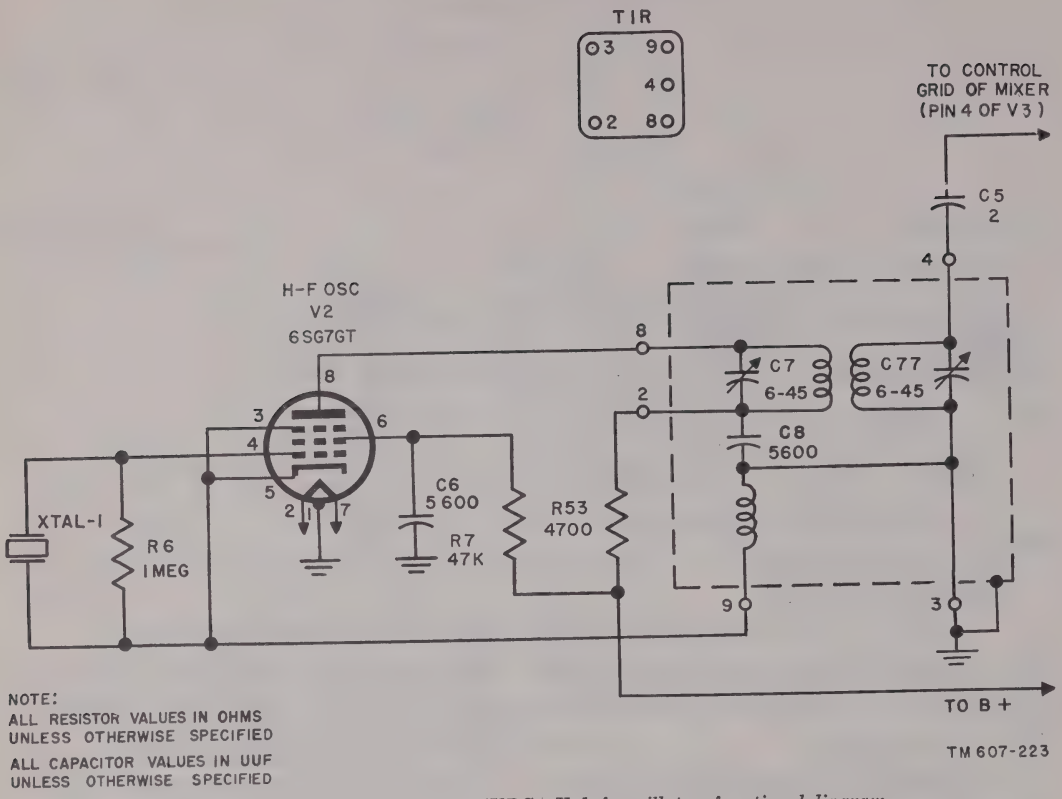


Figure 42. Radio Receiver R-435/VRC-2X, h-f oscillator, functional diagram.

triode section serves as a Pierce crystal-controlled oscillator and the hexode section serves as the mixer. The 4.3-mc signal from the first i-f amplifier stage is applied to the grid of the hexode section. The crystal-controlled signal (4,755 kc or 3,845 kc) generated by the triode section of V5 is applied to the hexode section internally since both sections have a common cathode and control grid. The output of V5 is tuned to the difference frequency, 455 kc.

a. Oscillator Section. The crystal is connected directly between plate and grid of the triode section of the tube. The oscillator output is coupled electronically into the mixer section, because the two sections of the tube have a common cathode. Resistor R15 (bypassed by capacitor C25) is the cathode bias resistor. Resistor R16 is the oscillator grid resistor, which is connected directly to the cathode, not to ground. The triode section, therefore, receives no bias from the voltage developed across the cathode resistor, but obtains bias from the voltage drop across R16 when rectified grid current flows. Resistor R17 is the plate resistor for the oscillator section.

b. Mixer Section. The plate circuit of the hexode section of the tube is contained in coupling unit T5R, and consists of a coil tuned to resonance at 455 kc by fixed capacitor C27, and by variable capacitor C26 (which is used for alinement). Resistor R18 is the plate circuit and screen resistor, and C30 is the screen and plate circuit r-f bypass capacitor. The mixer grid (cap of V5) is biased by the voltage drop across cathode resistor R15. Resistor R14, contained in transformer T4R, is the grid return resistor for the mixer, and it is bypassed by capacitor C23. The secondary of T4R is tuned by fixed capacitor C21 and variable trimmer capacitor C22 (which is used in alinement). The secondary coil of T4R completes the grid circuit of the mixer. Capacitors C21

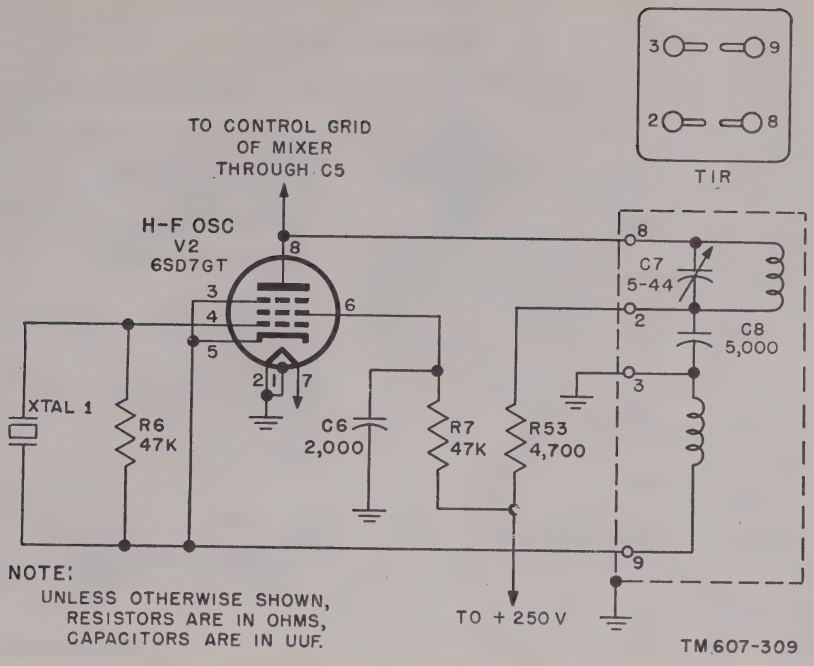


Figure 43. Radio Receivers R–237/VR and R–237A/VR, h-f oscillator, functional diagram.

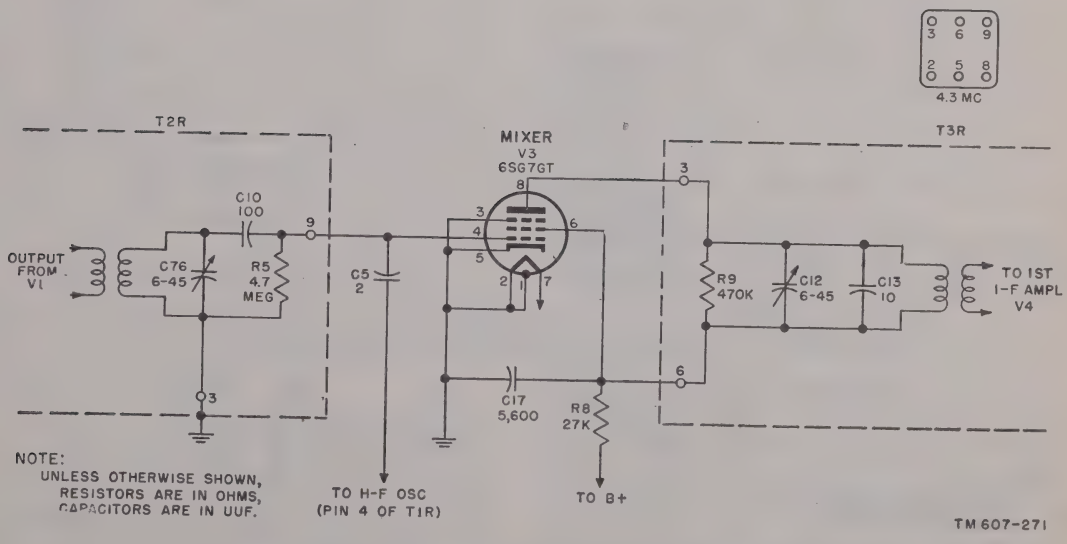


Figure 44. Radio Receiver R–435/VRC–2X, mixer, functional diagram.

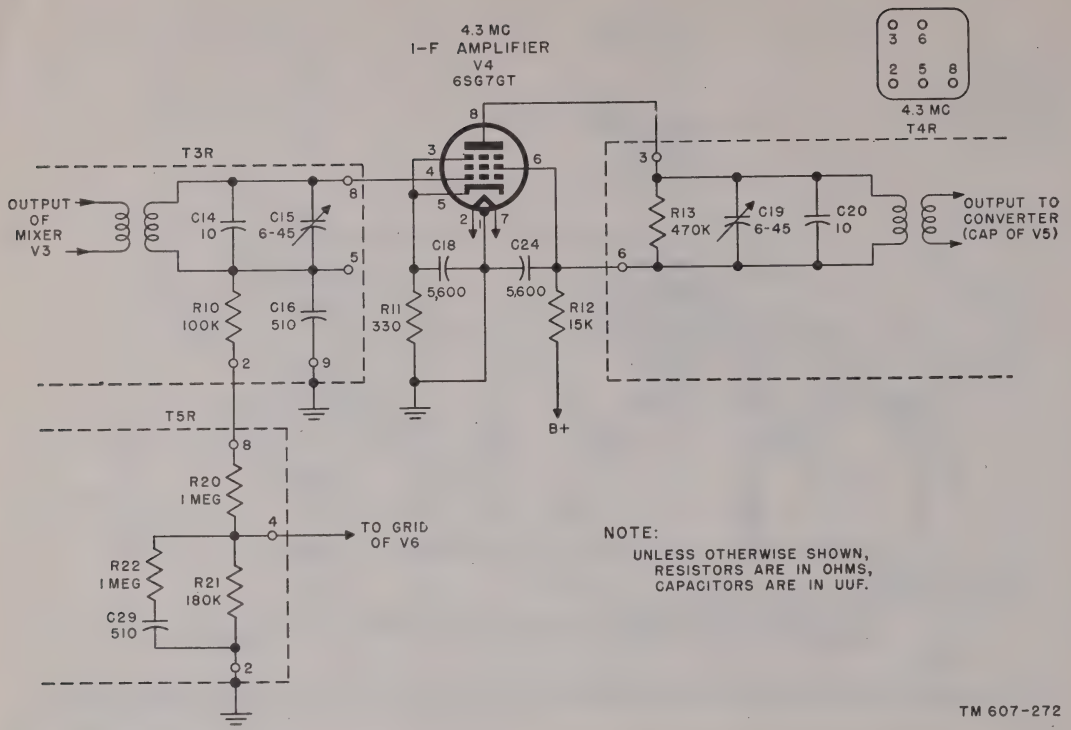


Figure 45. Radio Receiver R-435/VRC-2X, 4.3-mc i-f amplifier, functional diagram.

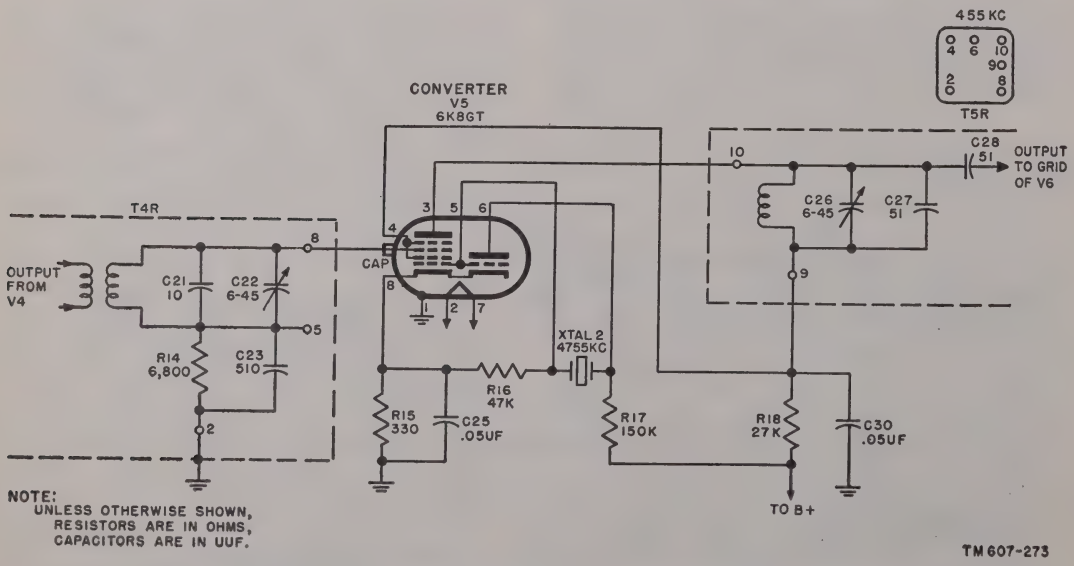


Figure 46. Radio Receiver R-435/VRC-2X, converter, functional diagram.

and C22 are used to tune the secondary to its fixed frequency of 4.3 mc.

c. Output Coupling. The 455-kc output of stage V5 is coupled from the plate circuit of the hexode section through coupling and blocking capacitor C28 to the grid of tube V6.

d. Circuit Differences.

(1) In Radio Receivers R–237/VR and R–237A/VR, resistor R14 in T4R (fig. 46) has a value of 27,000 ohms, and capacitor C22 in transformer T4R has a value of 5 to 44 $\mu\mu$f. These transformers may be replaced by the later models of T4R and T5R, if replacement is necessary.

(2) In Radio Receiver R–237B/VR the converter stage is identical with that shown in figure 46.

49. 455-kc I-f Amplifier
(fig. 47)

a. Amplifier Circuit. The 455-kc amplifier uses a 6SG7GT tube in a conventional amplifier circuit. This stage increases the sensitivity and selectivity of the equipment. The 455-kc signal taken from the output of V5 is applied to the control grid of V6, where it is amplified and coupled inductively to the following stage by T6R. The tuned output circuit of tube V6 is contained in transformer T6R, which includes a primary tuned by fixed capacitor C34 and variable trimmer capacitor C33. Both primary and secondary tuned circuits are shunted by resistors to broaden the frequency response. Resistor R25 is connected across the primary and resistor R26 is connected across the secondary of T6R. Cathode bias resistor R23 is bypassed by capacitor C31. Resistor R24 is the plate circuit and screen voltage dropping resistor, and capacitor C32 is the screen and plate circuit bypass capacitor.

b. AVC Circuit. The avc voltage is developed in the grid circuit of V5, which is contained in coupling unit T5R (fig. 47). With a strong signal, the grid draws current, and rectified grid current causes a voltage drop across resistor R21, making the ungrounded end negative. This voltage drop is added to the normal bias voltage produced across the cathode resistor. The stronger the signal, the more negative will be the voltage across R21, which then is fed back through filter resistors R20 and R10 (fig. 45) to the control grid of V4, where it is applied as bias. Hence the gain of the 4.3-mc i-f amplifier stage will be controlled by the avc voltage, since the greater the signal voltage, the greater will be the avc voltage, and the greater the bias applied to V4, which in turn, reduces its amplification. Resistor R22 and capacitor C29 constitute a decoupling network in the lead to the meter switch.

c. Circuit Differences.

(1) In Radio Receivers R–237/VR and R–237A/VR, a 6SD7GT type tube is used in the 455-kc i-f amplifier circuit. There is a slight difference in the values of the circuit elements of transformer T6R, which does not affect interchangeability of the transformers.

(2) In Radio Receiver R–237B/VR, the 455-kc i-f amplifier circuit is identical with that in figure 47, except for filament connections (par. 66).

50. First Limiter
(fig. 48)

The first and second limiter stages insure a constant voltage signal to the discriminator. Limiting materially reduces the audible noise output of the receiver without affecting the intelligence carried by the f-m signal. The limiting section of the positive half-cycle occurs in the grid circuits of the tubes. During the negative half-cycle, limiting occurs in the plate circuits.

a. Operation. The first limiter stage, using a 6SG7GT type tube (V7), is designed to remove the major amplitude variations from the 455-kc f-m signal. The tube is operated with a low voltage (110 volts) on both the plate and the screen. Resistor R29 is the grid leak bias resistor for V7 and is bypassed to ground by capacitor C37. The bias voltage developed at the grid end of R29 is coupled to squelch tube V12 through a filter circuit composed of R27, R19, and C38 (fig. 119). Resistor R28 is a multiplier resistor in position 2 of the meter circuit. The 455-kc signal is applied to the grid of V7 from the T6R secondary, which is tuned by fixed capacitor C35 and variable trimmer

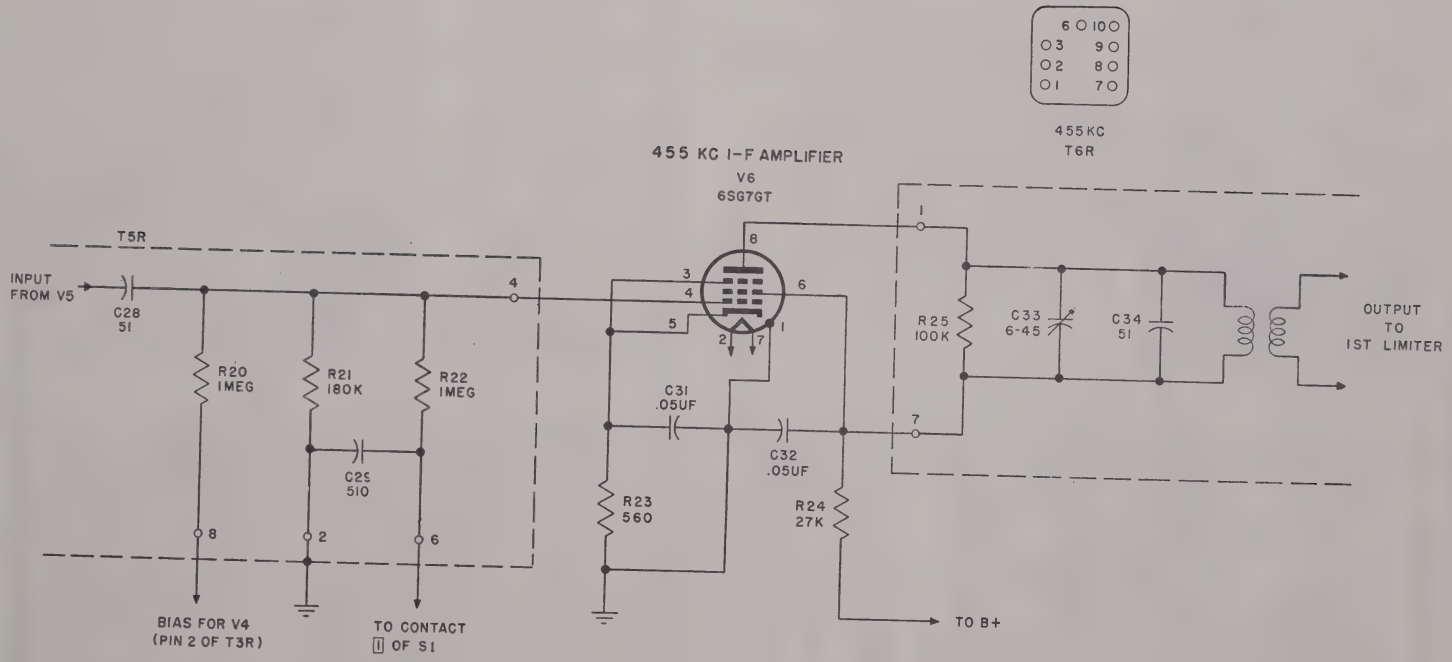


Figure 47. Radio Receiver R–435/VRC–2X, 455-kc i-f amplifier, functional diagram.

capacitor C36. The peak amplitudes of strong input signals extend over a greater voltage range than the usable dynamic range of the tube. The positive peaks of the signal cause V7 to draw grid current and the plate current to reach saturation. The negative peaks drive the tube to plate current cutoff. Thus, both peaks are leveled off when signals are of large amplitude. Any weak signals will be amplified in the usual manner and the amplified signal will be fed into the second limiter. When the grid draws current, grid leak bias is developed. The bias developed at the control grid is an indication of the i-f drive; therefore, maximum meter current at position 2 indicates maximum drive. Capacitors C40 and C41 tune the primary of T7R to 455 kc. Resistor R30 and capacitor C39 form a decoupling network for the plate circuit and the screen.

b. Circuit Differences.

(1) The first limiter circuit of Radio Receiver R–237(*)/VR is identical with that of Radio Receiver R–435/VRC–2X except for slight differences in values of circuit elements and the filament connections (par. 66).

(2) Radio Receivers R–237/VR and R–237A/VR use a 6SD7GT type tube in the first limiter stage.

51. Second Limiter

(fig. 49)

a. Operation. Second limiter tube V8 operates in the same manner as the first limiter and removes any remaining amplitude variations from the output of the first limiter. Weak signals having peak amplitudes within the operating range of the first limiter will have been amplified by the first limiter to an amplitude which will permit the second limiter to level off all the amplitude variations. The signal from the first limiter is applied to the grid of V8 through the secondary of T7R, which is tuned by capacitors C42 and C43. Plate and screen voltage is applied through decoupling resistor R33 which is bypassed by C45. Coupling to the discriminator is through transformer T8R. Resistor R31 is a meter multiplier for position 3 of the meter switch. Resistor R32, bypassed by C44, provides the bias for the second limiter stage.

b. Circuit Differences.

(1) The second limiter circuit of Radio Receiver R–237(*)/VR is identical with that of Radio Receiver R–435/VRC–2X except for slight differences in values of circuit elements and the filament connections (par. 66).

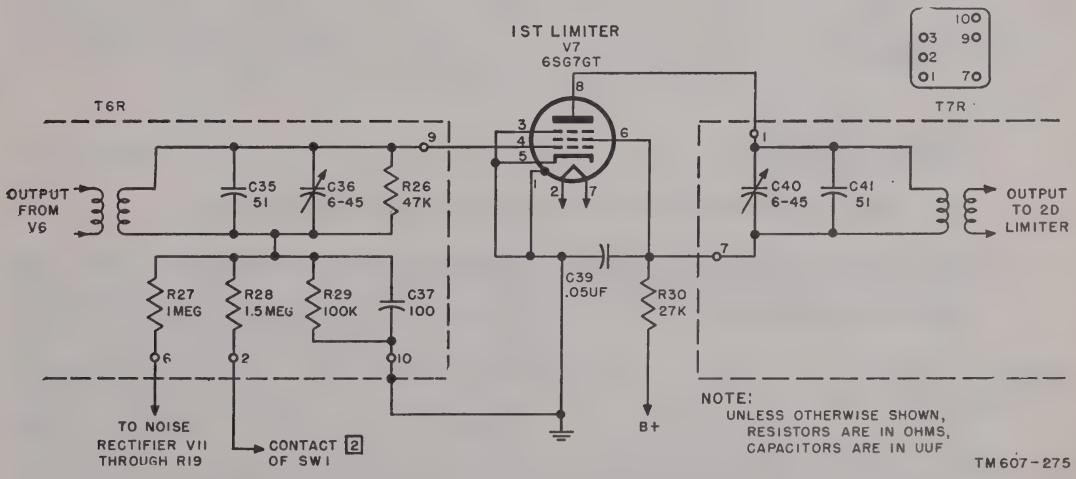


Figure 48. Radio Receiver R–435/VRC–2X, first limiter, functional diagram.

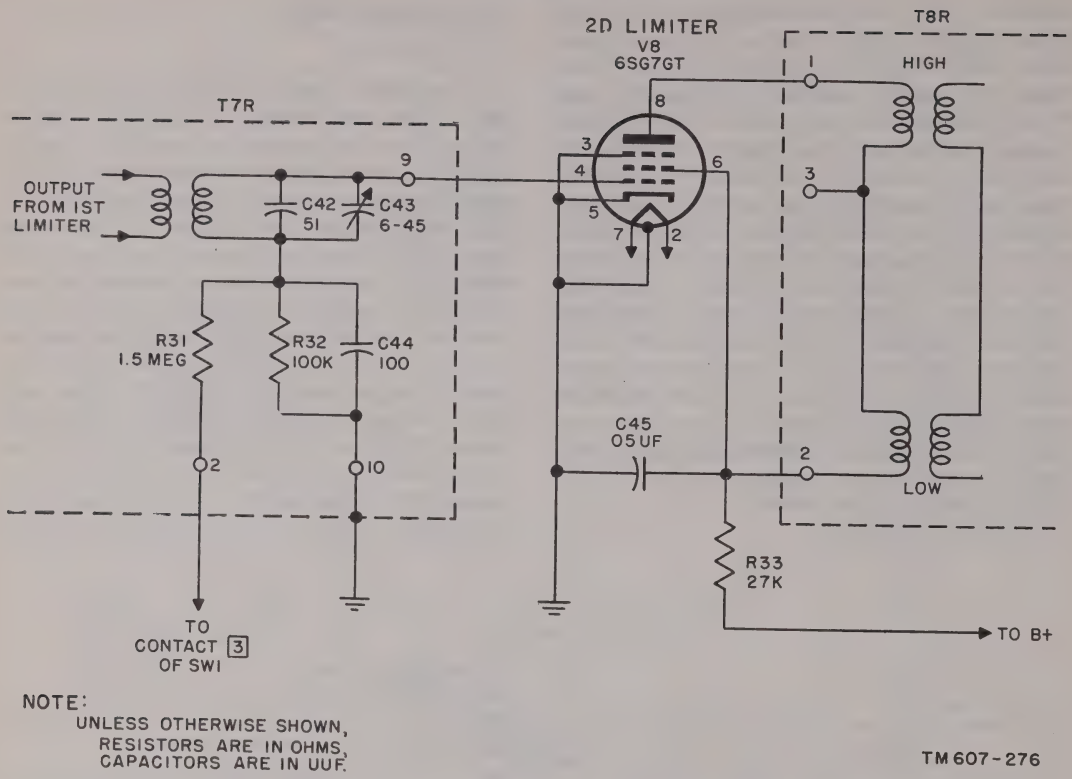


Figure 49. Radio Receiver R–435/VRC–2X, second limiter, functional diagram.

(2) Radio Receivers R–237/VR and R–237A/VR use a 6SD7GT type tube in the second limiter stage.

52. Discriminator

(fig. 50)

a. Function. The discriminator network consists of discriminator transformer T8R and a 6H6GT type tube (V9). The function of the discriminator circuit is to convert the frequency variations of the 455-kc signal into voltage variations which will occur at an audio rate. When the frequency of the i-f signal is exactly 455 kc (the nominal i-f frequency), the output voltages of the two diodes cancel. If the signal is frequency-modulated, a voltage will appear across diode load resistors R34 and R36 which will be proportional to the amount of frequency deviation. The discriminator used in this receiver consists of two resonant circuits, each of which feeds an individual diode. The diode loads (resistors R34 and R36) are connected so that the voltages developed in each one are added algebraically to obtain the output. Thus the amplitude of the output will be determined by the amount of frequency deviation and the frequency of the output will be determined by the rate of deviation.

b. Operation of Discriminator. T8R is composed of two separate transformers. The HIGH secondary section is tuned to 480 kc (which is 25 kc above the 455-kc input signal) by capacitors C46, and C47. The LOW section of T8R is tuned to 430 kc (which is 25 kc below the 455-kc input signal) by capacitors C50 and C51. Two half-wave rectifiers (one 6H6GT type tube) are connected in a back-to-back arrangement across each transformer secondary winding with a load resistor (R34 and R36) in series with each diode. When the voltage at the plate-end of either tuned circuit is positive, its recti-

fier conducts, current flows through the load resistors, and a voltage is developed across them. The direction of electron flow in each diode circuit is indicated by the arrows in figure 50. The polarity of the voltage drop across each load resistor (R34 and R36) is positive at the end toward its respective cathode, and negative toward its respective plate. Since the negative ends of the load resistors are connected, the two voltages oppose each other, and the resultant voltage between point A (pin 6 of T8R) and ground will be the difference between the individual voltages across the diode load resistors. The resultant polarity will be that of the greater voltage. When the intermediate frequency is at center frequency, equal currents are drawn, the voltages across R34 and R36 cancel, and the output at A is 0. When the input frequency is higher than the center intermediate frequency, more voltage is developed across the high-tuned circuit than across the low-tuned circuit, more current flows through R34 than through R36, and the polarity of the output from A to ground is positive. When the input frequency is lower than the center intermediate frequency, the reverse occurs; more current flows through R36 than through R34, and the output is negative. Capacitors C48 and C49 bypass i-f variations around the load resistors. Resistors R35 and R37 are multiplier resistors in the meter circuit.

c. Output Voltage Waveforms. Curves I and II (fig. 51) represents the voltages developed across load resistors R34 and R36. The resultant voltage at any one frequency is obtained by adding algebraically the individual diode load voltages. Only at 455 kc is the resultant voltage zero. From this illustration, it can be seen that if the input frequency of the f-m signal varies at the rate of 1,000 cps (cycles per second), the resultant voltage will be a 1,000-cycle audio voltage; frequency variations thus are changed into an audio signal. The greater the frequency swing of the f-m signal, the greater will be the amplitude of the audio signal.

d. Circuit Differences. The descriminator circuit of Radio Receiver R–237(*)/VR is identical with that of Radio Receiver R–435/VRC–2X, except for filament connections (fig. 72) and slight differences in the values of capacitors C48 and C49 (fig. 121).

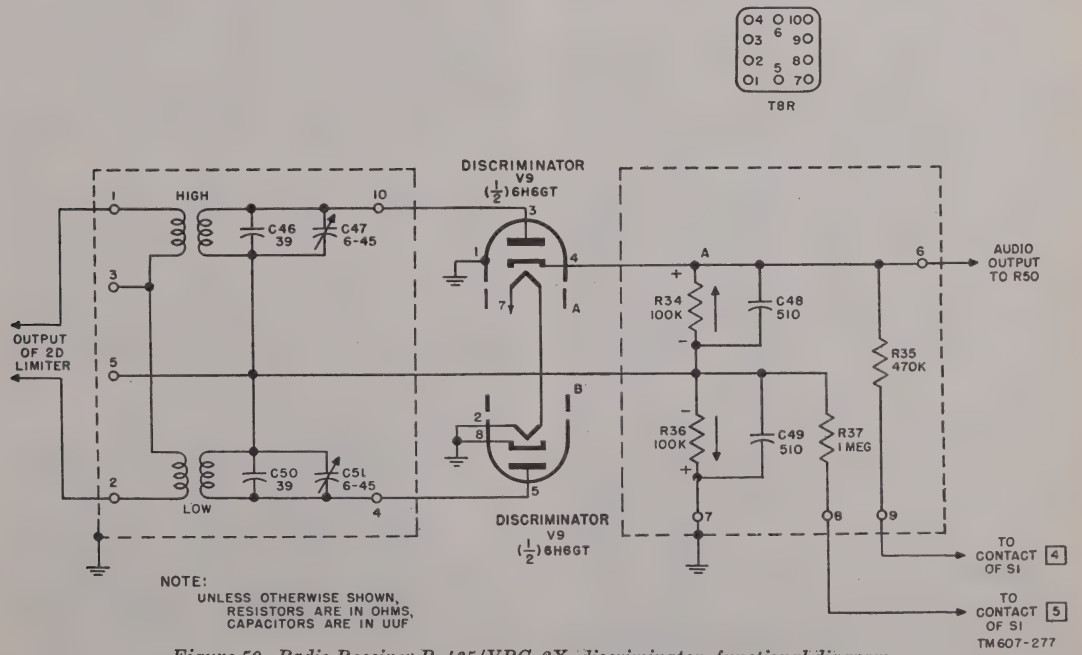


Figure 50. Radio Receiver R–435/VRC–2X, discriminator, functional diagram.

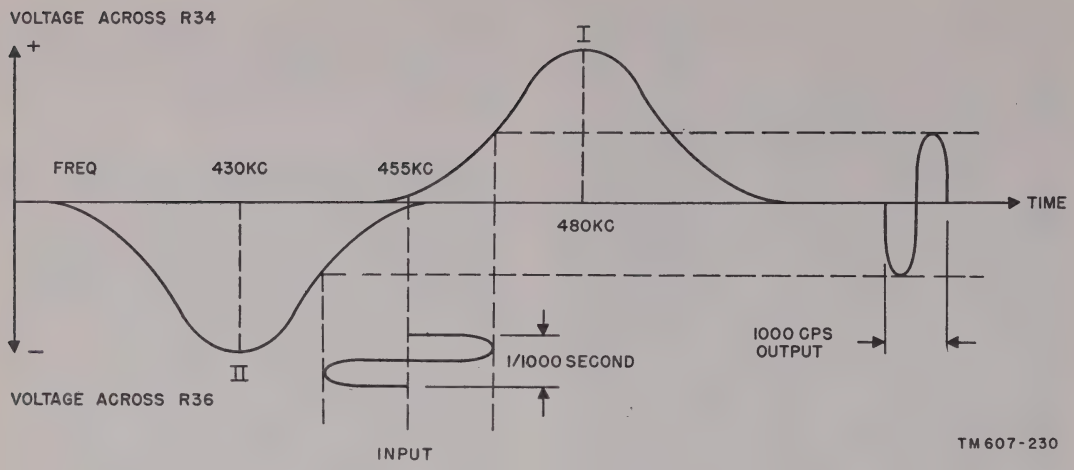


Figure 51. Voltage outputs across discriminator load resistances.

53. Noise Amplifier and Noise Rectifier (fig. 52)

The noise amplifier and noise rectifier stages are provided to permit the equipment to operate only when signals are received; thus the operator will hear only received signals and no noise between periods of signal reception.

a. Noise Amplifier. The output from the discriminator consists of an audio (voice frequency) component and an h-f component which is called the noise component. The noise component of the discriminator output is applied to the grid of V10 through a filter system composed of R38, C52, and R39. C52 presents a higher impedance to the audio output of the discriminator than to the noise output. This filter system is provided to insure that only the noise component frequencies will be applied to the noise amplifier. V10 is a conventional amplifier whose gain is varied by R3, the SQUELCH control in the control head. R3 varies the cathode bias of V10. C53 and C56 are bypass capacitors for the cathode and screen, respectively. Plate voltage is applied through voltage dropping and decoupling resistor R40. The amplified noise component is developed across the plate load consisting of L3 and C54. The plate load is resonated to the band of frequencies of the noise component so that the amplified output contains nothing but noise impulses. The output of V10 is coupled to the following stage by C55.

b. Noise Rectifier. The noise rectifier stage (V11) rectifies the output of V10 and applies it to the grid of the first limiter and to the grid of the squelch section of V12. The first diode builds up a positive potential to ground across C58. The second diode builds up a negative potential to ground across C57. Capacitors C57 and C578 discharge through R41 when the noise component is removed. The negative voltage across C57 is applied to the grid of V7, thereby reducing the gain of the first limiter. The positive potential across C58 is applied to the grid of V12 so that the squelch section will conduct. When the squelch section conducts (par. 54), the a-f amplifier section will be cut off, thus disabling the receiver. Resistor R42 and capacitor C59 form a low-pass filter (a long-time-constant) to prevent any a-f from operating the squelch (fig. 119).

c. Circuit Differences.

(1) Radio Receiver R–237/VR uses a 6SD-7GT type tube as the noise amplifier instead of the 6SG7GT. Resistor R3 has a value of 200 ohms, C52 and C54 are 2,000-$\mu\mu$f capacitors, and C57 and C58 are 5,000-$\mu\mu$f capacitors. Filament connections are as shown in figure 72.

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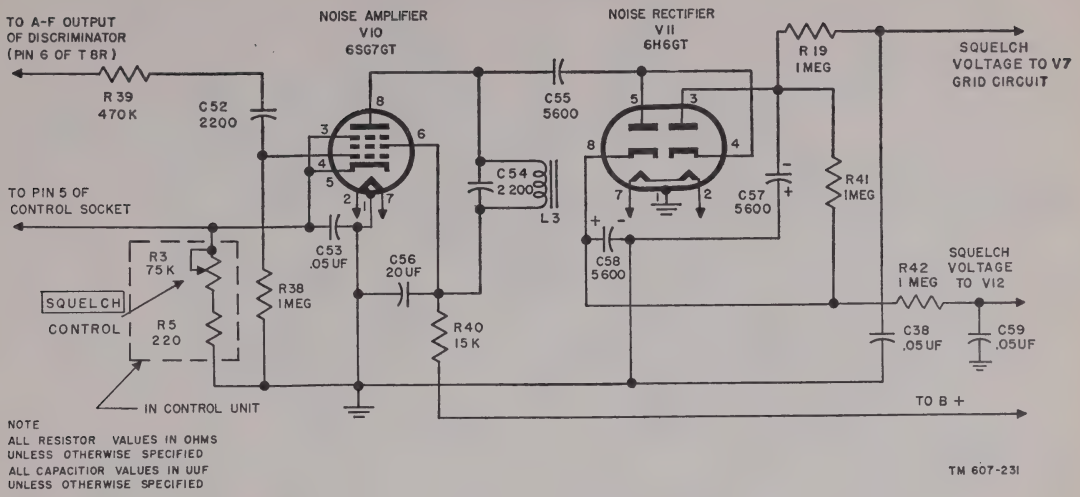


Figure 52. Radio Receiver R–435/VRC–2X, noise amplifier and noise rectifier, functional diagram.

(2) In Radio Receiver R–237A/VR, a 6SD-7GT type tube is used as the noise amplifier. Resistor R3 has a value of 50,000 ohms, C52 and C54 are 2,000-$\mu\mu$f capacitors, and C57 and C58 are 5,000-$\mu\mu$f capacitors.

(3) In Radio Receiver R–237B/VR, the noise amplifier and rectifier circuit is identical with that of Radio Receiver R–435/VRC–2X, except for filament connections (fig. 72)

54. Squelch and First A-f Amplifier (fig. 53)

The squelch circuit is designed to disable the receiver output when the desired carrier is not received. In this manner, hiss and undesirable background noise, normally present under no-signal conditions, are eliminated. Operation of the squelch circuit is accomplished by allowing plate current flow in the squelch portion of tube V12 when no carrier is being received.

a. Squelch. The squelch section of V12 functions as a d-c amplifier, which provides cut-off bias for the first a-f amplifier when no signal is received. The grid leak bias of V7 is applied to the squelch grid of V12 through resistors R27, R19, R41, and R42. Under a no-signal condition, this bias voltage from V7 is small enough to allow the squelch section of V12 to conduct. The positive output of the noise rectifier also is applied to the squelch grid, and causes the squelch section of V12 to conduct more heavily. When the squelch conducts, plate current flows through R44 and causes a voltage drop across it. The positive end of R44 is connected to the cathode of the a-f amplifier section of V12 through R46. The negative or less positive end of R44 is connected to the grid of the amplifier section of V12 through R43. Thus, the voltage drop across R44 increases the bias for the amplifier section of V12 and is sufficient to prevent the amplifier from operating. When a signal is received, the grid leak bias on V7 is increased. This increase is coupled to the squelch grid of V12 and the squelch is cut off. When the squelch no longer conducts, the current flow through R44 ceases and the extra bias on the a-f amplifier is reduced. The amplifier then operates normally, with cathode bias provided by R46. The voltage divider, composed of R47 and R45, is used to provide a low positive voltage for the plate of the squelch section of V12. Capacitors C60 and C61 are bypass capacitors used in the plate circuit of the squelch and cathode circuit of the a-f amplifier, respectively.

b. First A-f Amplifier. When signals are received, the audio output of the discriminator is coupled to the grid of the a-f amplifier through a filter system composed of R50, C64, C63, and R49. R50 and C64 de-emphasize the higher

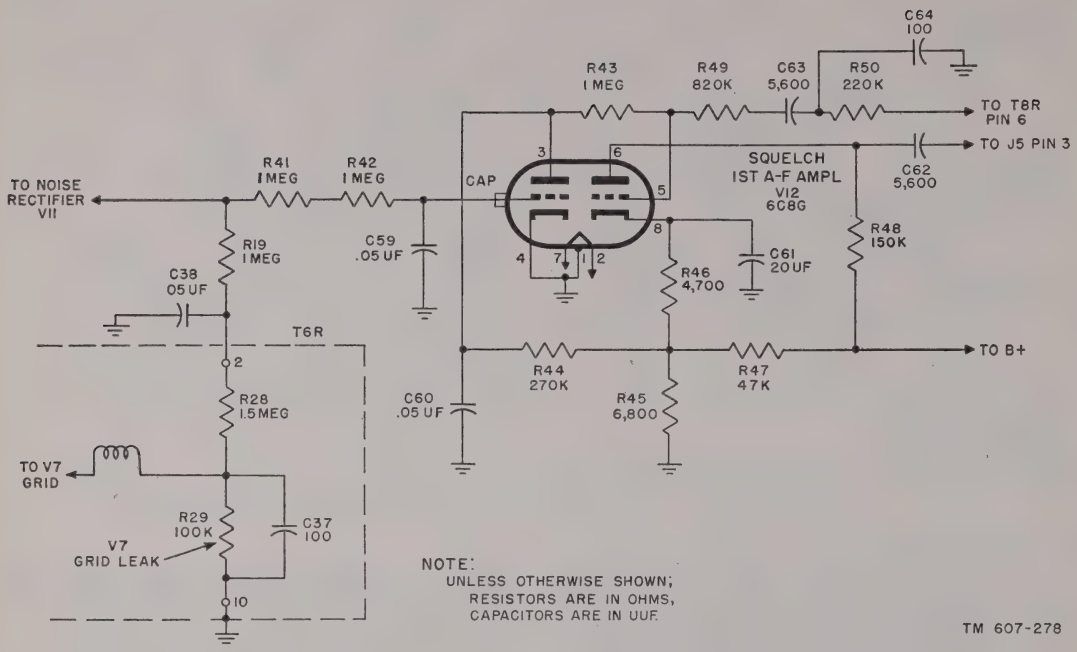


Figure 53. Squelch and first a-f amplifier, functional diagram.

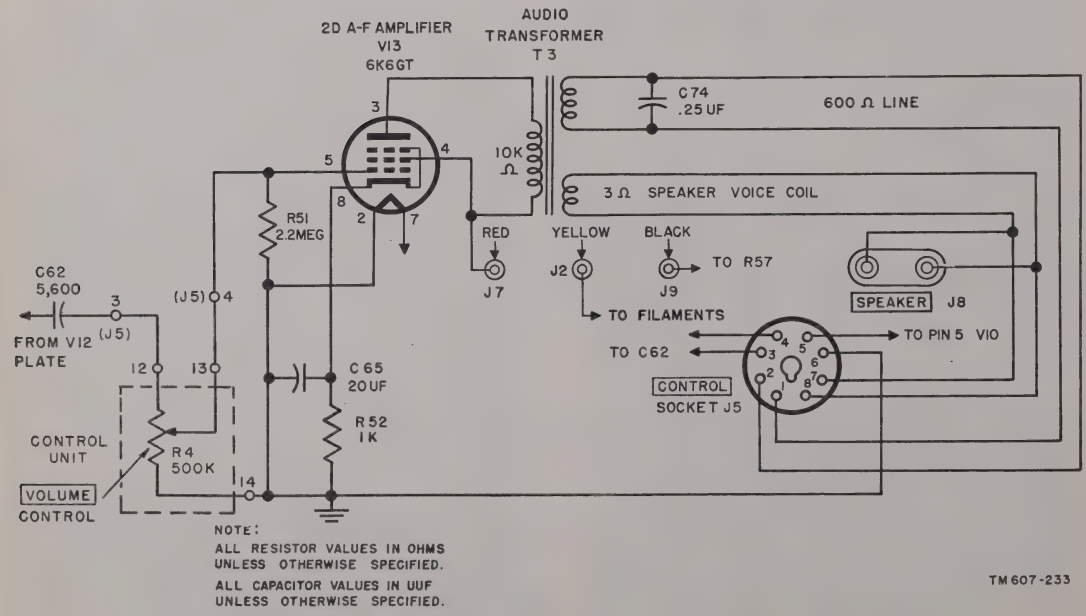


Figure 54. Radio Receiver R–435/VRC–2X, second a-f amplifier, functional diagram.

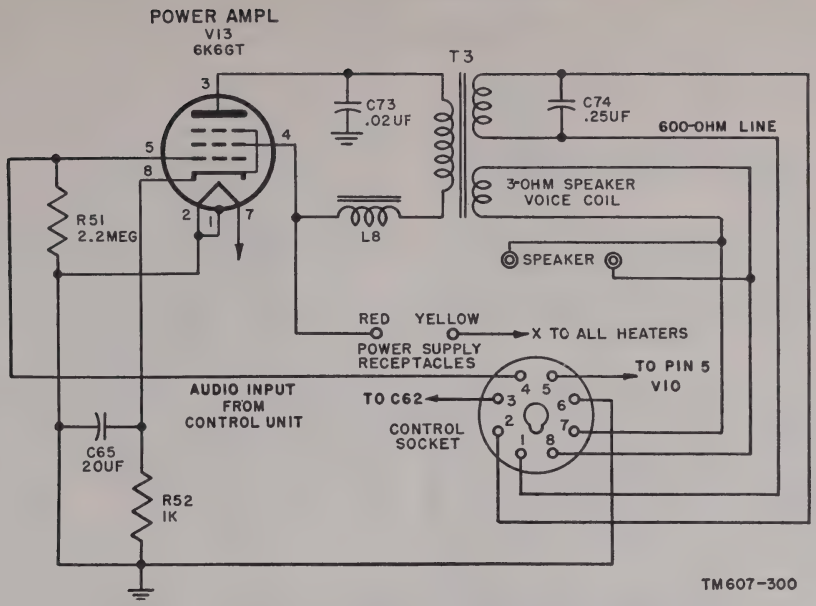


Figure 55. Radio R–237/VR, second a-f amplifier, functional diagram.

audio frequencies. The amplified output appears across load resistor R48 and then is coupled to the grid of the second a-f amplifier through C62 and the VOLUME control (R4) in the control head (fig. 70).

c. Circuit Differences.

(1) In Radio Receivers R–237/VR and R–237A/VR, the squelch and first a-f amplifier circuits are identical with that of Radio Receiver R–435/VRC–2X (fig. 53), except for the values of C61, C62, C63, and R48, which are 15 μf (microfarads), 5,000 $\mu\mu$f, 5,000 $\mu\mu$f, and 270,000 ohms respectively (fig. 121). Filament connections are as shown in figures 72 and 121.

(2) In Radio Receiver R–237B/VR, the squelch and first a-f amplifier circuits are identical with that of Radio Receiver R–435/VRC–2X, except for filament connections, which are shown in figures 72 and 124.

55. Second A-f Amplifier

(figs. 54 and 55)

a. Second A-f Amplifier. This stage (V13, a 6K6GT type tube) increases further the audio output of the receiver to provide sufficient drive for a speaker. The audio output of first a-f amplifier tube V12 is fed into the control head, and the volume level is selected manually. Resistor R4 (in the control head) is the VOLUME control. The audio input is applied to the control grid and is amplified in a conventional manner. Bias is developed across cathode resistor R52. R51 is the grid return resistor. Screen voltage is applied directly, and plate voltage is applied through the primary of T3. The output voltages are available at the impedance level of 3 ohms for the voice coil of the speaker, and 600 ohms for remote operation. Capacitor C74 improves the frequency response of the 600-ohm output.

b. Circuit Differences.

(1) In Radio Receiver R–237/VR, the second audio stage is similar to that of Radio Receiver R–435/VRC–2X, but has additional components as shown in figure 55. Capacitor C73 and inductor L8 are used to attenuate the higher audio frequencies.

(2) In Radio Receiver R–237A/VR, the second audio stage is identical with that of Radio Receiver R–237/VR (fig. 55).

(3) In Radio Receiver R–237B/VR, the second audio stage is identical with that of Radio Receiver R–435/VRC–2X (fig. 54), with the exception of jack J9, which is not required.

56. Power Supply PP–721/VRC–2X

(fig. 56)

Power Supply PP–721/VRC–2X is a conventional vibrator pack which is mounted on the same chassis with the receiver, and supplies all power requirements of Radio Receiver R–435/-VRC–2X.

a. Components. The major components of the power supply are the 24-volt vibrator E1, the power transformer T1, and two full-wave rectifier tubes 6X5GT. The tubes, V1 and V2, are connected in parallel. The 24-volt input at pin 6 of POWER plug P1 is filtered by choke L1 and capacitors C1 and C2. Choke L2 provides additional filtering for the receiver filament circuits. The vibrator input and the receiver filament circuits are protected against overload by FUSE F1. C5 bypasses to ground any r-f voltages appearing in the l-v input. C7 provides additional capacity for bypassing r-f variations to ground.

b. Vibrator Operation. Current flows from ground to pin 1 of the vibrator, through the driving coil to pin 2, then through half of the primary of transformer T1, out through the center tap pin 2, and through filter choke L1 and FUSE F1, to return to the battery. When the driving coil is energized, a magnetic field is developed which attracts the reed until it closes contact 2. When contact 2 is closed, the driving coil is shorted out, its magnetic field collapses, and the reed springs back to neutral position. Its momentum carries it beyond the neutral position until it closes contact 3. Battery current then flows through the second half of the primary of T1, but in the opposite direction. The reed is returned by spring action to the neutral position and is accelerated by the magnetic pull of the driving coil through which current is flowing again. The reed is pulled again to contact 2 and short-circuits the driving coil. The cycle then is repeated. The driving coil is short-circuited periodically. As the reed vibrates, battery current flows alternately in opposite directions through each half of the primary of T1. Thus an alternating current is produced in the primary of T1, which is stepped up in the secondary to approximately 265 volts. Capacitor C8 helps prevent sparking across the E1 contacts and acts as an r-f filter in the vibrator primary circuit. Capacitor C6 is connected across the primary of T1 and improves the current wave developed by the vibrator. The buffer circuit formed by C3, C9, and R1 further improves the waveform.

c. Rectifier. The output of the secondary of T1 is rectified by V1 and V2, with one section of each tube conducting on each half-cycle of the output of T1. The rectified output is filtered by capacitors C4A and C4B, and choke L3. Resistor R2 is a bleeder that aids in regulation by maintaining a minimum current through the output filter circuit.

d. Terminals. The battery input to the vibrator is from pin 6 of POWER plug P1 and through FUSE F1. The 24-volt input is filtered and is applied through choke L2, plug P3, and jack J2 (fig. 119) to the receiver filaments and to thermal resistor R57 where it is dropped to approximately 12 volts, which then is used for the series-connected filaments of the rectifier tubes. The 12-volt potential from R57 is applied to the rectifier filaments through jack J9 and plug P4. The h-v output from the rectifier is connected to pin 4 of POWER plug P1, through the power interconnector cable to pin 4 of RECEIVER jack J4 in the transmitter (fig. 120), and then to switching relay RY3. In the unenergized receive position of relay RY3, the hv is returned to the power supply through pin 3 of RECEIVER jack J4 and pin 3 of POWER plug P1 and then is applied to the receiver plate circuits through plug P2 which connects to jack J7 (fig. 119).

e. Circuit Differences.

(1) The power supply used in Radio Receiver R–237/VR is designed for 6-volt operation. It is similar in design to Power Supply PP–721/VRC–2X but differs in several circuit elements as shown in figure 57. Resistors R1 and R2 (fig. 57) are hash suppressor resistors. A single buffer capacitor, C3, is placed across the secondary of transformer T1. The rectifier and

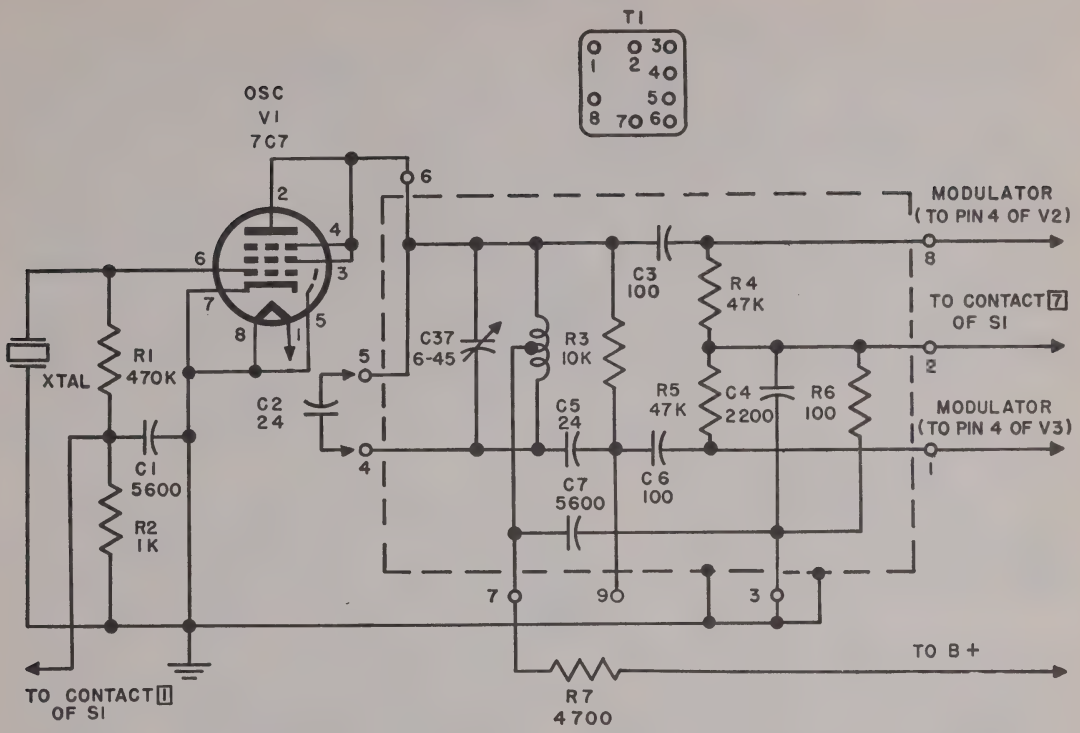


Figure 59. Radio Transmitter T–322/VRC–2X, oscillator, functional diagram.

with the current through it, but the voltage across C5 lags the current through it by 90°. Therefore, the voltages across C5 and R3 are 90° out of phase. Thus, although the r-f voltages at the two ends of the tuned circuit are 180° out of phase, the r-f voltages at the two ends of R3, (with respect to ground) are only 90° out of phase. The voltage across the upper half of the tank coil is applied through C3 to grid 4 of V2 (fig. 60). The vector sum of the voltage across the lower half of the tank coil and the voltage across C5 is applied to grid 4 of V3 through C6. This voltage is 90° out of phase with the voltage applied to grid 4 of V2. Resistor R7 and capacitor C7 form a decoupling network for the plate and screen. Capacitor C2 is used only when the transmitter operates at frequencies below 33 mc.

c. Circuit Differences.

(1) The oscillator circuits of Radio Transmitters T–193/VRC–2 and T–193A/-VRC–2 are identical with that of Radio Transmitter T–322/VRC–2X, except for differences in the values of capacitors C1, C4, C5, C7, and C37 (figs. 122 and 123).

(2) The oscillator circuit of Radio Transmitter T–193B/VRC–2 is identical with that of Radio Transmitter T–322/VRC–2X.

59. Modulator Stage

(fig. 60)

To produce the required f-m signal, two 7A8 type tubes (V2 and V3) are connected as a

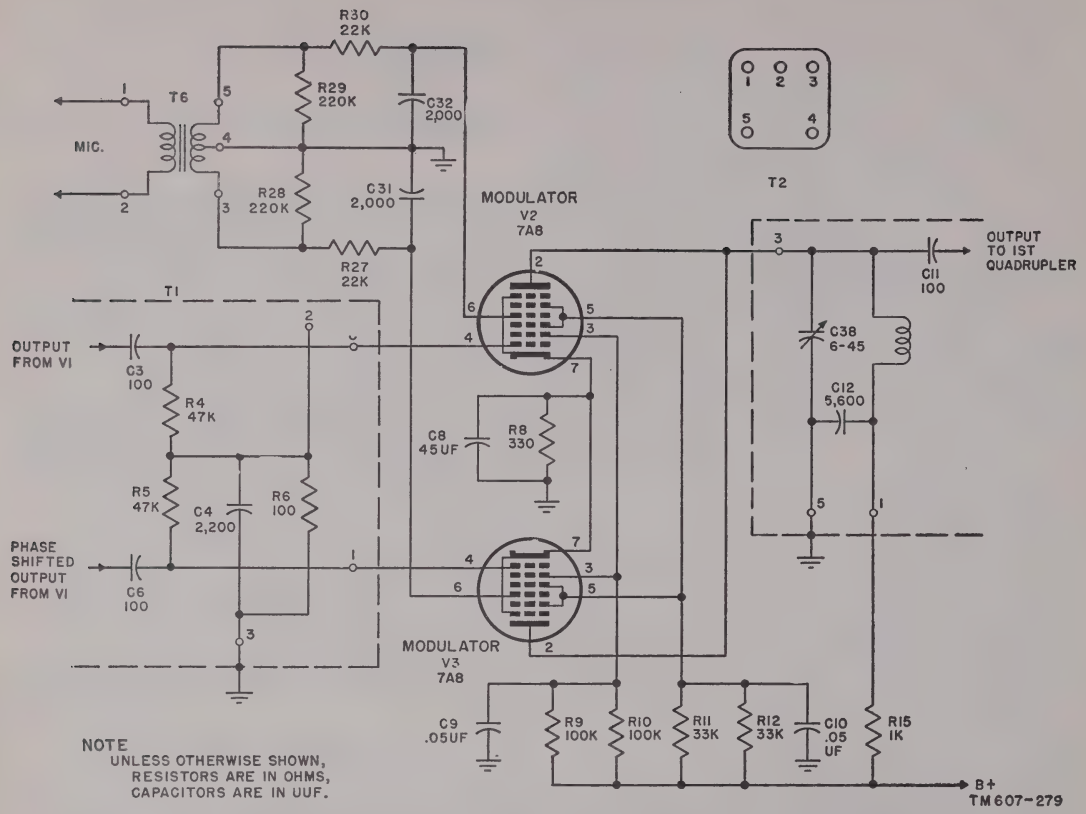


Figure 60. Radio Transmitter T-322/VRC-2X, modulator, functional diagram.

balanced modulator. The output of the modulator is phase-shifted by an amounted determined by the amplitude and frequency of the audio signal and at a rate determined by the frequency of the audio signal.

a. General. Voice energy at the microphone causes a pulsating dc (direct current) in the primary of microphone transformer T6. The a-c voice component appears across the secondary of T6. The secondary of T6 is center tapped to ground. This permits two a-f outputs, opposite in polarity, or 180° out of phase, to be taken from the ends of the secondary of T6. These 180° out-of-phase a-f outputs from T6 are applied to the signal grids of V2 and V3. The oscillator inputs to the modulator tubes are 90° out of phase (par. 58). The mixing of the r-f and a-f voltages in the modulator tubes results in a varying phase shift in the modulator plate circuit at the frequency of the a-f input.

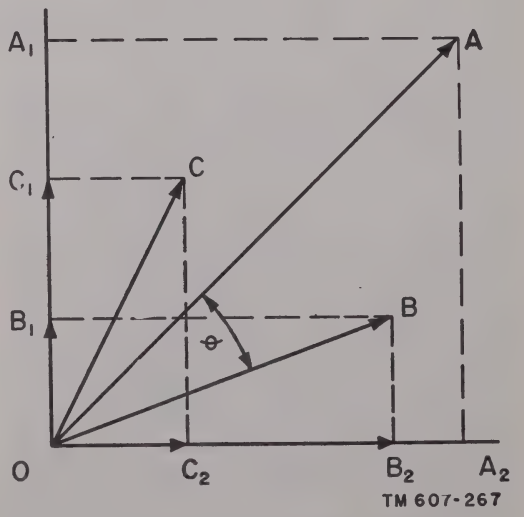


Figure 61. Modulator input voltages, vector diagram.

b. Operation. Bias for the two modulator tubes is obtained from cathode resistor R8, which is bypassed by C8. Resistor R6, bypassed by capacitor C4, serves as a meter shunt for modulator grid current. Resistors R4, R5, and R6 provide a grid return for the modulator tubes. R15 and C12 form a decoupling network for the plate circuit B+ supply. Resistors R11 and R12, bypassed by C10, are voltage-dropping resistors for the screens. Resistors R9 and R10, bypassed by C9, drop the pin 3 grid voltage for both tubes to the required value. C38 tunes the plate circuit to the crystal frequency. The modulator output is coupled to the first quadrupler stage by capacitor C11 which also keeps plate voltage from the grid of V4.

c. Modulator Characteristics. Resistors R27, R28, R29, and R30, together with capacitors C31 and C32, attenuate the higher frequencies. This frequency discrimination is necessary to offset a characteristic of this type of phase modulation, the frequency deviation being dependent on both the amplitude and the frequency of the applied audio voltage. This network makes the amplitude of the audio signal, as applied to the modulator, almost inversely proportional to its frequency, thus partially compensating for the frequency shift in the modulator, which is directly portional to the af. This results in a modulator output with a slightly rising frequency deviation at the higher af. The rising characteristic is used to help overcome the effects of noise.

d. Output Vectors. In figure 61, if line OA_1 represents the r-f output of V2, then OA_2 will represent the r-f output of V3, 90° out of phase. With no a-f input, OA will represent the r-f output voltage of the modulator. When an a-f signal is applied to the signal grids, the transconductances of V2 and V3 will be 180° out of phase with each other. (The transconductance will be controlled by the *audio* signal.) When the transconductance of V2 is at minimum, the output is at minimum, while the transconductance and the output of V3 is at maximum. OB_1 represents the output of V2, and OB_2 represents the output of V3 in this condition. The output will be OB, phase-shifted by θ degrees. The phase shift thus developed will be in proportion to the amplitude of the a-f signal. The phase shift is equivalent to a frequency shift which is proportional to the amplitude of the audio input. In phase modulation, the amount of frequency shift also is proportional to the frequency of the audio signal. The amount of frequency shift therefore will depend on both the amplitude and the frequency of the audio signal, and the rate of frequency shift will depend on the audio frequency. OC represents the output of V2 when the transconductance is at maximum and the transconductance of V3 is at minimum. The phase-modulated output is thus an f-m voltage, whose resting frequency is the frequency of the crystal oscillator.

e. Circuit Differences.

(1) In Radio Transmitters T–193/VRC–2 and T–193A/VRC–2, the modulator circuit is identical with that of Radio Transmitter T–322/VRC–2X, except for the values of C8, C12, C13, and C38 (figs. 122 and 123). Filament connections are as shown in figures 73, 122, and 123.

(2) In Radio Transmitter T–193B/VRC–2, the modulator circuit is identical with that of Radio Transmitter T–322/VRC–2X. Filament connections are as shown in figures 73 and 125.

60. First and Second Quadruplers
(figs. 62 through 65)

To increase the frequency deviation, the modulator output is fed into the two quadrupler stages. The output from the second quadrupler stage is 16 times the original crystal frequency, and the frequency deviation is 16 times the original frequency deviation. Both stages are identical schematically and functionally.

a. First Quadrupler. The output from the modulator stage is applied to the control grid of V4 through C11. The amplified signal is applied across a tuned plate circuit consisting of the primary of T3 which is resonated to four times the oscillator frequency by C39A. Coupling to the second quadrupler is effected through the secondary of T3 which also is resonated to four times the crystal frequency. Plate voltage is applied through decoupling resistor R19, which is bypassed by C16. Screen voltage is applied through dropping resistor R16, which is bypassed by C14. The first quadrupler stage

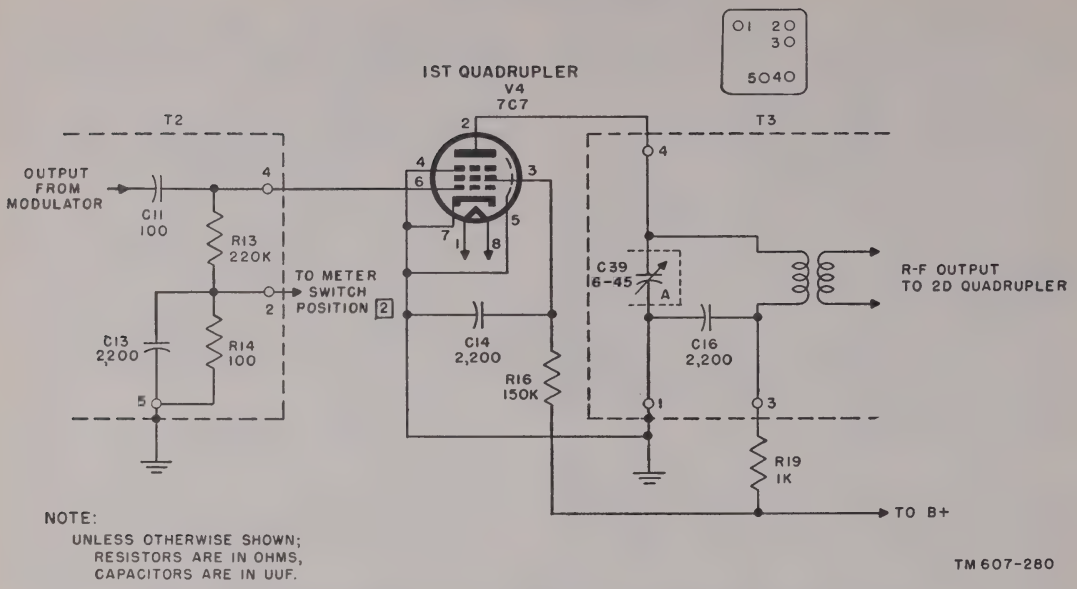


Figure 62. Radio Transmitter T–322/VRC–2X, first quadrupler, functional diagram.

develops bias across grid leak resistor R13. R14, bypassed by C13, is a shunt resistor in position 2 of the meter circuit when measuring grid current of the first quadrupler.

b. Second Quadrupler. The output signal from the first quadrupler is applied to the grid of V5 from pin 5 of T3. The amplified output of V5 is applied across the plate circuit consisting of the primary of T4 which is resonated to four times the frequency of the input signal by C40A. The secondary of T4 is resonated to the same frequency by C40B. R23 and C20 form a plate circuit decoupling network. R20, bypassed by C18, is a dropping resistor for the screen voltage. R17, in conjunction with C17, provides grid bias for the second quadrupler stage. R18 serves as a meter shunt resistor when S1 is in the second quadrupler grid position (3).

c. Circuit Differences.

(1) In Radio Transmitter T–193/VRC–2, the first and second quadrupler stages are identical with those of Radio Transmitter T–322/VRC–2X, except for slight differences in the values of several resistors and capacitors (fig. 122).

(2) In Radio Transmitter T–193A/VRC–2, the plate circuits of the first and second quadruplers contain single-tuned resonating coils, T3 and T4 (figs. 63, 65, and 123). The values of C39 and C40 differ slightly.

(3) In Radio Transmitter T–193B/VRC–2, the first and second quadrupler circuits are identical with those of Radio Transmitter T–322/VRC–2X, except for filament connections. (figs. 72 and 125).

61. Doubler
(fig. 66)

a. Operation. The frequency of the input signal applied to the doubler stage is 16 times the crystal frequency. V6 doubles this frequency and the resulting output is 32 times the crystal frequency. The plate circuit of the doubler stage is tuned to the correct frequency by C41. C23 is a plate circuit bypass capacitor. Screen voltage is applied through dropping resistor R24, which is bypassed by C22. R32, R36, and C25 form a decoupling network be-

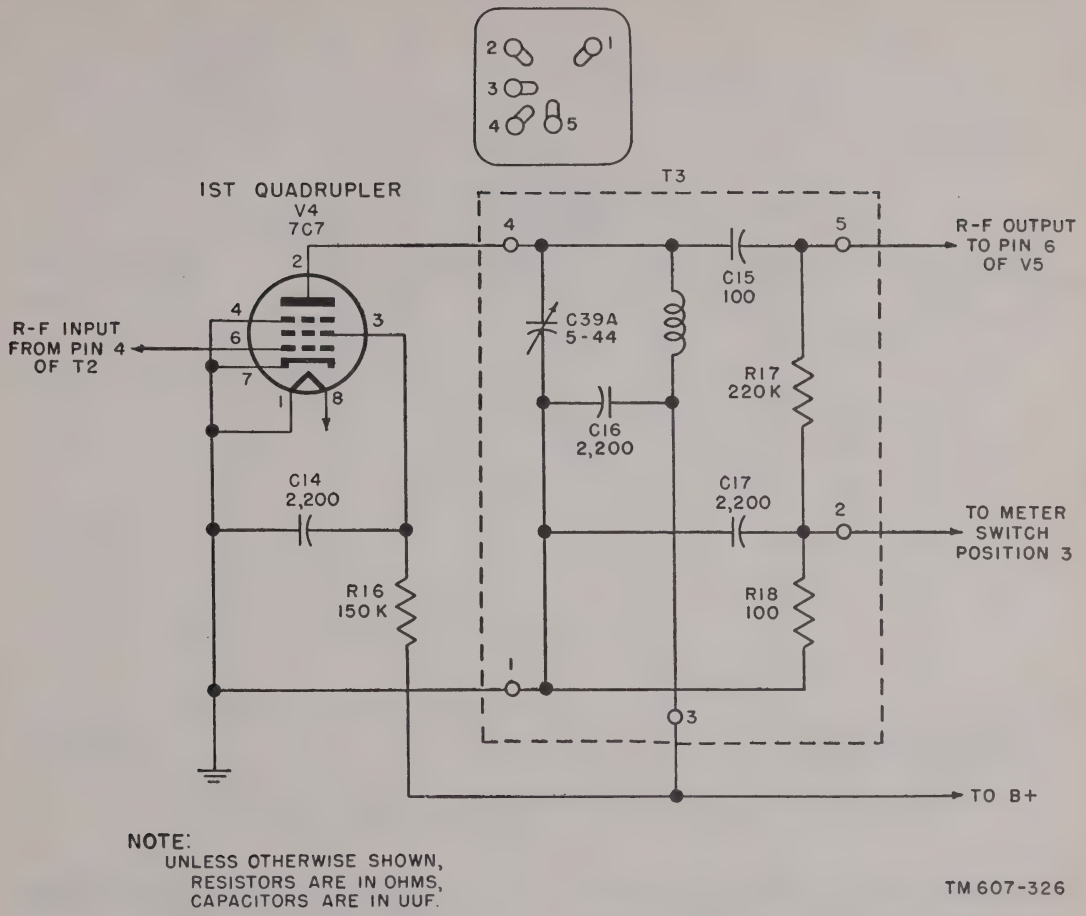


Figure 63. Radio Transmitter T–193A/VRC–2, first quadrupler, functional diagram.

tween the power amplifier stage and the other stages (fig. 120). C24 is the coupling capacitor to the final stage and also keeps the plate voltage from the grid of V7. R21 is a bias resistor for the doubler stage. R22 is a meter shunt resistor in position 4 of the meter circuit. C21 is the grid circuit bypass for V6.

b. Circuit Differences. In Radio Transmitter T–193(*)/VRC–2, the doubler circuit is identical with that of Radio Transmitter T–322/-VRC–2X except for filament connections and slight differences in the values of circuit elements (figs. 122, 123, and 125).

62. Power Amplifier
(fig. 67)

a. Operation. This stage operates as a conventional power amplifier and is used to raise the output of the transmitter to 30 watts. The output frequency is the same as the input frequency from the doubler stage. The input from the doubler stage is applied to the grid of V7 and is amplified across the tuned pi circuit composed of L1 and variable capacitors C28 and C29. Grid leak bias is provided by R34 and C24. R33, bypassed by C34, is a meter shunt resistor in position 5 of the meter circuit.

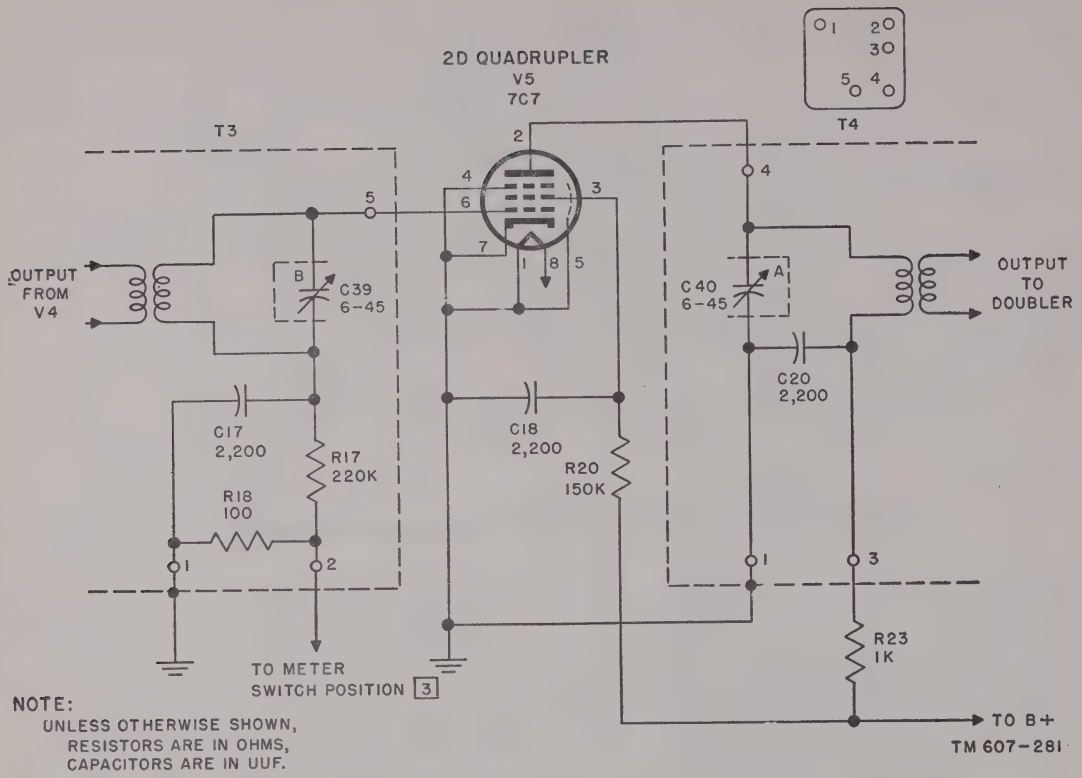


Figure 64. Radio Transmitter T–322/VRC–2X, second quadrupler, functional diagram.

R-f choke RFC1 in the grid circuit prevents r-f current loss through grid resistor R34. Cathode current is measured by means of the voltage drop across R25, which is bypassed by C26. RFC2 prevents r-f currents from entering the h-v supply. Screen voltage is applied through dropping resistors R37, R38, R39, and R26, which are bypassed to ground by C27. C30 keeps the h-v d-c off the antenna.

b. Circuit Differences.

(1) In Radio Transmitters T–193/VRC–2 and T–193A/VRC–2, the power amplifier circuit is similar to that of Radio Transmitter T–322/VRC–2X, but differs in values of circuit elements. Capacitor C42 is not present and the screen-dropping resistor consists only of R26 with a value of 20,000 ohms (figs. 122 and 123).

(2) In Radio Transmitter T–193B/VRC–2, the power amplifier circuit is identical with that of Radio Transmitter T–322/VRC–2X, except for filament connections (figs. 72 and 124). In some sets, capacitor C42 is not present.

63. Transmitter Power Supply

a. Radio Transmitter T–322/VRC–2X (fig. 68). A dynamotor power supply is used to provide the necessary hv for the transmitter. The output is filtered by C35 and C36. The heavy lines in figure 68 indicate the l-v motor circuit. Current from the battery flows through the field coils and motor winding of the armature, setting up a magnetic field around both.

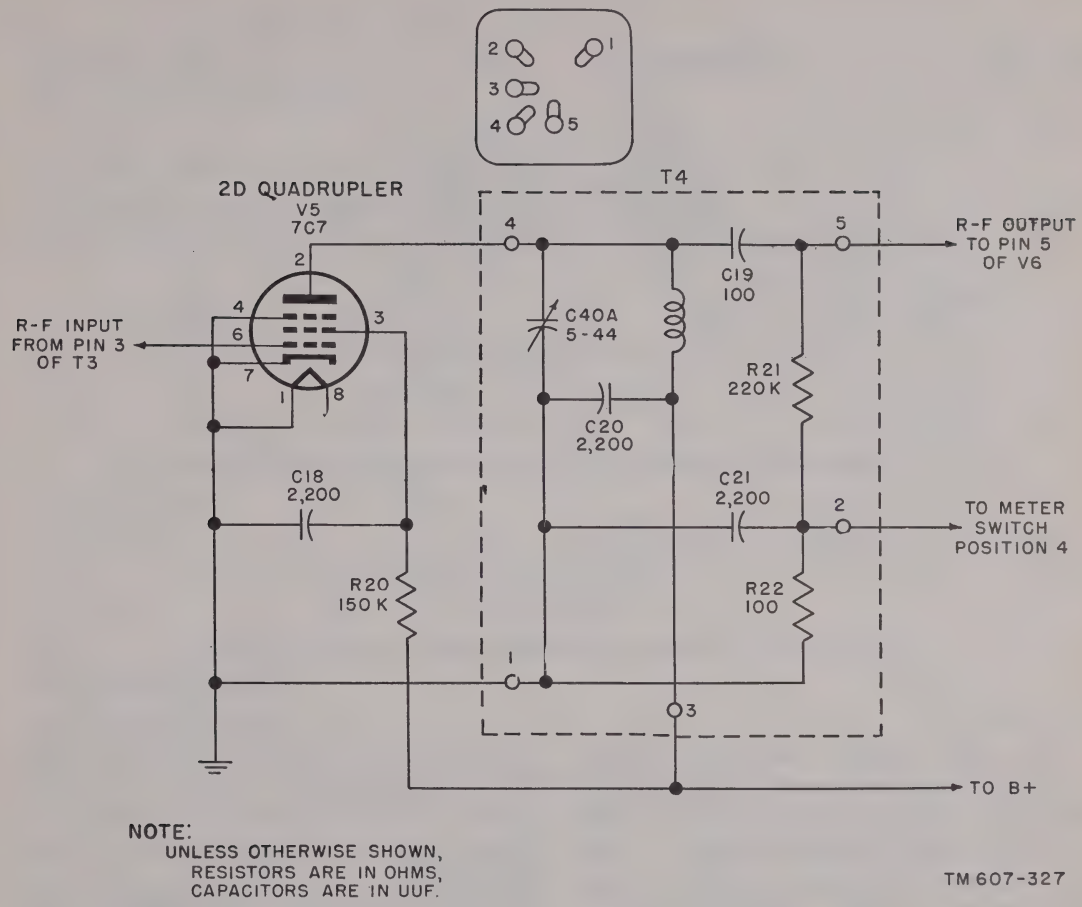


Figure 65. Radio Transmitter T–193A/VRC–2, second quadrupler, functional diagram.

Opposing polarities cause the armature to rotate. Since the armature and the field windings are in parallel, the armature speed remains fairly constant under varying load conditions. The h-v winding, represented by the finer lines in figure 68, also is wound on the motor armature. When the motor armature rotates, the h-v windings which are on the same armature cut the magnetic field and cause the hv to be generated. The motor winding requires a 24-volt power source and the h-v winding generates approximately 600 volts.

b. Radio Transmitter T–193B/VRC–2. The transmitter power supply circuit is almost identical with that of Radio Transmitter T–322/VRC–2X, (fig. 68) except that the primary or motor winding of the dynamotor is designed for a 6-volt power source and there is no terminal strip E30 in the h-v circuit.

c. Radio Transmitters T–193/VRC–2 and T–193A/VRC–2 (fig. 69). Two l-v vibrator rectifiers are connected in series to supply hv for the transmitter. The B+ lead from the cathode of the first full-wave rectifier, an OZ4A/1003 type tube, is connected directly to the B-lead at the secondary center tap of transformer T1

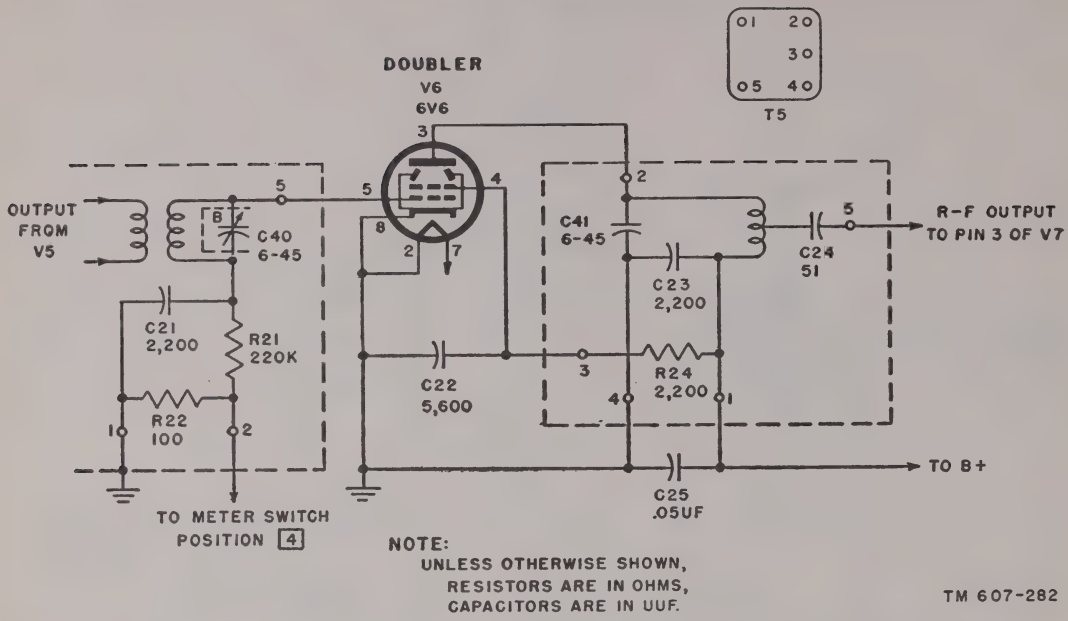


Figure 66. Radio Transmitter T-822/VRC-2X, doubler, functional diagram.

of the second rectifier. Associated with the first power supply are fuse M6, the input filter composed of choke M2 and capacitor C2, vibrator No. 1, hash suppressor resistors R1 and R2, transformer T2, buffer capacitor C4, dual capacitors C6, and filter capacitor C8. Serving similar purposes in the second power supply are fuse M5, the input filter composed of choke M1 and capacitor C1, vibrator No. 2, hash suppressor resistors R3 and R4, transformer T1, buffer capacitor C3, dual capacitors C5, and filter capacitor C7. Resistor R5 is the bleeder for the complete power supply. Vibrator action is similar to that described in paragraph 56*b*.

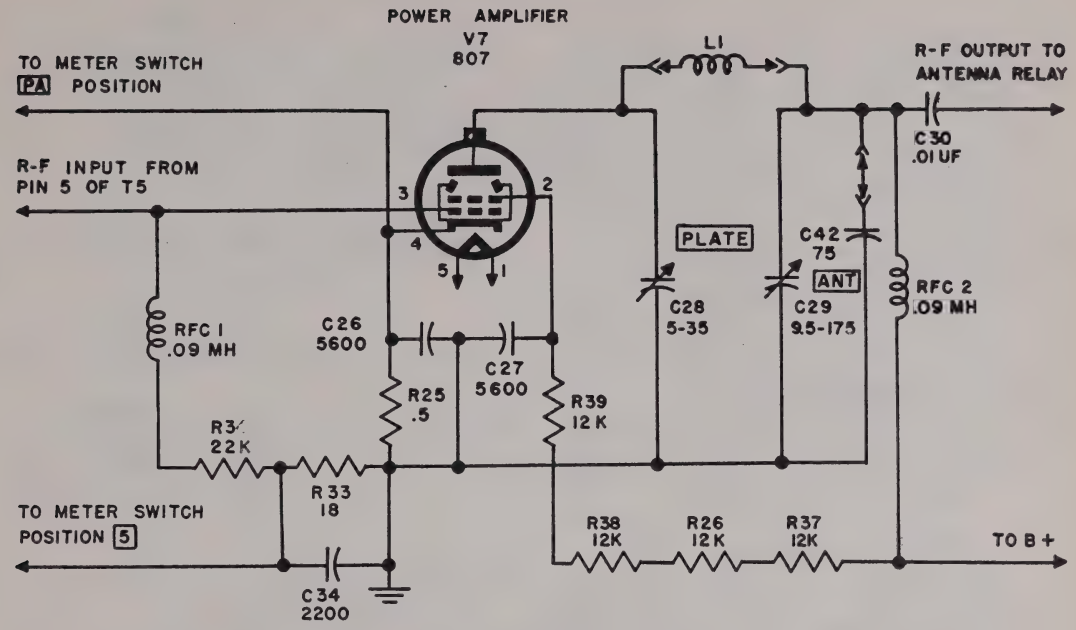


Figure 67. Radio Transmitter T-322/VRC-2X, power amplifier, functional diagram.

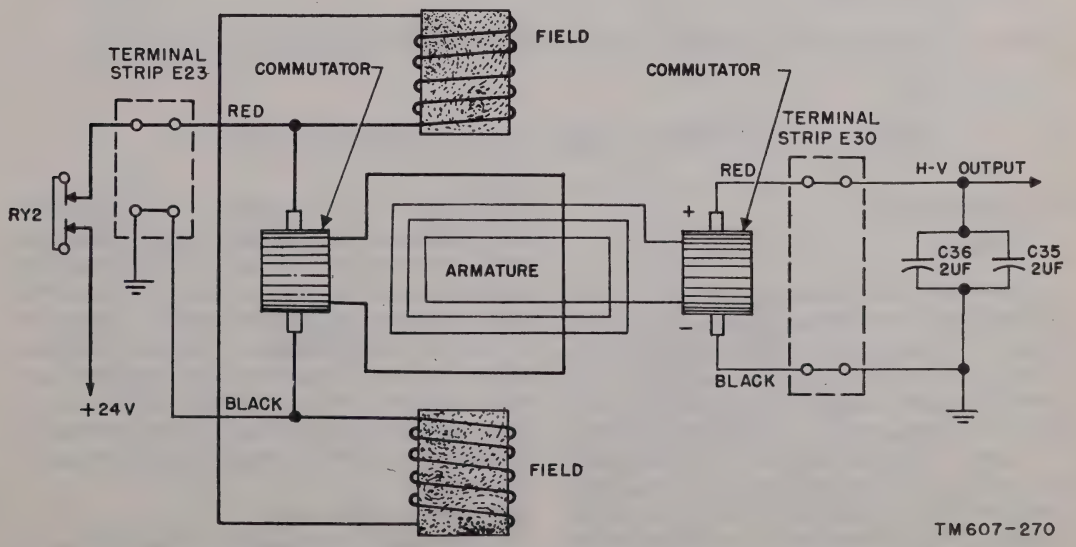


Figure 68. Radio Transmitter T-322/VRC-2X, power supply, functional diagram.

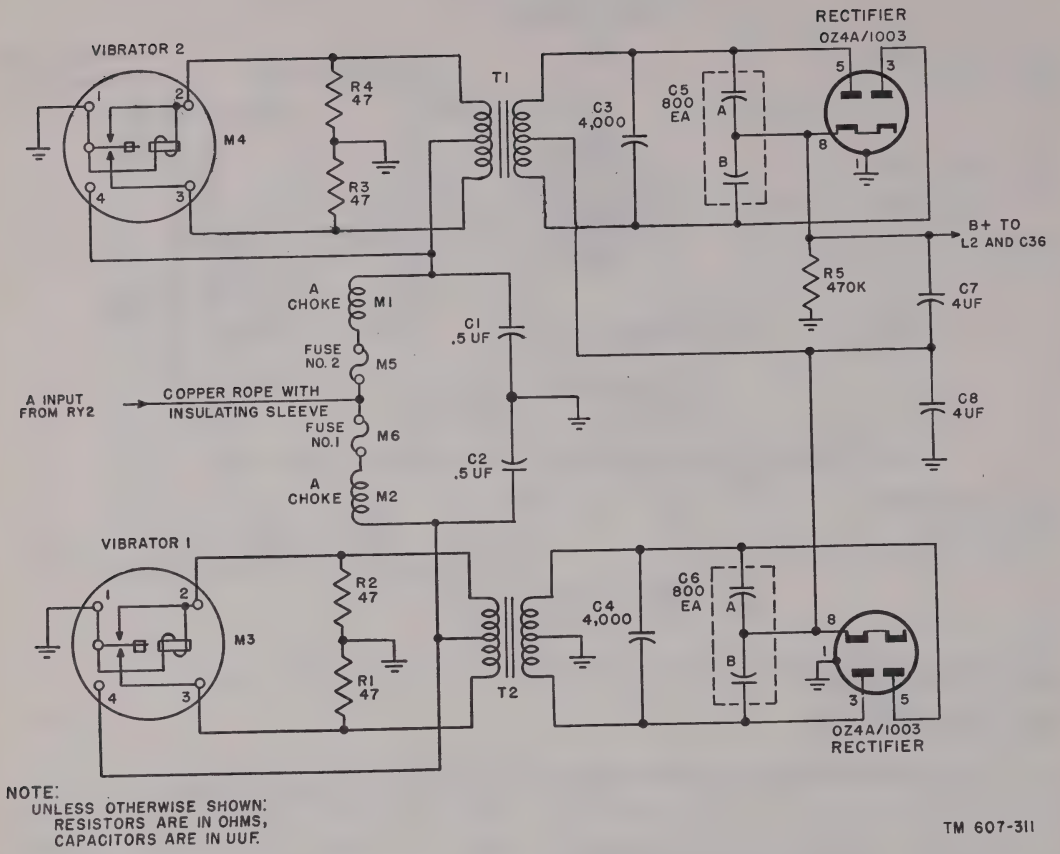


Figure 69. Radio Transmitters T–193/VRC–2 and T–193A/VRC–2, vibrator power supply, schematic diagram.

Section III. CONTROL HEAD AND CONTROL CIRCUITS

64. Control Head

(fig. 70)

a. Operation. All operating controls for the transmitter and receiver are located in the control head. Located on the VOLUME control is the main power switch which completes the circuit from the battery to the coil of relay RY1 on the transmitter, and supplies current to the green indicator lamp M4 through dropping resistor R1. Resistor R4 is the VOLUME control, which is connected in the grid circuit of second a-f amplifier tube V13. Resistor R3 is the SQUELCH control, which is connected as a variable cathode resistor in noise amplifier tube V10 to serve as a squelch noise gain control. In series with resistor R3 is small resistor R5. This gives a minimum cathode bias for V10 even when SQUELCH control resistor R3 is set for zero resistance. Resistor R2 is a shunt across the speaker voice coil. Red lamp M3 lights only when the transmitter is energized by depressing the push-to-talk switch. It indicates also that the receiver plate voltage is off.

b. Circuit Differences.

(1) Radio Set Control C-1060/VRC–2X, (fig. 70) used with Radio Set AN/-

VRC–2X, is designed for 24-volt operation, and indicating lamps M2 and M3 are rated at 28 volts each.

(2) The circuit of Radio Set Control C–493(*)/VRC–2, used with Radio Set AN/VRC–2, is identical with that of Radio Set Control C–1060/VRC–2X, except that lamps M2 and M3 are rated at 6 volts and voltage-dropping resistor R1 is 22 ohms.

65. Control Circuits
(fig. 71)

a. General. The functions of energizing and de-energizing the receiver and the transmitter are accomplished by the series-parallel arrangement of relays RY1, RY2, and RY3. When the equipment is in a receiving condition, only RY1 is energized. When the operator presses the push-to-talk button on the microphone, RY2 and RY3 also are energized by completing their returns to ground.

b. Relay RY1. Relay RY1 is energized when the VOLUME switch on the control head is closed. Operation of this switch and relay is shown in figure 71. The circuit may be traced in detail in figure 120. The specific path is as follows: From ground, battery current flows through the coil of RY1 to pin 3 of plug P1 and pin 3 of the transmitter control cable receptacle P11 (fig. 70), and through the cable to the terminal pin which plugs into pin jack 5 of the control head. From pin jack 5, current flows through the VOLUME control switch to pin jack 6, to the corresponding terminal pin

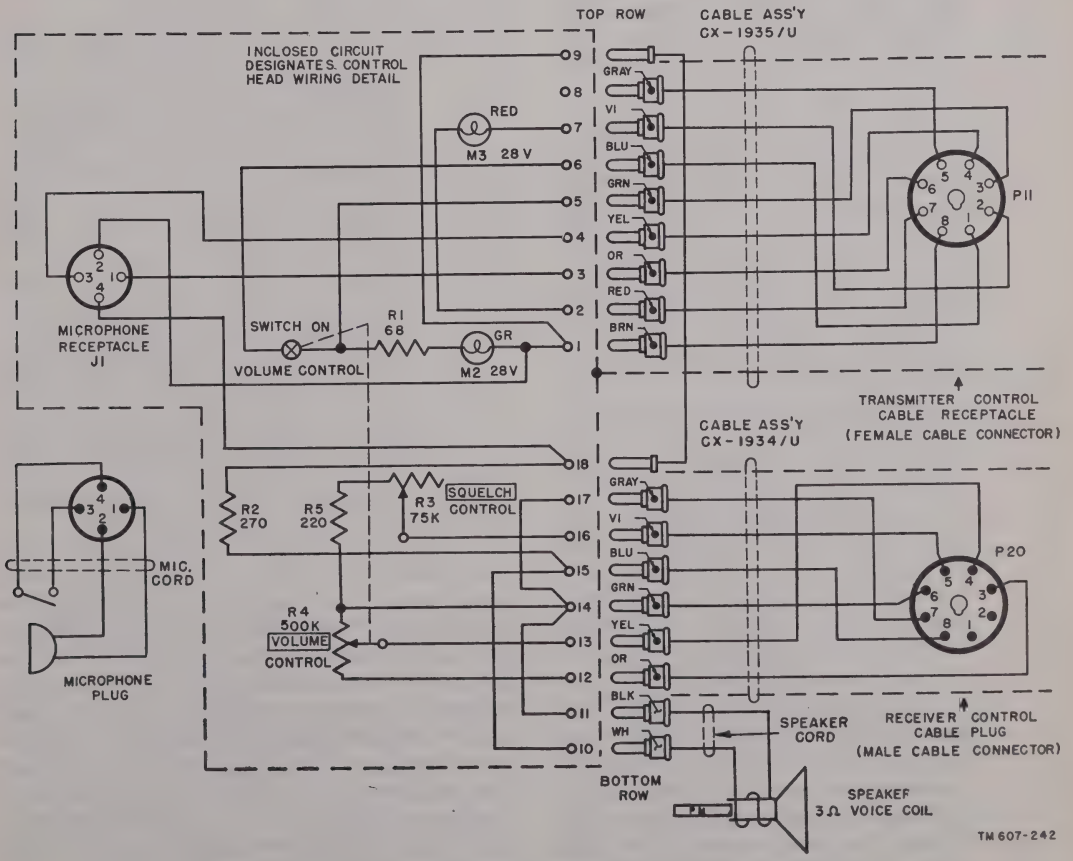


Figure 70. Radio Set Control C–1060/VRC–2X, schematic diagram.

of the transmitter control cable, through the cable to pin 1 of P11, and through pin 1 of P1 (fig. 120) to the four lugs of POWER plug P2. From P2, the relay current flows through battery cable receptacle P5, through the battery cable to plug P6, through fuse box E8 (fig. 32) to the battery, and through the battery back to ground. When the coil of RY1 is energized, the core becomes a strong electromagnet and attracts the armature, whose movement closes the contacts of the battery circuit to the transmitter filaments, receiver power supply, and the battery ends of RY2 and RY3. RY1 is energized all the time that the equipment is in operation and closes the following circuits.

(1) *Transmitter filaments.* Current flows from ground through the two branches of the transmitter filament circuits (fig. 120), through FUSE F1, through the closed contacts of relay RY1, through POWER plug P2, through the battery cable and fuse box to the battery, and back to ground.

(2) *Receiver power supply.* Current for the receiver power supply flows from ground to pin 1 of vibrator E1 (fig. 56), through the coil of E1 to terminal 2 of E1, through terminal 3 of transformer T1, through one-half the primary of T1 to center tap terminal 2 of T1, and through filter choke L1 to FUSE F1. FUSE F1 also carries the filament currents of the receiver and power supply. Current flows from ground through three parallel branches of four filaments in series (fig. 119), and through another parallel branch consisting of the tube V13 filament with resistor R55 in parallel and thermal resistor R56 in series, to pin jack J2. Current for the rectifier filaments (fig. 56) flows from ground through the filaments of V1 and V2 to pin terminal P4, and then through pin jack J9 in the receiver (fig. 119) and thermal resistor R57 to J2. From J2, the combined current from the receiver and receiver power supply filaments passes through terminal pin P3 (fig. 56) and filament filter choke L2 to FUSE F1. From FUSE F1, the total current from the receiver filaments, the receiver power supply filaments, and the vibrator passes to pin 6 of POWER plug P1, through cable receptacle P28 of power interconnector cable W9, through the cable to cable terminating plug P27, and through pin 6 of the RECEIVER receptacle J4 in the transmitter (fig. 120), to FUSE F1. The combined currents from the transmitter filaments and the receiver power supply pass through F1, through the closed contacts of RY1, through POWER plug P2, through battery cable receptacle P5, through the battery cable to plug P6, through fuse F2, contained in fuse box E8, (Fuse Box J–498/VRC–2X) to the battery, and through the battery to ground.

(3) *Green lamp.* The green lamp on the control head is lighted when the VOLUME switch is closed. Current flows from terminal 8 of P11 (grounded at the transmitter through pin 8 of P1) through the transmitter control cable to the pin terminal opposite pin jack 1, through pin jack 1, through green lamp M2, through resistor R1, and through the closed VOLUME switch to pin jack 6. From pin jack 6, the lamp current flows through the corresponding pin terminal of the transmitter control cable, through the control cable to terminal 1 of P11, from P11 to CONTROL plug P1 (fig. 120) on the transmitter, from P1 to POWER plug P2, and through battery to ground ((2) above).

c. Relay RY2. Relay RY2 (fig. 71) is energized when the push-to-talk button on the microphone is depressed, and power is applied to the transmitter power supply, to the red lamp in the control head, and to the microphone. When the push-to-talk switch is closed, pins 3 and 4 of the microphone plug (fig. 70) are short-circuited. This closes the circuit between terminals 3 and 4 of microphone receptacle J1, between pin jacks 4 and 1, and between terminals 4 and 8 of P11. Terminals 4 and 8 of P11 are connected to pins 4 and 8 of plug P1 (fig.

120). Thus, pin 4 of P1 is grounded through pin 8 of P1 when the push-to-talk switch is closed. Now the circuit of relay RY2 can be traced. From pin 4 of P1, battery current flows through the coil of RY2, through FUSE F1, through the closed contacts of RY1, and through battery to ground (*b* above).

(1) *Transmitter power supply.* When the coil of RY2 is energized by the current flowing through it, the armature contacts close the primary circuit of the dynamotor whose secondary output supplies plate voltage for the transmitter. The dynamotor circuit is shown in figure 68. Current flows from ground to terminal strip E23 and to the negative side of the l-v commutator, through the primary winding of the armature and through its parallel circuit, the field windings, to the positive side of the commutator, through the second terminal of E23, and through the closed contacts of RY2, to the contacts of RY1, and through battery to ground (*b* above).

(2) *Red lamp.* Red lamp M3 in the control head is lighted when the push-to-talk switch is closed. Lamp current flows from ground (pin 2 of P1, fig. 120) to terminal 2 of P11 (fig. 70), through the transmitter control cable to the terminal pin corresponding to pin jack 7, through pin jack 7 and red lamp M3 to pin jack 2, through the corresponding pin terminal of the transmitter control cable, through the cable to terminal 7 of P11, through pin 7 of P1 (fig. 120), through the closed contacts of RY2 and RY1, and back through the battery to ground (*b* above).

(3) *Microphone.* The microphone circuit is energized by the closing of RY2. Current flow is from ground (pin 8 of P1, fig. 120) to pin 8 of P11 (fig. 70), through the transmitter control cable to pin jack 1 of the control head, through terminal 2 of microphone receptacle J1 to pin 2 of the microphone plug, through the microphone to pin 1 of the microphone plug, through pin 1 of the microphone receptacle J1 to pin jack 3, through the transmitter control cable to terminal 6 of P11, and through pin 6 of P1 (fig. 120) to terminal 1 of MIC. jack J2. From terminal 1 of J2, the current flows to terminal 2 of microphone transformer T6, through the primary of T6 to terminal 1 of T6, through R31 to the power line junction, through the closed contacts of RY2 and RY1, and back through the battery to ground (*b* above).

d. Relay RY3. Relay RY3 operates at the same time as RY2. When the push-to-talk switch is closed, contacts 3 and 4 of the microphone plug close the circuit between terminals 3 and 4 of the microphone receptacle J1 (fig. 70), between pin jacks 1 and 4, between terminals 4 and 8 of P11, and between pins 4 and 8 of P1 (fig. 120). When the circuit is closed between pins 4 and 8 of P1, battery current flows from ground through the coil of RY3, through FUSE F1, the closed contacts of RY1, POWER plug P2, battery cable receptacle P6, the battery cable, plug P5, fuse box E8 (containing fuse F2), and through battery to ground.

(1) When RY3 is energized (shown in de-energized position in figure 120), one set of contacts closes the circuit between the h-v output of the dynamotor and plate circuits of the transmitter.

(2) A second set of contacts of the armature of RY3 is connected across terminals 3 and 4 of J4, which are in the B+ supply circuit to the receiver. When RY3 is energized, these contacts open and remove the hv from the receiver plate circuits.

(3) The third set of contacts of the armature of RY3 performs the function of switching the antenna circuit from the RECEIVER antenna receptacle to the transmitter output. When the receiver is being operated and RY3 is not energized, the armature contacts close the circuit between ANTENNA receptacle J3 and RECEIVER receptacle J5, which is connected to J6 in

the receiver through the antenna interconnecting cable. When RY3 is energized, the armature contacts open the circuit between J3 and J5 and close the circuit between J3 and the transmitter power amplifier output.

e. Circuit Differences. The control circuits of Radio Set AN/VRC–2 are identical with those of Radio Set AN/VRC–2X (fig. 71) with the following exceptions:

(1) Thermal resistor R57 and connectors B/P4 and R/J9 (fig. 119) are not present in Radio Receiver R–237(*)/VR.

(2) In Radio Transmitter T–193B/VRC–2, terminal block E30 (figs. 71 and 125) is not present.

(3) In Radio Transmitters T–193/VRC–2 and T–193A/VRC–2, a vibrator power supply (fig. 69) is used instead of a dynamotor, and the receiver h-v circuit is opened and closed by relay RY2 instead of relay RY3 (figs. 122 and 123).

(4) The input power for Radio Set AN/VRC–2 is at 6 volts instead of 24 volts.

66. Filament Circuits
(figs. 72 and 73)

Radio Set AN/VRC–2X is physically similar to Radio Set AN/VRC–2 procured on Orders Nos. 20591–P–49 and 21756–P–50. Radio Set AN/VRC–2X operates from a 24-volt battery; all models of Radio Set AN/VRC–2 operate from a 6-volt battery. Components of different value are used to accommodate this difference in input voltage. The major difference is in the filament circuits. Because the tubes used in both equipments operate on the same filament voltage, the filament circuits must be arranged differently. Figure 72 shows the receiver filament circuits of both sets, and figure 73 shows

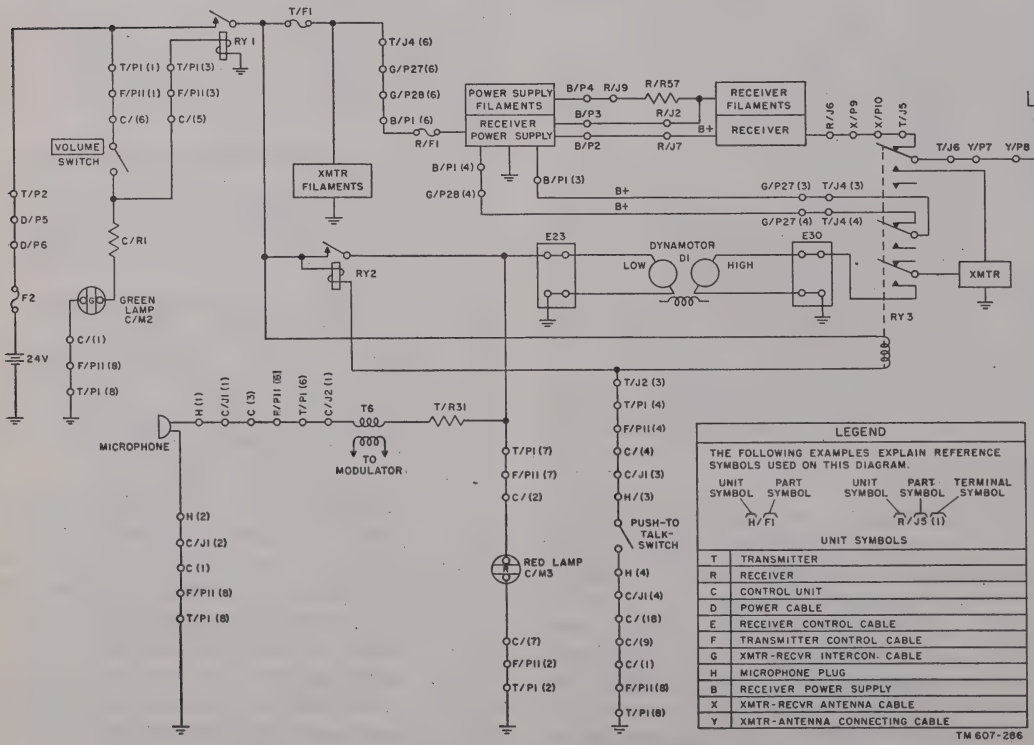


Figure 71. Radio Set AN/VRC–2X, control circuits, diagram.

the transmitter filament circuits of both sets. These are arranged as follows:

a. In Radio Set AN/VRC–2, all the filaments are connected in parallel across the 6-volt power source.

b. In Radio Set AN/VRC–2X, a series-parallel arrangement with additional components is necessary to achieve the proper filament voltage. Thermal resistors are used in the filament circuits of the power tubes of both the receiver and transmitter to drop the battery voltage and to function as constant current-type voltage regulators. The filaments of the rectifier tubes of Power Supply PP–721/VRC–2X are also in series with a thermal resistor (figs. 56 and 119).

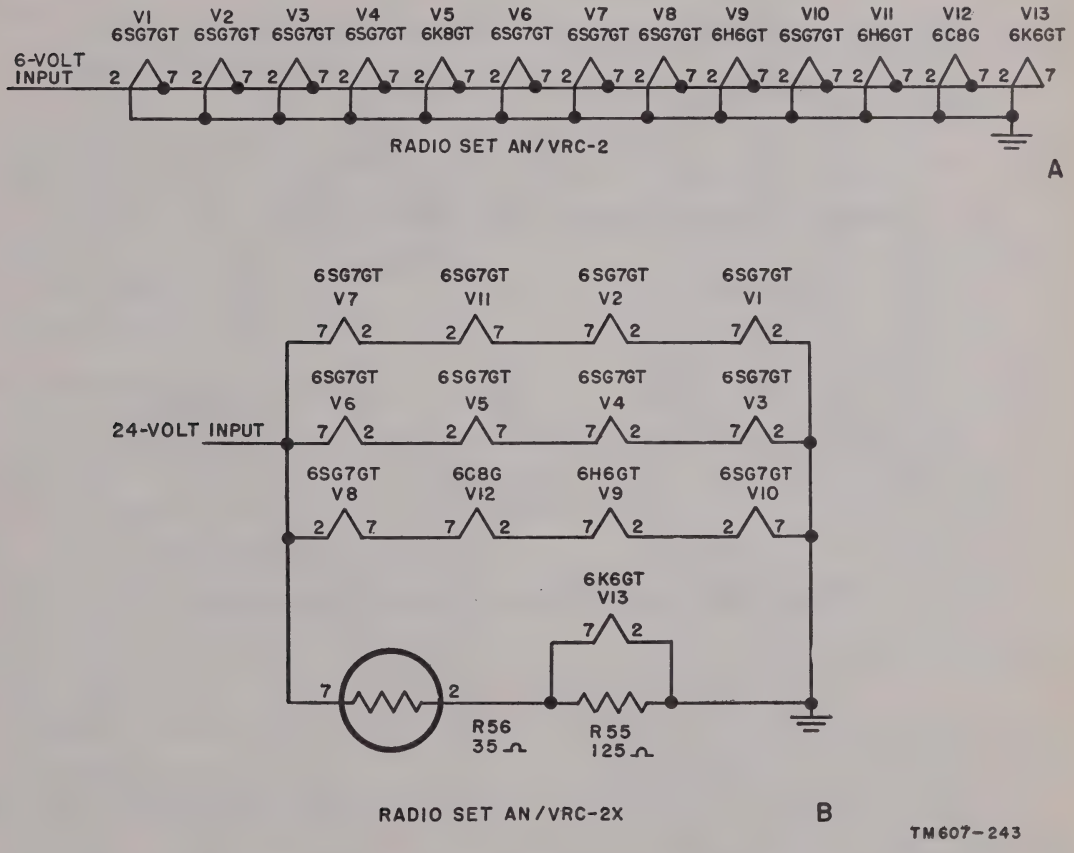


Figure 72. Radio Sets AN/VRC–2 and –2X, receiver, filament circuits.

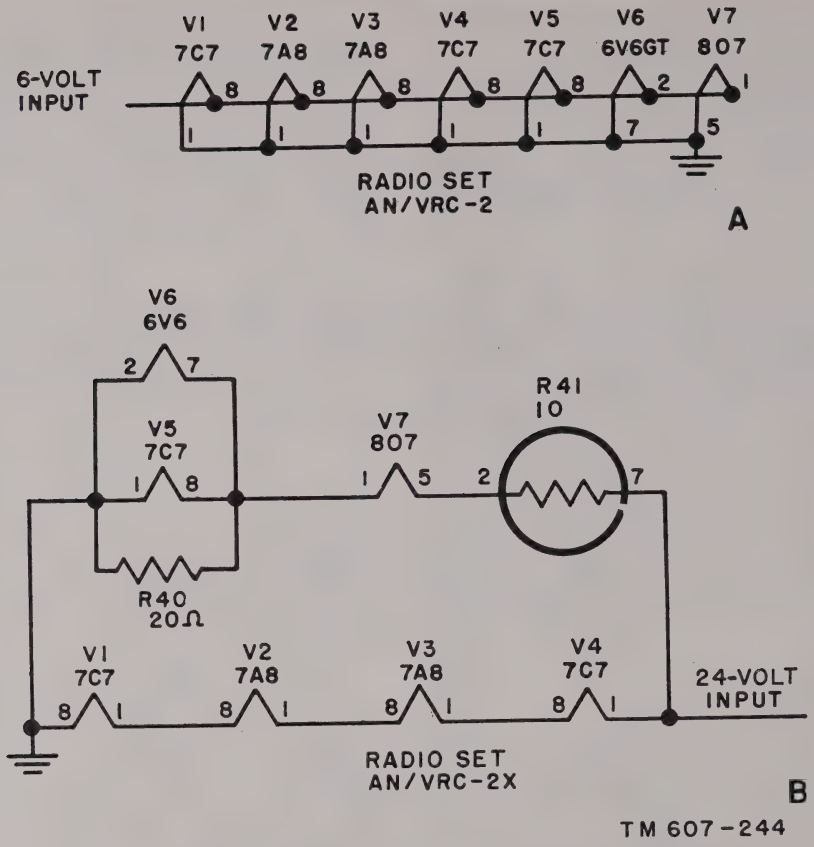


Figure 73. Radio Sets AN/VRC-2 and -2X, transmitter filament circuits.

CHAPTER 5

FIELD MAINTENANCE INSTRUCTIONS

Note. **This chapter contains information for field maintenance. The amount of repair that can be performed by units having field maintenance responsibility is limited only by the tools and test equipment available and by the skill of the repairman.**

Section I. TROUBLE SHOOTING AT FIELD MAINTENANCE LEVEL

Warning: When servicing the radio transmitter, be extremely careful because of the high voltages exposed. With the high voltage on, potentials as great as 600 volts may be present in the transmitter. Keep one hand in pocket when measuring socket voltages with the probe. Before touching any part after the voltage is shut off, short the part to ground.

67. Trouble-Shooting Procedures

The first step in servicing a defective radio set is to sectionalize the fault. Sectionalization means tracing the fault to the *major component or circuit* responsible for the abnormal operation of the set. The second step is to localize the fault. Localization means tracing the fault to the defective *part* responsible for the abnormal condition. Some faults such as burned-out resistors, r-f arcing, and shorted transformers often can be located visually and aurally. The majority of faults, however, must be localized by *checking voltage and resistance.*

a. System Sectionalization. System sectionalization is discussed in paragraphs 39, 40, and 41.

b. Component Sectionalization. The test listed below aid in isolating the source of trouble. To be effective the procedure should be followed in the order given. Remember that servicing procedure should cause no further damage to the receiver. First, trouble should be localized to a single stage or circuit. Then the trouble may be isolated within that stage or circuit by appropriate voltage, resistance and continuity measurements. The service procedure is summarized as follows:

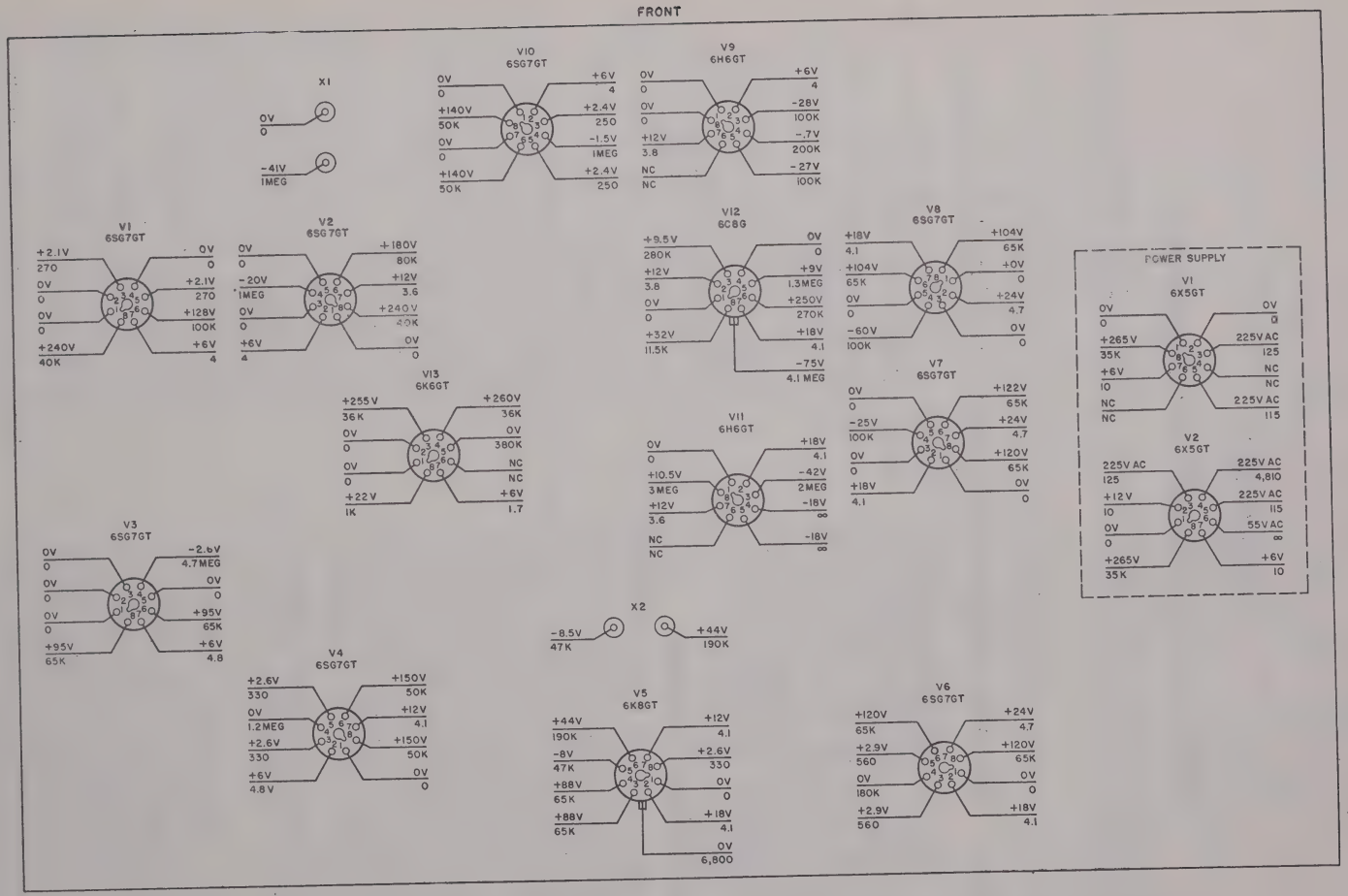
(1) *Visual inspection.* The purpose of visual inspection (par. 38) is to locate any visible trouble. Through this inspection alone, the repairman may frequently discover the trouble, or determine the stage in which the trouble exists. This inspection is valuable in avoiding additional damage to the receiver which might occur through improper servicing methods and in forestalling future failures.

(2) *Input resistance measurements.* These measurements (par. 71) prevent further damage to the receiver from possibe short circuits. Since this test gives an indication of the condition of the filter circuits, its function is more than preventive.

(3) *Operational test.* The operational test (par. 72) is important because it frequently indicates the general location of trouble. In many instances the information gained will determine the exact nature of the fault. In order to utilize this information fully, all symptoms must be interpreted in relation to one another.

(4) *Trouble-shooting charts.* The trouble symptoms listed in these charts (pars. 74 and 75) will aid greatly in localizing trouble.

(5) *Signal substitution.* The principal advantage of the signal substitution



NOTES:

1. VOLTAGE MEASUREMENTS ARE TAKEN WITH TRANSMITTER RECEIVER, CONTROL HEAD FULLY INTERCONNECTED, WITH POWER APPLIED. TURN THE VOLUME AND SQUELCH CONTROL TO FULL CLOCKWISE POSITION.
2. VOLTAGES ARE READ WITH A VACUUM-TUBE VOLTMETER BETWEEN TUBE SOCKET PIN AND CHASSIS.
3. RESISTANCE MEASUREMENTS ARE TAKEN WITH TRANSMITTER, RECEIVER AND CONTROL HEAD FULLY INTERCONNECTED WITH POWER SOURCE COMPLETELY DISCONNECTED. VOLUME AND SQUELCH CONTROLS AT MAXIMUM CLOCKWISE POSITION.
4. RESISTANCES ARE TAKEN BETWEEN CHASSIS AND INDICATED TUBE SOCKET CONNECTION.
5. VOLTAGE READINGS ABOVE LINE, RESISTANCE READINGS BELOW LINE.

TM 607-245

Figure 74. Radio Receiver R-435/VRC-2X, tube.

method (par. 76) is that it usually enables the repairman to localize a trouble accurately and quickly to a given stage when the general location of the trouble is not immediately evident from the above tests.

(6) *Intermittents.* In all these tests the possibility of intermittents should not be overlooked. If present, this type of trouble often may be made to appear by tapping or jarring the set. It is possible that the trouble is not in the receiver itself but in the installation (mounting or vehicle), or the trouble may be caused by external conditions. In this event, test the installation, if possible.

68. Trouble-Shooting Data

Take advantage of the material supplied in this manual. It will help in the rapid location of faults. Consult the trouble-shooting data in the following charts:

a. Receiver.

Fig. No.				Description
Radio Receiver R-485/VRC-2X	Radio Receiver R-237/VR	Radio Receiver R-237A/VR	Radio Receiver R-237B/VR	
56	57	57	57	Power supply, schematic diagram.
74	77	77	82	Tube socket voltage and resistance measurements.
75	78	80	75	Chassis layout, top view.
76	79	81	83	Chassis, bottom view.
84	85	85	84	Terminal strip TS1, voltage and resistance measurements.
86	87	88	89	Power supply, bottom view.
90				Connectors, resistance measurements.
119	121	121	124	Complete schematic diagram.

b. Transmitter.

Fig. No.				Description
Radio Transmitter T-322/VRC-2X	Radio Transmitter T-193/VRC-2	Radio Transmitter T-193A/VRC-2	Radio Transmitter T-193B/VRC-2	
91	103	103	101	Tube sockets, voltage and resistance measurements.
92	104	109	92	Chassis layout, top view.
93	105	110	102	Chassis layout, bottom view.
94			94	Terminal strip locations.
95			95	Terminal strip TS1, voltage and resistance measurements.
96			96	Terminal strip TS2, voltage and resistance measurements.
97			97	Terminal strip TS3, voltage and resistance measurements.
98			98	Terminal strip TS4, voltage and resistance measurements.
99			99	Terminal strip TS5, voltage and resistance measurements.
	107	107		Terminal board layout.
	108	108		Resistor strip layout.
	106	111		Power supply, bottom view.
100			100	Connectors, resistance measurements.
120	122	123	125	Complete schematic diagram.

c. Radio Set Control.

Fig. No.	Description
70	Complete schematic diagram.
112	Rear connectors, resistance measurements.
113	Location of components.

69. Test Equipment Required for Trouble Shooting

Test equipment	Technical manual
Multimeter TS-352/U or equal.	TM 11-5527
Signal Generator I-208, I-208-A, and I-208-B.	TM 11-317
Signal Generator I-72-G, H, J, and K or equal.	TM 11-307, TM 11-4052
Oscillator I-151-A and I-151-E.	TM 11-2524

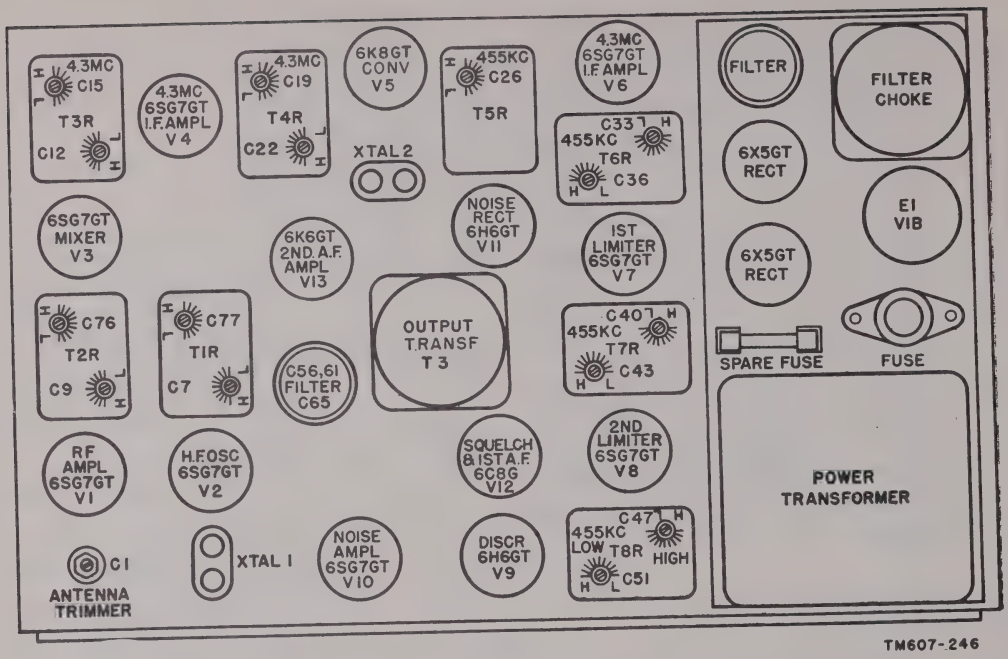


Figure 75. Radio Receivers R-435/VRC-2X and R-237B/VR, chassis layout.

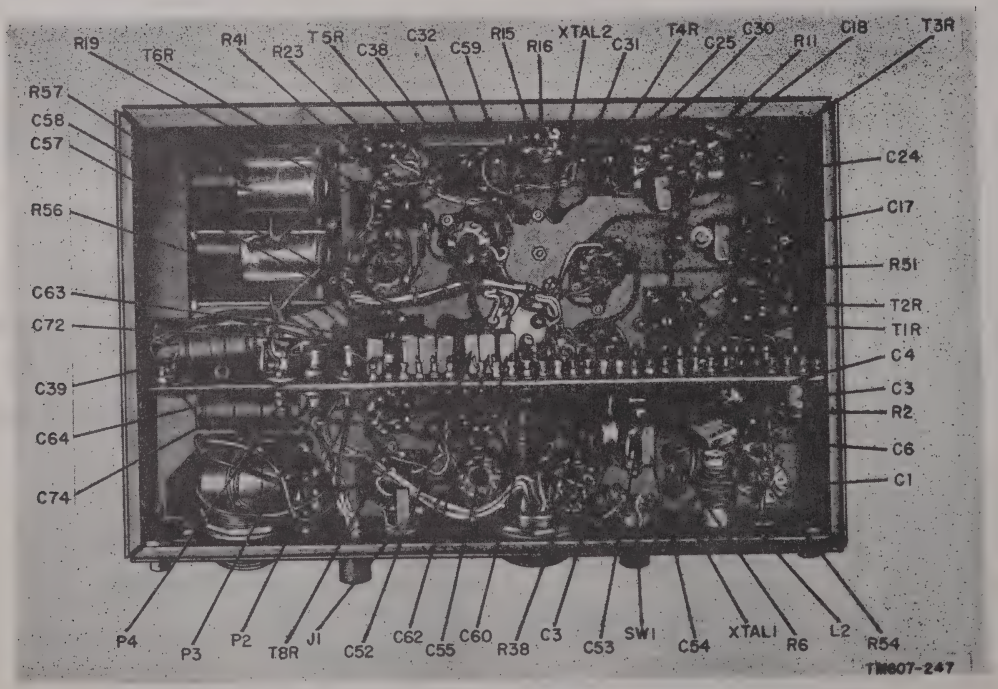


Figure 76. Radio Receiver R-435/VRC-2X, bottom view showing location of parts.

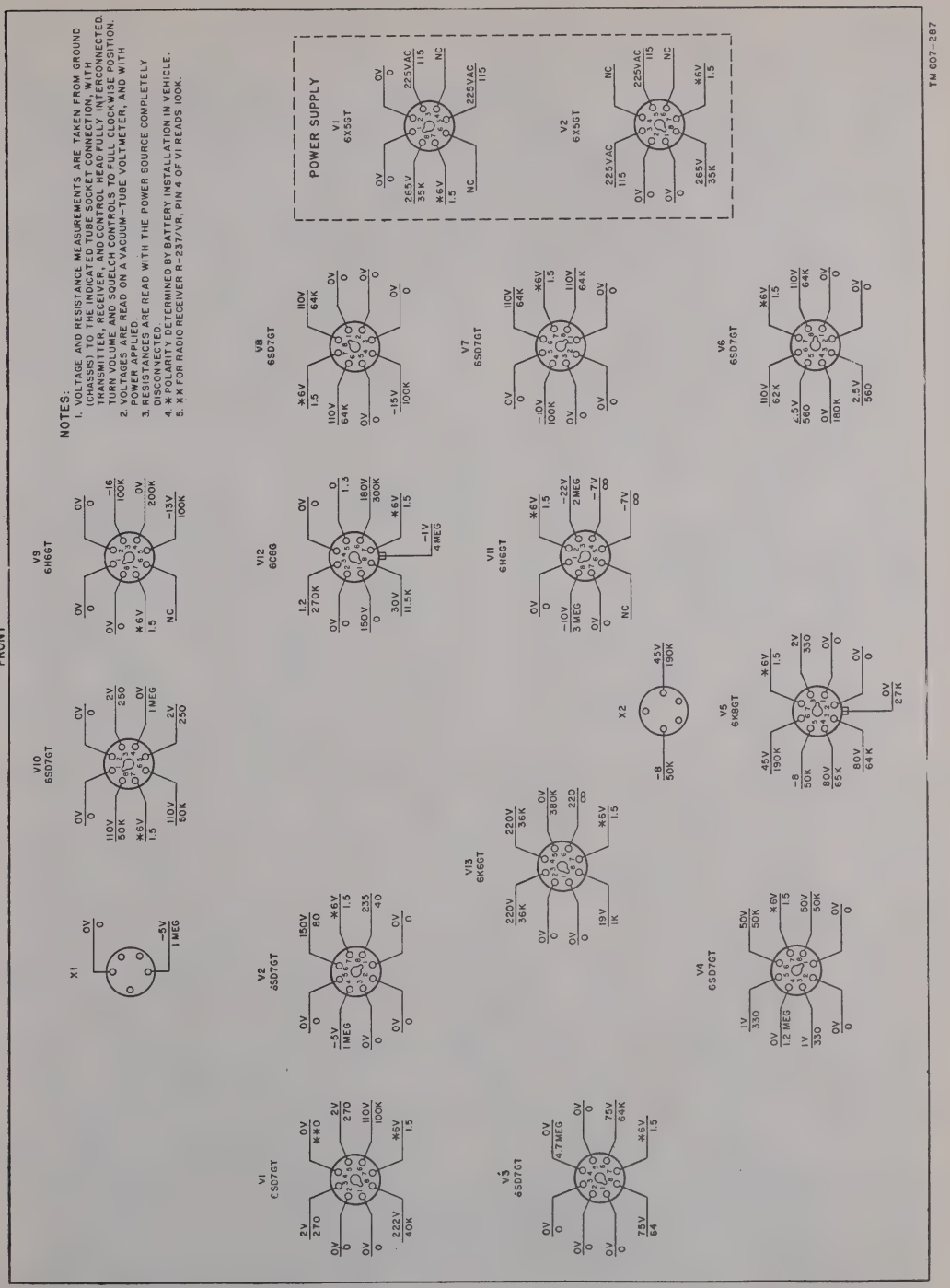


Figure 77. Radio Receivers R-237/VR and R-237A/VR, tube sockets, voltage and resistance measurements.

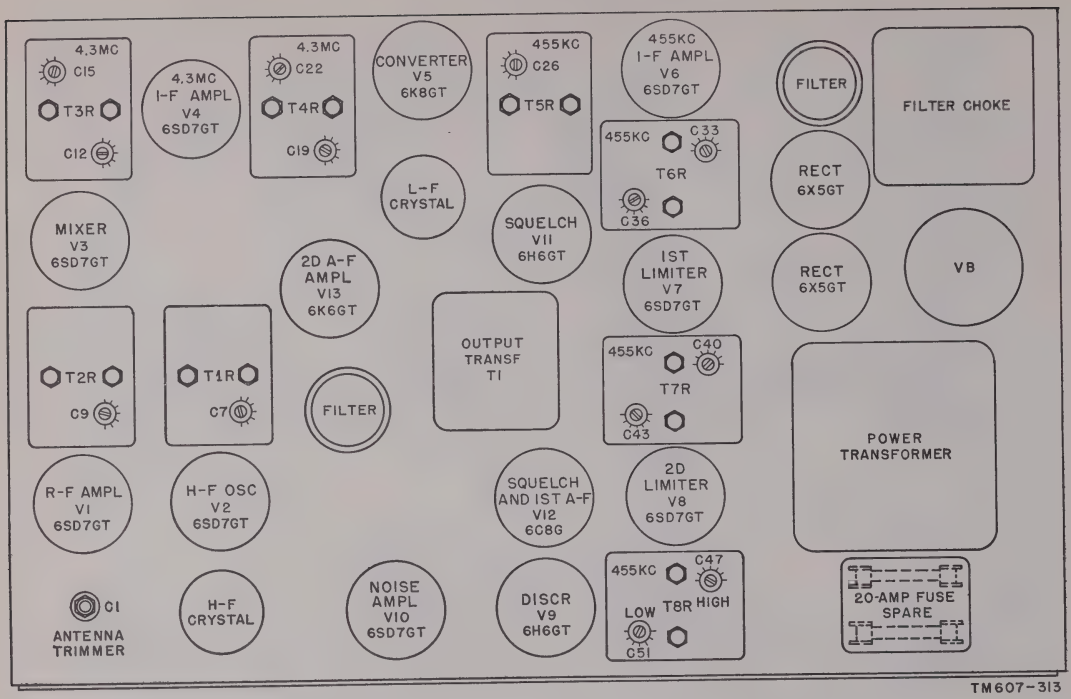


Figure 78. Radio Receiver R–237/VR, chassis layout.

Test equipment	Technical manual
Audio Oscillator TS–382A/U, or equal.	TM 11–2684A
Tube Tester I–177 and I–177–A, or equal.	TM 11–2627
Oscilloscope BC–1060–A, or OS–8A/U.	TM 11–2526 NAVSHIPS 91364
Electronic Multimeter TS–505/U, or equal.	TM 11–5511
Output Meters TS–585A/U, and TS–585B/U, or equal.	TM 11–5017
34-ohm dummy antenna (2A 271–11, or equal).	
Frequency Meter TS–480/U, or equal.	TM 11–5042
Microammeter, 0–50 μa (microampere) range (3F891–29, or equal).	

70. General Precautions

a. Whenever the transmitter is serviced, observe the following precautions very carefully:

(1) To prevent overheating, do not allow the dynamotor to run more than 5 minutes out of every 10.

(2) Be careful when the cover is removed; dangerous voltages are exposed.

b. Careless replacement of parts often makes new faults inevitable. Note the following points:

(1) Before a part is unsoldered, note the position of the leads. If the part, such as a transformer, has a number of connections, tag each of the leads to it.

(2) Be careful not to damage other leads by pulling or pushing them out of the way.

(3) Do not allow drops of solder to fall into the set, since they may cause short circuits.

(4) A carelessly soldered connection may create a new fault. It is very important to make well-soldered joints, since a poorly soldered joint is one of the most difficult faults to find.

(5) When a part is replaced in r-f or i-f circuits, it must be placed exactly as the original one was placed. A part

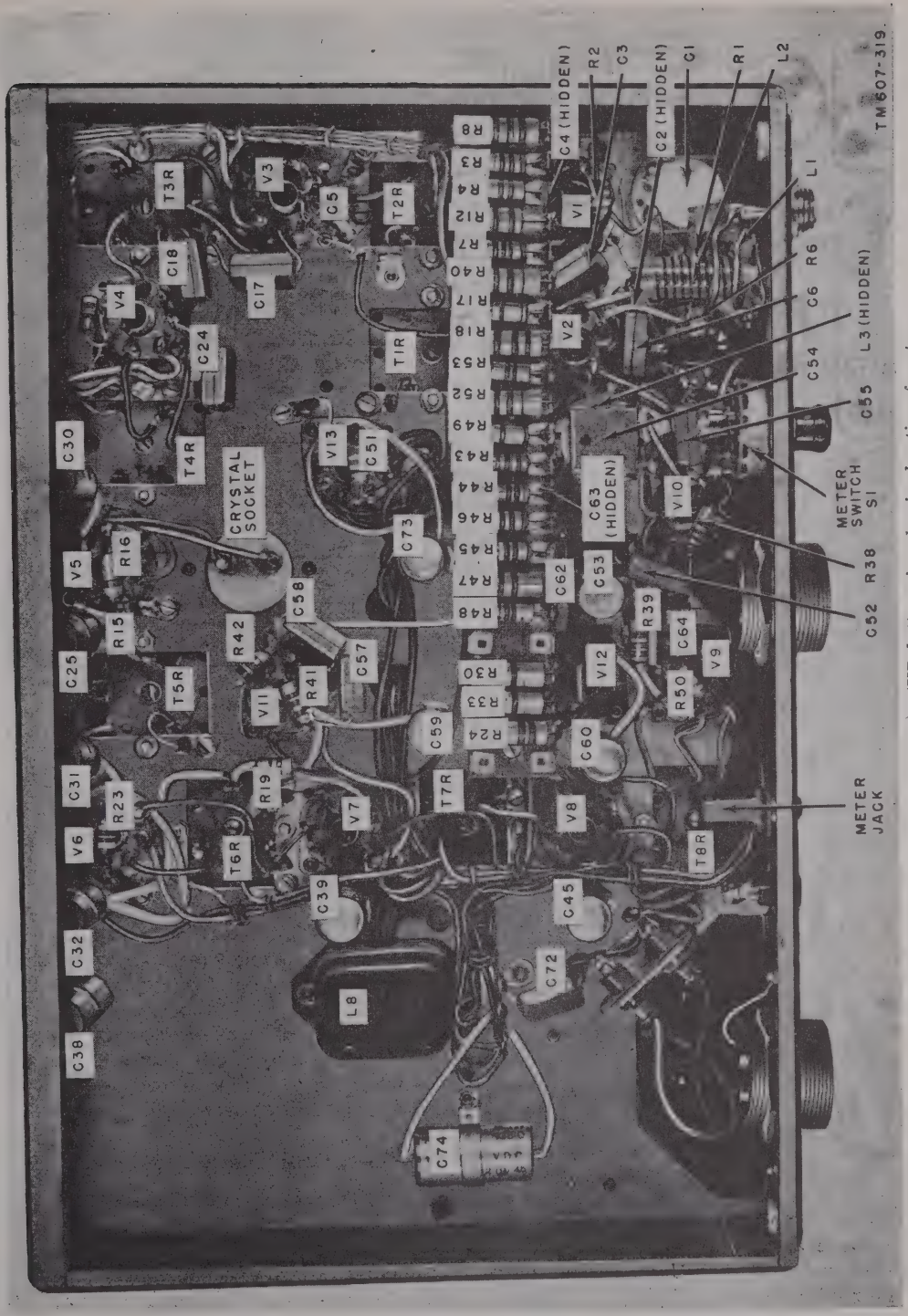


Figure 79. Radio Receiver R-237/VR, bottom view showing location of parts.

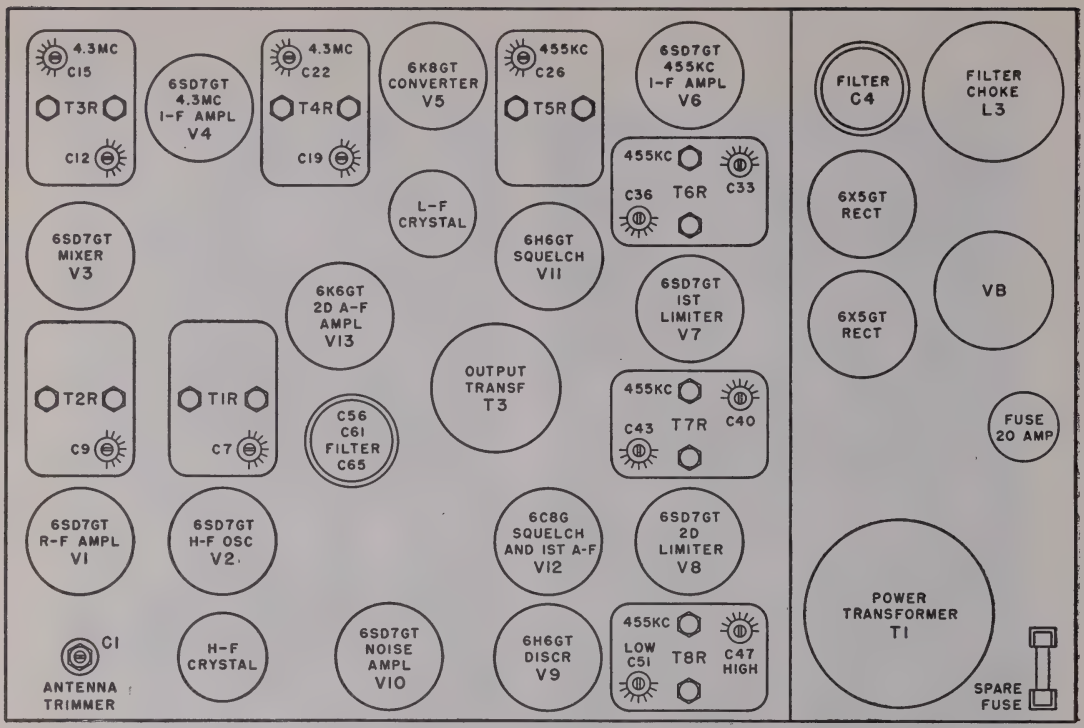


Figure 80. Radio Receiver R–237A/VR, chassis layout.

which has the same electrical value but different physical size may cause trouble in h-f circuits. Give particular attention to proper grounding when replacing a part. Use the same ground as in the original wiring. Failure to observe these precautions may result in decreased gain or possibly in oscillation in the circuit.

71. Checking Key Circuits for Shorts

(figs. 90, 100, and 112)

a. The purpose of the checks outlined in this paragraph is to make sure that when power is applied the equipment will not be damaged because of short circuits. Also, many types of troubles, such as shorted capacitors, faulty relay contacts, or faulty connectors, may be discovered by means of these tests. Use Electronic Multimeter TS–505/U. or equivalent, to check the readings given in figures 90, 100, and 112. For these measurements, all cables are disconnected.

b. If the required reading is not obtained, refer to the schematic diagram for the unit to determine which part or parts may be responsible for the trouble. Incorrect readings may be caused by shorted or leaky capacitors, defective relay contacts, defective resistors, wires shorted to the chassis, or a defective connection. Check each capacitor in the affected circuit section for leakage or short, and replace if necessary. Check all connectors and controls. Repair if necessary. Do not operate the equipment until the proper readings are obtained.

72. Operational Test

a. If the readings given in paragraph 71 are obtained, operate the equipment to locate the source of trouble. The operational checks serve as the first step in sectionalizing trouble. Before starting the operational check, make sure that

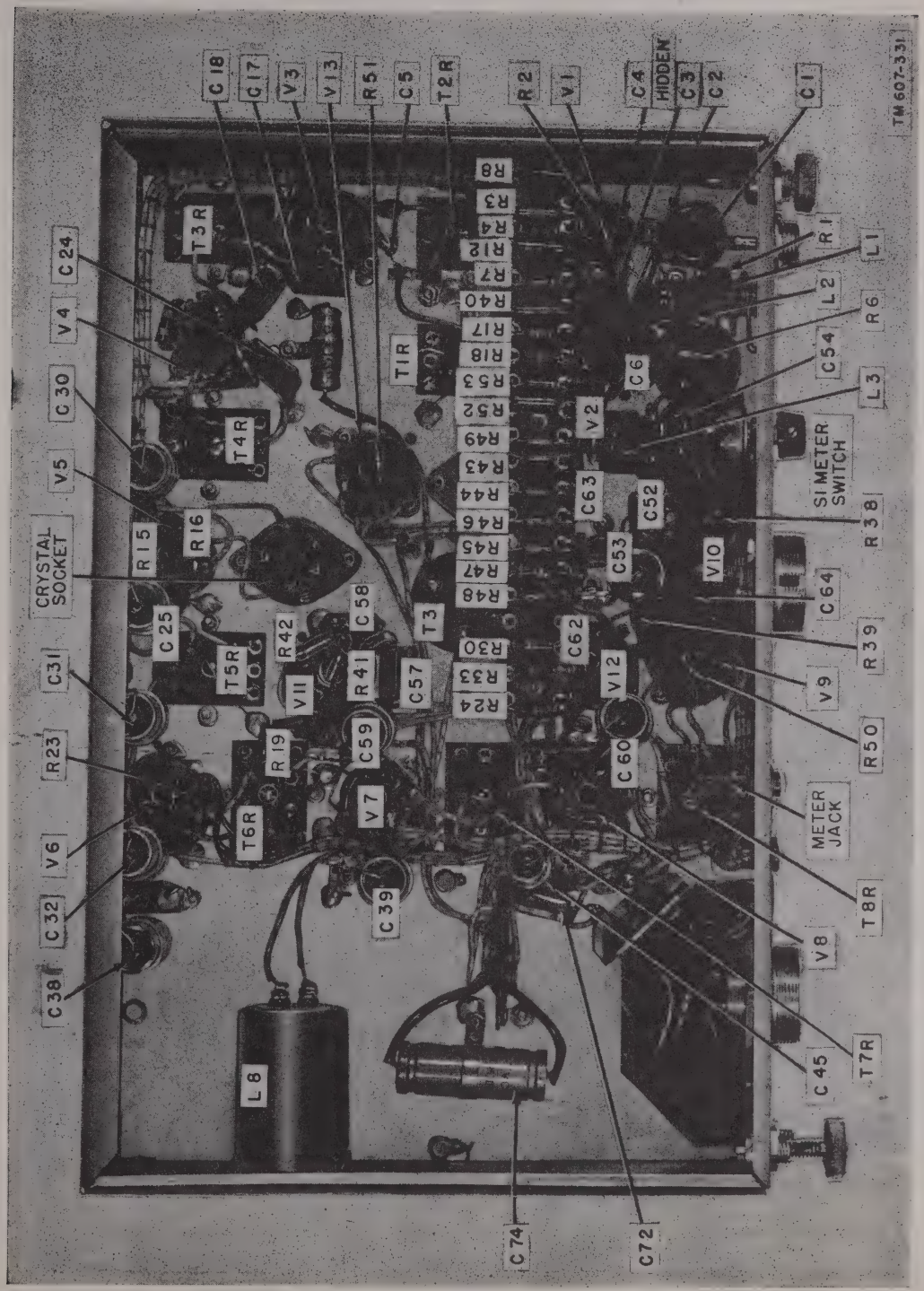


Figure 81. Radio Receiver R-287A/VR, bottom view, showing location of parts.

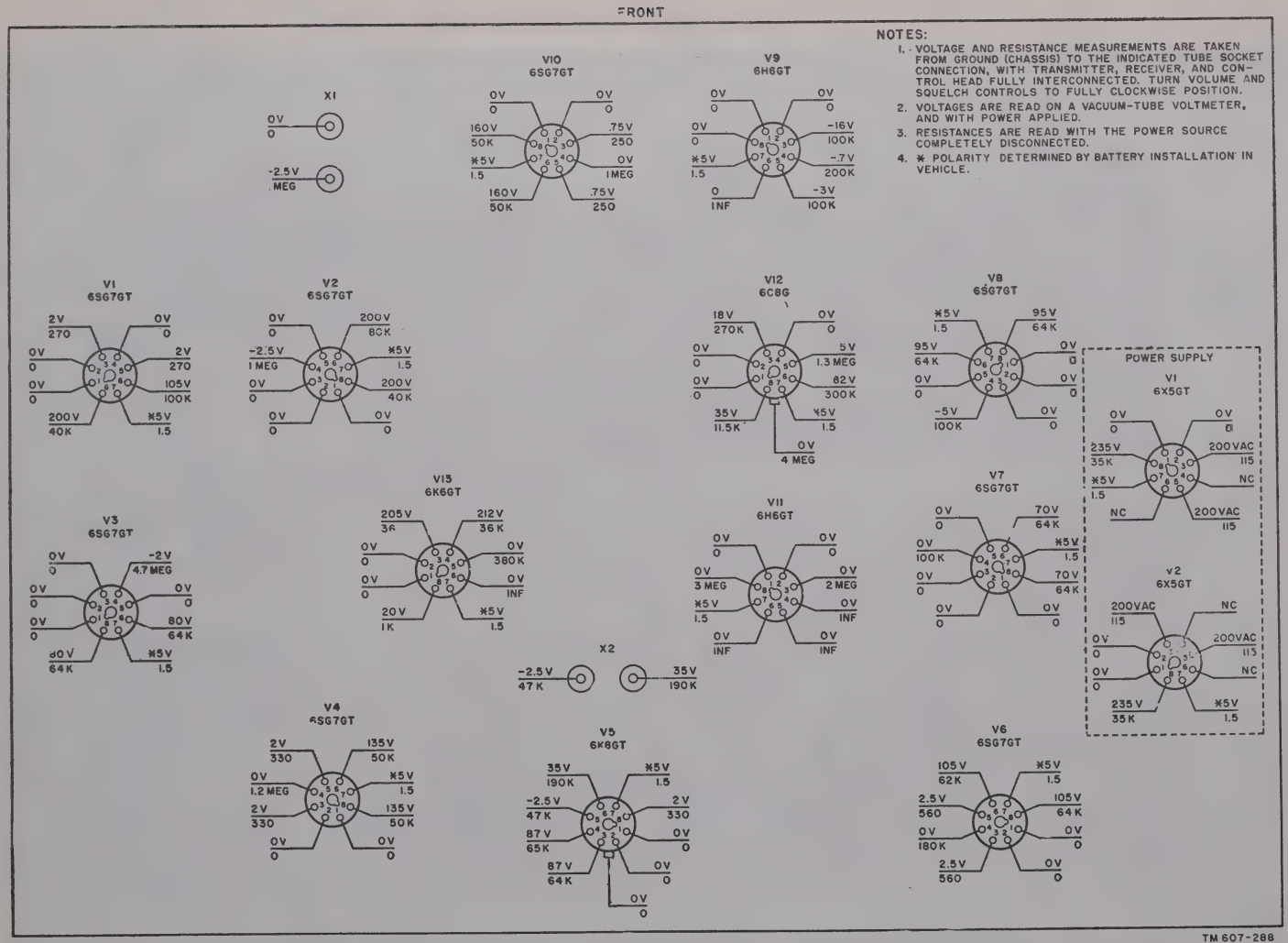


Figure 82. Radio Receiver R-237B/VR, tube sockets, voltage and resistance measurements.

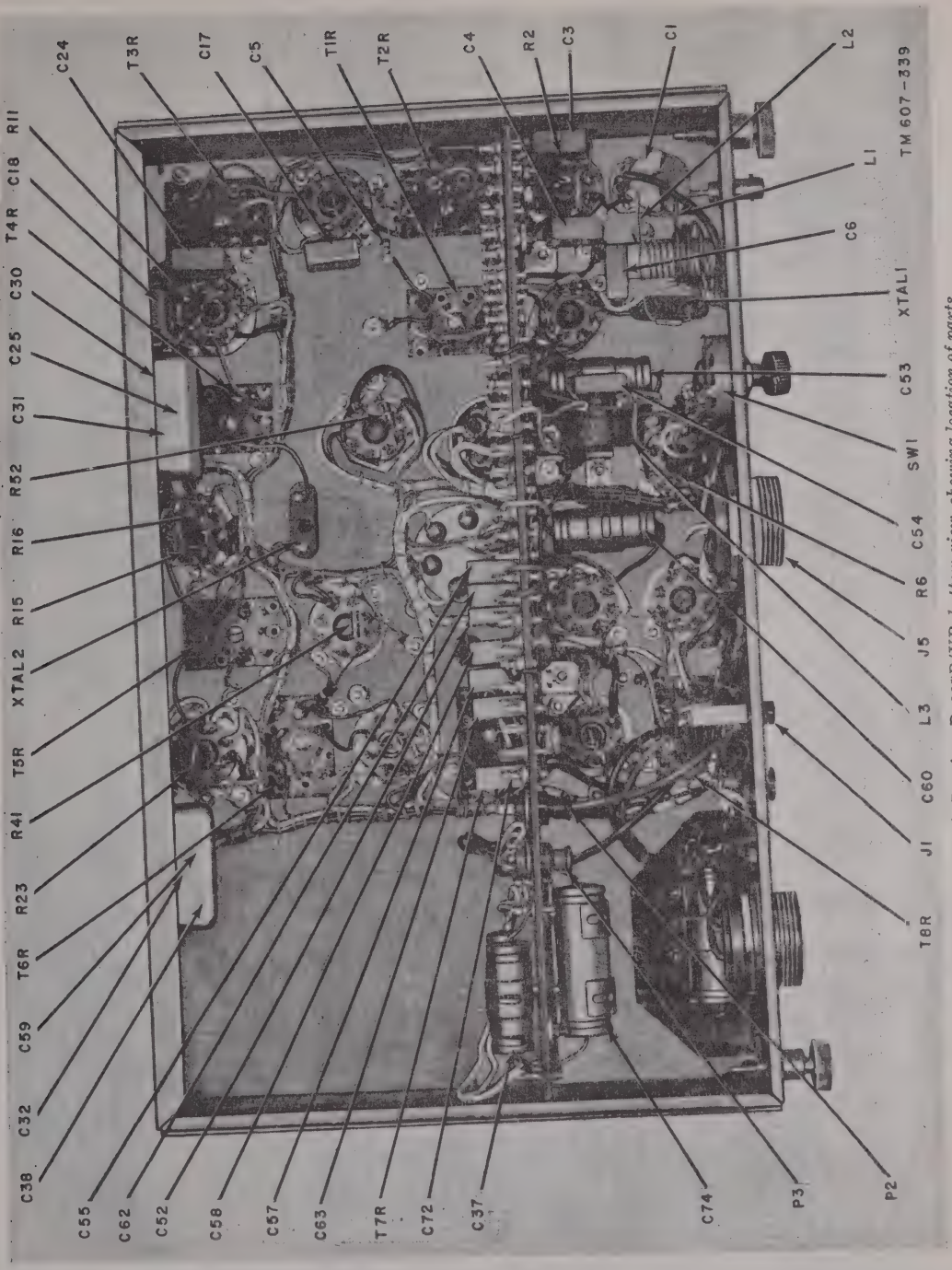


Figure 83. Radio Receiver R-237B/VR, bottom view, showing location of parts.

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Figure 84. Radio Receivers R-435/VRC-2X and R-237B/VR, terminal strip TS1, voltage and resistance measurements.

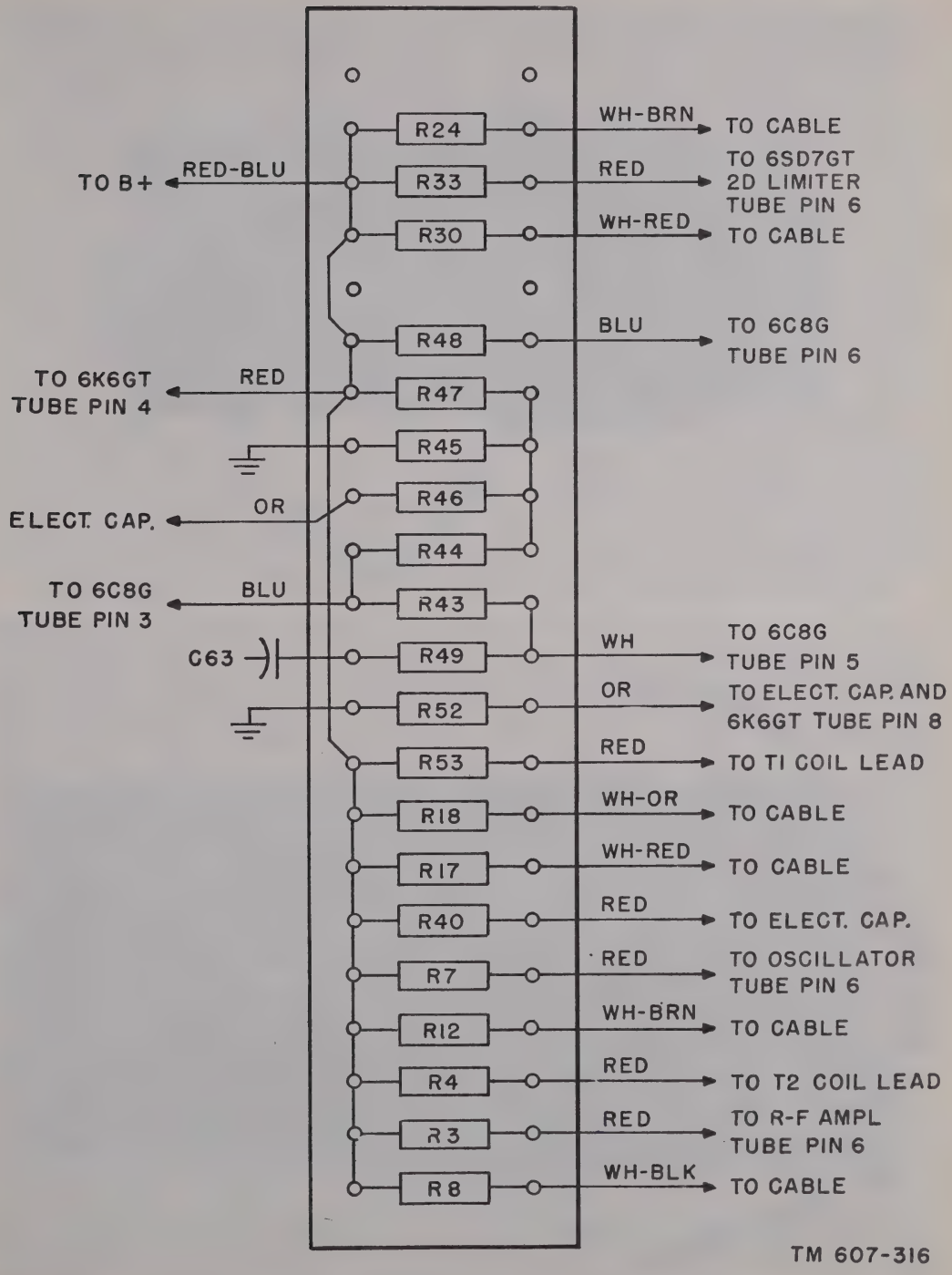


Figure 85. Radio Receivers R-237/VR and R-237A/VR, resistor strip layout.

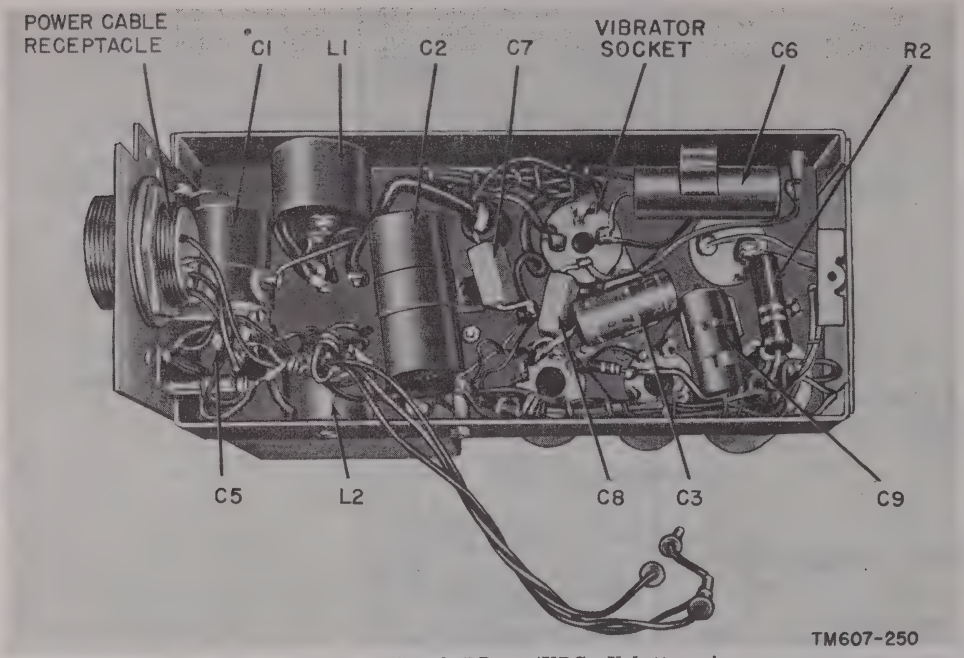


Figure 86. Power Supply PP-721/VRC-2X, bottom view.

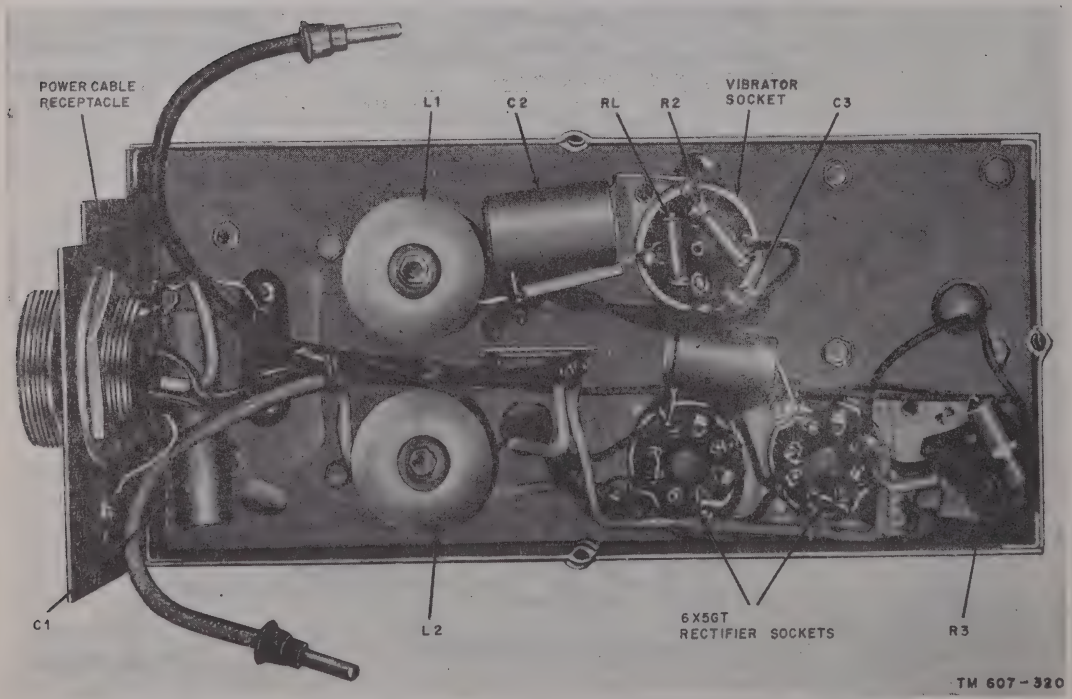


Figure 87. Radio Receiver R-237/VR, bottom view of power supply.

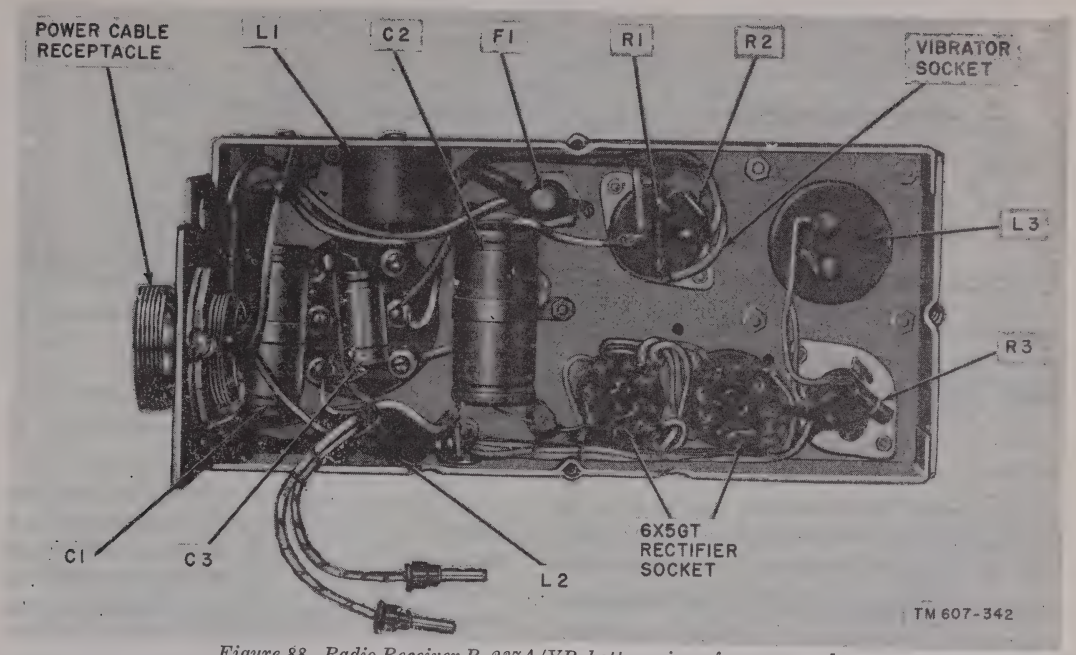


Figure 88. Radio Receiver R-237A/VR, bottom view of power supply.

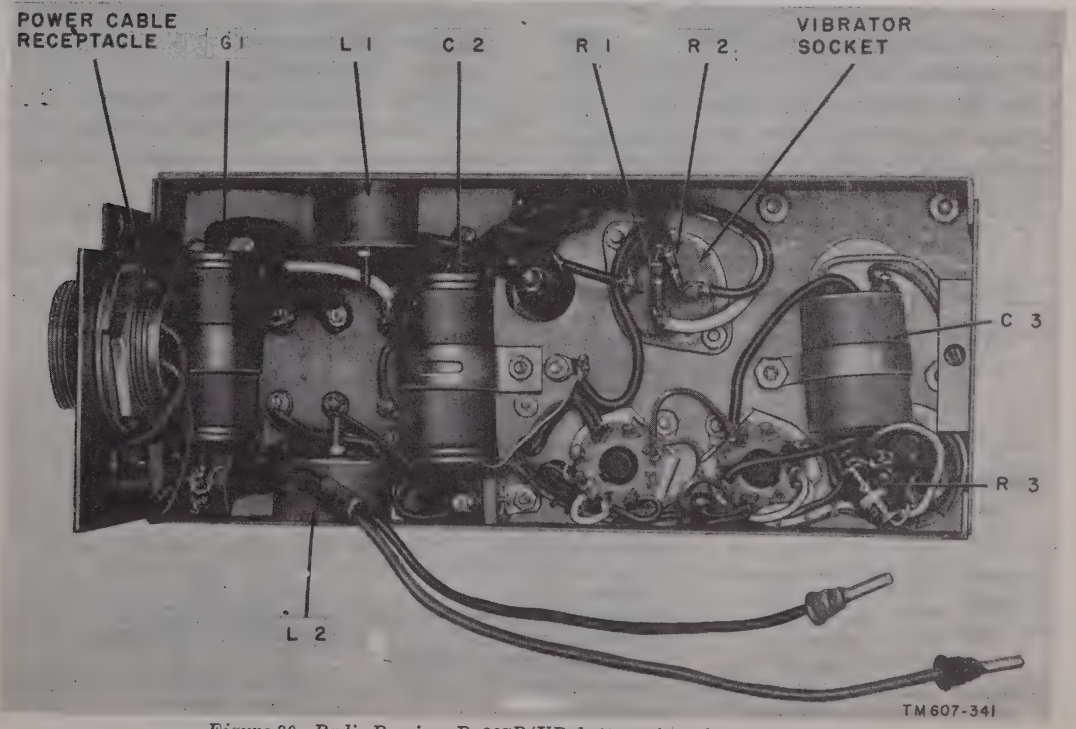


Figure 89. Radio Receiver R-237B/VR, bottom view of power supply.

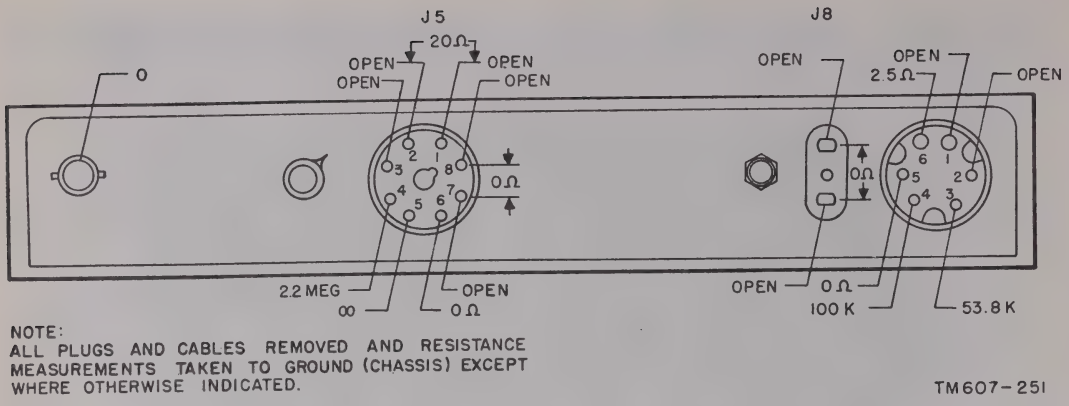


Figure 90. Radio Receiver R-435/VRC-2X, connectors, resistance measurements.

the equipment is set up the way it is under normal operating conditions. Use either dummy antenna illustrated in figure 116 if convenient.

b. Operate the equipment as described in the equipment performance checklist (par. 41). This checklist is important because it frequently indicates the general location of trouble and may save further trouble shooting if the corrective measures indicated are successful. Also, listen for crackling or buzzing noises which indicate h-v arcing. Check the equipment for smoke and odor of burned or overheated parts.

c. If the source of trouble still has not been located up to this point, trouble shooting is necessary. The first step is to trace the trouble to the faulty units. The following chart lists some of the various symptoms which may be recognized easily and gives the probable location of the existing trouble and the recommended correction. This chart will help the operator determine in which unit or stage the trouble is located. By using the chart, the operator can isolate the trouble to one component of the equipment and thus save time that might otherwise be lost in checking normal components.

Symptom	Probable trouble	Correction
1. All controls in normal operating position. Green lamp does not operate. Transmitter and receiver do not operate.	1. Battery dead. Main fuse or fuse in transmitter open. Battery cable defective. Relay RY1 defective. Volume switch in control head defective. Transmitter control cable defective.	1. Replace battery. Replace fuses. Replace cable. Repair relay RY1. Repair switch. Repair cable.
2. Transmitter normal but receiver dead.	2. Power cable from transmitter open. Receiver power supply or fuse defective. Receiver defective.	2. Repair cable. Repair power supply.
3. Receiver normal but transmitter dead.	3. Relay circuits RY2 and RY3 defective. Control head cable defective. Transmitter defective. Microphone switch defective.	3. Repair relay circuits. Repair cable. Repair transmitter. Replace microphone.
4. Receiver and transmitter normal but communication difficult.	4. Battery weak. Antenna poor. Location bad.	4. Recharge battery. Repair antenna. Change location.

Symptom	Probable trouble	Correction
5. Receiver normal but transmitter very weak.	5. Weak transmitter tubes. Transmitter misalined. Defective parts in transmitter.	5. Replace defective tubes. Retune transmitter. Replace defective parts.
6. Transmitter normal but receiver very weak.	6. Weak receiver tubes. Receiver misalined. Defective parts in receiver.	6. Replace defective tubes. Retune receiver. Replace defective parts.

Caution: Open fuses usually indicate that too much current is being drawn through the fused circuit. Do not replace the fuse until the source of trouble has been discovered. Refer to paragraph 71.

73. Localization

After the trouble has been sectionalized to the faulty unit, the next step is to localize the trouble to the defective stage and component. Since the equipment contains metering circuits for measuring voltages at various points, the localization process is simplified. The trouble-shooting charts for the transmitter and receiver make full use of these metering circuits. The required input signal and meter reading for each stage are given in the alinement section of the manual. If the set does not function properly, try to aline it according to the procedure outlined. Note where difficulties appear and refer to the trouble-shooting chart for the unit involved.

74. Trouble-Shooting Chart for Receiver

Before attempting to do any trouble shooting, study all paragraphs which discuss the theory of operation of the receiver and its power supply. The following chart is supplied as an aid in locating trouble in the receiver and power supply unit. This chart lists symptoms which the repairman observes, either visually or audibly, while making a few simple tests. Once the trouble has been localized to a stage or circuit, a tube check and voltage and resistance measurements of this stage or circuit ordinarily should be sufficient to isolate the defective part. Normal voltage and resistance measurements are given in figure 74. Before proceeding, make all corrections indicated in paragraph 72. The proper METER jack readings are found in paragraph 81. The readings are taken with a microammeter, 0- to 50-μa (microampere) range (3F891–29 or equivalent), connected as described in paragraph 81*a*.

Symptom	Probable trouble	Correction
1. Filaments in receiver do not light. Green lamp lights.	1. Input source to power supply.	1. Check fuse in receiver power supply. Check power cable to receiver.
2. Receiver filaments light; no plate power.	2. Power supply or relay RY3.	2. Repair power supply. Repair relay circuit.
3. Some tube filaments do not light.	3. Defective tube.	3. Check filament circuits.
4. Low or no meter reading on position 5.	4. Tube V9 defective.	4. Replace tube V9. Repair or realine the preceding stages and discriminator transformer.
5. A 5-μa or greater meter reading on position 4.	5. Defective tube V9. Misalined discriminator.	5. Replace tube V9. Repair or realine discriminator transformer.
6. Low or no meter reading on position 3.	6. Defective tube V8. No output from the first limiter. Capacitor C44 shorted.	6. Replace tube V8. Repair and realine the preceding stages and transformer T7R. Replace capacitor C44.

Symptom	Probable trouble	Correction
7. Low or no meter reading on position 2.	7. Tube V7 defective. Capacitor C37 shorted. No output from 455-Kc amplifier.	7. Replace tube V7. Replace capacitor C37. Repair or realine preceding stages and first limiter transformer T6R.
8. Low or no meter reading on position 1.	8. Tube V6 defective. Capacitor C29 shorted. No output from converter tube V5.	8. Replace tube V6. Replace capacitor C29. Repair or realine preceding stages.

75. Trouble-Shooting Chart for Transmitter

Warning: Be extremely careful when making measurements since there are voltages in excess of 600 volts in the transmitter which are dangerous and can be fatal. Except for making voltage measurements, turn the power off when working in this unit. Before attempting any trouble shooting, study the theory section dealing with the transmitter. Do not leave power on for more than a few seconds at a time. Use a microammeter (with a range of 0 to 50 μa, 3F891–29 or equivalent) to obtain the readings given in paragraph 83 of this manual.

Symptom	Probable trouble	Correction
1. Transmitter dead (no plate power).	1. Dynamotor defective. Capacitors C35 or C36 defective. Relays RY2 or RY3 defective. Microphone switch defective.	1. Repair dynamotor. Replace capacitors. Repair relay circuits. Repair microphone.
2. Only some filaments light.	2. Defective tube.	2. Check tubes in filament string.
3. Low or no reading on meter on PA position.	3. Defective tube V7. Power supply defective. Capacitor C27, C28, or C29 shorted. Antenna loading too light.	3. Replace tube V7. Repair power supply or replace rectifier tube. Replace capacitor. Retune or repair the antenna circuits.
4. Abnormally high meter reading on PA position.	4. No r-f excitation from preceding stages. Plate circuit not tuned to the correct frequency. Grid circuit changed in value.	4. Repair or retune the preceding stages. Retune plate circuit. Check grid circuit components.
5. Low or no meter reading on position 5.	5. No r-f excitation from preceding stages.	5. Repair or retune preceding stages. Replace capacitor C34.
6. Low or no meter reading on position 4.	6. Defective tube V6. Capacitor C21 shorted. No r-f excitation from preceding stages.	6. Replace tube V6. Replace capacitor C21. Repair or retune preceding stages.
7. Low or no meter reading on position 3.	7. Defective tube V5. Capacitor C17 shorted. No r-f excitation from preceding stages.	7. Replace tube V5. Replace capacitor C17. Repair or retune preceding stages.
8. Low or no meter reading on position 2.	8. Defective tube V4. Capacitor C13 shorted. No r-f excitation from preceding stages.	8. Replace tube V4. Replace capacitor C13. Repair or retune preceding stages.
9. Low or no meter reading on MOD. position.	9. Tube V2 or V3 or both defective. Capacitor C4 shorted. No r-f excitation from oscillator.	9. Replace tube V2 or V3 or both. Replace capacitor C4. Repair or retune oscillator stage.
10. Low or no meter reading on position 1.	10. Tube V1 defective. Capacitor C1 shorted. Crystal defective. Oscillator stage defective.	10. Replace tube V1. Replace capacitor C1. Replace crystal. Check the crystal and oscillator stage components.

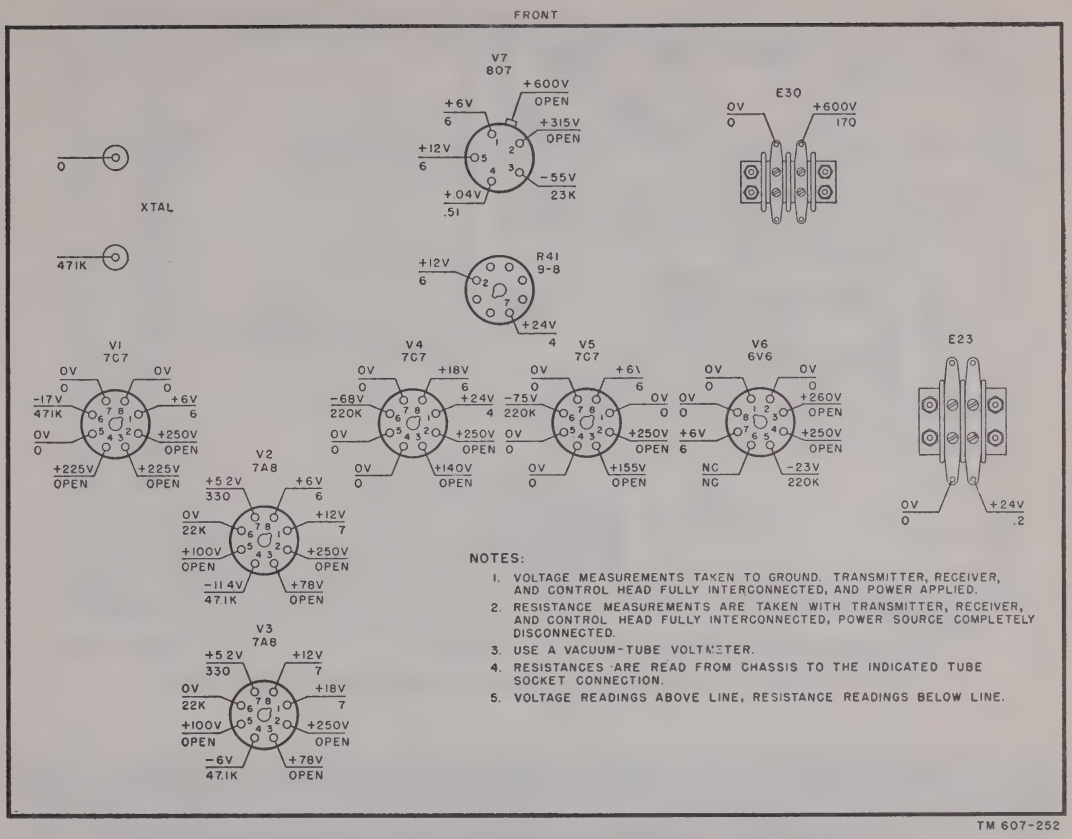


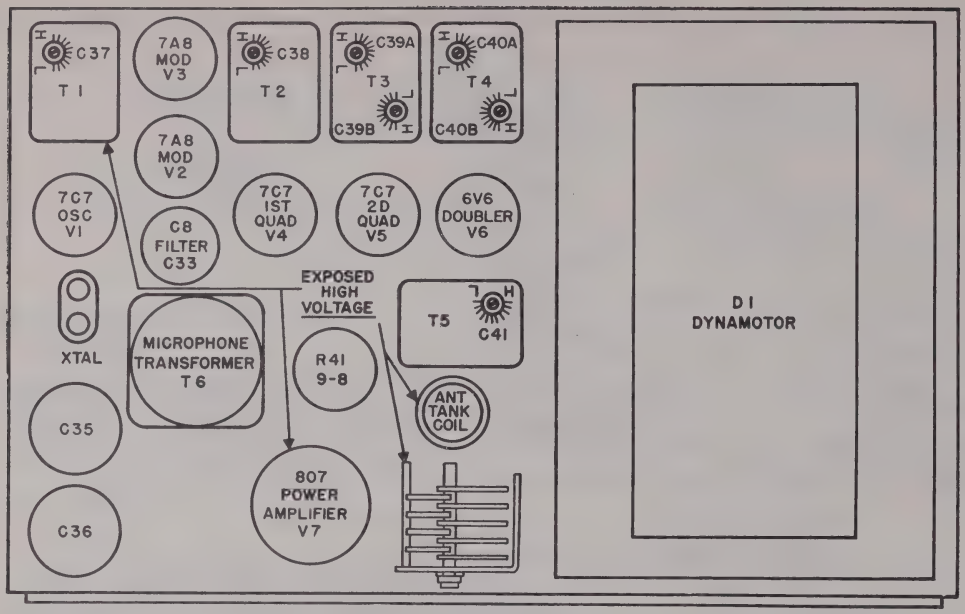
Figure 91. Radio Transmitter T–822/VRC–2X, tube sockets, voltage and resistance measurements.

76. Signal Substitution in Receiver

Troubles not found by use of the trouble-shooting chart in paragraph 74 can be localized quickly by signal substitution. This method will indicate the defective stage quickly. In the tests indicated, ground one side of the signal generator to the receiver chassis and connect the other side through a capacitor to the point indicated. When working back from the output to the input stages, decrease the output of the signal generator as much as possible. If possible, compare with a receiver known to be in good condition. The equipment must be connected completely and the controls set in normal position. If distortion is present, check the tube, cathode resistor, and screen bypass in the faulty circuit.

a. Inject a 400-cycle signal through a .01-μf capacitor into pin 5 of V13 and note if distortion is present. If no signal is heard or if distortion is present, the condition is caused by faulty circuit components from V13 to the speaker. If distortion is present, inject the 400-cycle signal into pin 5 of V12 and note if distortion appears. Check components between the two stages if distortion appears now, or if no signal is heard.

b. Inject a 455-kc f-m modulated signal through a .001-μf capacitor onto the plate of the second limiter; then work back to pin 4 of V8, pin 8 of V7, pin 4 of V7, pin 8 of V6, pin 4 of V6, and pin 3 of V5. Notice between what points the signal disappears or distortion is



NOTE:
R41 IS NOT USED IN RADIO TRANSMITTER T-193B/VRC-2.

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Figure 92. Radio Transmitters T–322/VRC–2X and T–193B/VRC–2, chassis layout.

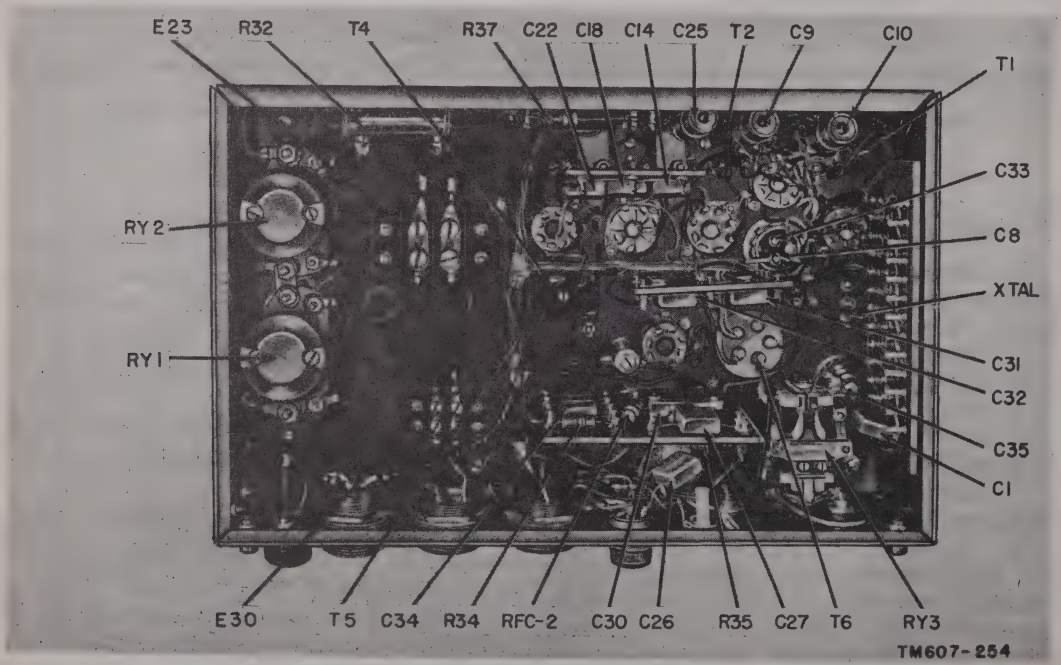


Figure 93. Radio Transmitter T–322/VRC–2X, bottom view showing location of parts.

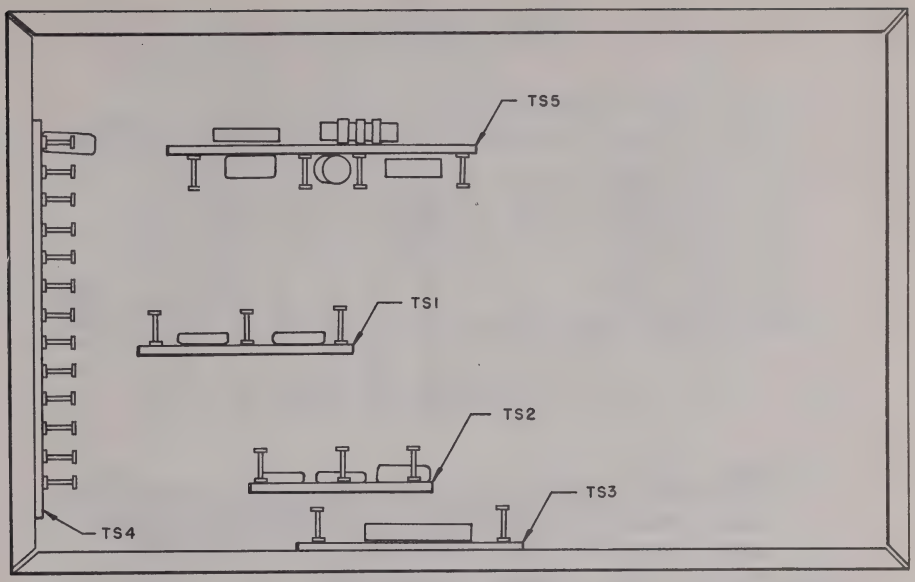
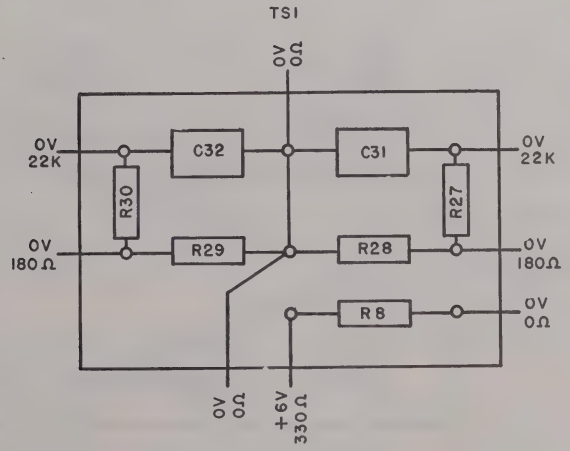


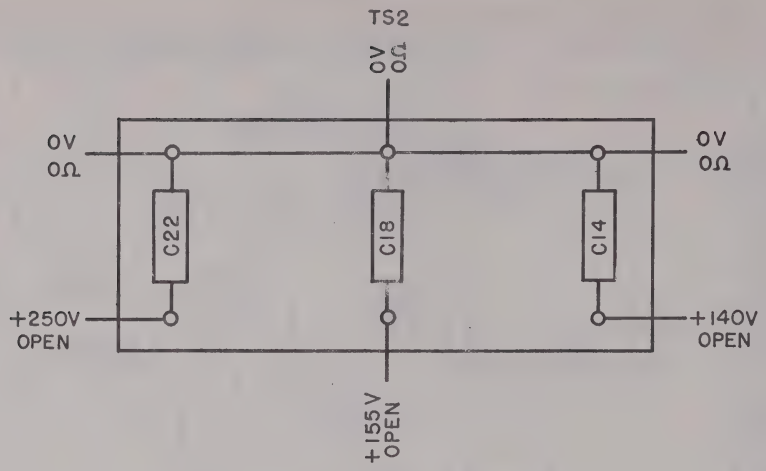
Figure 94. Radio Transmitters T–322/VRC–2X and T–193B/VRC–2, terminal strip locations.



NOTES:
1. RESISTANCE MEASUREMENTS TAKEN TO GROUND (CHASSIS) WITH POWER SOURCE REMOVED. VOLTAGE MEASUREMENTS TAKEN TO GROUND (CHASSIS) USING A VACUUM-TUBE VOLTMETER.
2. 24-VOLT INPUT TO 8-FOOT POWER CABLE.
3. OUTPUT LOAD AT TRANSMITTER 34 OHMS.

TM 607-256

Figure 95. Radio Transmitters T–322/VRC–2X and T–193B/VRC–2, terminal strip TS1, voltage and resistance measurements.

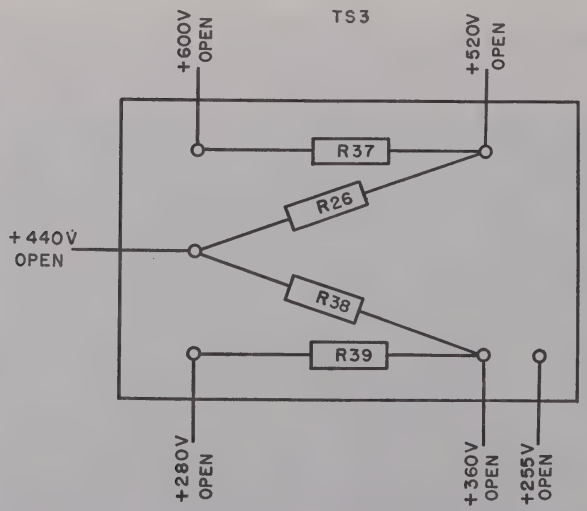


NOTES:

1. RESISTANCE MEASUREMENTS TAKEN TO GROUND (CHASSIS) WITH POWER SOURCE REMOVED. VOLTAGE MEASUREMENTS TAKEN TO GROUND (CHASSIS) USING A VACUUM-TUBE VOLTMETER.
2. 24-VOLT INPUT TO 8-FOOT POWER CABLE.
3. OUTPUT LOAD AT TRANSMITTER 34 OHMS.

TM 607-257

Figure 96. Radio Transmitters T–322/VRC–2X and T–193B/VRC–2, terminal strip TS2, voltage and resistance measurements.

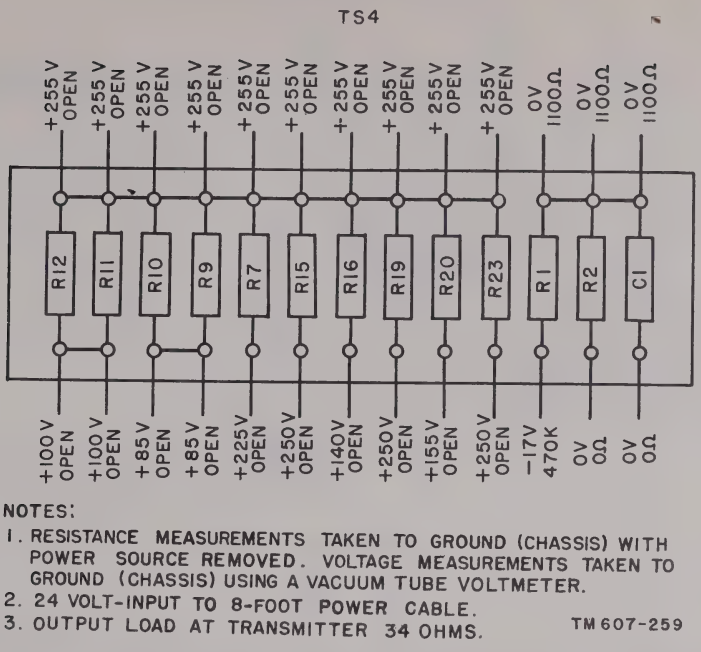


NOTES:

1. RESISTANCE MEASUREMENTS TAKEN TO GROUND (CHASSIS) WITH POWER SOURCE REMOVED. VOLTAGE MEASUREMENTS TAKEN TO GROUND (CHASSIS) USING A VACUUM TUBE VOLTMETER.
2. 24-VOLT INPUT TO 8-FOOT POWER CABLE.
3. OUTPUT LOAD AT TRANSMITTER 34 OHMS.

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Figure 97. Radio Transmitters T–322/VRC–2X and T–193B/VRC–2, terminal strip TS3, voltage and resistance measurements.



NOTES:

1. RESISTANCE MEASUREMENTS TAKEN TO GROUND (CHASSIS) WITH POWER SOURCE REMOVED. VOLTAGE MEASUREMENTS TAKEN TO GROUND (CHASSIS) USING A VACUUM TUBE VOLTMETER.
2. 24 VOLT-INPUT TO 8-FOOT POWER CABLE.
3. OUTPUT LOAD AT TRANSMITTER 34 OHMS.

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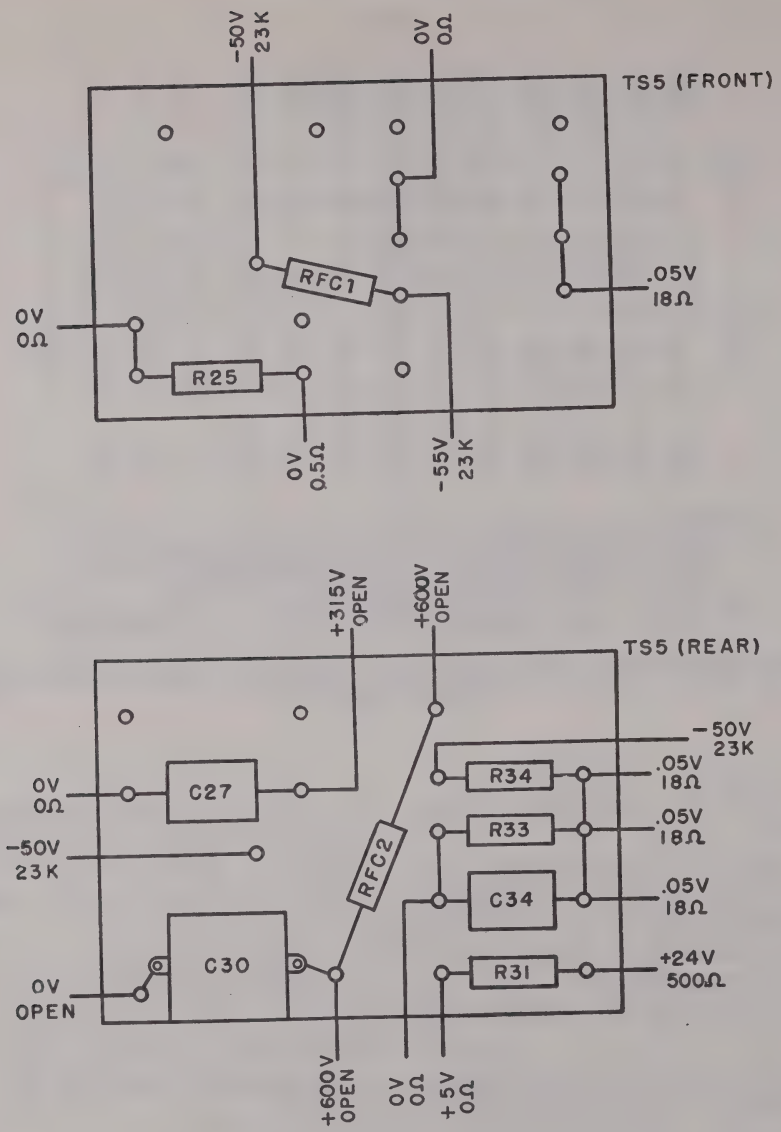
Figure 98. Radio Transmitters T–322/VRC–2X and T–193B/VRC–2, terminal strip TS4, voltage and resistance measurements.

introduced. Check the components between these two points.

c. Inject a 4.3-mc frequency-modulated signal through a .001-μf capacitor onto the cap of V5. Work back to pin 8 of V4, pin 4 of V4, pin 8 of V3, and pin 4 of V3. Notice between what points the signal disappears or distortion is introduced, and check the components involved.

d. Inject a f-m signal at the operating frequency into pin 4 of V3. Adjust slightly the frequency of this signal to obtain an output in the speaker. If the audio modulation or tone is heard, h-f oscillator V2 is clear of trouble. If there is no output from the speaker, check h-f oscillator stage V2.

e. Inject the f-m signal, in turn, on pin 8 of V1, pin 4 of V1, then through a .001-μf capacitor to pin 4 of V1, and then into ANTENNA receptacle J6. Note between which points the signal disappears, and check the components included.



NOTES:
1. RESISTANCE MEASUREMENTS TAKEN TO GROUND (CHASSIS) WITH POWER SOURCE REMOVED. VOLTAGE MEASUREMENTS TAKEN TO GROUND (CHASSIS) USING A VACUUM TUBE VOLTMETER.
2. 24 VOLT INPUT TO 8 FOOT POWER CABLE.
3. OUTPUT LOAD AT TRANSMITTER 34 OHMS.

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Figure 99. Radio Transmitters T–322/VRC–2X and T–193B/VRC–2, terminal strip TS5, voltage and resistance measurements.

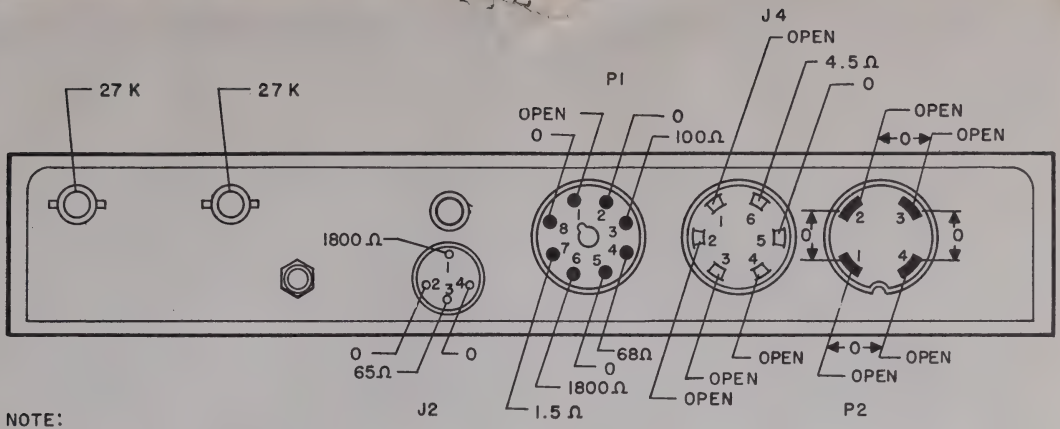


Figure 100. Radio Transmitters T–322/VRC–2X and T–193B/VRC–2, connectors, resistance measurements.

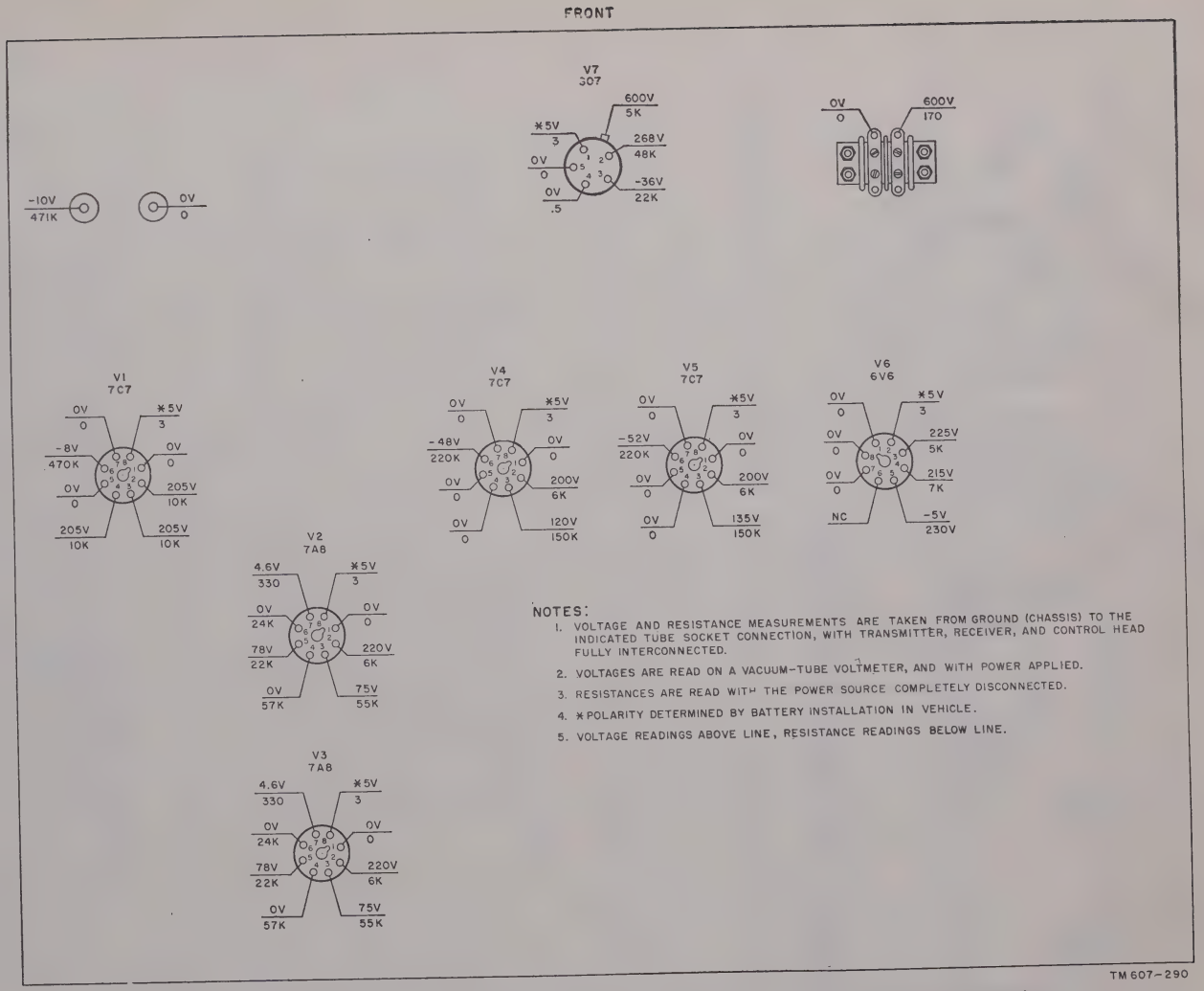


Figure 101. Radio Transmitter T–193B/VRC–2, tube sockets, voltage and resistance measurements.

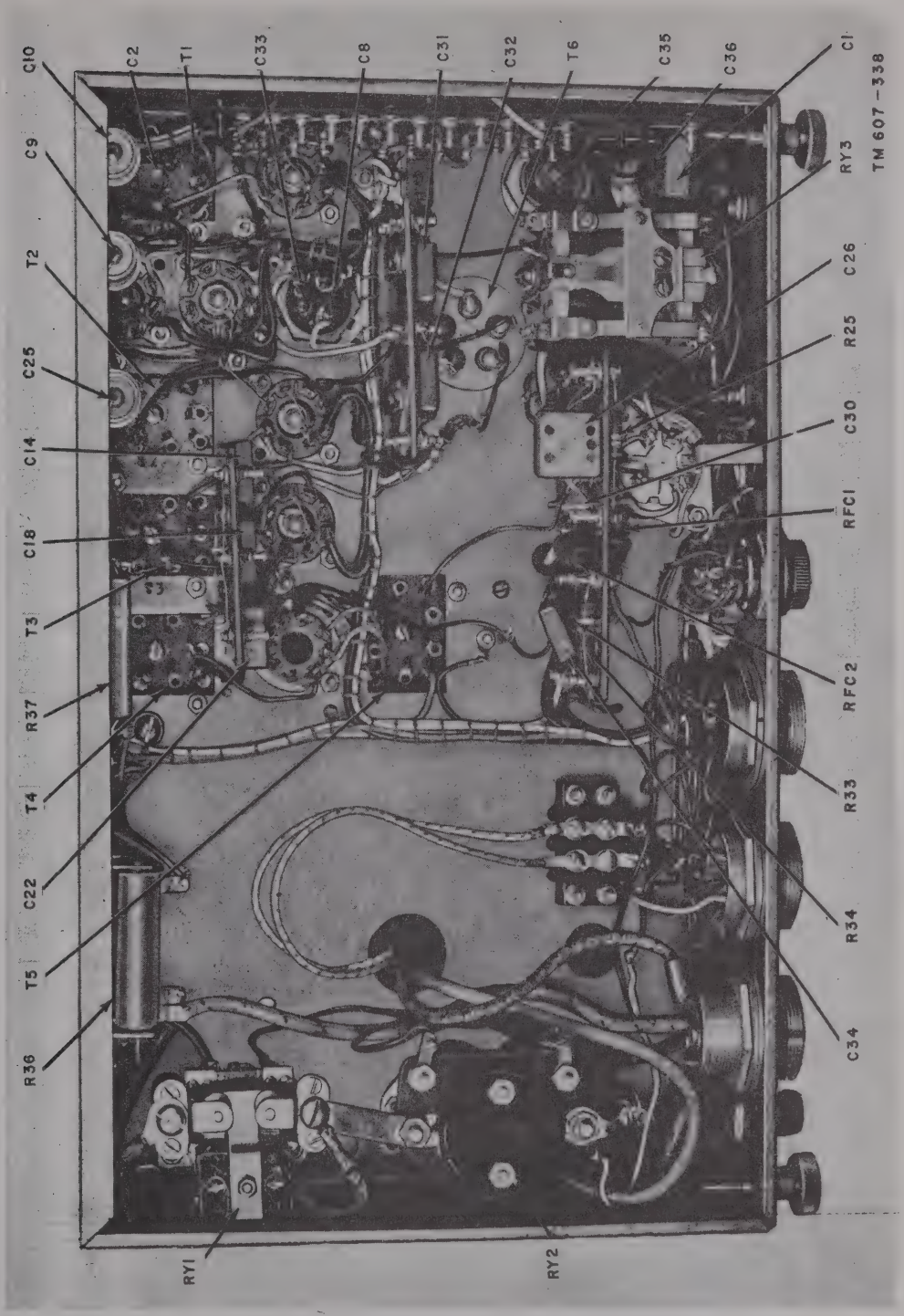


Figure 102. Radio Transmitter T-193B/VRC-2, bottom view showing location of parts.

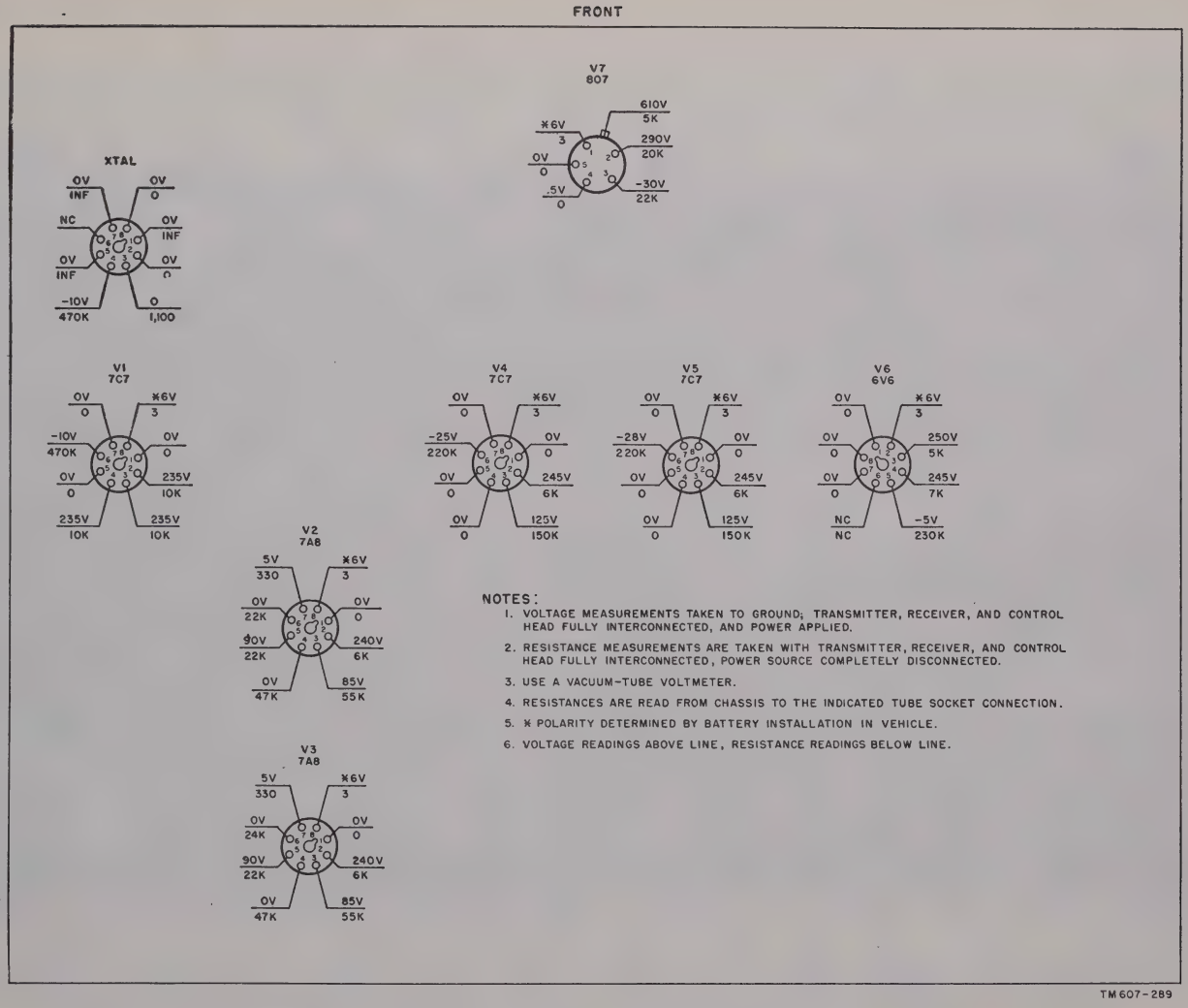


Figure 103. Radio Transmitters T-193/VRC-2 and T-193A/VRC-2, tube sockets, voltage and resistance measurements.

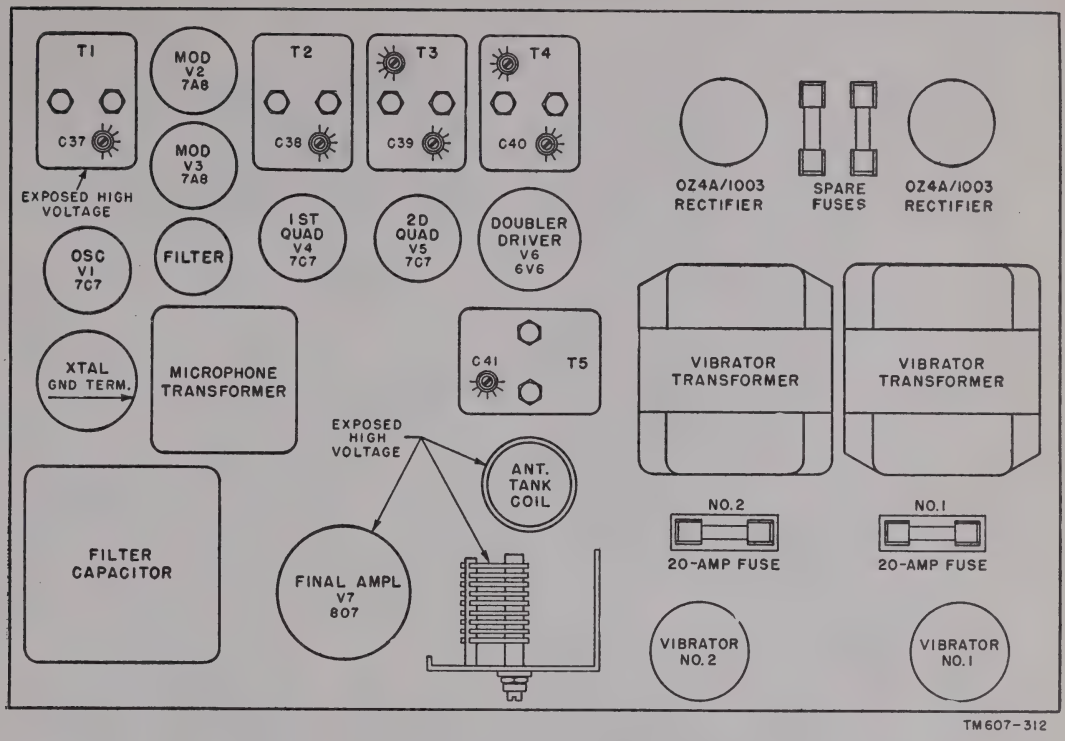


Figure 104. Radio Transmitter T–193/VRC–2, chassis layout.

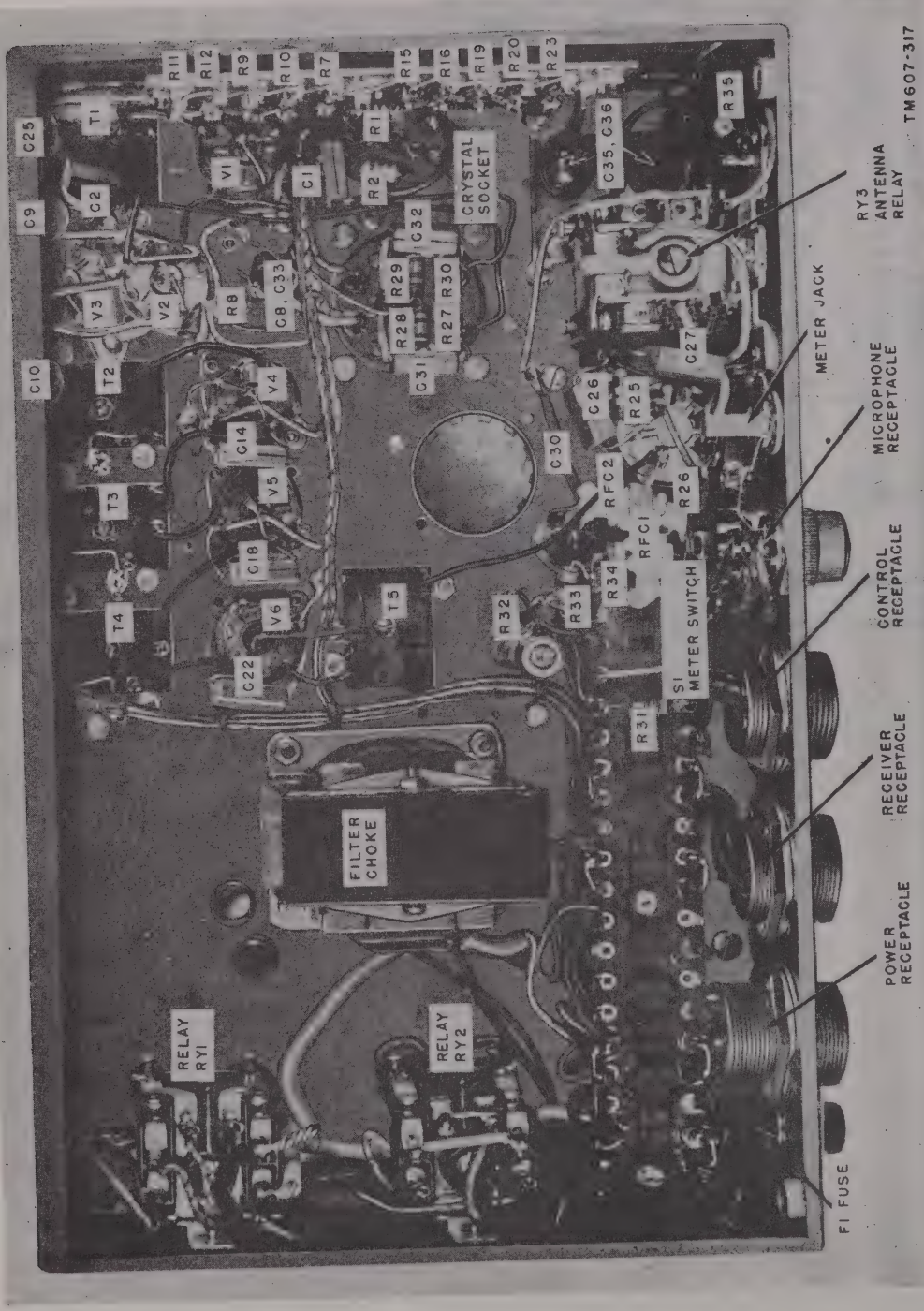


Figure 105. Radio Transmitter T-193/VRC-2, bottom view showing location of parts.

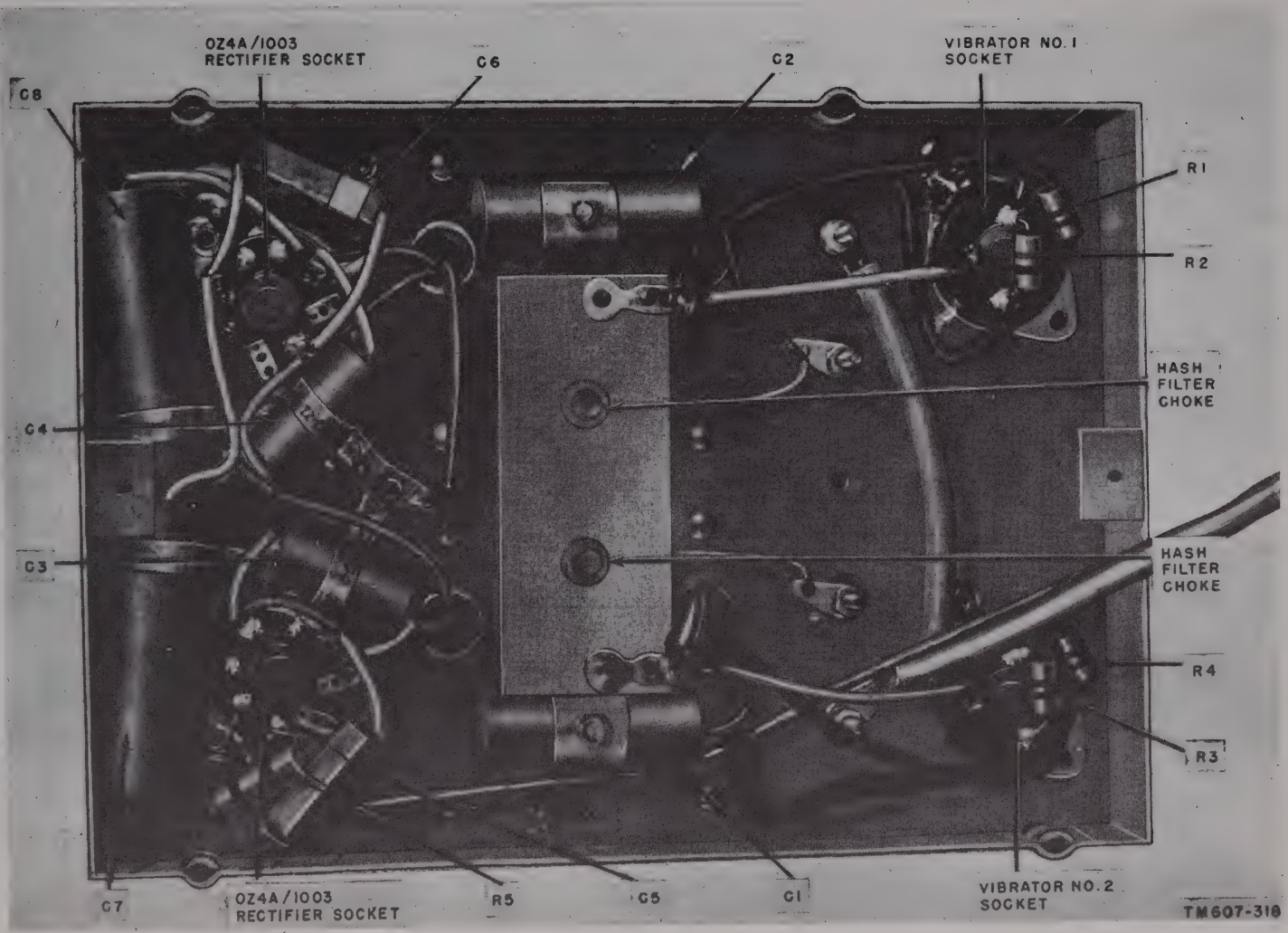


Figure 106. Radio Transmitter T–193/VRC–2, bottom view of power supply.

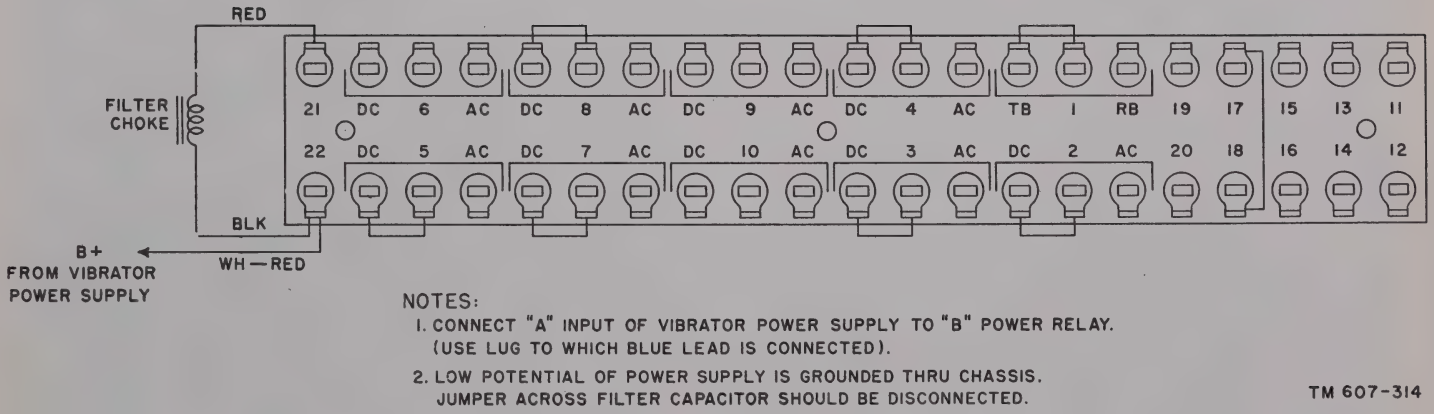


Figure 107. Radio Transmitters T–193/VRC–2 and T–193A/VRC–2, terminal board layout.

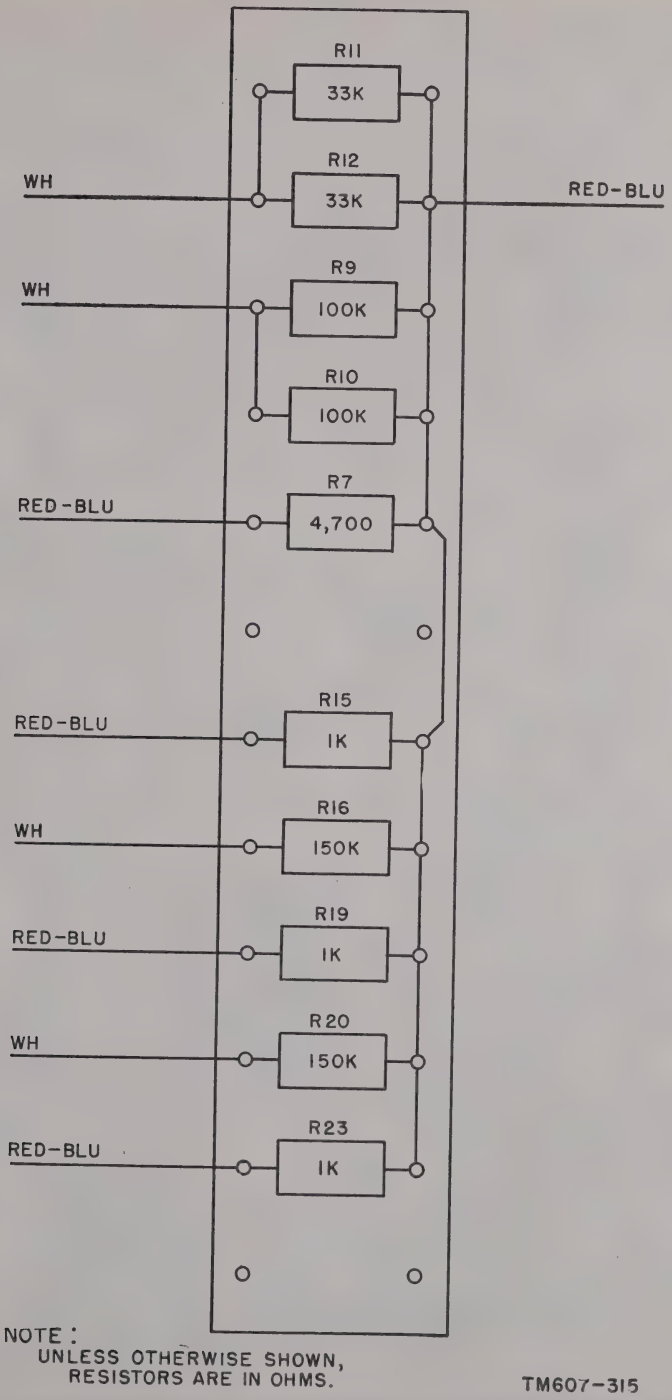


Figure 108. Radio Transmitters T-193/VRC-2 and T-193A/VRC-2, resistor strip layout.

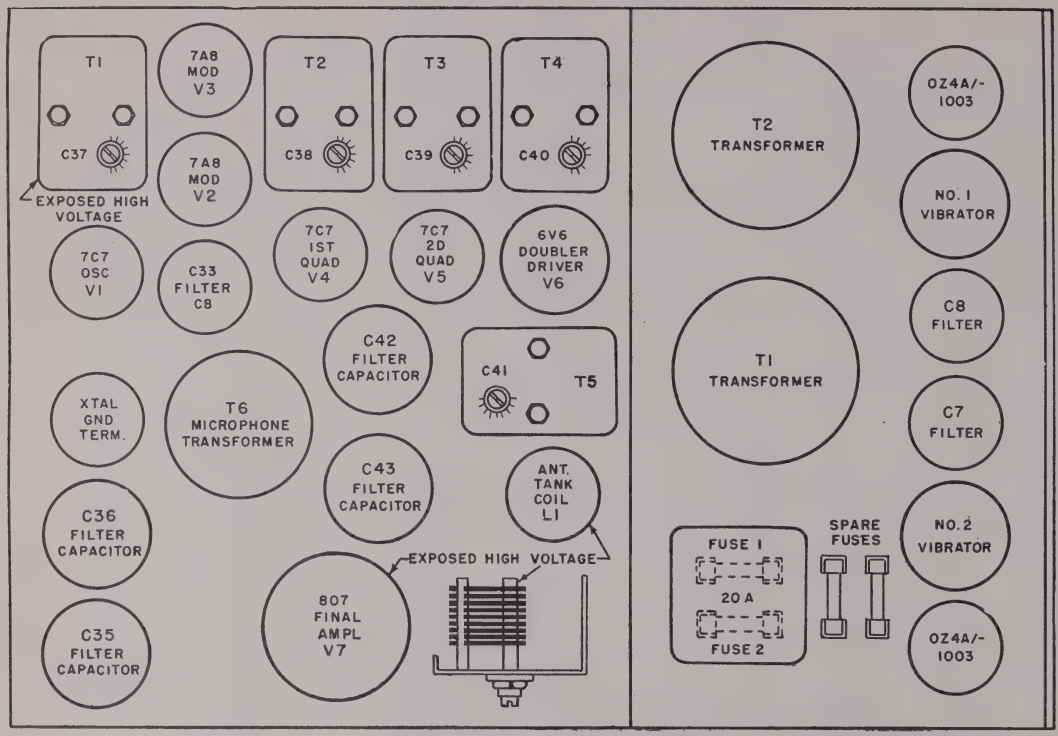


Figure 109. Radio Transmitter T–193A/VRC–2, chassis layout.

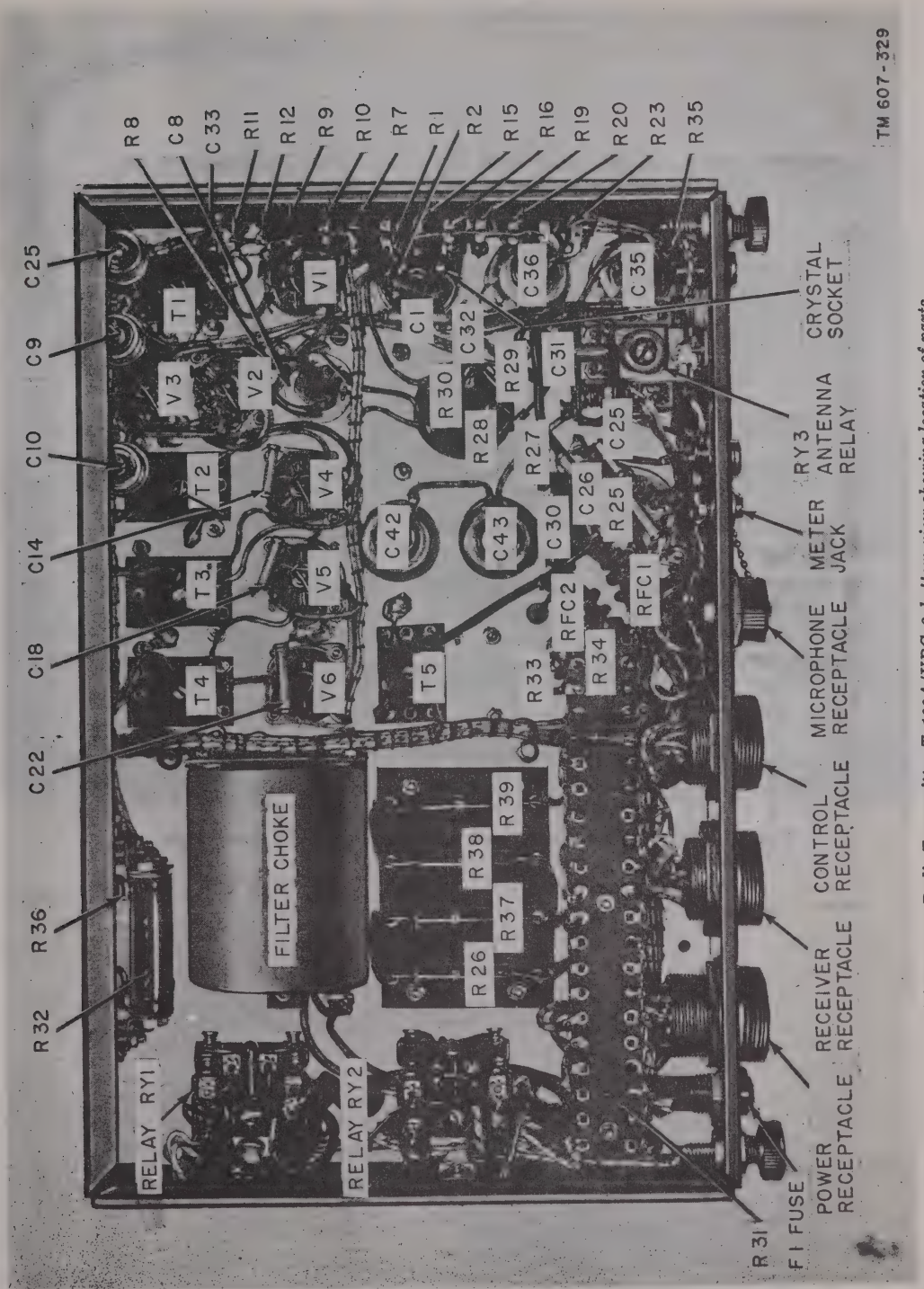


Figure 110. Radio Transmitter T-193A/VRC-2, bottom view showing location of parts.

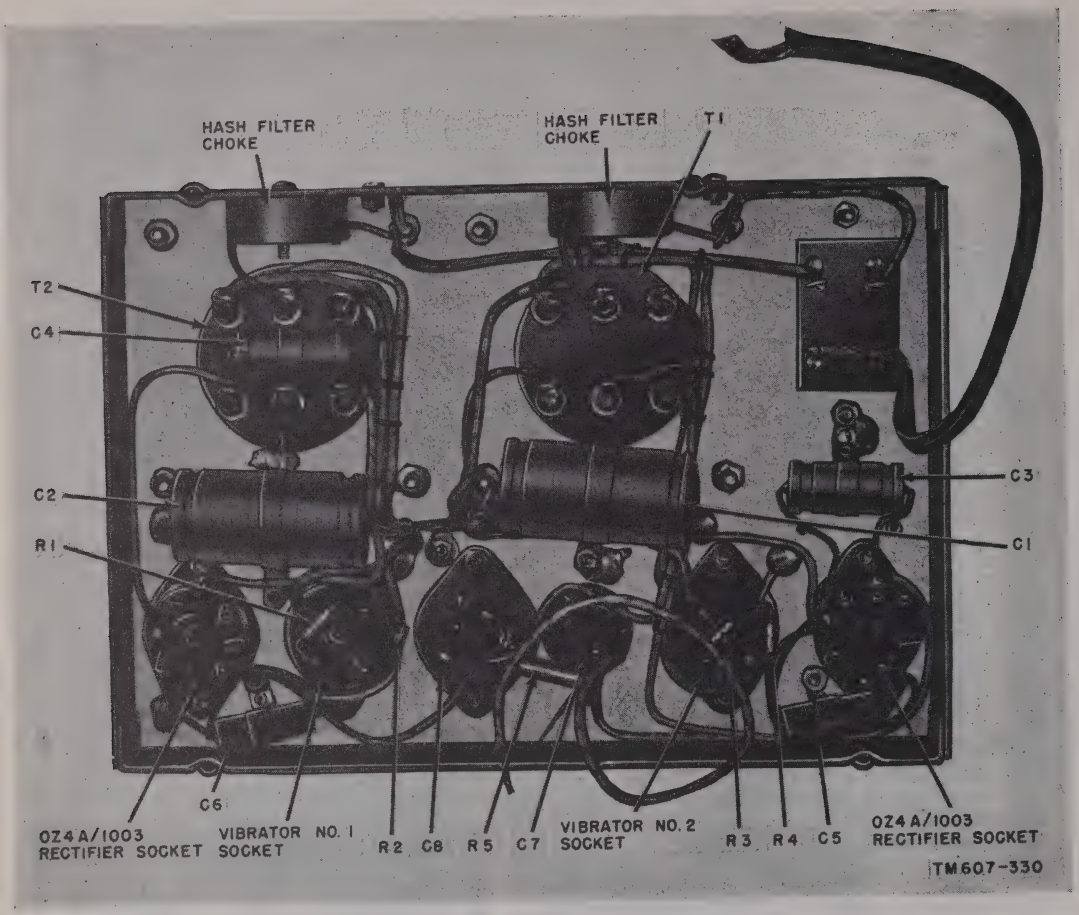
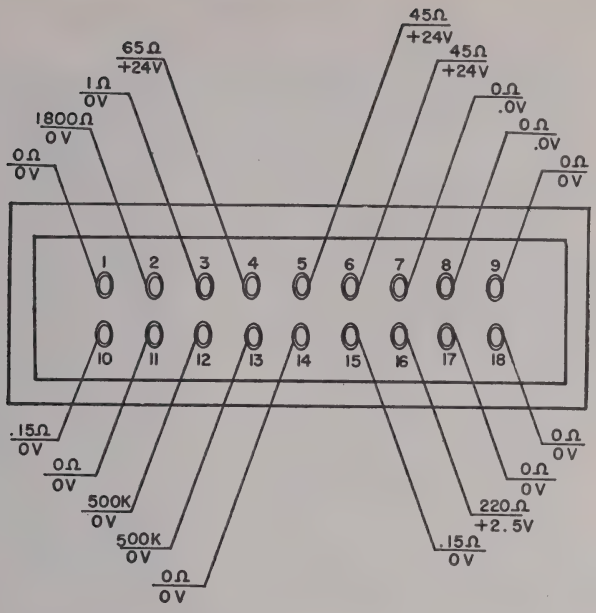


Figure 111. Radio Transmitter T–193A/VRC–2, bottom view of power supply.



NOTES:

1. ALL RESISTANCE READINGS TAKEN TO GROUND.
   TRANSMITTER & RECEIVER FULLY CONNECTED BUT POWER REMOVED.
   SQUELCH & VOLUME CONTROLS FULL CLOCKWISE POSITION.
2. ALL VOLTAGE READINGS TAKEN TO GROUND.
   TRANSMITTER & RECEIVER FULLY CONNECTED TO POWER. (24 V DC).
   SQUELCH & VOLUME CONTROLS FULL CLOCKWISE POSITION.

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Figure 112. Radio Set Control C-1060/VRC-2X, rear, resistance measurements.

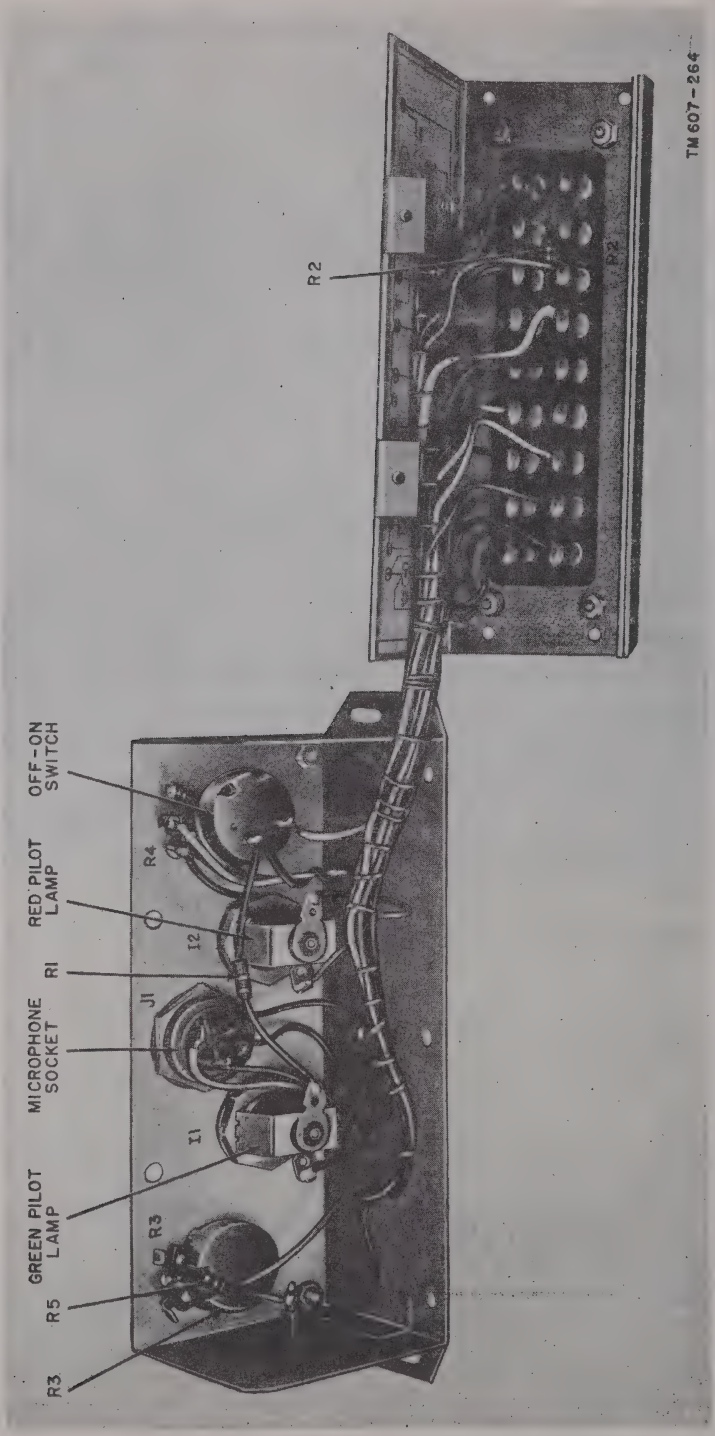


Figure 113. Radio Set Control C-1060/VRC-2X, location of components.

Section II. REPAIRS

77. Replacement of Parts

Most of the parts in the equipment are accessible and can be replaced without special instructions if they are found faulty. However, observe the precautions given below:

a. Tagging Leads. Tagging leads is essential to assure that correct rewiring will be made when a part is replaced. Before unsoldering leads from transformers, tube sockets, panel connectors, or other parts, tie together the leads that are attached to each of these parts. With small tags or short pieces of adhesive tape, identify all wires in accordance with their numbered connections. Identify every lead that is to be removed.

b. Parts and Substitution. When damaged parts must be replaced, identical parts should be used. If identical parts are not available and the damaged component is beyond repair, a substitution must be made. The part substituted must have identical electrical properties and must be of equal or higher voltage and current rating.

c. Location. Relocation or substitution of parts may develop certain difficulties such as hum, noise, or crosstalk, and is not recommended.

d. Mounting. Mount the new or replaced part in the same mounting position as that formerly occupied by the damaged part. Fasten all mountings securely.

e. Soldering. Before soldering any connection, carefully scrape all parts that will be touched by the solder until all traces of rust, corrosion, and paint or varnish are removed. Dust the sprayed parts with a small clean brush. Clean all parts to be soldered. Wrap the wire around the solder lug so that it is mechanically secure. Use very little solder and sufficient heat to make shielded leads secure; make sure that the shield is soldered properly to the ground lug. The same applies to bonded connections between metal subassembly frames and the chassis plate. Make sure that the ground lug is bonded securely to the chassis. Be sure to clean away all particles or splashes of solder.

78. Dynamotor Inspection and Repair

Note. Refer to paragraph 34 for lubrication instructions.

a. Inspect brushes, brush assemblies, brush holders, and all miscellaneous parts after 50 hours of operation, as follows:

(1) Check and clean all accessible parts with a clean lint-free cloth.

(2) Inspect all machine screws and nuts on all supports or mounting brackets and see that they are tight.

b. Inspect brushes for defects and length; see if they are broken, cracked, or chipped.

c. Inspect for loosely fastened or broken-off brush shunts (pigtails).

d. Check for burned-off or broken strands (kinked, worn, or otherwise damaged); replace with complete brush assemblies obtained from spares.

Note. During replacement, comply with proper markings on brushes and brush holders (+ to +; — to —). This is done for quick and proper replacement, thereby eliminating a sand-in operation. No sanding should be necessary to obtain a good brush fit if it is replaced correctly.

e. Inspect brushes for length. Replace the brush if the brush spring extends less than ½-inch out of the holder when the brush is seated against the commutator.

f. Inspect both of the commutators for cleanliness, excessive wear, flats, or any unevenness. Replace a dynamotor having worn or otherwise damaged commutators with a new dynamotor.

g. Check bearings for loose shaft fit and defects such as binding or excessive wear as noted by wobble between the inner and outer races. *Do not remove bearings from the shaft.* Replace a dynamotor having defective or worn bearings with a new dynamotor.

Note. The above operation is to be performed only by qualified personnel.

79. Refinishing

Instructions for refinishing badly marred panels on exterior cabinets are given in TM 9–2851. Also refer to paragraphs 35 and 36 of this manual.

Section III. ALINEMENT PROCEDURES

80. Test Equipment Required

Test equipment required for the alinement of the equipment is the same as that listed in paragraph 69. Use Alinement Tool TL–207 in making all the adjustments indicated.

81. Receiver Alinement

a. General.

(1) *Alining f-m receivers.* The usual practice of using an output meter on the voice coil of an a-m (amplitude-modulator) receiver to indicate gains and resonance is of no value in alining the f-m receiver. The output of an f-m receiver at the speaker depends on frequency swing and not solely upon amplification of the carrier. Alinement and gain measurements are carried out in f-m work by observing, with a high-resistance voltmeter or series microammeter, the voltage or current developed by grid rectification in the limiter stages. Alinement is made to bring this reading to a maximum value. Stage gains can be determined by choosing a reference level and applying to the stage under measurement sufficient input to develop this reference level.

(2) *Quieting signal.* By definition, the quieting signal is that input signal necessary to make a reduction of 20 db (decibels) in the output noise at the speaker. The measurement is made in a well-shielded room in the absence of extraneous noises. This measurement may be considered as an overall figure of merit for the receiver, because it indicates sufficient gain, lack of excessive regeneration, and proper operation of the amplifier tubes. The actual measurement is made by observing the noise voltage at the speaker without any carrier at the antenna. Then sufficient carrier is introduced at the antenna to reduce the output voltage to one-tenth of its former value (a reduction of 20 db). The input is defined as the quieting signal.

(3) *Meter readings.* The METER jack and METER SWITCH provided on the receiver panel (figs. 34 and 119) facilitate a rapid alinement check of each circuit having a METER SWITCH position. Readings are taken by connecting a microammeter to the METER jack by means of a Plug PL–55. The negative terminal of the meter must be connected to the sleeve (ground) of the plug, and the positive terminal must be connected to the tip of the plug. A meter centered at zero may be used, and it should be kept in mind that all meter readings are negative. The following typical readings at the METER jack for alinement of the receiver are taken with 1,000 μv (microvolts) of unmodulated carrier frequency applied to receiver ANTENNA receptacle J6.

Meter switch position	Circuit	Alinement control	Typical reading
1	455-kc i-f amplifier grid current	T5R	—25 μa
2	First limiter grid current	T6R	—35 μa
3	Second limiter grid current	T7R	—44 μa
4	Resultant discriminator load current	T8R	0
5	Diode resistor R36 current	T8R	—26 μa

Note. Slight deviations from these figures are permissible. However, any deviation of more than 25 percent should be considered as sufficient cause for realinement or possible tube replacement.

(4) *Trimmers.* Before beginning the actual alinement procedure, set the trimmers to their approximate positions, using figure 114 as a guide. Select the proper crystals by referring to paragraph 84. When adjusting double-tuned transformers, the primary is adjusted for maximum reading and then the reading is increased by tuning the secondary. Finally, the primary is tuned for a greater reading, if possible.

b. 455-KC Amplifier and Limiters. By using a .05-μf capacitor in series with the source, and a 1-megohm resistor from the grid cap to ground, apply a 455-kc signal to the grid cap of V5. Set the METER SWITCH to position 2 and with alinement tool TL–207 adjust T5R and T6R for maximum meter deflection. Set the METER SWITCH to position 3 and tune T7R for maximum deflection of the meter. Repeat the tuning procedure outlined above, decreasing the generator output as required to insure sharp tuning at the peaks. An input signal of approximately 1,000 μv should indicate a reading of 27 μa at position 2 and 37 μa at position 3.

c. Discriminator Alinement Procedure.

(1) Connect a signal generator (through a .01-μf capacitor) to the grid cap of tube V5. Insert a 1-megohm resistor between the grid cap and ground. Adjust to the following settings:

(*a*) Input signal level to 30,000 μv.

(*b*) The h-f and l-f trimmers, C47 and C51, to mark H.

(2) Rotate the meter switch knob to position 5. Set the signal generator to 430 kc and adjust the l-f trimmer (farthest from the power supply) to a maximum reading on the microammeter.

(3) Rotate the meter switch knob to position 4. Reverse the meter polarity; then set the signal generator on 480 kc. Adjust the h-f trimmer (closest to the power supply) for a peak reading. This reading should indicate a value in excess of 35 μa.

(4) Repeat step 2; this reading should indicate a value in excess of 35 μa.

(5) Reset the meter switch to position 4. Adjust the signal generator to 455 kc. If the meter indication is positive, turn the l-f trimmer toward mark H until the microammeter indicates zero. If the meter indication is negative, turn the h-f trimmer toward mark L until the microammeter indicates zero.

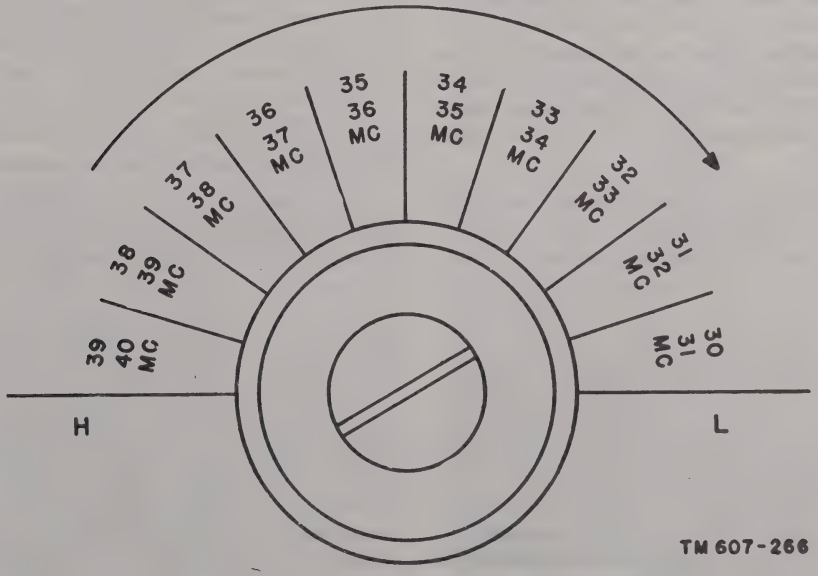


Figure 114. Details of trimmer adjustments.

A tolerance of ±4 μa is permitted for correct alinement.

(6) The discriminator alinement is checked as follows:

(*a*) Rotate the meter switch knob to position 4.

(*b*) Adjust the signal generator to 440 kc. The meter reading should indicated a value in excess of 25 μa of negative polarity.

(*c*) Readjust the signal generator to 470 kc. The meter reading should indicate a value in excess of 25 μa of positive polarity.

(*d*) The discriminator now should be alined correctly. The meter readings of (*b*) and (*c*) above (taken at 15 kc above and below the 455-kc intermediate frequency) should be equal and opposite in polarity, and of approximately 25 μa, at the two extremes. If their absolute values are not within 10 μa of being equal, realine the discriminator as outlined above.

d. 4.3-MC I-F Amplifier. Set the METER SWITCH to position 2. Remove the h-f oscillator crystal. Apply a 4.3-mc signal, through a .05-μf capacitor, to pin 4 of V3. Adjust the signal generator frequency for maximum reading of the meter. This compensates for minor discrepancies in the crystal frequency of XTAL 2. Adjust T3R and T4R for maximum meter deflection. An input signal of 10 k μv should indicate 23 μa.

e. R-F Circuits. Replace the h-f oscillator crystal. Set the METER SWITCH to position 2. Connect the h-f generator directly to ANTENNA receptacle J6. Make the leads as short as possible and be sure that the cable shield is grounded to the chassis. With the signal generator set approximately at the operating frequency, readjust the frequency of the generator for maximum meter reading. Then adjust the trimmers on top of transformers T1R and T2R and antenna trimmer capacitor C1 for maximum meter readings. An input of 2 μv should produce a meter reading of approximately 20 μv. As tuning progresses, decrease the output of the signal generator until the final adjustment is made with a signal input of less than 1 μv. False alinement, such as tuning to a harmonic of the oscillator, is shown by a steady meter reading which does not decrease as the input signal is decreased. Realinement of the r-f section is necessary. If there is a sudden rise in the grid current of the limiter when the r-f circuits are being alined, it is an indication of oscillation in the r-f stage. Check resistor R54 and the jumper between the socket mounting of tube V1 and ground. If oscillation occurs in the r-f stage when the antenna is removed for alinement purposes, check the condition of resistor R54. In the absence of an input signal, the fluctuating noise in the receiver should produce a reading of approximately 10 μa.

Note. In Radio Receivers R–237/VR and R–237A/VR, transformers T1R and T2R are single-tuned.

f. Check on Quieting Signal. Use an output meter across the 600-ohm output of the receiver. With no signal input to the receiver, set the VOLUME control so that the output meter reads a convenient level. Apply an unmodulated signal at channel frequency to the antenna. Increase the input signal until the output meter reading is reduced to one-tenth of its previous reading. This input signal is the quieting signal, and it should be approximately .4 μv. This corresponds to 20 db. If the quieting signal is high, alinement of the receiver is probably faulty and should be rechecked. If an increase in signal input at very low input levels results in an increase in noise, rather than a decrease, regeneration is indicated.

g. Overall Check. Typical meter readings for a properly alined receiver are given in *a* above.

h. Alinement with Test Transmitter. The transmitter whose signal normally is picked up by the receiver may be used as a frequency standard in alining the receiver. Proceed as follows: Use the transmitter signal instead of one from a signal generator, and adjust the discriminator as outlined in *c* above. Then turn off the transmitter and connect a signal generator to the receiver. Adjust the frequency of the signal generator so that the discriminator circuit shows exact balance (meter reading 0 in position 4). The signal generator then will be exactly at the frequency of the transmitter. Proceed with alinement. The discriminator balance also can be used as a means of comparing

the frequencies of several transmitters intended to operate at the same frequency. A variation of 2 μa in the discriminator reading represents a deviation of approximately 1 kc.

82. Emergency Field Alinement of Radio Receivers

The alinement procedure outlined in paragraph 81 involves test equipment beyond the unit echelon. To derive the maximum efficiency from Radio Set AN/VRC–2(*), a suitable means of accurate alinement had to be found using equipment on hand. The method described below is simple, saves time, and insures efficient operation.

a. The second harmonic of the second quadrupler of the transmitter is used for a low-power oscillator to aline the receiver in place of a signal generator as required in paragraph 81.

b. The following parts and materials are required:

1 eight-prong octal plug (tube base)
1 four-prong plug (tube base)
3 pieces of wire, each 2 feet long
1 battery BA–40 (90 volts)
1 microammeter, 0–50 μa
1 alinement tool TL–207

c. Using the materials listed above, construct an alinement adapter as shown in figure 115.

(1) Aline the transmitter as described in paragraph 83.

(2) After the transmitter has been alined properly, remove tubes V6 (6V6) and V7 (807), with both sets remaining on.

(3) Insert plug A of the alinement adapter (fig. 115) into socket V6 of the transmitter. Remove the microphone to assure that the dynamotor will not be started during this procedure.

(4) Insert plug B (fig. 115) of the alinement adapter into the socket of Battery BA–40. There should now be a strong enough signal to aline the receiver.

(5) Adjust the distance between the lead from the alinement adapter and the receiver antenna for best results. A weaker signal will give more sensitivity in alining the low-frequency i-f stages.

d. The method of alinement outlined above has been tested and found satisfactory on receivers which were not badly out of alinement. However, in changing the operating frequency of the receiver, difficulty was experienced in the alinement of the set because of insufficient signal input to the receiver.

e. When using this emergency field alinement procedure, be sure that the transmitter crystal oscillator is functioning. Under normal conditions the transmitter crystal oscillator grid current (meter switch position one) is about 16 μa, but with the 90-volt battery BA–40 plate supply as suggested in the emergency alinement procedure, the transmitter crystal oscillator grid current is only about 3 or 4 μa. Under these conditions the transmitter crystal oscillator tends to drop out of oscillation.

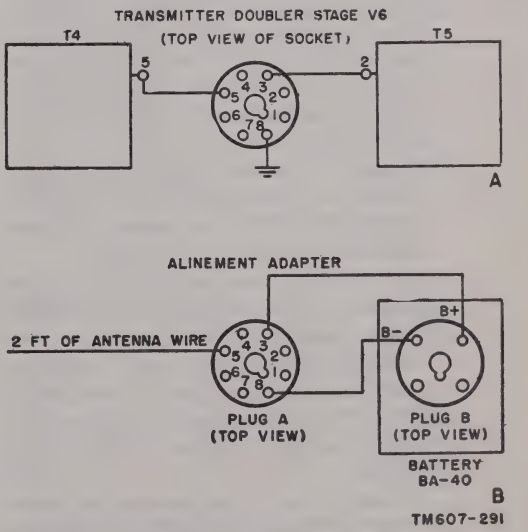


Figure 115. Adapter for emergency field alinement.

83. Transmitter Alinement

The transmitter must be alined carefully because of the relatively high frequency multiplication. All necessary alinement controls are located conveniently on the top or the front of the chassis. A different crystal is required for each output frequency. Several plate coils for various frequencies are supplied for the final amplifier. It is recommended that the trans-

mitter be tuned using one of the dummy antennas shown in figure 116. This will eliminate the possibility of causing unnecessary interference. Be certain that the battery is fully charged. The transmitter should not be turned on for more than a few seconds at a time while adjustments are being made, because excessively high currents flow when the transmitter is not alined completely. Alinement tool TL–207 or a nonmetallic screw driver should be used for the alinement adjustments. Location of transmitter alinement controls is shown in figures 92, 104, and 109.

Caution: Be careful not to touch the plate cap of tube V7 or other points of high voltage on the transmitter during the alinement procedure.

a. Preliminary Procedure. Before beginning the actual alinement of the transmitter, perform the following preliminary procedures.

(1) Select the proper crystal and tank coil by referring to the information in paragraph 84. If the operating frequency lies between 30 and 33 mc. connect capacitor C2 across terminals 4 and 5 of T1.

(2) Connect a dummy antenna (two are shown in figure 116) to the transmitter at ANTENNA receptacle J3. Make the leads as short as possible.

(3) Set all transformer adjustments to the proper frequency. Refer to figure 114.

(4) Plug a microammeter (par. 69) into METER jack J1 with meter terminals connected as described in paragraph 81*a*. Typical readings at the various meter switch positions are listed in *h* below.

Note. When tuning double-tuned transformers, adjust the primary for maximum meter reading; after adjusting the secondary for peak, the primary is retuned for maximum. Use alinement tool TL–207 for all alinement adjustments.

b. Oscillator. Set the METER SWITCH to position 1. Depress the push-to-talk button on the microphone. (Do not depress the switch for more than 2 or 3 seconds at a time.) Tune capacitor C37 in transformer T1 for maximum meter reading. Rotate the control counterclockwise to a setting slightly higher in frequency than the peak reading position to assure more

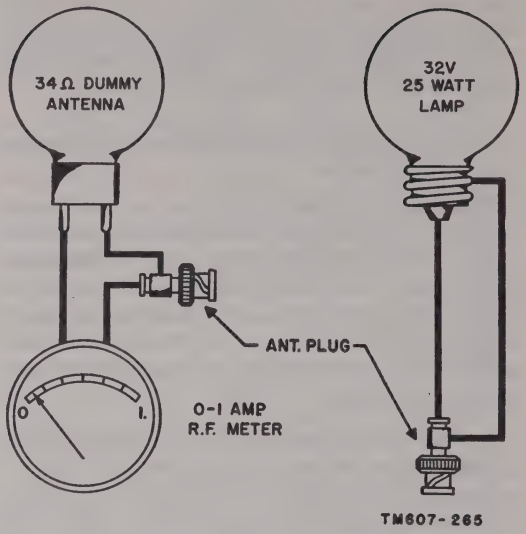


Figure 116. Dummy antennas.

stable operation. This is a small part of a turn in the counterclockwise direction from the resonant point. The resonant point for this adjustment should be found quickly by the maximum meter deflection. If the range from 30 mc to 33 mc is to be used, capacitor C2 must be connected across trimmer capacitor C37 at terminals 4 and 5 on the bottom of transformer T1. Normal reading in position 1 is 20 μa. Some variations will be caused by differences in crystal activity and tubes. As a further check, turn the METER SWITCH to the MOD. position. The meter reading should be approximately 45 μa.

c. Modulator. The modulator alinement is very similar to that of the oscillator. The output tuned circuit of this stage is tuned to the same frequency as the oscillator. Set the METER SWITCH to position 2. Adjust capacitor C38 in transformer T2 for maximum meter reading. The meter reading should be approximately 30 μa.

d. First Quadrupler. Set the METER SWITCH to position 3. Tune transformer T3 for maximum meter reading. The slots in the tuning shafts of T3 should point approximately to the carrier frequency (fig. 114). The normal meter reading in position 3 is 30 μa. The first quadrupler alinement will require more care

than the previously alined stages. All adjustments from this stage to the power amplifier must be very carefully performed in order to be sure that the stage is tuned to the correct harmonic. The trimmer adjustments on transformer T3 must be tuned to the fourth harmonic of the crystal frequency. In double-tuned transformers, however, the wrong harmonic will give a maximum peak of considerably less than the correct harmonic, provided both trimmers have been preset approximately to their correct positions for the desired frequency.

Note. In Radio Transmitter T–193A/VRC–2, transformer T3 is single-tuned.

e. Second Quadrupler. The second quadrupler must be tuned to the fourth harmonic of the first quadrupler, which is the sixteenth harmonic of the crystal oscillator and modulator frequency. In tuning second quadrupler transformer T4, follow the precautions outlined for the first quadrupler to be certain that the trimmers are tuned to the correct harmonic. Turn the METER SWITCH to position 4. Preset both trimmers of T4 so that the slots in the tuning shafts point approximately to the carrier frequency. Then adjust trimmers for maximum meter reading. The meter should read 20 μa.

Note. In Radio Transmitter T–193A/VRC–2, transformer T4 is single-tuned.

f. Doubler. The doubler must be tuned to the second harmonic of the second quadrupler, which is the thirty-second harmonic of the crystal. This is the output frequency. Set the METER SWITCH to position 5. Adjust the trimmer on top of transformer T5 for maximum meter reading. A peak reading of approximately 33 μa should be obtained.

g. Power Amplifier. The power amplifier is a straight frequency amplifier, at the output frequency of the transmitter. Set the METER SWITCH to PA position. *Reverse the meter leads, unless a 0-centered meter is used.* Before applying plate voltage, set antenna capacitor C29, located on the front of the chassis and marked ANT., to its maximum capacitance. Set PLATE tank tuning capacitor C28 about 75 percent unmeshed. Operate the press-to-talk button and quickly adjust PLATE capacitor C28 for a dip in the meter reading. Tune for maximum dip, which will be the indication of resonance in the plate circuit. Reduce the value of C29 slightly and readjust C28 for minimum reading. Continue this adjustment until the meter reads 40 μa at the dip obtained by rotating the PLATE capacitor.

h. Typical Transmitter Alinement Readings.

Meter switch position	Circuit	Alinement control	Typical meter reading (μa)	Allowable limit of meter reading (μa)
1	Oscillator grid current.	T1	—20	—11 minimum
2	First guadrupler grid current.	T2	—30	—12 minimum
3	Second quadrupler grid current.	T3	—30	—12 minimum
4	Doubler grid current.	T4	—20	—6 minimum
5	Power-amplifier grid current.	T5	—33	—12 minimum
PA	Power-amplifier cathode current.	PLATE	40	42 maximum
MOD.	Modulator grid current.	T1	—45	—15 minimum

i. Antenna Loading. The output of the transmitter is indicated by the dummy antenna. Antenna loading is increased by decreasing the value of capacitor C29. If the antenna does not load properly at low frequencies, proceed as follows:

(1) If the power amplifier cannot be adjusted to full load with C29 at minimum capacitance, disconnect C42 (the 75-$\mu\mu$f capacitor across C29 which is found in Radio Transmitter T–322/VRC–2X and in some procurements of Radio Transmitter T–193B/VRC–2). Retune the set.

(2) Radio Transmitters T–193/VRC–2 and T–193A/VRC–2 were supplied with an antenna loading coil. Insert the loading coil in series with the antenna and repeat the tuning procedure.

84. Changing Frequencies

a. General. Since Radio Set AN/VRC–2(*) may be operated between the frequencies of 30 to 40 mc, it is often desirable and necessary to change channel frequencies. Personnel using this equipment should become familiar with the frequency relationships outlined below.

b. Radio Receivers R–435/VRC–2X and R–237(*)/VR.

(1) To change frequencies in the receiver, it is necessary to insert the proper h-f crystal and to adjust C1 for the desired frequency. The correct frequency for the h-f crystal is calculated as follows:

(*a*) If the channel frequency is between 30 and 37 mc, subtract 4.3 and divide by 4.

(*b*) If the channel frequency is between 37 and 40 mc, subtract 4.3 mc and divide by 5.

(2) The convertor crystal should always be 3,845 or 4,755 kc.

(3) Antenna trimmer C1 is adjusted for maximum meter reading with the METER SWITCH in position 1. (Aline the receiver by following the procedure in paragraph 81.)

c. Radio Transmitters T–322/VRC–2X and T–193(*)/VRC–2. To change channels in the transmitter, proceed as follows:

(1) Insert a crystal whose frequency is $\frac{1}{32}$ of the output frequency.

(2) Insert the proper plate tank coil, L1, based on the following information:

Radio Transmitters T–322/VRC–2X and T–193B/VRC–2

Frequency range (mc)	Number of turns
30.0 to 33.0	8
33.0 to 37.0	7
37.0 to 40.0	6

Radio Transmitters T–193/VRC–2 and T–193A/VRC–2

30.0 to 31.4	11
31.5 to 32.7	10
32.8 to 35.4	9
35.5 to 38.1	8
38.1 to 40.0	6

(3) Aline the transmitter by following the procedure outlined in paragraph 83.

Section IV. FINAL TESTING

85. General

This section is intended as a guide to be used in determining the quality of a repaired Radio Set AN/VRC–2X. The minimum test requirements outlined in paragraphs 87 through 94 may be performed by maintenance personnel with adequate test equipment and necessary skills. Repaired equipment meeting these requirements will furnish uniformly satisfactory operation.

86. Test Equipment Required for Final Testing

The instruments needed for testing the repaired equipment are listed below:

Signal Generator I–208–A or SG–12/U with metered output covering the range of frequencies. The generator should have provision for an independent a-f output at audio frequencies ranging from 500 to 2,500 cycles. If the generator does not possess independent a-f capabilities, a separate a-f generator may be used to furnish a-f signals.

Electronic voltmeter (Electronic Multimeter TS–505/U or equal).

Distortion meter (TS–705/U, TS–723/U, or equal).

Dummy antenna (34-ohm).

1.5-ampere r-f meter.

Output meter TS–585/U or equal.

Deviation meter, if available.

Standard telephone plug, with leads (Plug PL–55).

Micrometer, range 0 to 50 μa (3F891–29 or equal).

87. Preparation

a. Insert the cable plugs into proper receptacles.

b. Connect Signal Generator I–208 to the receiver ANTENNA connector through a 34-ohm resistor.

c. Connect Electronic Multimeter TS–505/U across the 600-ohm output winding of the output transformer.

d. Insert a 7,675-kc crystal in the receiver h-f crystal socket.

e. Apply power.

f. Set the METER SWITCH to position 2.

g. Feed in 1,000 μv of unmodulated carrier frequency (35 mc).

h. Tune T3R, T4R, C1, T1R, and T2R, in that order, for maximum meter reading. Since the first limiter grid saturates at about 30 μa, the signal generator output should be decreased as the set is being tuned, and the meter reading reaches this point.

i. When the trimmers are finally tuned, carefully readjust the signal frequency until meter position 4, the output of the discriminator, reads zero.

Note. Frequency specified in *g* above is midrange of the set.

88. Sensitivity

a. Adjust the signal frequency to produce zero balance as in paragraph 87*i*.

b. Reduce the signal generator output to zero by pulling the attenuator all the way out.

c. Set the squelch control so that noise is heard.

d. Raise the noise volume to a convenient level, preferably about 1 to 5 volts. Note the db level on the multimeter.

e. Increase the signal generator output from zero until the noise level decreases 20 db (or one-tenth of the noise level voltage). The signal voltage required to produce 20-db quieting should not exceed 1.0 μv.

89. Minimum Squelch

a. Adjust the signal frequency to produce zero balance as described in paragraph 87*i*.

b. Reduce the signal generator output to zero.

c. Adjust the squelch control until the silencing action just begins and no noise is heard in the speaker. The signal voltage required to remove the silencing action should not exceed .18 μv.

90. Maximum Squelch

a. Adjust the signal generator to produce zero balance as described in paragraph 87.

b. Reduce the signal generator output to zero.

c. Set the squelch control to the fully counterclockwise position.

d. Increase the signal magnitude until the silencing action begins. The signal required to do so should not exceed 2.0 μv.

91. Audio Distortion

a. Adjust the signal generator to produce zero balance as described in paragraph 87.

b. Set the signal input at 10 μv, and modulate it at 1,000 cps to produce 15-kc deviation.

c. Disconnect the speaker.

d. Adjust the VOLUME control to produce an audio power output of 1 watt (24 volts).

e. Connect a distortion meter (Spectrum Analyzer TS–723/U) across the 600-ohm output circuit, and take the reading.

f. The distortion should not exceed 12 percent.

92. I-f Bandwidth

Feed a 4.3-mc signal directly into the first mixer grid, pin 4 of V3. Set the signal output to approximately 10 μa and the frequency to give maximum meter indication in position 2. Readjust the signal amplitude to give a convenient reading below 30 μa. The signal amplitude should be doubled and the signal frequency varied to both sides of the frequency which gave maximum meter indication until the meter reading is the same as the initial setting. The bandwidth at two times down (6 db) should be 18 kc or more. The above procedure should be repeated, except that the signal magnitude should be increased by 1,000 times (60 db), and the bandwidth so obtained should not exceed 107 kc.

93. Power Output

Using a dummy antenna (fig. 116) consisting of a 34-ohm, 100-watt, noninductive resistor in series with a 1.5-ampere r-f meter, measure the power output of the properly alined trans-

mitter. The meter reading should not be less than .9 ampere.

94. Modulation Sensitivity

a. Feed a .1-volt, 3,500-cycle sine wave into the transmitter MIC. jack, and measure the carrier deviation with a deviation meter connected. The carrier deviation should be 15 kc from the nominal carrier frequency.

b. If a deviation meter is not available, the deviation may be determined by measurement of the discriminator a-c voltage output of a properly calibrated f-m receiver. The receiver may be calibrated by applying the output of an f-m signal generator to the receiver and noting the magnitude of the discriminator a-c output voltage for specific settings of the deviation control on the signal generator. With the signal generator removed and the calibrated receiver tuned to the transmitter, the value of the discriminator a-c output voltage then can be used to determine the deviation of the transmitter signal.

CHAPTER 6

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

95. Repacking for Shipment or Limited Storage

a. The exact procedure in repacking for shipment or limited storage depends on the material available and the conditions under which the equipment is to be shipped or stored. Refer to paragraph 14 and reverse the instructions given.

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

96. Demolition of Materiel to Prevent Enemy Use

The demolition procedures outlined in paragraph 97 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 commanding officer.

97. Methods of Destruction

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

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

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

d. Bend. Bend panels, cabinet, and chassis.

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. Destruction. Destroy everything.

APPENDIX I

REFERENCES

Note. For availability of items listed, check SR 310–20–3, SR 310–20–4, and SR 310–20–5. Check Department of the Army Supply Manual SIG 1 for Signal Corps Supply Manuals.

1. Army Regulations

AR 380–5	Military Security (Safeguarding Security Information).
AR 750–5	Maintenance of Supplies and Equipment (Maintenance Responsibility and Shop Operation).

2. Supply Bulletins

SB 11–6	Dry Battery Supply Data.

3. Auxiliary Equipment and Test Equipment

TM 11–307	Signal Generators I–72–G, H, J, K, and L.
TM 11–317	Signal Generator I–208, I–208–A and I–208–B.
TM 11–2524	Oscillator I–151–A and I–151–E.
TM 11–2526	Oscilloscope BC–1060–A.
NAVSHIPS 91364	Oscilloscope OS–8A/U.
TM 11–2627	Tube Tester I–177 and I–177–A.
TM 11–2684A	Audio Oscillator TS–382A/U.
TM 11–4052	Signal Generators I–72–A, –B, –C, –D, –E, –F, –G, –H, –J, and –K. Repair Instructions.
TM 11–5017	Output Meters TS–585A/U and TS–585B/U.
TM 11–5042	Frequency Meter TS–480/U.
TM 11–5511	Electronic Multimeter TS–505/U.
TM 11–5527	Multimeter TS–352/U.

4. Painting, Preserving, and Lubrication

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 69	Lubrication of Ground Signal Equipment.
TM 9–2851	Painting Instructions for Field Use.

5. Camouflage, Decontamination, and Demolition

FM 5–20	Camouflage, Basic Principles.
FM 5–25	Explosives and Demolitions.
TM 3–220	Decontamination.

6. Other Publications

FM 24–18	Field Radio Techniques.
FM 72–20	Jungle Warfare.
SR 310–20–3	Index of Training Publications.
SR 310–20–4	Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
SR 310–20–7	Index of Tables of Organization and Equipment, Reduction Tables, Tables of Organization, Tables of Equipment, and Tables of Allowances.
SR 310–20–5	Index of Administrative Publications.
SR 700–45–5	Unsatisfactory Equipment Report (Reports Control Symbol CSGLD–247 (R1)).
SR 725–405–5	Preparation and Submission of Requisitions for Signal Corps Supplies.
SR 745–45–5 Navy Shipping Guide, Article 1850–4 AFR 71–4	Report of Damaged or Improper Shipment (Reports Control Symbols CSGLD–66 (Army), SandA–70–6 (Navy), and AF–MC–U2 (Air Force)).
TB SIG 4	Methods for Improving the Effectiveness of Jungle Radio Communication.
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 178	Preventive Maintenance Guide for Radio Communication Equipment.
TB SIG 219	Operation of Signal Equipment at Low Temperatures.
TB SIG 223	Field Expedients for Wire and Radio.
TM 9–2857	Storage Batteries, Lead-Acid Type.
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 11–455	Radio Fundamentals.
TM 11–483	Suppression of Radio Noises.
TM 11–660	Introduction to Electronics.
TM 11–661	Electrical Fundamentals (Direct Current).
TM 11–681	Electrical Fundamentals (Alternating Current).
TM 11–4000	Trouble Shooting and Repair of Radio Equipment.

APPENDIX II
IDENTIFICATION TABLE OF PARTS

1. Requisition of Parts

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 specific T/O&E, T/A, SIG 7&8, list of allowances of expendable material, or another authorized supply basis. For an index of available supply manuals in the Signal portion of the Department of the Army Supply Manual, see the latest issue of SIG 1.

2. Identification Table of Parts for Radio Sets AN/VRC–2 and AN/VRC–2X

Note. Column 1 refers to items procured on Order Nos. 23054–PH–43, 24673–PH–43, and 29040–PH–45 (unlettered components). Column 2 refers to items procured on Order No. 12732–PH–47 ("A" model components). Column 3 refers to items procured on Order No. 20591–PH–49 ("B" model components). Column 4 refers to items procured on Order No. 21756–PH–50 ("B" model components). Column 5 refers to items procured on Order No. 16816–P–51 (AN/VRC–2X components).

Ref. symbol	Model					Name of part and description	Function of part	Signal Corps stock No.
	1	2	3	4	5			
	(*)	(*)				RADIO SET AN/VRC–2: vehicular; fm; output 25 w; 1 fixed frequency between 30 and 40 mc; input 6 v dc; includes transmitter, receiver, control unit, antenna, and necessary accessories.	Vehicular, voice-operated, frequency-modulated radio transmitter, receiver, and associated components.	2S4502–2
			(*)	(*)		RADIO SET AN/VRC–2: F3 type of emission, MBCA ref dwg group 5; 30 w output; 30–40 mc freq range; 1 band; 6 v dc; for vehicular use; grouping of B model components, mp and fp; US Army spec 71–3290.	Vehicular, voice-operated, frequency-modulated radio transmitter, receiver, and associated components.	2S4502–2B
					(*)	RADIO SET AN/VRC–2X: F3 type of emission, MBCA ref dwg group 5; 25 w output; 30–40 mc freq range; 1 band; 24 v dc; components mp and fp; US Army spec 71–3290.	Vehicular, voice-operated, frequency-modulated radio transmitter, receiver, and associated components.	2S4502–2X
						TECHNICAL MANUAL TM 11–607		Order through AGC
E1	(*)	(*)				ANTENNAS AT–129/VR and AT–129A/VR: whip type; cad pl steel; one piece; 6′ 6″ lg x .272″ dia at bottom, tapered; 30 to 40 mc; 72 ohms input; Galvin type #P–253.	Radiates or receives radio-frequency energy.	2A292–6
E1			(*)	(*)		ANTENNA AT–129B/VR: whip type; 30.0 to 40.0 mc freq range; telescopic construction; mts by three ¼–20 studs 120° apart on 3¼″ dia circle; for receiving-transmitting; Utility Elec part/dwg #PC–1425.	Radiates or receives radio-frequency energy.	2A292–6B

H1, H2					(*)	BOLT, thumb: #8–32; ¾" lg; Parker-Kalon type S, modified per Utility Elec dwg #PB–3236.	Cover fastener for receiver and transmitter.	6L17108–8.49S
					(*)	BRACKET: ant. bkt support; L-shape; 8⅞" lg x 5" wd x 6½" h o/a; Sig C dwg SC–C–28591.	Antenna bracket support	2Z1239.278
A2					(*)	BRACKET: Mast Bracket MP–50; ant. support; wedge shape; 8" lg x 5¼" wd x 5" h o/a; Sig C dwg SC–D–1520.	Antenna mounting bracket	2A2090–50
		(*)				CABINET: speaker; black crackle pressed cardboard; 9⅝" dia x 3¼" d; Hawley part #472.	Speaker housing	2Z1578.29
				(*)	(*)	CABLE, power: electrical; Cordage CO–137; af interconnecting; six #18 AWG stranded tinned copper cond; Sig C dwg SC–C–18897.	Cordage for receiver control cable.	3E2137
				(*)	(*)	CABLE, special purpose: electrical; Cordage CO–136; af interconnecting; 6 cond, two #12 AWG, two #16 AWG, and two #20 AWG stranded tinned copper cond; Sig C spec 71–700.	Cordage for power inconnector cable.	3E2136
					(*)	CABLE, special purpose: electrical; Cordage CO–212; portable installation; 1 inner cond #8 AWG and 1 concentric cond #8 AWG; US Army spec 71–161c.	Cordage for battery cable	3E2212
				(*)	(*)	CABLE, special purpose: electrical; type CO–03 MGF (8/20) SJO485 per MIL spec MIL–C–3432.	Cordage for transmitter control cable.	1B4020–8.1
W1	(*)	(*)				CABLE ASSEMBLY, special purpose: two #20 and six #22 AWG stranded cond, rubber insulation, color-coded; 16 ft lg excluding terminations; 1 Amphenol part #08F1 on one end and 8 Amphenol part #71–1M on other; Galvin dwg #1B81102.	Transmitter control cable	3E4300–6.1
W1			(*)			CABLE ASSEMBLY, power: electrical; 8 cond, seven #18 AWG and one #14 AWG stranded; 16 ft lg excluding terminations; Utility Elec part/dwg #PB–1226.	Transmitter control cable	3E7350–1.192.1
W1					(*)	CABLE ASSEMBLY: Special Purpose Electrical Cable Assembly CX–1935/U; 8 stranded cond. #20 AWG; 6' lg excluding terminals.	Transmitter control cable	3E5999–6.37
W2	(*)	(*)				CABLE ASSEMBLY, special purpose: six #22 and two #20 AWG stranded cond, rubber insulation, color-coded; 16 ft lg excluding terminations; 1 Amphenol part #08M on one end and 6 Amphenol part #71–1M on other (2 cond parallel w/other); Espey dwg #WB10.206 or Galvin dwg #1X81306.	Receiver control cable	3E4300–6
W2			(*)			CABLE ASSEMBLY, power: electrical; 8 cond, 7 #18 AWG and 1 #14 AWG stranded; 16 ft lg excluding terminations; Utility Elec part/dwg #PB–1227.	Receiver control cable	3E7350–1.192.2
W2					(*)	CABLE ASSEMBLY: Special Purpose Electrical Cable Assembly CX–1934/U; 6 stranded cond, #18 AWG; 6' lg excluding terminals.	Receiver control cable	3E5999–6.36

Ref. symbol	Model 1	2	3	4	5	Name of part and description	Function of part	Signal Corps stock No.
W3	(*)	(*)				CABLE ASSEMBLY, special purpose: two #16 stranded cond rubber insulation; 4 ft lg excluding terminations; 2 Amphenol part #71–1M on one end, tinned leads on other; Espey dwg #WN10.213 or Galvin #1X82217.	Loudspeaker cable	3E4300–57
W3			(*)	(*)	(*)	CABLE ASSEMBLY, power: electrical; two #18 AWG stranded cond; 4′ lg; Utility Elec dwg PB–1407.	Loudspeaker cable	3E7350–1.48
W5	(*)	(*)				CABLE ASSEMBLY, RF: uses Army-Navy Radio Frequency Cable RG–8/U; 27″ lg excluding terminations; 1 Jones part #P101–$\frac{D}{18}$ on ea end; Espey part #WB10.212 or Galvin dwg #1A82272–27.	Transmitter-receiver r-f interconnecting cable.	3E4300–49
W5			(*)			CABLE ASSEMBLY, RF: uses Army-Navy Radio Frequency Cable RG–59A/U; 29″ lg o/a.	Transmitter-receiver r-f interconnecting cable.	3E7350–2.27.2
W6					(*)	CABLE ASSEMBLY, RF: Cord CG–426A/U; coax; 73-ohm impedance; 3′ 4″ lg o/a; Sig C dwg SC–D–34932–1.	Transmitter-antenna interconnecting cable.	3E599A–2.17
W6		(*)				CABLE ASSEMBLY, RF: uses Army-Navy Radio Frequency Cable RG–8/U; 20″ lg excluding terminations; 1 Jones part #P101–$\frac{D}{18}$ on one end; other end tinned; Espey dwg #WN10.204.	Antenna lead-in cable	3E7350–2.20.1
	(*)					CABLE ASSEMBLY, RF: uses Army-Navy Radio Frequency Cable RG–8/U; 40″ lg excluding terminations; Jones HB part #P–101–D$\frac{3}{8}$ on one end, other end tinned; Galvin dwg #1A82270.	Antenna lead-in cable	1F4G1–1.40
W6			(*)			CABLE ASSEMBLY, RF: uses Army-Navy Radio Frequency Cable RG–59/U; approx 48″ lg o/a.	Antenna lead-in cable	3E7350–2.40.1
	(*)	(*)				CABLE ASSEMBLY, special purpose: 8 stranded cond, rubber insulation, color-coded; 27″ lg; Amphenol part #06MS on one end, Amphenol part #06F1 on other; Galvin dwg #1B81305.	Transmitter-receiver interconnecting cable.	3E4300–21
W7			(*)			CABLE ASSEMBLY, power: electrical; 8 cond c/o 7 #18 AWG and 1 #14 AWG stranded; 26″ lg excluding terminations; Utility Elec part/dwg #PB–1225.	Transmitter-receiver interconnecting cable.	3E7350–1.26
W7					(*)	CABLE ASSEMBLY: electrical; 2 stranded cond, #20 AWG; 2 stranded cond, #12 AWG; 8′ lg excluding terminations.	Transmitter-receiver interconnecting cable.	3E5999–6.38
W8					(*)	CABLE ASSEMBLY: electrical; Cordage CO–212; 8′ lg excluding terminations; Sig C dwg SC–D–68572.	Power cable	3E5999–7.8
W5					(*)	CABLE ASSEMBLY, RF: Cord CG–426A/U; coax; 73-ohm impedance; 7′ lg o/a; Sig C dwg SC–D–34932–1.	Transmitter-receiver r-f interconnecting cable.	3E5999A–2.16
W8			(*)			CABLE ASSEMBLY, power: 2 cond ea #4 AWG stranded; 16 ft lg excluding terminations.	Power cable	3E7350–1.192.3

E5						(*)	CONNECTOR, adapter: Adapter UG–273/U; male 1 end, female other end; 1 round male cont 1 end, 1 split female cont other end; straight type; $\frac{33}{64}$" OD x $1\frac{7}{32}$" lg; Navy dwg RE49F389.	Antenna adapter	2Z308–273
E6			(*)	(*)	(*)	CONNECTOR, adapter: Adapter UG–306/U; 1 round male cont 1 end, 1 round female cont other end; 90° angle type; 1" lg x 1" wd x $\frac{5}{16}$" h; ANRFCCC dwg RE49F429.	Antenna adapter	2Z308–306
P7 through P10						(*)	CONNECTOR, plug: Plug UG–260/U; 1 male coax cont; straight type; 1" lg x $\frac{31}{64}$" dia; ANRFCCC dwg RE49F380.	Cable terminations	2Z7390–260
P6						(*)	CONNECTOR, plug: 3 round male pol cont; straight type; $1\frac{11}{32}$" lg x 1.737" dia; Bendix-Scintilla #10–42622–2P.	------ do ------	2Z3023–76
P5						(*)	CONNECTOR, plug: 4 flat female pol cont; straight type; $1\frac{3}{4}$" lg x $1\frac{5}{16}$" dia; Amphenol type 92–F1T.	Cable termination	6Z3179
P33						(*)	CONNECTOR, plug: 4 round male pol cont; straight type; $1\frac{1}{2}$" lg x $\frac{7}{8}$" dia o/a; Amphenol part #91–MC4MT.	Connector plug	2Z3024–105
P28						(*)	CONNECTOR, plug: 6 round female pol cont; straight type; $1\frac{3}{4}$" lg x $1\frac{1}{2}$" dia; Amphenol type 79–06F1T.	Cable termination	2Z3026–53
P27						(*)	CONNECTOR, plug: 6 round male pol cont; straight type; $1\frac{3}{4}$" lg x $1\frac{1}{2}$" dia; Amphenol type 79–06MT.	--- -- do ------	2Z3026–52
P11						(*)	CONNECTOR, plug: 8 round female pol cont; straight type; $1\frac{3}{4}$" lg x $1\frac{1}{2}$" dia; Amphenol type 79–08F1–MT.	------ do ------	2Z3069–57
P20						(*)	CONNECTOR, plug: 8 round male pol cont; straight type; $1\frac{7}{8}$" lg x $1\frac{1}{4}$" dia; Amphenol type 79–08MT.	------ do ------	2Z3028–71
			(*)	(*)			CONNECTOR, plug: 1 round male cont; straight type; black; $\frac{3}{8}$" lg less cont; $\frac{1}{2}$" dia; Amphenol part #71–1L.	------ do ------	2Z3021–198
	(*)						DYNAMIC LOUDSPEAKER: black wrinkle enamel housing; PM; 3-ohm voice coil; $1\frac{1}{2}$" dia x $3\frac{13}{16}$" d; Galvin part #1X14390.	Converts electrical energy to sound energy.	6C292–1
LS1		(*)					DYNAMIC LOUDSPEAKER: 5½" dia cone; PM; 4-ohm voice coil; 6½" dia x 3½" d o/a; Quam part #55PM.	Converts electrical energy to sound energy.	6C293–11
LS2			(*)	(*)	(*)		DYNAMIC LOUDSPEAKER LS–158/U: PM field; cone type 5" dia; 3.2-ohm voice coil impedance; 5.390" dia housing x 2½" d; US Army spec 71–3290.	Converts electrical energy into mechanical energy.	6C43–43
LS3			(*)	(*)	(*)		DYNAMIC LOUDSPEAKER: PM field; cone type 5" dia; $5\frac{1}{16}$" dia x 2½" d o/a; Best Mfg part 5–PM.	Cone assembly for Loudspeaker LS–158/U.	6C43–41
F2						(*)	FUSE, cartridge: Navy type 28044–25; 25 amp; 2" lg x $\frac{5}{16}$" dia o/a; Buss type NON–25.	Overload protection	3Z2625.13
F1			(*)				FUSE, cartridge: renewable; 50 amp; 3" lg x ¾" dia o/a; Buss part #REN–50: for fuse box.	----- do ------	3Z2650.10

Ref. symbol	Model 1	2	3	4	5	Name of part and description	Function of part	Signal Corps stock No.
			(*)			FUSE: open link; 50 amp; $3\frac{13}{32}$" lg x $\frac{3}{8}$" wd o/a; Buss type #LKN50; for fuse box.	Overload protection	3Z3050–1
F1				(*)		FUSE, cartridge: Navy type #20879–50; 50 amp; 3" lg x $\frac{1}{16}$" dia o/a; Buss type NON–50; for fuse box.	------ do	3Z2650.7
			(*)	(*)		FUSE BOX: two ½" cable entrances; 6¼" lg x $2\frac{5}{16}$" wd x 2⅞" h; Sig dwg SC–D–28122.	Fuse guard	3Z2855–5
E8					(*)	FUSE BOX J–498/VRC–2X: provides 2 entrances to fit AN–931–7–11 rubber grommet; 6⅛" lg x $2\frac{3}{16}$" wd x 2½" h; US Army spec 71–3290.	------ do	2Z5600–498
			(*)	(*)		FUSEHOLDER: block type; accom 1 cartridge type fuse 3" lg x ¾" dia; 4⅝" lg x 1⅞" wd x 2⅛" h; Chase-Shawmut type #20685.	Fuseholder	3Z2880–17
E1					(*)	FUSEHOLDER: block type; accom 1 cartridge type fuse 2" lg x $\frac{2}{16}$" dia; 3½" lg x $1\frac{7}{16}$" wd x 1¾" h; Chase-Shawmut type 20675.	------ do	3Z3282–48
H10			(*)	(*)	(*)	GROMMET: rubber; fits ½" dia hole; ⅝" OD x ⅜" ID x ¼" thk w/$\frac{1}{16}$ wd groove; Atlan India Rub #230.	Cable entry	6Z4856–8
H3, H24					(*)	GROMMET: fits $\frac{11}{16}$" dia hole; $\frac{7}{16}$" dia hole x $\frac{1}{16}$" wd groove x $\frac{5}{16}$" wd x $1\frac{3}{16}$" dia o/a; Atlan India Rub type 2282.	Cable entries	6Z4856–45
			(*)	(*)		GROMMET: rubber; fits $\frac{25}{32}$" hole; ½" hole dia; $\frac{5}{64}$" wd groove, $\frac{3}{32}$" thk; $\frac{31}{32}$" OD; Canfield Rub part #3546.	Cable entry for fuse box	6Z4876–40
			(*)	(*)		HANGER, microphone: steel, cad pl; 5⅜" lg, 1¼" wd, ¾" d; o/a; Utility Elec dwg #PA–1261	Holding hook for microphone	2B1096–2
H11					(*)	HANGER, microphone: $5\frac{5}{16}$" lg x 2¾" wd x 1½" h o/a; Utility Elec dwg #PB–2877, #PB–2923.	Holds mike when not in use	2B1096–1
A8			(*)	(*)	(*)	HOUSING: loudspeaker; 3" lg x 5½" dia; Utility Elec dwg #PD–1271.	Speaker housing	2Z5091–128
					(*)	INSTALLATION KIT: for installing Radio Set AN/VRC–2X.	Mounting hardware	2S4502–2X–V76/5
A1					(*)	MAST BASE AB–15/GR: ant. support; 15¼" lg x 3⅛" dia o/a; Sig C dwg SC–D–12517.	Antenna base	2A2081–15
E3					(*)	MAST SECTION AB–23/GR: ant. sect.; 23½" lg x $\frac{7}{32}$" dia x .012" wall thk; Sig C dwg SC–D–13614.	Whip section of antenna	2A2450–23
E4					(*)	MAST SECTION AB–24/GR: ant. sect.; 23½" lg x $\frac{7}{32}$" dia x .012" wall thk w/$\frac{3}{16}$" steel ball on tapered end; Sig C dwg SC–D–13614.	------ do	2A2450–24
E2					(*)	MAST SECTION MS–117: ant. sect.; 39½" lg, from .252" to .373" dia; Sig C dwg SC–D–12521.	------ do	2A2417
M11					(*)	MICROPHONE M–38/U carbon: 50-ohms impedance; unidirectional; 4" lg x 2½" wd x 2" d; cable 5' lg; Utility Elec dwg PC2924; complete mike assy.	Converts sound energy into electrical energy.	2B1657–36

M4					(*)	MICROPHONE: carbon; 50 ohms impedance; unidirectional; 4" lg x 2¼" wd x 2" d; Electro-Voice type 210–M–307.	------ do ------	2B1657–35
M11			(*)	(*)		MICROPHONE M–27/U: 30-50 ohms impedance; unidirectional.	------ do ------	2B1720–3
M11	(*)	(*)				MICROPHONE, carbon: 30-50 ohms impedance; output level 32 db below 1 volt for 10 bar speech signal; unidirectional; includes $\frac{5}{16}$" dia hook for hanging and 3 ft of 3 cond cable terminated w/Amphenol 4 prong plug, #91–MC–4M; Shure #102–B.	------ do ------	2B1711
A3, A18					(*)	MOUNTING: for rec and xmtr; Sig C dwg SC–D–28085 and SC–D–28106.	Shock mountings for chassis of receiver and transmitter.	2Z8405A–1
N5					(*)	PLATE, identification: marked Fuse Box J–498/VRC–2X; 2¼" lg x ⅞" wd x .032" thk; Utility Elec dwg PD–3267.	Nomenclature plate	2Z7090.137
					(*)	POWER SUPPLY PP–721/VRC–2X; vibrator type; nonsynchronous; output 250 v dc, 80 ma; input 24 v dc, 3.5 amp; 8⅜" lg x $3\frac{37}{32}$" wd x $8\frac{3}{16}$" h; US Army spec 71–3290.	Receiver power supply	3H4497–721
			(*)	(*)	(*)	RADIO FREQUENCY CABLE RG–59A; coax; 73 ohms impedance; 21$\mu\mu$f/ft; .242" OD; JAN spec JAN–C–17.	Cordage for antenna cable	1F425–59A
					(*)	RADIO RECEIVER R–435/VRC–2X: F3 reception, MBCA ref dwg group 5; 30-40 mc freq range; 24 v, 5 amp dc; 14¾" lg x 9¼" wd x 10¾" h; superheterodyne ckt; US Army spec 71–3290.	Radio receiver for any single, selected frequency within the 30- to 40-mc range.	2C4180–435
	(*)	(*)				RADIO RECEIVERS R–237/VR and R–237A–VR: fm; 30 to 40 mc; 6 v dc, 14.5 amp input; metal cabinet 15" lg x 10" wd x 11½" h; 13 tube double superheterodyne; crystal controlled; includes vibrator power supply.	Radio receiver for any single, selected frequency within the 30- to 40-mc range.	2C4180–237A
			(*)	(*)		RADIO RECEIVER R–237B/VR: F3 reception MBCA ref dwg groups; 30-40 mc freq range; 6.3 v, 14.5 amp dc input; 14¾" lg x 9¼" wd x 10¾" h; superheterodyne ckt; incl vibrator power supply; for comm; US Army Spec 71–3290.	Radio receiver for any single, selected frequency within the 30- to 40-mc range.	2C4180–237B
	(*)	(*)				RADIO SET CONTROL C–493/VRC–2 and C–493A/VRC–2: olive drab crackle steel finish; 7¼" lg x 2¼" h x 3¼" d; includes volume control and squelch control.	Contains operating controls for transmitter and receiver.	2C686
			(*)	(*)		RADIO SET CONTROL C–493–A, B/VRC–2: manual control; steel case; 7¼" lg, 3¼" wd, 2¼" h o/a; mtd on instrument panel of vehicle; fp; controls squelch and volume of radio set; Utility Elec dwg No. PD–1403.	Control unit	2C686
E7					(*)	RADIO SET CONTROL C–1060/VRC–2X: squelch and vol control; 7⅜" lg x 3½" wd x 2⅜" h; table mtd; US Army spec 71–3290.	------ do ------	2C684–1060

Ref. symbol	Model 1	2	3	4	5	Name of part and description	Function of part	Signal Corps stock No.
	(*)	(*)				RADIO TRANSMITTERS T–193/VRC–2 and T–193A/VRC–2: fm; 30-40 mc; 25 w output; 6 v dc, 25 amp input; metal cabinet, 14½" lg x 12½" wd x 9½" h; crystal controlled; includes vibrator power supply.	Radio transmitter for any single, selected frequency within the 30- to 40-mc range.	2C6675–25V
			(*)	(*)		RADIO TRANSMITTER T–193B/VR: F3 type of emission, MBCA ref dwg group 5, 30-40 mc; 30 w output; 14¾" lg x 9¼" wd x 10¾" h; for comm; US Army Spec 71–3290.	Radio transmitter	2C6900–193B
					(*)	RADIO TRANSMITTER T–322/VRC–2X: F3 type of emission, MBCA ref dwg group 5, 30-40 mc; 25 w output; 14¾" lg x 9¼" wd x 10¾" h; US Army spec 71–3290.	------ do ------	2C6703–7
O9, O35					(*)	RING, retainer: captive screw retainer; .171" ID x .295" OD x .031" thk w/rim .062" wd; Natl Lock Washer part WA510.	Captive screw retainers	2Z7858–182
O39					(*)	STUFFING TUBE: 1 packing chamber; straight type; .526" bore dia; $2\frac{13}{64}$" lg x 1⅜" dia; Bendix-Scintilla part #10–35998–225	Stuffing tube	6Z3858–26
	(*)	(*)				SUPPRESSOR, electrical noise: choke coil and capacitor; 5" lg x 3¼" wd x 2⅛" h; sheet copper container; Galvin part #1X80084.	Filters out undesired electrical noise.	3Z1891–9.1
			(*)	(*)		TERMINAL, lug: style #3 modified MBCA ref dwg group 20; round tongue end type; $1\frac{55}{32}$" lg x $\frac{31}{32}$" wd x ½" h; Thomas & Betts type #F73.	Cable termination	3Z12073–35.21
				(*)		THUMBSCREW: wing head; #8–32 thd; ¾" lg; Utility Elec part/dwg #PA–1125; for fuse box.	Secures fuse box cover	6L20128–7
					(*)	WIRE, electrical: 1 stranded cond #4 AWG, of 133 strands #25 AWG; IPCEA spec, std S–19–81 modified per USA spec 71–4945 for battery power cable.	Battery cable	1B804.17

3. Antenna AT–129(*)/VR

Note. Column 1 refers to items procured on Order Nos. 23054–PH–43, 24673–PH–43, and 29040–PH–45 (unlettered components). Column 2 refers to items procured on Order No. 12732–PH–47 ("A" model components). Column 3 refers to items procured on Order No. 20591–PH–49 ("B" model components). Column 4 refers to items procured on Order No. 21756–PH–50 ("B" model components). Column 5 refers to items procured on Order No. 16816–P–51 (AN/VRC–2X components).

Ref. symbol	Model 1	2	3	4	5	Name of part and description	Function of part	Signal Corps stock No.
	(*)	(*)				ANTENNA SECTION: brass; 23¾" lg x ¼" dia; Galvin part #47A16236.	Antenna support rod	2A292–6/R2

	(*)	(*)			ANTENNA SECTION: cad pl steel; 6′ 6″ lg x .272″ dia at bottom, tapered; Galvin part #1X16277.	Antenna rod and ball assembly	2A292–6/R1
			(*)	(*)	ANTENNA SECTION: radiation of hf energy; 6′ ¼″ lg, tapered .225″ to .100″ dia; Utility Elec dwg #PB–1430.	------ do ------	2A291–40
			(*)	(*)	ANTENNA SECTION: radiation of hf energy; allows adjustment of ant. lg; hollow tube, 18⅛″ lg; Utility Elec part/dwg PB–1434.	Antenna support rod	2A2496–44
			(*)	(*)	BASE, antenna: supports ant. and fastens to side of vehicle; 7¾″ h x 4″ wd approx; Utility Elec part/dwg #PC–1445.	Mounting for antenna	2A326.2–9
	(*)	(*)			INSULATOR: conical; female; porcelain; Galvin part #67K16238.	Feedthrough insulator	3G1000–8.12
	(*)	(*)			INSULATOR: conical; male; porcelain; Galvin part #67K16237.	------ do ------	3G1000–10.2
	(*)	(*)			MOUNTING, antenna: cad pl brass or steel block; 1⅛″ lg x ¾″ wd x ⅜″ thk; .507″ hole for ant. rod; Galvin part #1X81017.	Mounting for antenna	2A292–6/B1
			(*)	(*)	NUT, collet: provides locking action for ant. extension; ¾″ x ⅞″ h; Utility Elec part #PA–1428.	------	6L3008–20–12.3

4. Radio Receivers R–237(*)/VR and R–435/VRC–2X

Note. Column 1 refers to items procured on Order Nos. 23054–PH–43, 24673–PH–43, and 29040–PH–45 (unlettered components) Column 2 refers to items procured on Order No. 12732–PH–47 ("A" model components). Column 3 refers to items procured on Order No. 20591–PH–49 ("B" model components). Column 4 refers to items procured on Order No. 21756–PH–50 ("B" model components). Column 5 refers to items procured on Order No. 16816–P–51 (AN/VRC–2X components).

Ref. symbol	Model 1 R–237/VR	Model 2 R–237A/VR	Model 3 R–237B/VR	Model 4 R–237B/VR	Model 5 R–435/VRC–2X	Name of part and description	Function of part	Signal Corps stock No.
	(*)	(*)				RADIO RECEIVERS R–237/VR and R–237A/VR: fm; 30–40 mc; 6 v dc, 14.5 amp input; metal cabinet 15″ lg x 10″ wd x 11½″ h; 13 tube double superheterodyne; crystal controlled; includes vibrator power supply.	Radio receiver for any single selected frequency within the 30- to 40-mc range.	2C4180–237A
			(*)	(*)		RADIO RECEIVER R–237B/VR: fm; 30–40 mc	------	2C4180–237B
					(*)	RADIO RECEIVER R–435/VRC–2X: F3 reception, MBCA ref dwg group 5; 30–40 mc freq range; 24 v, 5 amp dc; mtd in steel cabinet; 14¾″ lg x 9¼″ wd x 10¾″ h; 13 electron tubes and 2 thermal resistors; superheterodyne ckt; US Army spec 71–3290.	Radio receiver for any single selected frequency within the 30- to 40-mc range.	2C4180–435

T. O. 31R2-2VRC2-11

(Part of 12R) ---- 3K2027122

Ref. symbol	Model 1 R-237/VR	2 R-237A/VR	3 R-237B/VR	4 R-237B/VR	5 R-435/VRC-2X	Name of part and description	Function of part	Signal Corps stock No.
T2R	(*)	(*)	(*)	(*)	(*)	AMPLIFIER SUBASSEMBLY: plate tuning and coupling; 4" lg x 2" wd x 1 7/16" d; Utility Elec part #PB–1475.	V1 r-f amplifier transformer and coupling to V2.	2Z9629–202
T3R		(*)	(*)	(*)	(*)	AMPLIFIER SUBASSEMBLY: interstage coupling; 4" lg x 2" wd x 1 7/16" d; Utility Elec part #PB–1477.	V3 mixer transformer	2Z9643.343
T4R			(*)	(*)	(*)	AMPLIFIER SUBASSEMBLY: plate tuning coupling; 4" lg x 2" wd x 1 7/16" d; Utility Elec part #PB–1478.	V4 i-f amplifier transformer	2Z9643.344
T5R			(*)	(*)	(*)	AMPLIFIER SUBASSEMBLY: plate tuning and coupling; 4" lg x 2" wd x 1 7/16" d; Utility Elec part #PB–1479.	V5 converter transformer	2Z9641.304
T6R			(*)	(*)	(*)	AMPLIFIER SUBASSEMBLY: interstage coupling; 4" lg x 2" wd x 1 7/16" d; Utility Elec part #PB–1479.	V6 i-f amplifier transformer	2Z9641.307
T7R			(*)	(*)	(*)	AMPLIFIER SUBASSEMBLY: interstage coupling; 4" lg x 2" wd x 1 7/16" d; Utility Elec part #PB–1481.	V7 first limiter transformer	2Z9641.305
T8R			(*)	(*)	(*)	AMPLIFIER SUBASSEMBLY: interstage coupling; 4" lg x 2" wd x 1 7/16" d; Utility Elec #PC–1482.	V8 second limiter transformer	2Z9641.306
T3R	(*)					AMPLIFIER SUBASSEMBLY: i.f. (high); 4.3 mc; consists of pri and secd on ceramic core; includes capacitors and resistors in aluminum can 4½" lg x 1⅞" wd x 1½" d; Galvin part #24B81313.	V3 mixer transformer	2Z9643.9
T3R		(*)				AMPLIFIER SUBASSEMBLY: i.f. (high); 4.3 mc; consists of pri and secd on polystyrene form; includes capacitors and resistors in aluminum can 4" lg x 2" wd x 1½" d; Espey part #AB2.306.	------ do ------	2Z9643.286
T4R	(*)					AMPLIFIER SUBASSEMBLY: i.f. (high); 4.3 mc; consists of pri and secd on ceramic core; includes capacitors and resistors in aluminum can 4½" lg x ⅞" wd x 1½" d; Galvin part #1X81314.	V4 to V5 i-f transformer	2Z9643.10
T4R		(*)				AMPLIFIER SUBASSEMBLY: i.f. (high); 4.3 mc; consists of pri and secd on lucite form; includes capacitors and resistors in aluminum can 4" lg x 2" wd x 1½" d; Espey part #ZB2.307.	------ do ------	2Z9643.287
T5R	(*)					AMPLIFIER SUBASSEMBLY: i.f. (low); 455 kc; single coil on ceramic core; includes capacitors and resistors in aluminum can 4½" lg x 1⅞" wd x 1¼" d; Galvin part #1X81315.	V5 to V6 i-f transformer	2Z9641.37

T5R		(*)				AMPLIFIER SUBASSEMBLY: i.f. (low); 455 kc; single coil on ceramic core; includes capacitors and resistors in aluminum can 4" lg x 2" wd x 1½" d; Espey part #ZB2.308.	------ do ------	2Z9641.277
T6R	(*)					AMPLIFIER SUBASSEMBLY: i.f. (low); 455 kc; includes 2 coils on ceramic form; capacitors and resistors in aluminum can 4½" lg x 1⅞" wd x 1½" d; Galvin part #1X81316.	V6 to V7 i-f transformer	2Z9641.38
T6R		(*)				AMPLIFIER SUBASSEMBLY: i.f. (low); 455 kc; includes 2 coils on ceramic form; includes capacitors and resistors in aluminum can 4" lg x 2" wd x 1½" d; Espey part #ZB2.309.	------ do ------	2Z9641.278
T7R	(*)					AMPLIFIER SUBASSEMBLY: i.f. (low); 455 kc; includes 2 coils on ceramic form; includes capacitors and resistors in aluminum can 4½" lg x 1⅞" wd x 1½" d; Galvin part #1X81317.	V7 to V8 i-f transformer	2Z9641.39
T7R		(*)				AMPLIFIER SUBASSEMBLY: i.f. (low); 455 kc; includes 2 coils on ceramic form; includes capacitors and resistors in aluminum can 4" lg x 2" wd x 1½" d; Espey part #ZB2.310.	------ do ------	2Z9641.279
T8B	(*)					AMPLIFIER SUBASSEMBLY: i.f. (low); 455 kc; pri and secd windings on ceramic form; includes capacitors and resistors in aluminum can 4½" lg x 1⅞" wd x 1½" d; Galvin part #1X81318.	V8 to V9 i-f transformer	2C4520A-13V/C1
T8R		(*)				AMPLIFIER SUBASSEMBLY: i.f. (low); 455 kc; pri and secd windings on ceramic form; mtd in aluminum can 4" lg x 2" wd x 1½" d; Espey part #ZB2.311.	------ do ------	2Z9641.280
H34, H35			(*)	(*)	(*)	BOLT, thumb: RH; ¼"-20 thd; 1$\frac{13}{32}$" lg; Utility Elec part #PB-3249.	Base fasteners	6L604-1.3
C5			(*)	(*)	(*)	CAPACITOR, fixed: ceramic dielectric; 2 $\mu\mu$f ±.25 $\mu\mu$f; 500 vdcw; JAN type CC30CK020C.	V2 to V3 coupling	3D9002-27
C13, C14, C20, C21.			(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 10 $\mu\mu$f ±10%; 500 vdcw; JAN type CM20B100K.	C13: V3 plate tuning C14: V4 grid tuning. C20: V4 plate tuning. C21: V5 grid tuning.	3K2010021
C46, C50			(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 39 $\mu\mu$f ±5%; 500 vdcw; JAN type CM20C390J.	V9 plate tuning	3K2039032
C27, C28, C34, C35, C41, C42.			(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 51 $\mu\mu$f ±5%; 500 vdcw; JAN type CM20C510J.	C27: V5 plate tuning C28: V6 grid coupling. C34: V6 plate tuning. C35: V7 grid tuning. C41: V7 plate tuning. C42: V8 grid tuning.	3K2051032
C64			(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 100 $\mu\mu$f ±10%; 500 vdcw; JAN type CM20B101K.	V12 amplifier input filter	3K2010121
C75			(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 270 $\mu\mu$f ±5%; 500 vdcw; JAN type CM20B271J.	Trap, 4.3 mc (part of T2R)	3K2027122

Ref. symbol	Model 1 R-237/VR	Model 2 R-237A/VR	Model 3 R-237B/VR	Model 4 R-237B/VR	Model 5 R-436/VRC-2X	Name of part and description	Function of part	Signal Corps stock No.
C16, C23, C29, C48, C49.			(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 510 $\mu\mu$f $\pm$5%; 500 vdcw; JAN type CM20D511J.	C16: V4 grid r-f filter C23: V5 grid r-f filter. C29: V6 grid r-f filter. C48, C49: V9 cathode r-f filter.	3K2051142
C2	(*)	(*)				CAPACITOR, fixed: mica; 510 $\mu\mu$f; 500 vdcw; $\frac{51}{64}$" lg x $\frac{15}{32}$" wd x $\frac{7}{32}$" thk; JAN type CM20B511J.	V1 grid return bypass	3K2051122
C6, C52, C54, C72.	(*)	(*)				CAPACITOR, fixed: mica; 2200 $\mu\mu$f; 500 vdcw; $\frac{53}{64}$" lg x $\frac{53}{64}$" wd x $\frac{11}{32}$" thk; JAN type CM30B222K.	C6: V2 screen bypass C52: V10 noise input coupling. C54: V10 plate load tuning. C72: B+ bypass.	3K3022221
C10, C37, C44, C52, C54.			(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 2200 $\mu\mu$f $\pm$10%; 500 vdcw; JAN type CM30B222K.	C10: V3 grid coupling C37: V7 grid r-f bypass. C44: V8 grid r-f bypass. C52: V10 grid coupling. C54: V10 plate load tuning.	3K3022221
C3, C4, C17, C18, C24, C55, C57, C58, C62, C63.	(*)	(*)				CAPACITOR, fixed: mica; 5100 $\mu\mu$f; 500 vdcw; $\frac{53}{64}$" lg x $\frac{53}{64}$" wd x $\frac{11}{32}$" thk; JAN type CM35B512J.	C3: V1 cathode bypass C4: V1 screen bypass. C17: V3 plate return and screen bypass. C18: V4 cathode bypass. C24: V4 plate return and screen bypass. C55: V10 noise output coupling. C57, C58: V11, output load filter. C62: V12 output coupling. C63: V12 input coupling.	3K3551222
C3, C4, C6, C8, C11, C17, C18, C24, C55, C57, C58, C62. C63, C72.			(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 5,600 $\mu\mu$f $\pm$10%; 500 vdcw; JAN type CM35B562K.	C3: V1 cathode bypass C4: V1 screen bypass. C6: V2 screen bypass. C8: V2 plate decoupling. C11: V1 plate decoupling. C17: V3 screen bypass. C18: V4 cathode bypass. C24: V4 screen bypass. C55: V11 input coupling.	3K3556221

							C57, C58: V11 output load filter. C62: V12 amplifier output coupling. C63: V12 amplifier input coupling. C72: B+ r-f bypass.	
C73	(*)	(*)				CAPACITOR, fixed: paper; 20,000 μμf; 600 vdcw; 1⅝" lg x $\frac{7}{16}$" dia; JAN type CP29A1EF203M.	V13 output bypass	3DA250-358
C25, C30, C31, C32, C38, C39, C45, C53, C59, C60.	(*)	(*)				CAPACITOR, fixed: paper; 50,000 μμf; 600 vdcw; 1½" lg x ⅝" dia; JAN type CP29A1EF503M.	C25: V5 cathode bypass C30: V6 plate return and screen bypass. C31: V6 cathode bypass. C32: V6 plate return and screen bypass. C38: V11 squelch time constant. C39: V7 plate return and screen bypass. C45: V8 plate return and screen bypass. C53: V10 cathode bypass. C59: V12 input filter. C60: V12 plate filter.	3DA50-259
C39, C45, C53, C60.			(*)	(*)	(*)	CAPACITOR, fixed: paper dielectric; 50,000 μμf ±20%; 600 vdcw; JAN type CP29A1EF503M	C39: V7 screen bypass C45: V8 screen bypass. C53: V10 cathode bypass. C60: V12 squelch plate bypass.	3DA50-259
C25, C30, C31, C32, C38, C59.			(*)	(*)	(*)	CAPACITOR, fixed: paper dielectric; 50,000 μμf +20% —10% ea sect.: 600 vdcw; JAN type CP53B5EF503V.	C25: V5 cathode bypass C30: V5 plate and screen decoupling. C31: V6 cathode bypass. C32: V6 plate and screen decoupling. C38: V7 bias filter, V11 to V7. C59: V12 amplifier, input filter.	3DA20-279
C74			(*)	(*)	(*)	CAPACITOR, fixed: paper dielectric; 250,000 μμf ±20%; 200 vdcw; JAN type CP29A1EC254M.	Output transformer line bypass	3DA250-340
C74	(*)	(*)				CAPACITOR, fixed: paper; 250,000 μμf; 200 vdcw; 2$\frac{5}{16}$" lg x $\frac{13}{16}$" dia; JAN type CP28A1EC254M.	600-ohm line bypass	3DA20-174
C56, C61, C65	(*)					CAPACITOR, fixed: electrolytic; 3 sect.; 15 μf-15 μf-20 μf; 250 vdcw, 25 vdcw; sealed metal can; 2¼" lg x 1" dia; Mallory part #A93403-1.	C56: V10 plate return and screen bypass. C61: V12 cathode bypass. C65: V13 cathode bypass.	3DB20-32
C56, C61, C65		(*)				CAPACITOR, fixed: electrolytic; 3 sect.; 20 μf per sect.; 450 vdcw; sealed metal case; 3" lg x 1⅝" dia; Pyramid part #TM-T20-450S.	C56: V10 plate return and screen bypass. C61: V12, cathode bypass. C65: V13, cathode bypass.	3DB20-110

Ref. symbol	Model 1 R-237/VR	Model 2 R-237A/VR	Model 3 R-237B/VR	Model 4 R-237B/VR	Model 5 R-435/YRC-2X	Name of part and description	Function of part	Signal Corps stock No.
C56, C61, C65			(*)	(*)	(*)	CAPACITOR, fixed: electrolytic; 3 sect.; 20 μf ea sect.; 450 vdcw; JAN type CE33F200B.	C56: V10 screen bypass C61: V12 cathode bypass. C65: V13 cathode bypass.	3DB20–132
C7, C9, C12, C15, C19, C22, C33, C36, C40, C43, C47, C51, C76, C77					(*)	CAPACITOR, variable: air dielectric; plate meshing type; 2 sect.; 7–44 μμf; $1\frac{5}{16}$" lg x $1\frac{3}{16}$" wd x $1\frac{13}{32}$" h; Sickles FW type ATR–1 dual.	C7: V2 plate tuning C9: V1 plate tuning. C12: V3 plate tuning. C15: V4 grid tuning. C19: V4 plate tuning. C22: V5 grid tuning. C33: V6 plate tuning. C36: V7 grid tuning. C40: V7 plate tuning. C43: V8 grid tuning. C47, C51: V9 plate tuning. C76: V3 grid tuning (T2R). C77: V3 grid tuning (T1R).	3D9044V–7
C26			(*)	(*)	(*)	CAPACITOR, variable: air dielectric; plate meshing type; 7–44 μμf; $1\frac{5}{64}$" lg x $1\frac{13}{16}$" wd x $1\frac{13}{32}$" d; Sickles FW part #ART–1 single.	V5 plate tuning	3D9044V–5
C1					(*)	CAPACITOR, variable: air dielectric; plate meshing type; 1 sect.; 6–50 μμf; $1\frac{3}{16}$" lg x $1\frac{5}{16}$" wd x $1\frac{7}{32}$" d; Sickles FW type SD–3443.	V1 grid tuning	3D9050V–126
C1	(*)					CAPACITOR, variable: air; single sect.; rotary type; ceramic insulation; 3.5–50.0 μμf ±5%; .937" wd x 1.218" lg x 1.406" h; shaft $\frac{3}{32}$" lg x ¼" dia; RCC series #22067.	Antenna trimmer	3D9050V–103
C1		(*)				CAPACITOR, variable: ceramic dielectric; single sect.; rotary type; ceramic insulation; 3.5–50.0 μμf ±5%; .937" wd x 1.218" h x .125" thk; Centralab part #823–BZ.	------ do ----------	3D9050V–115
C1			(*)	(*)		CAPACITOR, variable: air; plate meshing type; 42. μμf max to 5. μμf min; JAN type CT1C040.	V1 grid coil tuning	3D9042V–7
			(*)			CLIP: xtal holder	Crystal holder	2Z2713.130
O1, O2		(*)				CLIP: spring retainer; steel; $\frac{3}{16}$" lg x ½" wd x .016" thk; Amphenol part #2–11.	Hold speaker jack in place	2Z7857–16
E46			(*)	(*)	(*)	CLIP, electrical: electron tube; ⅞" lg x $\frac{5}{16}$" wd x $\frac{7}{16}$" h	V5 grid clip	2Z3712.22

L1	(*)	(*)				COIL, RF: unshielded; ¾" dia x $\frac{9}{16}$" lg; Galvin part #24A81270.	Antenna primary	2C4520A–13V/C5
L2	(*)	(*)				COIL, RF: unshielded; $\frac{9}{16}$" dia x 1½" lg; polystyrene form; Galvin part #24A81272.	Antenna secondary	2C4520A–13V/C6
L1			(*)	(*)	(*)	COIL, RF: ant.; unshielded; $\frac{1}{18}$" lg x .88" dia; Utility Elec part #PA–1069.	Antenna primary coil	3C1084Z74–7
L2			(*)	(*)	(*)	COIL, RF: ant.; unshielded; $\frac{3}{32}$" lg x .556" dia. Utility Elec part #PA–1070.	Antenna secondary coil	3C1084Z74–6
					(*)	COLLAR. spacing: stand-off; $\frac{3}{16}$" lg x $\frac{5}{16}$" dia; Utility Elec part #PA–1454.	Stand-off	2Z2935–165
					(*)	COLLAR, spacing: ⅝" lg x $\frac{11}{16}$" dia; Utility Elec part #PA–1472.	Spacer	2Z2935–166
J7			(*)	(*)	(*)	CONNECTOR, receptacle: 1 round female cont; straight type; red body; ½" lg x ½" dia; Amphenol part #78–1LT.	B+ power receptacle	2Z3062–215
J2			(*)	(*)	(*)	CONNECTOR, receptacle: 1 round female cont; straight type; yellow body; ½" lg x ½" dia; Amphenol part #78–1LT.	Filament power receptacle	2Z3062–214
J6			(*)	(*)	(*)	CONNECTOR, receptacle: 1 round female cont; straight type; $1\frac{1}{32}$" lg x ½" dia; Industrial Products Corp part #5575.	Antenna receptacle	2Z3062–188
J5				(*)	(*)	CONNECTOR, receptacle: 8 round female pol cont; straight type; 1" lg x 1⅜" dia; Amphenol #79–P08FT.	Control cable receptacle	2Z3069–52
J7	(*)	(*)				CONNECTOR, receptacle: 1 round cont; ½" lg x ½" dia shoulder; cylindrical red bakelite body; Amphenol part #78–1L.	Receptacle	2Z5573.5
J3, J4	(*)	(*)				CONNECTOR, receptacle: 1 round cont; ½" lg x ½" dia shoulder; cylindrical black bakelite body; Amphenol part #78–1L.	------ do	2Z5573.4
J2	(*)	(*)				CONNECTOR, receptacle: 1 round cont; ½" lg x ½" dia shoulder; cylindrical yellow bakelite body; Amphenol part #78–1L.	------ do	2Z5573.6
J6	(*)	(*)				CONNECTOR, female contact: 1 round cont; ¾" lg x ⅜" dia body; cylindrical chrome plated brass body; Jones HB part #S101–D.	------ do	2Z8671.30
J5	(*)	(*)				CONNECTOR, female contact: 8 round radial cont; 1" lg x 1⅜" dia body; chrome plated brass shell; Amphenol part #79–P08F.	------ do	2Z8678.13
			(*)	(*)	(*)	COVER, radio receiver: steel; $14\frac{9}{16}$" lg x $9\frac{3}{16}$" wd x $11\frac{3}{16}$" h; Utility Elec part #PD–1163.	Receiver cover (less guard)	2Z3351–350
Y1			(*)	(*)	(*)	CRYSTAL UNIT, quartz: incl Crystal Holder HC–1/U; 1⅝" lg x $12\frac{3}{16}$" wd x $\frac{7}{16}$" d; 4,755 kc freq; Sig C dwg SC–A–46042, SC–D–20877, SC–D–20879.	V5 frequency control	2X28–4755
				(*)	(*)	GROMMET: rubber; fits $\frac{5}{16}$" hole; $\frac{5}{16}$" dia hole x ¼" wd x $\frac{7}{16}$" o/a; Canfield Rub #1971B.	Hole liner	6Z4856–44
				(*)	(*)	SWITCH GUARD MX–1368/VRC–2X: steel; 14⅞" lg x 3¾" wd x 4¼" d; Army spec 71–3290.	Protective cover for switches and plugs.	2Z4883A–1368

Ref. symbol	Model 1 R-237/VR	Model 2 R-237A/VR	Model 3 R-237B/VR	Model 4 R-237B/VR	Model 5 R-435/VRC-2X	Name of part and description	Function of part	Signal Corps stock No.
				(*)	(*)	HANDLE: cover; 3" lg x 2¾" wd x ¾" d, incl 1¾" OD washer; Natl Lock part #61–207.	Cover handle	2Z4928–106
E1	(*)	(*)				HOLDER, crystal: for single quartz plate; 2 pins, ¾" spacing; 1⅜" lg x 1⅜" wd x ½" thk; plastic body; Prem Crys Labs part #PL–218C.	Holder for quartz crystal	2XH23.3
J1	(*)					JACK, telephone: for 2 cont plug .25" dia; 1.173" lg x 1¼" wd x ¾" h; cont arrangement J1; Galvin part #9A20261.	Meter jack	2Z5595
J1		(*)				JACK, telephone: for 2 cont plug .25" dia; 1¼" lg x ¾" dia; cont arrangement J1; Utal part #1–1MP.	------ do ------	4C4312.23
J1			(*)	(*)	(*)	JACK JJ–034: for 2 cond plug; .250" dia	------ do ------	2Z5534
	(*)					KNOB, round; black bakelite; for ¼" shaft; molded arrow ⅝" dia x $\frac{7}{16}$" thk; Crowe part #6126.	Control knob	2Z5748.20
		(*)	(*)	(*)	(*)	KNOB: round; black plastic; for ¼" dia shaft; $\frac{11}{16}$" dia x $\frac{13}{32}$" thk.	------ do ------	2Z5821–4.1
					(*)	LATCH, fastener: for cover; 2" lg x ⅝" wd x ⅜" d; Utility Elec dwg #PA–1473; to fit Natl Lock part #61–207.	Cover fastener	6Z6918–27
					(*)	MOUNTING: tube socket; steel cad pl; Utility Elec part #EPB–3003.	Mounting for tube sockets	2Z6820.441
T1R	(*)	(*)	(*)	(*)	(*)	OSCILLATOR SUBASSEMBLY: hf osc tuning; 4½" lg x 2" wd x $1\frac{7}{16}$" d; Utility Elec part #PB–1476–A.	V2 h-f oscillator tuning	2Z9629–201
			(*)	(*)	(*)	PLATE, identification: control and connection indicator; $14\frac{7}{16}$" lg x 2½" wd x .032" thk; Utility Elec part #PB–1129.	Control and connection indicator	2Z7091–655
					(*)	PLATE, instruction: caution; 3" lg x ⅞" wd x .032" thk; Utility Elec part #PB–3255.	Caution plate	2Z7091–656
					(*)	PLATE, stop: holds capacitor firm; 1" lg x $\frac{33}{64}$" wd x .017" thk; Utility Elec part #PA–1266.	Capacitor positioner	2Z7091–654
L3		(*)				REACTOR: audio; 42 mh at 17 ma; 105 ohms resistance; 500 v rms test; uncased; $1\frac{5}{32}$" lg x $2\frac{5}{32}$" wd x $1\frac{5}{32}$" h; Espey part #LA2.303.	V10 plate load	3C323–179C
L3	(*)					REACTOR: audio; 42 mh at 17 ma; 105 ohms resistance; unshielded, $1\frac{5}{32}$" lg x $\frac{33}{32}$" wd x $1\frac{5}{32}$" h; Galvin part #24A82480.	------ do ------	3C4053–2

L8		(*)				REACTOR: filter choke; .5 hy at 22 ma; 110 ohms resistance; 500 v rms test; steel case; 2¼" h x 1½" dia; Espey part #LA16.228.	V13 a-f choke	3C321-21
L8	(*)					REACTOR: filter choke; .5 hy at 20 ma; 110 ohms resistance; steel case; 2⅝" lg x 1.41" wd x 1½" h; Chi Trans part #8B-K0.	------ do ------	3C362-22
L3			(*)	(*)	(*)	REACTOR: 50 mh inductance; 190 ohms dc resistance; open steel frame; 1½" lg x 1" wd x 1⅝" d; Utility Elec Corp part #PA-1072.	V10 plate load tuning	3C573K-1
R11	(*)	(*)				RESISTOR, fixed: composition; 100 ohms; ½ w; .655" lg x .249" dia; JAN type RC20BF101J.	V4 cathode	3RG20BF101J
R2	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: composition; 270 ohms ±10%; ½ w; JAN type RC20BF271K.	V1 cathode bias	3RC20BF271K
R11, R15	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: composition; 330 ohms ±10%; ½ w; JAN type RC20BF331K.	R11: V4 cathode bias R15: V5 cathode bias.	3RC20BF331K
R23	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: composition; 560 ohms ±10%; ½ w; JAN type RC20BF561K.	V6 cathode bias	3RC20BF561K
R52	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: composition; 1,000 ohms ±10%; 1 w; JAN type RC30BF102K.	V13 cathode bias	3RC30BF102K
R54			(*)	(*)		RESISTOR, fixed: composition; 3,900 ohms ±10%; ½ w; JAN type RC20BF392K.	Prevents oscillation during alinement.	3RC20BF392K
R4, R46, R53	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: composition; 4,700 ohms ±10%; ½ w; JAN type RC20BF472K.	R4: V1 plate decoupling R46: V12 cathode bias. R53: V2 plate decoupling.	3RC20BF472K
R14, R45	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: composition; 6,800 ohms ±10%; ½ w; JAN type RC20BF682K.	R14: V5 hexode grid #3 grid leak. R45: V12 cathode bias bleeder.	3RC20BF682K
R18	(*)	(*)				RESISTOR, fixed: composition; 10,000 ohms; 1 w; 1.28" lg x .310" dia; JAN type RC30BF103K.	V5 plate decoupling	3RC30BF103K
R54					(*)	RESISTOR, fixed: composition; 10,000 ohms ±10%; ½ w; JAN type RC20BF103K.	Prevents oscillation during alinement.	3RC20BF103K
R12, R40	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: composition; 15,000 ohms ±10%; 1 w; JAN type RC30BF153K.	R12: V4 plate and screen decoupling. R40: V10 plate and screen decoupling.	3RC30BF153K
R8, R18, R24, R30, R33.	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: composition; 27,000 ohms ±10%; 1 w; JAN type RC30BF273K; R18 is 10,000 ohms in unlettered and A model receivers.	R8: V3 plate and screen decoupling. R18: V5 hexode plate and een decoupling. R24: V6 plate and screen decoupling. R30: V7 plate and screen decoupling. R33: V8 plate and screen decoupling.	3RC30BF273K
R7, R16	(*)	(*)				RESISTOR, fixed: composition; 47,000 ohms; ½ w; .655" lg x .249" dia; JAN type RC21BF473K.	R7: V2 screen R16: V5 oscillator grid.	3RC21BF473K

Ref. symbol	Model 1 R-237/VR	Model 2 R-237A/VR	Model 3 R-237B/VR	Model 4 R-237B/VR	Model 5 R-435/VRC-2X	Name of part and description	Function of part	Signal Corps stock No.
R40, R47	(*)	(*)				RESISTOR, fixed: composition; 47,000 ohms; 1 w; 1.28" lg x .310" dia; JAN type RC31BF473K.	R40: V10 plate decoupling R47: V12 bleeder and voltage dropping.	3RC31BF473K
R7, R16, R26			(*)	(*)	(*)	RESISTOR, fixed: composition; 47,000 ohms ±10%; ½ w; JAN tvpe RC20BF473K.	R7: V2 screen decoupling R16: V5 triode grid leak. R26: V7 grid load.	3RC20BF473K
R47			(*)	(*)	(*)	RESISTOR, fixed: composition; 47,000 ohms ±10%; 1 w; JAN type RC30BF473K.	V12 bias bleeder	3RC30BF473K
R3	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: composition; 68,000 ohms ±10%; ½ w; JAN type RC20BF683K.	V1 screen dropping	3RC20BF683K
R10, R25, R29, R34, R36.			(*)	(*)	(*)	RESISTOR, fixed: composition; 100,000 ohms ±10%; ½ w; JAN type RC20BF104K.	R10: V4 grid filter R25: V6 plate load. R29: V7 grid leak. R34, R36: V9 cathode lead.	3RC20BF104K
R1	(*)	(*)				RESISTOR, fixed: composition; 100,000 ohms; ½ w; .655" lg x .249" dia; JAN type RC21BF104K.	V1 screen	3RC20BF104K
R17	(*)	(*)	(*)	(*)		RESISTOR, fixed: composition; 150,000 ohms; ½ w; .655" lg x .249" dia; JAN type RC20BF154K.	V5 oscillator plate	3RC20BF154K
R17, R48					(*)	RESISTOR, fixed: composition; 150,000 ohms ±10%; ½ w; JAN type RC20BF154K.	R17: V5 triode plate load R48: V12 amplifier plate load.	3RC20BF154K
R21			(*)	(*)	(*)	RESISTOR, fixed: composition; 180,000 ohms ±10%; ½ w; JAN type RC20BF184K.	V6 grid lead	3RC20BF184K
R50	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: composition; 220,000 ohms ±10%; ½ w; JAN type RC220BF224K.	V12 amplifier input filter	3RC20BF224K
R44					(*)	RESISTOR, fixed: composition; 270,000 ohms ±10%; ½ w; JAN type RC20BF274K.	V12 squelch plate voltage divider.	3RC20BF274K
R44, R48	(*)	(*)	(*)	(*)		RESISTOR, fixed: composition; 270,000 ohms ±10%; ½ w; JAN type RC20BF274K.	R44: V12 squelch plate load R48: V12 a-f plate.	3RC20BF274K
R39	(*)	(*)				RESISTOR, fixed: composition; 470,000 ohms; ½ w; .655" lg x .249" dia; JAN type RC21BF474K.	V10, input coupling	3RC21BF474K
R6, R9, R13, R39				(*)	(*)	RESISTOR, fixed: composition; 470,000 ohms ±10%; ½ w; JAN type RC20BF474K.	R6: V2 grid leak R9: V4 plate load. R13: V3 plate load. R39: V10 input filter.	3RC20BF474K
R49	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: composition; 820,000 ohms ±10%; ½ w; JAN type RC20BF824K.	V12 amplifier input filter	3RC20BF824K

R19, R20, R22, R27, R32, R38, R41, R42, R43.			(*)	(*)	(*)	RESISTOR, fixed: composition; 1 meg ±10%; ½ w; JAN w; JAN type RC20BF105K	R19: Bias filter, V11 to V7 R20: Grid decoupling, V6 to V4. R22: V6 grid meter isolation. R27: Bias filter, V11 to V7. R32: V8 grid leak. R38: V10 grid leak. R41: V11 load. R42: V12 squelch input filter. R43: V12 squelch plate coupling.	3RC20BF105K
R6, R19, R38, R41. R42, R43.	(*)	(*)	(*)	(*)		RESISTOR, fixed: composition; 1 meg; ½ w; .655" lg x .249" dia; JAN type RC21BF105K.	R6: V2 grid R19: Coupling, V7 to V11. R38: V10 grid. R41: V11 output load. R42: V12 input coupling. R43: V12 squelch voltage coupling.	3RC21BF105K
R28. R31			(*)	(*)	(*)	RESISTOR, fixed: composition; 1.5 meg ±10%; ½ w; JAN type RC20BF155K.	R28: V7 grid meter isolation R31: V8 grid meter isolation.	3RC20BF155K
R51	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: composition; 2.2 meg ±10%; ½ w; JAN type RC20BF225K.	V13 grid leak	3RC20BF225K
R5			(*)	(*)	(*)	RESISTOR, fixed: composition; 4.7 meg ±10%; ½ w; JAN type RC20BF475K.	V3 grid leak	3RC20BF475K
R56					(*)	RESISTOR, thermal: 35 ohms nom resistance; 450 ma, 7.16 w nom oper cur; T9 tube; Amperite part #4H12.	Filament voltage stabilizing	3Z6925–3.26
R57					(*)	RESISTOR, thermal: 20 ohms nom resistance; 580 ma, 6.38 w nom oper cur; T9 tube; Amperite #6–13.	Filament voltage stabilizing	3Z6925–3.21
O48				(*)	(*)	(*)	RETAINER, crystal holder: 1⅜" lg x $1\frac{3}{16}$" wd x $\frac{7}{16}$" d; Utility Elec #PA–1148.	Crystal holder retainer	2Z2712.130
O49, O50, O51						(*)	RETAINER, electron tube: SS; friction mtd; Times Facsimile part #2 Hat w/post.	O49: Tube retainer O50, O51: Thermal resistor retainers.	2Z7780–165
X3 through X17				(*)	(*)	(*)	SOCKET, electron tube: 8 std octal cont; one piece saddle mtg; $1\frac{9}{16}$" lg x $1\frac{7}{32}$" wd x ½" h o/a; Cinch #51A14887.	Tube sockets	2Z8670.24
A2				(*)	(*)		SHOCK MOUNT M–448: vibration; 2⅜" sq metal base; round rubber body 1½" dia; approx $1\frac{1}{16}$" h; Sig dwg SC–D–19169.	Shock mount	2Z8415–448
J8, X1, X2				(*)	(*)	(*)	SOCKET SO–200: 2 small cont; above chassis mtg; $1\frac{13}{64}$" lg x $\frac{11}{64}$" wd x $\frac{1}{16}$" h; Sig C dwg SC–D–16887.	J8: Speaker receptacle X1, X2: Crystal sockets.	2Z8799–200
X1, X2	(*)	(*)					SOCKET, tube: 5 cont; under chassis plate mtg; mica filled bakelite body; $1\frac{7}{64}$" dia x ½" d; Amphenol part #77–MIP5T.	Crystal sockets	2Z8675.17
	(*)						SOCKET, tube: octal; bakelite body; 1⅝" x $\frac{1}{16}$" x ¾" d; Amphenol part #88–8B.	Holds and connects tube to circuit.	2Z8678.207
X10 through X15.		(*)					SOCKET, tube: octal; under chassis plate mtg; mica filled bakelite body; $1\frac{11}{16}$" x $1\frac{3}{16}$" x $\frac{5}{16}$" thk; Cinch part #51A12543.	------ do ------	2Z8678.298

Ref. symbol	Model 1 R-237/VR	Model 2 R-237A/VR	Model 3 R-237B/VR	Model 4 R-237B/VR	Model 5 R-435/VRC-2X	Name of part and description	Function of part	Signal Corps stock No.
X3 through X9		(*)				SOCKET, tube: octal; under chassis plate mtg; mica filled bakelite body; $1\frac{11}{16}$" x $1\frac{3}{16}$" x $\frac{5}{16}$" thk; Cinch part #ER237.	Holds and connects tube to circuit.	2Z8678.297
	(*)					SOCKET, tube: octal; steel mtg plate bakelite body; $1\frac{13}{32}$" dia; Amphenol part #88–8–T–CS.	------ do ------	2Z8678.116
X3 through X15			(*)			SOCKET, tube: octal; one piece saddle below chassis mtg	Tube sockets	2Z8678.335
			(*)	(*)		SPRING: flat type; catch for cover; $3\frac{5}{16}$" lg x $\frac{7}{16}$" wd x ½" h; Utility Elec dwg #PA–1258.	Cover holder	2Z8877.696
H41			(*)	(*)	(*)	STUD: 2½" lg x ¼" dia; 1 end threaded w/#6–32 thd $\frac{5}{16}$" lg, other end threaded w/#6–32 thd ¼" lg; Utility Elec part #PA–1147.	Crystal retainer support	6L31150–7
H42, H43, H44					(*)	STUD: 3⅛" lg x ⅛" dia; 1 end threaded w/5–40 #2 thd $\frac{7}{16}$" lg, other end $\frac{1}{32}$" x 45° cham; Utility Elec part #PB–3004–2.	Tube retainer supports	6L31154–29
SW1			(*)	(*)	(*)	SWITCH, rotary: 1 pole 5 position; $\frac{13}{16}$" lg x 1¼" dia; Mallory part #3215J.	Meter switch	3Z9825–55.6
SW1	(*)					SWITCH, rotary: 1 pole, 5 position; 1¼" dia x $\frac{13}{16}$" thk nonshorting; Mallory part #3215J.	------ do ------	3Z9825–55.6
SW1		(*)				SWITCH, rotary: 1 pole, 5 position; phenolic fiber base; 1¼" dia x $\frac{7}{16}$" thk; locking action, normally closed; Espey part #SA12.087.	------ do ------	3Z9825–70.12
E47			(*)	(*)	(*)	TERMINAL BOARD: mts resistors, capacitors, and connectors; 68 feedthrough swaged type term.; 13⅞" lg x 2¼" wd x 1¼" thk; Utility Elec part #PC–2925.	Mounting for resistors, capacitors, and connectors.	3Z770–68.6
T3			(*)	(*)	(*)	TRANSFORMER, AF: plate coupling type; pri 10,000 ohms impedance, secd 3.2 and 600 ohms impedance; HS case; 2" lg x 2" wd x 2½" h; Utility Elec part #PA–1021.	Audio output transformer	2Z9632.528
T3	(*)					TRANSFORMER, AF: output; pri 10,000 ohms impedance, one secd 600 ohms and 1 secd 3 ohms; metal case; $1\frac{33}{32}$" sq x 1⅞" h; Chi Trans part #7D–F1.	V13 audio output	2Z9637.11
T3		(*)				TRANSFORMER, AF: output; pri 10,000 ohms impedance, one secd 600 ohms and 1 secd 3.2 ohms; steel case; 2½' h x 1¾" dia; Espey part #TA15.031.	------ do ------	2Z9633.63
V1, V2, V3, V4,	(*)	(*)				TUBE, electron: 6SD7GT; pentode	V1: R-f amplifier V2: H-f oscillator.	2J6SD7GT

V6, V7, V8, V10.							V3: Mixer. V4: I-f amplifier. V6: I-f amplifier. V7: First limiter. V8: Second limiter. V10: Noise amplifier.	
V12	(*)	(*)	(*)	(*)	(*)	TUBE, electron: type 6C8G	Squelch, first a-f amplifier	2J6C8G
V9, V11	(*)	(*)	(*)	(*)	(*)	TUBE, electron: type 6H6GT	V9: Discriminator V11: Noise rectifier.	2J6H6GT
V13	(*)	(*)	(*)	(*)	(*)	TUBE, electron: type 6K6GT	2d a-f amplifier	2J6K6GT
V5	(*)	(*)	(*)	(*)	(*)	TUBE, electron: type 6K8GT	Converter	2J6K8GT
V1, V2, V3, V4, V6, V7, V8, V10.			(*)	(*)	(*)	TUBE, electron: type 6SG7GT	V1: R-f amplifier V2: H-f oscillator. V3: Mixer. V4: Amplifier, 43 mc i.f. V6: 455 kc i-f amplifier. V7: First limiter. V8: Second limiter. V10: Noise amplifier.	2J6SG7GT
						POWER SUPPLY GROUP		
	(*)	(*)				POWER SUPPLY: vibrator type; nonsynchronous; input 6.3 v at 14.5 amp; output 250 v at 80 ma; 6X5GT rectifier tube; 8½" lg x 4" wd x 8" h.	Source of d-c power for receiver	3H4490–4
			(*)	(*)		POWER SUPPLY: for Radio Receiver R–237B/VR; nonsynchronous vibrator; full-wave rectification; output, 280 v 60 ma, 6 v 8.5 amp dc; input 6 v dc; 8¾" lg x 3¾" wd x 4" h; incl filter; Utility Elec part #PD–1164.		3H4490–5
					(*)	POWER SUPPLY PP–721/VRC–2X: vibrator type; nonsynchronous; output 250 v dc, 80 ma; input 24 v dc, 3.5 amp; 8⅜" lg x 3$\frac{31}{32}$" wd x 8$\frac{5}{16}$" h; filter incl; mts by one #8–32 anchor nut in horiz plane and two ⅛" dia holes in vert plane; mp and fp; US Army spec 71–3290.	Plate voltage supply for receiver.	3H4497–721
					(*)	BARE UNIT: for Power Supply PP–721/VRC–2X		3H4497–721Z
C5		(*)	(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 100 $\mu\mu$f ±10%; 500 vdcw; JAN type CM20B101K.	R-f bypass	3K2010121
C3, C9					(*)	CAPACITOR, fixed: paper dielectric; 5000 $\mu\mu$f ±20%; 1500 vdcw; 1¼" lg x 1" dia; Dublier type MCC.	Buffers	3DA5–241
C7, C8					(*)	CAPACITOR, fixed: mica dielectric; 5600 $\mu\mu$f ±10%; 500 vdcw; JAN type CM35B562K.	R-f filters	3K3556221
C3		(*)	(*)	(*)		CAPACITOR, fixed: paper; 6000 $\mu\mu$f; 1500 vdcw; 1$\frac{7}{16}$" lg x 1$\frac{1}{16}$" dia; JAN type CP28A1EH602M.	Buffer	3DA6–106
C3	(*)					CAPACITOR, fixed: paper; 6000 $\mu\mu$f; 1600 vdcw; 1$\frac{1}{16}$" lg x $\frac{31}{32}$" dia; Fast part #A–5170.	------ do	3DA6–58
C1, C2	(*)	(*)	(*)	(*)	(*)	CAPACITOR, fixed: paper dielectric; 500,000 $\mu\mu$f ±20%; JAN type CP29A1EC504M.	Input filters	3DA500–582

Ref. symbol	Model 1 R-237/VR	Model 2 R-237A/VR	Model 3 R-237B/VR	Model 4 R-237B/VR	Model 5 R-435/VRC-2X	Name of part and description	Function of part	Signal Corps stock No.
C6					(*)	CAPACITOR, fixed: paper dielectric; 2.0 μf +25%–15%; 200 vdcw; 1 45/64" lg x .670" dia; Astron Corp type MQCF–2–2M.	Vibrator filter	3DB2–285
C4				(*)	(*)	CAPACITOR, fixed: electrolytic; 2 sect., 20 μf per sect.; 450 vdcw; JAN type CE42F200R.	Output filter	3DB20–113
C4	(*)					CAPACITOR, fixed: electrolytic; 2 sect.; 10-15 μf; 400 vdcw; 3 7/32" lg x 1 7/64" dia; metal can; Mallory type FP, part #101–246.	Filter	3DB15–16
C4		(*)				CAPACITOR, fixed: electrolytic; 2 sect.; 20 μf per sect.; 450 vdcw; 3" h x 1⅜" dia; metal can, common negative, not grounded; Pyramid part #TM–D20–450S.	do	3DB20–111
C4			(*)			CAPACITOR, fixed: electrolytic; 2 sect.; 20 μf, 450 vdcw ea sect.; JAN type CE32F200R.	Output filter	3DB20–67
O11, O12				(*)	(*)	CLIP: electrical, fuse; 15/32" jaw opening; ¾" lg x 15/32" wd x ½" h; Buss type 4551.	Fuse clips	2Z2712.194
O40, O41, O42					(*)	CLIP: electrical, capacitor; 5/16" max jaw opening; 53/64" lg x 13/32" wd x 11/64" h; Kolten part/dwg #EA–1.	Capacitor clips	2Z2712.288
O13			(*)	(*)	(*)	CLIP: electrical, vibrator; 1½" jaw opening; 1⅞" lg x 1⅝" wd x 11/32" h; United Carr type #52035.	Vibrator clip	2Z2712.175
L2			(*)	(*)	(*)	COIL, RF: fil choke; unshielded; 27/32" lg x 1 5/16" dia; Utility Elec part/dwg #PA–1068.	Filament choke	3C1084Z74–4
L1			(*)	(*)	(*)	COIL, RF: choke; unshielded; 27/32" lg x 1 5/16" dia; Utility Elec part/dwg #PA–1071.	Input filter	3C1084Z74–5
L2	(*)	(*)				COIL, RF: choke; unshielded; 2.9 mh at 1000 cps; 4 amp d-c rating; .007 ohms resistance; 1" lg x 1½" dia; Fast part #5795.	Filament choke	3C323–12B
L1	(*)	(*)				COIL, RF: choke; unshielded; 22 mh at 1000 cps; 3.5 amp d-c rating; .091 ohms resistance; ⅝" lg x 1½" dia; Fast part #A5989.	Filter	3C362–21
P2	(*)	(*)				CONNECTOR, male contact: 1 straight round cont; 1 23/32" lg less cont x ⅛" dia; cylindrical red bakelite body; cable opening ⅛" dia; Amphenol part #71–1L.	B+ output	2Z7111.80
P3	(*)	(*)				CONNECTOR, male contact: 1 straight round cont; 1 23/32" lg less cont x ⅛" dia; cylindrical walnut bakelite body; cable opening ⅛" dia; Amphenol part #71–1L.	Filament output	2Z7111.81

P1	(*)	(*)				CONNECTOR, male contact: 6 straight round radial cont; 1⅛" dia x 1⅛" chrome plated brass shell; Amphenol part #79–P06M.	Power connector	2Z3099
P4					(*)	CONNECTOR, plug: 1 round male cont; straight type; ⅜" lg, excluding cont, x ½" dia; black; Amphenol part #71–1L.	Rectifier filament connection	2Z3021–198
P2			(*)	(*)	(*)	CONNECTOR, plug: 1 round male cont; straight type; ⅜" lg x ½" dia; red; Amphenol part #71–1LT.	B+ output	2Z3021–207
P3			(*)	(*)	(*)	CONNECTOR, plug: 1 round male cont; straight type; ⅜" lg x ½" dia; yellow; Amphenol part #71–1LT.	Filament connection	2Z2031–206
P1			(*)	(*)	(*)	CONNECTOR, receptacle: 6 round male cont; pol, straight type; 1⅛" lg x 1⅜" dia; Amphenol part #79–P06M–T.	Power connector	2Z3026–40
F1					(*)	FUSE, cartridge: 5 amp; 1½" lg x $\frac{13}{32}$" dia; Buss type #AGU–5.	Overload protection	3Z2605.7
F1	(*)	(*)				FUSE, cartridge: Sig C type FU–11; 20 amp at 25 v rating; 1¼" lg x ¼" dia; NEC terminals; Littelfuse part #311020.	------ do ------	3Z1911
F1			(*)	(*)		FUSE, cartridge: 15 amp; 1½" lg x $\frac{13}{32}$" dia; Buss type No. #AGU–15.	------ do ------	3Z2615.12
E1			(*)			FUSE POST FU–39: extractor type; for $\frac{3}{32}$" dia x 1¼" lg size fuses; Buss type #HCM–BL, GL.	Holder for fuse F1	3Z1939
				(*)		FUSEHOLDER: extractor post type; for fuse 1½" lg x $\frac{13}{32}$" dia; Buss type #HPC.	------ do ------	3Z2878–1.8
E1		(*)				FUSEHOLDER: extractor post type; for one 3AG cartridge fuse; 50 amp, 250 volt rating; 2" lg x .625" dia; Buss part #HKM–L.	------ do ------	3Z3285–2
	(*)					FUSEHOLDER: panel mtg; for two 3 AG cartridge fuse 2½" lg x 1¼" wd x ¾" d; metal cover; Littelfuse part #1237.	------ do ------	3ZK2855–1
E18					(*)	FUSEHOLDER: extractor post type; for one cartridge type fuse 1½" lg x $\frac{13}{32}$" dia; $2\frac{7}{16}$" lg x $1\frac{23}{32}$" h x 1⅛" wd; Buss type HPC–HWP.	Fuseholder	3Z2876–6.4
E19, E20, E21, E22.			(*)	(*)	(*)	INSULATOR, standoff: cylindrical pillar shape; brown polished bakelite; ⅞" lg o/a x ¼" dia; Utility Elec dwg #PA–1610.	Stand-off terminals	3G350–145
O17			(*)	(*)	(*)	PLATE, stop: 1" lg x $\frac{33}{64}$" wd x .017" thk, excluding $\frac{1}{16}$" lip; Utility Elec dwg #PA–1266.	Prevents capacitor from turning	2Z7091–654
L3		(*)	(*)	(*)	(*)	REACTOR: 2.25 hy —10% + infinity; 80 ma dc; 600 ohms dc resistance; HS case; $2\frac{13}{16}$" sq x 2⅞" h; UTC type E–4680.	B+ filter choke	3C321–20
L3	(*)					REACTOR: filter choke; 2.45 hy at 80 ma; steel case; $2\frac{5}{16}$" lg x $2\frac{5}{32}$" wd x $2\frac{23}{32}$" h; Chi Trans part #GV–772.	Smoothing choke	3Z1893–8
R1, R2	(*)	(*)				RESISTOR, fixed: composition; 47 ohms; ½ w; .655" lg x .249" dia; JAN type RC21BF470K.	R1, R2: Hash suppressors	3RC21BF470K
R1, R2			(*)	(*)		RESISTOR, fixed: composition; 47 ohms ±10%; ½ w; JAN type RC20BF470K.	------ do ------	3RC20BF470K

Ref. symbol	Model 1 R-237/VR	2 R-237A/VR	3 R-237B/VR	4 R-237B/VR	5 R-435/VRC-2X	Name of part and description	Function of part	Signal Corps stock No.
R1					(*)	RESISTOR, fixed: composition; 4700 ohms ±10%; ½ w; JAN type RC20BF472K.	R-f suppressor	3RC20BF472K
R3	(*)	(*)	(*)	(*)		RESISTOR, fixed: composition; 100,000 ohms ±10%; 2 w; JAN type RC42BE104K.	B+ bleeder	3RC42BE104K
R2					(*)	RESISTOR, fixed: composition; 100,000 ohms ±10%; 2 w; JAN type RC42BE104K.	------ do ------	3RC42BE104K
	(*)					SOCKET, tube: 4 cont medium; bakelite body; two .14" dia mtg holes on 1.5" centers; Cinch part #2154.	Vibrator socket	2Z8674.39
X1		(*)				SOCKET, tube: 4 cont medium; under chassis plate mtg; mica filled bakelite body; $1\frac{1}{16}$" dia x $\frac{5}{16}$" thk; Amphenol part #77–M1P4T.		
	(*)					SOCKET, tube: octal; bakelite body; two .141" mtg holes on 1.312" centers; Cinch part #37.	Tube socket	2Z8678.50
X2, X3		(*)				SOCKET, tube: octal; under chassis plate mtg; mica filled bakelite body; $1\frac{11}{16}$" x $1\frac{3}{16}$" x $\frac{5}{16}$" thk; Cinch part #51A12543.	------ do ------	2Z8678.298
X1			(*)			SOCKET, tube: 4 cont med; one piece saddle mtg under chassis.	Vibrator socket	2Z8659–5.1
X2, X3			(*)			SOCKET, tube: octal; one piece saddle mtg	Tube sockets	2Z8678.335
X1				(*)	(*)	SOCKET, electron tube: 4 med cont; molded in plate mtg; 1⅞" lg x $1\frac{9}{32}$" wd x $\frac{15}{32}$" d; Amphenol type #77–M1P–4TM.	Vibrator socket	2Z8674.84
X2, X3					(*)	SOCKET, electron tube: 8 std octal cont; one piece saddle mtg; $1\frac{1}{16}$" lg x $1\frac{7}{32}$" wd x ½" h o/a; Cinch type 51A14887.	Tube sockets	2Z8670.24
T1					(*)	TRANSFORMER, power: vibrator; input 24 v dc, 1.86 amp; output 560 v, .080 amp; HS metal case; 3⅜" lg x 3¼" wd x $4\frac{5}{16}$" h; Utility Elec part/dwg #PB–3000.	Vibrator transformer	2Z9625–83
T1	(*)					TRANSFORMER, power: vibrator type; input 6 v dc; output 230 v at 80 ma; steel case; $3\frac{15}{32}$" lg x $2\frac{25}{32}$" wd x $2\frac{31}{32}$" h; Chi Trans part #5444D.	Power transformer	2Z9625–10
T1		(*)	(*)	(*)		TRANSFORMER, power: vibrator type; input 6 v dc, ct; output 560 v at 80 ma; output freq 100 cyc; nonsynthetic HS metal case.	------ do ------	2Z9625–54
V1, V2	(*)	(*)	(*)	(*)	(*)	TUBE, electron: type 6X5WGT	Full-wave rectifiers	2J6X5WGT

E1					(*)	VIBRATOR, nonsynchronous: input 24 v dc, 2.0 amp; $3\frac{3}{16}$" lg x 1½" dia; ATR type 24831.	Converts dc to ac	3H6691–49
E1	(*)	(*)	(*)	(*)		VIBRATOR, nonsynchronous: 6 v dc input; single reed; 100 cps; $2\frac{3}{16}$" lg x 1½" dia; A1 base; Oak part #6248.	Converts 6 v dc to h-v ac	3H6694–2

5. Radio Set Controls C–493(*)/VRC–2 and C–1060/VRC–2X

Note. Column 1 refers to items procured on Order Nos. 23054–PH–43, 24673–PH–43, and 29040–PH–45 (unlettered components). Column 2 refers to items procured on Order No. 12732–PH–47 ("A" model components). Column 3 refers to items procured on Order No. 20591–PH–49 ("B" model components). Column 4 refers to items procured on Order No. 21756–PH–50 ("B" model components). Column 5 refers to items procured on Order No. 16816–P–51 (AN/VRC–2X components).

Ref. symbol	Model 1 C–493/VRC–2	Model 2 C–493A/VRC–2	Model 3 C–493B/VRC–2	Model 4 C–493B/VRC–2	Model 5 C–1060/VRC–2X	Name of part and description	Function of part	Signal Corps stock No.
	(*)	(*)				RADIO SET CONTROLS C–493/VRC–2 AND C–493A/VRC–2: olive drab crackle steel; 7¼" lg x 2¼" h x 3¼" d; incl vol control, squelch control, and on-off switch; Espey type #AD1.126 or Galvin type #P–8022.	Contains operating controls for receiver and transmitter.	2C686
			(*)	(*)		RADIO SET CONTROL C–493B/VRC–2: manual control; gray crackle finish; steel case; 7¼" lg x 3¼" wd x 2¼" h o/a; controls squelch and vol; Utility Electronics Corp dwg #PD–1403.	------ do ------	2C686
					(*)	RADIO SET CONTROL C–1060/VRC–2X: squelch and vol control; 7⅜" lg x 3½" wd x 2⅜" h; steel case; US Army spec 71–3290.	------ do ------	2C684–1060
O5, O52	(*)	(*)	(*)	(*)	(*)	CLIP, electrical: fuseholder; $\frac{23}{64}$" lg x $\frac{11}{32}$" wd x $\frac{5}{16}$" h; ¼" jaw opening; Littelfuse type #121001.	Spare fuseholders	3Z1013.6
P29, P30			(*)	(*)	(*)	CONNECTOR, plug: 1 round male cont; straight type; ⅜" lg excluding term. x ½" dia; Amphenol part #71–1LT.	Connection plugs	2Z3021–206
J1	(*)	(*)	(*)	(*)	(*)	CONNECTOR, receptacle: 4 round female pol cont; straight type; $\frac{11}{32}$" lg x 1⅛" dia; Amphenol type #91–PC4FT.	Microphone connector	2Z3065–91
F1					(*)	FUSE, cartridge: 10 amp, 32 v; 1½" lg x $\frac{13}{32}$" dia; Buss type #AGU–10.	Spare for transmitter	3Z2610.1

Ref. symbol	Model 1 C-493/VRC-2	Model 2 C-493A/VRC-2	Model 3 C-493B/VRC-2	Model 4 C-493B/VRC-2	Model 5 C-1060/VRC-2X	Name of part and description	Function of part	Signal Corps stock No.
F1	(*)	(*)				FUSE FU-11, cartridge: 20 amp at 25 v rating; 1¼" lg x ¼" dia; NEC term.; Littelfuse #311020.	Spare for transmitter	3Z1911
E44			(*)	(*)	(*)	INSULATOR, stand-off: cylindrical pillar shape; brown polished bakelite; ⅞" lg o/a x ¼" dia; Utility Electronics Corp part #PA-1610.	Insulator	3G350-145
			(*)	(*)	(*)	KNOB: bar; black bakelite; for ¼" dia shaft; marked w/white line; 1¼" lg x ¾" wd x ⅝" thk; Harry Davies Moldppart #2300-black.	Volume control knob	2Z5786.47
	(*)	(*)				KNOB: black croplastic; for ¼" shaft; ⅞" dia x $\frac{13}{32}$" h; Crowe part #6129.	Control knob	2Z5748.21
N3			(*)	(*)		LABEL: ckt; 6⅛" wd x .005" thk; Utility Electronics part/dwg PC-1242.	Circuit label	6D16797-5
N3					(*)	LABEL: ckt; 6⅛" wd x .005" thk; Utility Electronics Corp part #PB-3203.	------ do	6D16797-4
M2, M3					(*)	LAMP, incandescent: 28 v, .17 amp; miniature bayonet base; $\frac{13}{16}$" h o/a; GE #356.	Pilot lamps	2Z5877-33
M2, M3	(*)	(*)	(*)	(*)		LAMP LM-52, incandescent: 6.3 v at 150 ma; miniature bayonet base; GE part #Mazda-47.	For pilot lights	2Z5952
W10					(*)	LEAD, electrical: uses Sig C stk No. 1B1720.7 wire; 1$\frac{3}{16}$" lg excluding term.; Utility Electronics Corp part #PA-1365.	Jumper lead	3E7998-1.12
I1					(*)	LIGHT, indicator: w/green lens; f/G 3½ miniature bayonet base lamp; 1$\frac{3}{16}$" lg x 1" wd x 1" h; Dialco #855MB-432.	Pilot light	2Z5991-248
I2					(*)	LIGHT, indicator: w/red lens; f/G 3½ miniature bayonet base lamp; 1$\frac{3}{16}$" lg x 1" wd x 1" h; Dialco #855-MB-$\frac{1}{32}$.	------ do	2Z5991-247
I1			(*)	(*)		LIGHT, indicator: w/green lens; for G-3½, T-3¼ miniature bayonet base lamp; 1⅞" lg x 1⅛" wd x $\frac{13}{16}$" dia o/a; Dialco part #810-B-432.	------ do	2Z5883-13
I2			(*)	(*)		LIGHT, indicator: w/red lens; for G-3½, T-3¼ miniature bayonet base lamp; 1¾" lg x 1" dia o/a; Dialco part #810B-431.	------ do	2Z5991-160
I1	(*)	(*)				LIGHT ASSEMBLY, indicator: incl bayonet type socket, socket mtg spacers, and green jewel; Drake part #50.	For pilot light	2Z5991

I2	(*)	(*)				LIGHT ASSEMBLY, indicator: incl bayonet type socket, socket mtg, spacers, and red jewel; Drake part #50.	------ do ------	2Z5991-1
N2			(*)	(*)		PLATE, identification: inscribed "Signal Corps US Army Radio Set Control C-493B/VRC-2;" 3½" lg x 1" wd x .032" thk; Utility Electronics part/dwg #PA-1146.	Nomenclature plate	2Z7090.126
N2					(*)	PLATE, identification: marked "Signal Corps US Army Radio Set Control C-1060/VRC-2X Utility Electronics Corp;" 3½" lg x 1" wd x .032" thk; Utility Electronics Corp part #PA-3202.	------ do ------	2Z7093-267
N1			(*)	(*)	(*)	PLATE, identification: marked "SQUELCH" and "VOLUME"; 6$\frac{3}{32}$" lg x 2⅛" wd x .036" thk; Utility Electronics Corp part #PB-1145.	Control indicator	2Z7093-268
R1	(*)	(*)	(*)	(*)		RESISTOR, fixed: comp; 22 ohms; ½ w; .655" lg x .249" dia; JAN type RC20BF220K.	Voltage dropping	3RC20BF220K
R1					(*)	RESISTOR, fixed: comp; 68 ohms +10%; ½ w; JAN type RC20BF680K.	------ do ------	3RC20BF680K
R5					(*)	RESISTOR, fixed: comp; 220 ohms +10%; ½ w; JAN type RC20BF221K.	Squelch limiting	3RC20BF221K
R2			(*)	(*)	(*)	RESISTOR, fixed: comp; 270 ohms +10%; ½ w; JAN type RC20BF271K.	V1 cathode (transmitter)	3RC20BF271K
R3	(*)	(*)				RESISTOR, variable: wire-wound; 50,000 ohms; 4 w; 1$\frac{17}{32}$" dia x $\frac{11}{16}$" thk; linear taper; no switch; Utah part #4P.	Squelch control	2Z7281.25
R3			(*)			RESISTOR, variable: comp; 75,000 ohms ±20%; ½ w; JAN type RV3AUFK753B.	------ do ------	3RV47506
R3			(*)	(*)	(*)	RESISTOR, variable: comp; rotating brush type; 75,000 ohms ±20%; ½ w; $\frac{13}{16}$" lg x 1⅛" dia; IRC type Q.	------ do ------	3Z475-17
R4				(*)	(*)	RESISTOR, variable: comp; rotating brush type; 500,000 ohms ±20%; ½ w; $\frac{13}{16}$" lg x 1⅛" dia; IRC type Q.	Volume control	3Z7498-50.182
R4	(*)	(*)				RESISTOR, variable: comp; 500,000 ohms; 1 w; 1⅛" dia x $\frac{3}{32}$" thk; SPST switch; CTS type #AC-35.	------ do ------	2Z7272-35
R4			(*)			RESISTOR, variable: comp; 500,000 ohms ±20%; ¼ w; SPST switch; JAN type RV3BUFK504D.	------ do ------	3RV55029
R5	(*)	(*)				RESISTOR, fixed: comp; 220 ohms; ½ w; .655" lg x .249" dia; JAN type RC21BF221K.	Series, for squelch control	3RC21BF221K
R2	(*)	(*)				RESISTOR, fixed: comp; 270 ohms; ½ w; .655" lg x .249" dia; JAN type RC21BF271K.	Speaker shunt	3RC21BF271K
			(*)	(*)	(*)	TERMINAL BOARD: connecting blocks; 18 solder lug term.; 5½" lg x 1½" wd x $\frac{13}{16}$" h o/a; Jones HB Div part #110-J-15120.	Connecting block	3Z770-18.15

6. Radio Transmitters T–193 (*) /VRC–2 and T–322/VRC–2X

Note. Column 1 refers to items procured on Order Nos. 23054–PH–43, 24673–PH–43, and 29040–PH–45 (unlettered components). Column 2 refers to items procured on Order No. 12732–PH–47 ("A" model components). Column 3 refers to items procured on Order No. 20591–PH–49 ("B" model components). Column 4 refers to items procured on Order No. 21756–PH–50 ("B" model components) Column 5 refers to items procured on Order No. 16816–P–51 (AN/VRC–2X components).

Ref. symbol	Model 1 T–193/VRC–2	Model 2 T–193A/VRC–2	Model 3 T–193B/VRC–2	Model 4 T–193B/VRC–2	Model 5 T–322/VRC–2X	Name of part and description	Function of part	Signal Corps stock No.
	(*)	(*)				RADIO TRANSMITTERS T–193/VRC–2 and T–193A/VRC–2: fm; 30 to 40 mc; 25 w output; 6.3 v dc, 25 amp input; mtd in metal cabinet; 15" lg x 10" wd x 11½" h; crystal controlled; incl vibrator power supply.	Radio transmitter for any single, selected frequency within the 30- to 40-mc band.	2C6675–25V
			(*)	(*)		RADIO TRANSMITTER T–193B/VRC–2: fm; freq range 30 to 40 mc; output 30 w.	------ do ------	2C6900–193B
					(*)	RADIO TRANSMITTER T–322/VRC–2X: F3 type of emission, MBCA ref dwg group 5; 30 to 40 mc; xtal controlled; 25 w output; 24 v dc, 8.3 amp; inclosed in metal case; 14¾" lg x 9¼" wd x 10¾" h; Army spec 71–3290.	------ do ------	2C6703–7
	(*)	(*)	(*)	(*)	(*)	TECHNICAL MANUAL 11–607	------	Order through AGO
T3	(*)	(*)	(*)	(*)	(*)	AMPLIFIER SUBASSEMBLY: 1st quadrupler transf; shielded; 4" lg x 2" wd x 1½" d; marked T3 w/ckt diagram; Utility Electronics Corp dwg #PB–1485.	V4 first quadrupler transformer	2C428–3
T4	(*)	(*)	(*)	(*)	(*)	AMPLIFIER SUBASSEMBLY: 2d quadrupler transf; shielded; 4" lg x 2" wd x 1½" d; marked T4 w/ckt diagram; Utility Electronics Corp dwg #1486.	V5 second quadrupler transformer.	2C428–4
T5	(*)	(*)	(*)	(*)	(*)	AMPLIFIER SUBASSEMBLY: doubler transf; shielded; 4" h x 2" lg x 1½" wd; marked T5 w/ckt diagram; Utility Electronics Corp dwg #PB–1487.	V6 doubler transformer	2C428–2
H12, H13			(*)	(*)	(*)	BOLT, thumb: RH; ¼"–20; 1 19/32" lg; Utility Electronics Corp part #PB–3249.	Base fasteners	6L604–1.3
					(*)	BRUSH SET, electrical contact: u/w dynamotor; 2 input and 2 output brushes; ea marked w/polarity "+" or "—" p/o Dynamotor DY–85/VRC–2X; Morganite Co per Electro-Engineering Prod Co dwg A–17164 and A–17237.	Dynamotor brushes	3H535EP

			(*)			BRUSH SET, electrical contact: hv neg and pos commutator brush. (Used only with dynamotor, stock No. 3H1514–5.)	H-v output	3H535W
			(*)			BRUSH SET, electrical contact; lv neg and pos commutator brush. (Used only with dynamotor, stock No. 3H1514–5.)	L-v input	3H535W–1
				(*)		BRUSH SET, electrical contact: hv and lv neg and pos commutator brushes. (Used only with dynamotor, stock No. 3H1505–10.)	H-v and l-v brushes	3H535–CM
O1	(*)	(*)	(*)	(*)	(*)	CAP: electrical; cover for connectors not in use; ½" lg x ⅞" dia; Amphenol #91–CCC–3.	Connector cover	2Z1607–64
C48					(*)	CAPACITOR, fixed: mica dielectric; 5 $\mu\mu$f ±20%; 500 vdcw; JAN type CM25B050M.	V1 oscillator feedback	3K2505024
C2, C5		(*)	(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 24 $\mu\mu$f ±5%; 500 vdcw; JAN type CM20B240J.	C2: V1 oscillator plate tuning. C5: Phase-shifting capacitor.	3K2024022
C24			(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 51 $\mu\mu$f ±5%; 500 vdcw; JAN type CM20B510J.	V7 grid couplings	3K2051022
C2	(*)					CAPACITOR, fixed: mica dielectric; 50 $\mu\mu$f; 500 vdcw; $\frac{21}{64}$" lg x $\frac{15}{32}$" wd x $\frac{7}{32}$" thk; molded case; JAN type CM20B470K.	V1 plate coil tuning	3K2047021
C42					(*)	CAPACITOR, fixed: mica dielectric; 75 $\mu\mu$f; 2500 vdcw; CM45B750K.	Antenna load limiting capacitor	3K4575022
	(*)	(*)	(*)	(*)		CAPACITOR, fixed: mica dielectric; 100 $\mu\mu$f ±10%; 2500 vdcw; 1⅝" lg x 1⅛" wd x $\frac{23}{64}$" thk; Dubilier part #4LS–53010. (added per MWO 11–607.)	------ do ------	3K4510121
C3, C6, C11			(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 100 $\mu\mu$f ±10%; 500 vdcw; JAN type CM20B101K.	C3: V2 grid coupling C6: V3 grid coupling. C11: V4 grid coupling.	3K2010121
C31, C32			(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 2000 $\mu\mu$f ±5%; 500 vdcw; JAN type CM30B202J.	Modulation filters	3K3020222
C4, C13, C14, C16, C17, C18, C20, C21, C23, C34.			(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 2200 $\mu\mu$f ±10%; 500 vdcw; JAN type CM30B222K.	C4: V2 and V3 grid r-f meter bypass. C13: V4 grid r-f meter bypass. C14: V4 screen bypass. C16: V4 plate decoupling. C17: V5 r-f grid filter. C18: V5 screen bypass. C20: V5 plate decoupling. C21: V6 r-f grid filter. C23: V6 plate decoupling. C34: V7 grid r-f meter bypass.	3K3022221
C14, C18, C27, C31, C32, C34.	(*)	(*)				CAPACITOR, fixed: mica; 2200 $\mu\mu$f: 500 vdcw; $\frac{21}{64}$" lg x $\frac{23}{64}$" wd x $\frac{7}{32}$" thk; molded case; JAN type CM30B222K.	C14: V4 screen bypass C18: V5 screen bypass. C27: V7 screen bypass. C31: V3 modulation filter. C32: V2 modulation filter. C34: V7 grid metering bypass.	3K3020221

Ref. symbol	Model 1 T-193/VRC-2	Model 2 T-193A/VRC-2	Model 3 T-193B/VRC-2	Model 4 T-193B/VRC-2	Model 5 T-322/VRC-2X	Name of part and description	Function of part	Signal Corps stock No.
C1, C22, C26	(*)	(*)				CAPACITOR, fixed: mica; 5100 $\mu\mu$f; 500 vdcw; $\frac{53}{64}$" lg x $\frac{53}{64}$" wd x $\frac{11}{32}$" thk; molded case; JAN type CM35B512J.	C1: V1 grid metering bypass C22: V6 screen bypass. C26: V7 cathode metering bypass.	3K3551222
C1, C7, C12, C22, C26, C27.			(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 5600 $\mu\mu$f ±10%; 500 vdcw; JAN type CM35B562K.	C1: V1 grid r-f meter bypass C7: V1 plate decoupling. C12: V2 and V3 plate decoupling. C22: V6 screen bypass. C26: V7 cathode bypass. C27: V7 screen bypass.	3K3556221
C30	(*)	(*)	(*)	(*)	(*)	CAPACITOR, fixed: mica dielectric; 10,000 $\mu\mu$f ±10%; 1200 vdcw; JAN type CM50B103K.	Antenna coupling	3K5010321
C9, C10, C25			(*)	(*)	(*)	CAPACITOR, fixed: paper dielectric; 50,000 $\mu\mu$f ±20%; 600 vdcw; JAN type CP29A1EF503M.	C9: V2 and V3 grids 2 bypass C10: V2 and V3 grids 3 and 5 bypass. C25: B+ filter.	3DA50–259
C9, C10, C25	(*)	(*)				CAPACITOR, fixed: paper; 50,000 $\mu\mu$f; 600 vdcw; 1½" lg x ⅝" dia; JAN type CP29A1EF503M.	C9: V2 and V3, grid 2 bypass C10: V2 and V3, grids 3 and 5 bypass. C25: B+ bypass.	3DA50–259
C35, C36, C42, C43.		(*)				CAPACITOR, fixed: paper; 2 $\mu\mu$f; 1000 vdcw; 5¼" lg x x 1½" dia; JAN type CP40B1EG205K.	C35 and C36: B+ filter C42 and C43: Bypasses.	3DB2–161
C35, C36			(*)	(*)	(*)	CAPACITOR, fixed: paper dielectric; 2 μf +20% —10% 1000 vdcw; JAN type CP40B2EG205V.	B+ filters	3DB2–233
C35, C36	(*)					CAPACITOR, fixed: paper; dual sect.; 6–2 μf; 1000 vdcw; metal can; 4¼" lg x 2¾" dia; Galvin part #8B–81109.	C35 and C36: B+ filters	3DB6–18.1
C8, C33	(*)					CAPACITOR, fixed: electrolytic; 2 sect.; 40–20 μf; 25 vdcw; aluminum can; $2\frac{1}{16}$" lg x $1\frac{3}{32}$" dia; Mallory part #SP033069.	C8: V2 and V3, cathode bypass C33: Microphone circuit bypass.	3DB40–20
C8, C33			(*)	(*)	(*)	CAPACITOR, fixed: electrolytic; 2 sect.; 45 μf ea sect.; 150 vdcw; JAN type CE42C450J.	C8: V2 cathode bypass C33: Carbon microphone d-c filter.	3DB45–10

C8, C33		(*)				CAPACITOR, fixed: electrolytic; 2 sect.; 50–50 μf; metal can; 150 vdcw; 3" h x 1" dia; common neg, ins from can; Pyramid part #TM–D–50–150–S.	C8: V2 cathode bypass C33: Carbon microphone d-c filter.	3DB50–30
C28	(*)	(*)				CAPACITOR, variable: air; single sect., plate meshing type; 7 to 35 μμf; .060 air gap; $1\frac{1}{16}$" lg x $1\frac{11}{16}$" wd x $1\frac{5}{8}$" h excluding shaft; screw driver adj; 11 cad pl plates; 360° rotation; ceramic insulation; Bud Rad #MC–1880–25–SLS.	V7 plate tuning	3D9035V–22
C28					(*)	CAPACITOR, variable: air dielectric; plate meshing type; 7 to 35 μμf; $1\frac{7}{16}$" lg x $1\frac{11}{16}$" wd x $1\frac{5}{8}$" h; Bud Rad #2003.	------ do ------	3D9035V–52
C37, C38, C41					(*)	CAPACITOR, variable: air dielectric; plate meshing type; 1 sect.; 7 to 44 μμf; $1\frac{5}{64}$" lg x $1\frac{13}{16}$" wd x $1\frac{13}{32}$" h; Sickles FW type ATR–1 single.	C37: V1 plate tuning C38: V2 and V3 plate tuning. C41: V6 plate tuning.	3D9044V–5
C39A, C39B, C40A, C40B.					(*)	CAPACITOR, variable: air dielectric; plate meshing type; 2 sect.; 7 to 44 μμf; $1\frac{5}{64}$" lg x $1\frac{13}{16}$" wd x $1\frac{13}{32}$" h; Sickles FW type ATR–1 dual.	C39A: V4 plate tuning C39B: V5 grid tuning. C40A: V5 plate tuning. C40B: V6 grid tuning.	3D9044V–7
C29	(*)	(*)	(*)	(*)	(*)	CAPACITOR, variable: air dielectric; plate meshing type; 6 to 170 μμf; $2\frac{1}{16}$" lg x $1\frac{45}{64}$" wd x $1\frac{45}{64}$" h; Bud Rad #CE–20032.	Antenna tuning	3D9170V–3
	(*)					CLAMP: crystal; steel, phosphor-bronze and rubber; $2\frac{1}{4}$" h x $2\frac{1}{2}$" h; Galvin part #1X81949.	Clamps crystal holder in place	2Z2626.36
O28					(*)	CLIP: electrical; electron tube; $\frac{1}{8}$" lg x $\frac{13}{32}$" wd x $\frac{5}{16}$" h; ICA part #1550.	V7 plate cap (part of W12)	2Z1613–2
L1					(*)	COIL, RF: ant. tuning; 6 turns; unshielded; $1\frac{1}{2}$" lg x $1\frac{13}{64}$" OD; 37 to 40 mc range; Utility Electronics Corp dwg #PA–1055–1.	Antenna tuning, 37 to 40 mc	3C1084Z74–2
L1					(*)	COIL, RF: ant. tuning; 7 turns; unshielded; $1\frac{1}{2}$" lg x $1\frac{13}{64}$" OD; 33 to 37 mc; Utility Electronics Corp dwg #PA–1055–6.	Antenna tuning, 33 to 37 mc	3C1084Z74–1
L1					(*)	COIL, RF: ant. tuning; 8 turns; unshielded; $1\frac{1}{2}$" lg x $1\frac{13}{64}$" OD; 30 to 33 mc; Utility Electronics Corp dwg #PA–1055–2.	Antenna tuning, 30 to 33 mc	3C1084Z74
RY1	(*)					COIL, relay: solenoid, iron core; 6 v dc; 17 ohms resistance; 1" h x 1" dia; REMCo part #30–40901.	For relay	3C1125
L7, L8, L9		(*)				COIL, relay: solenoid, iron core and frame; 6 v dc; 15-ohm resistance; coil $\frac{3}{4}$" lg x $\frac{3}{4}$" dia, frame $1\frac{3}{4}$" wd x $2\frac{1}{4}$" lg; Allied Coil #29 for B06D relay.	------ do ------	3C1127
RY2, RY3	(*)	(*)				COIL, relay: solenoid, iron core; 6 v dc; 11-ohm resistance; 1" h x 1" dia; p/o RBM #30–60014 relay.	------ do ------	3C1125–1
L1	(*)	(*)				COIL, RF: unshielded; $1\frac{5}{16}$" lg x $1\frac{1}{16}$" OD; air core; 32.8 to 31.5 mc; Galvin part #24K82010.	Antenna tuning	2C6675–25V/C1
L1	(*)	(*)				COIL, RF: unshielded; $1\frac{13}{32}$" lg x $1\frac{5}{16}$" OD; air core; 35.5 to 32.8 mc; Galvin part #24K82009.	------ do ------	2C6675–25V/C2
L1	(*)	(*)				COIL, RF: unshielded; $1\frac{7}{8}$" lg x $1\frac{3}{16}$" dia; air core; 38.1 to 35.5 mc; Galvin part #24K82008.	------ do ------	2C6675–25V/C3

Ref. symbol	Model 1 T-193/VRC-2	Model 2 T-193A/VRC-2	Model 3 T-193B/VRC-2	Model 4 T-193E/VRC-2	Model 5 T-322/VRC-2X	Name of part and description	Function of part	Signal Corps stock No.
L1	(*)	(*)				COIL, RF: unshielded; $1\frac{23}{32}$" lg x $1\frac{3}{16}$" dia; air core; 31.5 to 30 mc; Galvin part #24K82011.	Antenna tuning	2C6675–25V/C5
L1	(*)	(*)				COIL, RF: unshielded; $\frac{5}{16}$" lg x $1\frac{3}{16}$" dia; air core; 40 to 38.1 mc; Galvin part #24K82006.	------ do ------	2C6675–50BN/C3
RFC1, RFC2	(*)	(*)				COIL, RF: 3 pi, universal wound; unshielded; .09 mh; 150 ma; 3-ohm resistance; $\frac{29}{32}$" lg x ½" dia; phenolic form; Espey dwg #LA2.299.	R-f chokes for V7 grid and plate	3C362–51
RFC1, RFC2			(*)	(*)	(*)	COIL, RF: r-f choke; unshielded; $\frac{29}{32}$" lg x $\frac{29}{32}$" dia; Utility Electronics Corp dwg #PA–1054.	RFC1: V7 grid r-f choke RFC2: V7 plate r-f choke.	3C1084Z74–3
O7, O8				(*)		COLLAR, spacing: stand-off; $\frac{13}{32}$" lg x ⅜" dia; u/w Dynamotor DY–85/VRC–2X; Utility Electronics Corp dwg #PA–1455.	Spacer	3H987–6
J3, J5					(*)	CONNECTOR, receptacle: 1 round female cont; straight; $1\frac{3}{32}$" lg x ½" dia; Industrial Products Corp #5575.	J3: ANTENNA connector J5: RECEIVER connector	2Z3062–188
J3, J5	(*)	(*)				CONNECTOR, female cont: 1 round straight contact; $1\frac{5}{32}$" lg x $\frac{7}{32}$" dia; chrome plated body; Jones HB part #S–101–D.	For external connections	2Z8671.30
J2	(*)	(*)				CONNECTOR, female cont: 4 flat radial cont; $\frac{33}{32}$" lg x 1⅛" dia; black bakelite body, nickel pl brass shell; Amphenol part #PC4F.	------ do ------	2Z8674.1
J4	(*)	(*)				CONNECTOR, female cont; 6 round radial cont; $1\frac{1}{32}$" lg x 1½" dia; chrome plated; Amphenol part #P06FS.	For receiver connections	2Z8676.26
P2	(*)	(*)				CONNECTOR, male cont: 4 straight flat contacts; 1⅜" lg x 1⅜" dia; chrome-plated body; Amphenol part #92C1.	For external connections	2Z7114.27
P1	(*)	(*)				CONNECTOR, male cont: 8 round radial cont; $\frac{29}{32}$" lg x $1\frac{7}{64}$" dia; chrome-plated shell; Amphenol part #P08M.	For control connections	2Z7118.13
P2			(*)	(*)	(*)	CONNECTOR, receptacle: 4 flat male pol cont; 1⅜" lg x 1⅜" dia; Amphenol type #92–CIT.	POWER connectors to battery cable.	2Z3024–92
J2			(*)	(*)	(*)	CONNECTOR, receptacle: 4 round female pol cont; straight; $1\frac{1}{8}$" lg x 1¼" dia; Amphenol type #91–PC4FT.	MIC connectors	2Z3065–91
J4			(*)	(*)	(*)	CONNECTOR, receptacle: 6 round pol female cont; straight; $1\frac{1}{32}$" lg x 1½" dia; Amphenol #79–P06FT.	RECEIVER connectors	2Z2067–44
P1			(*)	(*)	(*)	CONNECTOR, receptacle: 8 round male pol cont; straight; $\frac{33}{64}$" lg x $1\frac{7}{64}$" dia; Amphenol #79–P08MT.	CONTROL connectors to transmitter control cable.	2Z3069–51

E2, E3, E4		(*)				CONTACT, relay: ¼" dia cont; 2 contact arms 1⅜" lg x 1¼" wd; modified U shape; p/o Allied Cont part #B06D29.	Relay contacts	2Z3197–7
RY1, RY2, RY3	(*)					CONTACT, relay: ¼" dia cont; silver cont; set of 3 cont, ea mtd on brass finger; ⅞" lg x ⅝" wd x ¼" d; p/o RBMCo relays 30–60014, 30–40901, and 30–60017.	------ do ------	2Z3191–89
A16			(*)	(*)	(*)	COVER: radio receiver; used as rec or xmtr cover; 14 5/16" lg x 9¼" wd x 11 5/16" h; Utility Electronics Corp #PD–1163.	Cover	2Z3351–350
					(*)	CRYSTAL UNIT, quartz: incl Crystal Holder HC–1/U; 1⅜" lg x 1 3/16" wd x 7/16" d; 1 xtal plate; 4755 freq; Sig dwg SC–A–46042, SC–D–20877, SC–D–20879.	V1 frequency control	2X28–4755
D1			(*)			DYNAMOTOR DY–65/VRC–2: plate voltage supply; output 600 v dc, .175 amp; input 5.5 v dc, 31 amp.	Converts l-v dc to h-v dc	3H1514–5
D1				(*)		DYNAMOTOR: plate voltage supply; output 600 v dc, .175 amp; input 5.8 v dc, 31 amp.	------ do ------	3H1505–10
D1					(*)	DYNAMOTOR DY–85/VRC–2X: power supply; 600 v, .175 amp, 105 w dc output; 24 v, 8 amp dc input; 7⅜" lg x 4¾" wd x 4⅜" h; Electro-Engineering Co #G17400.	D-c power source for transmitter.	3H1535–85
F1					(*)	FUSE, cartridge: 10 amp, 32 v; 1½ lg x 13/32" dia; Buss type AGU–10.	Overload protector	3Z2610.1
F1				(*)		FUSE, cartridge: 20 amp, 32 v; 1½" lg x 13/32" dia; Buss type AGU–20.	------ do ------	2Z2620
F1	(*)	(*)				FUSE, cartridge: Sig C type FU–41; 50 amp; 1¼" lg x 9/32" dia; Buss part #4AG50, Littelfuse #1342.	------ do ------	3Z1941
E1	(*)	(*)	(*)	(*)		FUSE POST FU–39: extractor post type; for 4AG type fuse; 2¼" lg x ⅝" dia; Galvin part #65A83336.	Fuseholder	3Z1939
E26					(*)	FUSEHOLDER: extractor post type; for 1 cartridge type fuse, 1½" lg x 13/32" dia; 2 7/16" lg x 1 25/32" h x 1⅛" wd; Buss type HPC–HWP.	------ do ------	3Z2876–6.4
			(*)	(*)		GROMMET: rubber; fits 1/16" hole; Canfield Rub part #1971B.	Insulation protector	6Z4856–44
			(*)	(*)		GROMMET: rubber; fits 11/32" dia hole; Pierce Rob part #14A (added per MWO 11–607–2.)	------ do ------	6Z4854–3
			(*)	(*)		GROMMET: rubber; fits 25/32" hole; Canfield Rub part #3546.	------ do ------	6Z4876–40
			(*)	(*)	(*)	GUARD SWITCH MX–1368/VRC–2X: 14⅞" lg x 3¾" wd x 4¼" d; connector and control guard; Utility Electronics Corp dwg #PD–3220.	Plug guard and cover	2Z4883A–1368
H14, H15					(*)	HANDLE: cover; 3" lg x 2¾" wd x ¾" d incl 1¾" OD washer; Natl Lock part #61–207.	Cover handles	2Z4928–106
E27					(*)	INSULATOR, bushing: rectangular; natural phenolic grade LTS–E–2; polished; 1⅜" lg x 1" wd x ⅞" h; Utility Electronics Corp dwg #PA–1102.	Feedthrough insulator	3G320–235
E28, E29			(*)	(*)	(*)	INSULATOR, stand-off: round post shape; JAN type NS5W0112.	Stand-off insulators	3G3501–12.1

Ref. symbol	Model 1 T-193/VRC-2	Model 2 T-193A/VRC-2	Model 3 T-193B/VRC-2	Model 4 T-193B/VRC-2	Model 5 T-322/VRC-2X	Name of part and description	Function of part	Signal Corps stock No.
	(*)					INSULATOR: lucite; ½" lg x ½" dia; Bud Rad part #1-1909.	Feedthrough insulator	3G1839-18
	(*)					INSULATOR: lucite; ½" lg x ½" dia; Galvin part #67A81122.	Stand-off insulator	3G1837-16.5
J1	(*)	(*)				JACK, telephone: for 2 cont 0.25" dia plug; 1¼" lg x ¾" dia; cont arrangement J1; Utah part #1-1MP.	Meter jack	2Z5595
J1			(*)	(*)	(*)	JACK JJ-034: tel; for 2 cond plug, shank ¼" dia	do	2J5534
	(*)	(*)	(*)	(*)	(*)	KNOB: round black bakelite; f/¼" dia shaft; 1⅛" dia x 13/32" h; w/pointer; Davies W type 1400.	Control knob	2Z5821-4.1
H16, H17			(*)	(*)	(*)	LATCH, fastener: cover fastener; 2" lg x ⅝" wd x ⅜" d; to fit Natl Lock part #61-207.	Cover fasteners	6Z6918-27
W12					(*)	LEAD, electrical: wire braid ¼" wd; 2½" excluding term.; Utility Electronics Corp dwg #PA-1156.	V7 plate lead	3E7998-2.11
T2	(*)	(*)	(*)	(*)	(*)	MODULATOR SUBASSEMBLY: modulator transf; 4" h x 2" lg x 1½" wd; marked T-2 w/ckt diagram; Utility Electronics Corp dwg #PB-1484.	V2 and V3 modulator transformer.	2G2543
T1	(*)	(*)	(*)	(*)	(*)	OSCILLATOR SUBASSEMBLY: osc transf; shielded; 4" h x 2" lg x 1½" d; marked T1 w/ckt diagram; Utility Electronics Corp dwg #PC-1483.	V1 oscillator transformer	2C2798-20
N6					(*)	PLATE, identification: 3" lg x ⅞" wd x .032" thk; Utility Electronics Corp dwg #PA-3223.	Nomenclature plate	2Z7090.102
					(*)	PLATE, identification: 4" lg x 2" wd x .032" thk; Utility Electronics Corp dwg #PA-2933A.	Identification plate	2Z7090.109
N7					(*)	PLATE, identification: 14 1/16" lg x 2½" wd x .036" thk; Utility Electronics Corp dwg #PB-1119.	Control identification plate	2Z7090.103
N8					(*)	PLATE, instruction: caution; 3" lg x ⅞" wd x .032" thk; Utility Electronics Corp part #PB-3255.	Caution plate	2Z7091-656
N4					(*)	PLATE, instruction: caution; 3" lg x 1" wd x .032" thk; p/o Dynamotor Dy-85/VRC-2X; Utility Electronics Corp dwg #PB-3256.	do	3H4280-5
A6					(*)	PLATE, mounting: dynamotor mtg; 8¼" lg x 5" wd x 1/16" h; p/o Dynamotor DY-85/VRC-2X; Utility Electronics Corp dwg #PB-3257.	Dynamotor mounting plate	3H4280-30
L2	(*)					REACTOR: 2.5 hy at 280 ma; 43-ohm resistance; steel case; 3" lg x 2 5/16" wd x 2⅝" h; Chi Trans part #4205E.	Filter choke	3C317-22

A30 0697

L2		(*)				REACTOR: 2.5 hy at 280 ma; 43-ohm resistance; steel case; 2¼" h x 1½" dia; Espey part #LA16.227.	------ do ------	3C321–22
RY1	(*)					RELAY, armature: DPST; 35 amp cont; 6 v dc; 17-ohm coil; 2¼" lg x 1⅝" wd x 1$\frac{15}{16}$" h; RBM part #30–40901.	Relay armature	2Z7588–10
RY2	(*)							
RY1, RY2, RY3		(*)				RELAY, armature: DPDT; 35-amp cont; 6 v dc, 11-ohm coil; 2¼" lg x 1⅝" wd x 1$\frac{15}{16}$" h; RBM part #30–60014.	------ do ------	2Z7588–11
						RELAY, armature: hinged arm type; DPDT; 15 amp cont; 6 v dc, 15-ohm coil; 1⅞" lg x 1⅝" h x 1$\frac{13}{32}$" wd; Allied Cont part #B06D29.	------ do ------	2Z7588–112
RY3	(*)					RELAY, armature: DPDT; 35 amp cont; 6 v dc, 11-ohm coil; 2¼" lg x 1⅝" wd x 1$\frac{15}{16}$" h; RBM part #30–60017.	------ do ------	2Z7588–12
RY3					(*)	RELAY, armature: 3 PDT; single wdg; 24 v dc oper voltage; 2$\frac{13}{16}$" lg x 1⅝" wd x 1½" h; Allied Cont type #HRX–9D–34.	Receive-transmit control	2Z7592–116
RY1, RY2					(*)	RELAY, solenoid: SPST; 29 v dc oper voltage; 2⅞" lg x 1¾" wd x 2⅝" h; AB bulletin #X91419.	RY1: Power on-off control RY2: Transmitter power control.	2Z7586–221
RY2			(*)	(*)		RELAY, solenoid: SPST normally open; 6 v dc oper voltage; 2¼" lg x 2" wd x 2½" h; Cutlet-Hammer part #6041H83A.	Transmitter power control	2Z7599–97
RY1			(*)	(*)		RELAY, armature: SPST; 24 v dc rated voltage; 2" lg x 2¼" wd x 2½" h; Allied Cont type #CN13D27.	Power on-off control	2Z7585–190
RY3			(*)	(*)		RELAY, armature: 3 PDT; 32 v dc rated voltage; 115 v ac; 2$\frac{13}{16}$" lg x 1⅝" wd x 1½" h; Allied Cont type #HRX–28.	Receive-transmit control	2Z7585–189
R25	(*)	(*)				RESISTOR, fixed: wire-wound; .5 ohm ±5%; ½ w; $\frac{3}{32}$" lg x $\frac{3}{64}$" dia; comp covered; JAN type RU3BA51J.	V7 cathode metering	3RU03601
R33	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 18 ohms ±10%; ½ w; JAN type RC20BF180K.	V7 grid metering	3RC20BF180K
R40					(*)	RESISTOR, fixed: wire-wound; 20 ohms ±5%; 4.5 w; JAN type RW29J200.	V5 and V6 filament shunt	3RW14133
R6, R14, R18, R22.			(*)	(*)	(*)	RESISTOR, fixed: comp; 100 ohms ±10%; ½ w; JAN type RC20BF101K.	R6: V2 and V3 grid metering. R14: V4 grid metering. R18: V5 grid metering. R22: V6 grid metering.	3RC20BF101K
R8			(*)	(*)	(*)	RESISTOR, fixed: comp; 330 ohms ±10%; ½ w; JAN type RC20BF331K.	V2 and V3 cathode bias	3RC20BF331K
R31	(*)	(*)	(*)	(*)		RESISTOR, fixed: comp; 470 ohms; ½ w; .655" lg x .249" dia; JAN type RC20BF471K.	Microphone current limiting	3RC20BF471K
R2, R15, R19, R23.	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 1000 ohms ±10%; ½ w; JAN type RC20BF331K.	R2: V1 grid metering. R15: V2 and V3 plate decoupling. R19: V4 plate decoupling. R23: V5 plate decoupling.	3RC20BF102K
R31					(*)	RESISTOR, fixed: comp; 1800 ohms ±10%; ½ w; JAN type RC20BF182K.	Carbon microphone d-c dropping resistor.	3RC20BF182K

Ref. symbol	Model 1 T-193/VRC-2	Model 2 T-193A/VRC-2	Model 3 T-193B/VRC-2	Model 4 T-193B/VRC-2	Model 5 T-322/VRC-2X	Name of part and description	Function of part	Signal Corps stock No.
R24			(*)	(*)	(*)	RESISTOR, fixed: comp; 2200 ohms ±10%; ½ w; JAN type RC20BF222K.	V6 screen dropping	3RC20BF222K
R32, R36		(*)	(*)	(*)	(*)	RESISTOR, fixed: wire-wound; 2500 ohms ±5%; 12 w; JAN type RW26707.	B+ dropping resistors	3RW26707
R7	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 4700 ohms ±10%; ½ w; JAN type RC20BF472K.	V1 plate decoupling	3RC20BF472K
R26, R37, R38, R39.		(*)				RESISTOR, fixed: comp; 4700 ohms; 2 w; JAN type RC42BF472K.	R26: V7 screen dropping resistor. R37, R38, R39: V7 screen dropping resistor.	3RC42BF472K
R32	(*)					RESISTOR, fixed: wire-wound; 5000 ohms; 10 w; 2" lg x ½" dia; Clarostat part #A–20J.	V1· V6 voltage dropping	3Z5450.4
R3			(*)	(*)	(*)	RESISTOR, fixed: comp; 10,000 ohms ±10%; ½ w; JAN type RC20BF103K.	Phase-shifting resistor	3RC20BF103K
R26, R37, R38, R39.			(*)	(*)	(*)	RESISTOR, fixed: comp; 12,000 ohms ±10%; 2 w; JAN type RC42BE123K.	V7 screen dropping resistors	3RC42BE123K
R26	(*)					RESISTOR, fixed: wire-wound; 20,000 ohms; 10 w; 1¾" lg x 9/16" dia; WL type 1¾" Z.	V7, screen	3Z5600.7
R27, R30	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 22,000 ohms ±10%; ½ w; JAN type RC20BF223K	Modulation filters	3RC20BF223K
R34	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 22,000 ohms ±10%; 1 w; JAN type RC30BF223K.	V7 grid leak	3RC30BF223K
R35	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 27,000 ohms ±10%; ½ w; JAN type RC20BF273K.	Antenna bleeder	3RC20BF273K
R11, R12	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 33,000 ohms ±10%; ½ w; JAN type RC20BF333K.	V2 and V3 grids 3 and 5 dropping resistors.	3RC20BF333K
R4, R5			(*)	(*)	(*)	RESISTOR, fixed: comp; 47,000 ohms ±10%; ½ w; JAN type RC20BF473K.	R4: V2 grid leak. R5: V3 grid leak.	3RC20BF473K
R9, R10	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 100,000 ohms ±10%; ½ w; JAN type RC20BF104K.	V2 and V3 grids 2 dropping resistors.	3RC20BF104K
R16, R20	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 150,000 ohms ±10%; ½ w; JAN type RC20BF154K.	R16: V4 screen dropping R20: V5 screen dropping.	3RC20BF154K
R13, R17, R21, R28, R29.	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 220,000 ohms ±10%; ½ w; JAN type RC20BF224K.	R13: V4 grid leak R17: V5 grid leak. R21: V6 grid leak.	3RC20BF224K

							R28, R29: Microphone transformer load.	
R1	(*)	(*)	(*)	(*)	(*)	RESISTOR, fixed: comp; 470,000 ohms ±10%; ½ w; JAN type RC20BF474K.	V1 grid leak	3RC20BF474K
R25			(*)	(*)	(*)	RESISTOR, fixed: wire-wound; .51 ohm ±5%; ½ w; JAN type RU3BR51J.	V7 cathode bias	3RU03601
R41					(*)	RESISTOR, thermal: 10 ohms; 860 ma, 688 mw oper cur; RMA size T9; ballast tube type; 2⅞" lg excluding cont x $1\frac{3}{16}$" dia; Amperite type #9–8.	Filament current regulator	3Z6925–3.27
O24			(*)	(*)	(*)	RETAINER, crystal holder: 1⅜" lg x $1\frac{3}{16}$" wd x $\frac{7}{16}$" d; Utility Electronics Corp part #PA–1148.	Crystal holder	2Z2712.130
O25, O33					(*)	RETAINER, electron tube: for ST–14 and ST–16 envelopes; Times Facsimile Co #4T Hat (w/o post).	Tube retainers	2Z7780–166
O26					(*)	RETAINER, electron tube: SS; friction mtd; Times Facsimile Co #2T (w/o post).	------ do ------	2Z7780–165
A9			(*)	(*)		SHOCK MOUNT M–448: vibration; 2⅜" sq metal base, round rubber body 1½" dia; approx $1\frac{1}{16}$" h; Sig dwg SC–D–19169.	Shock mount	2Z8415–448
X1	(*)	(*)				SOCKET, tube: 5 cont med; under chassis mtg; steatite body; $1\frac{1}{16}$" dia x $\frac{5}{16}$" thk, mtg plate 2⅛" x 1⅜" oval; Amphenol part #RSS5.	Holds and connects tube to circuit.	2Z8763.4
X2	(*)	(*)				SOCKET, tube: 5 cont medium; under chassis mtg; $1\frac{1}{16}$" dia x $\frac{3}{16}$" thk, mtg plate 1½" x $1\frac{5}{16}$" oval; Amphenol part #MIP5T.	------ do ------	2Z8675.17
X4 through X8	(*)	(*)				SOCKET, tube: 1 octal; under chassis mtg; $1\frac{3}{16}$" dia x $\frac{5}{16}$" thk body, mtg plate $1\frac{11}{16}$" x $1\frac{3}{16}$" oval; Cinch part #6969.	------ do ------	2Z8678.60
X3		(*)				SOCKET, tube: octal; under chassis mtg; $1\frac{1}{16}$" dia x $\frac{5}{16}$" thk body, mtg plate $1\frac{11}{16}$" x $1\frac{5}{16}$" oval; Cinch part #51A12543.	------ do ------	2Z8678.298
X3	(*)					SOCKET, tube: octal; 1⅝" lg x $\frac{13}{16}$" wd x ¾" thk; Amphenol part #88–8B.	------ do ------	2Z8678.207
X2			(*)	(*)	(*)	SOCKET SO–200; two small cont; $1\frac{13}{64}$" lg x $\frac{41}{64}$" wd x $\frac{13}{16}$" h; Sig C dwg SC–D–16887.	Crystal socket	2Z8799.200
X1			(*)	(*)	(*)	SOCKET, electron tube: 5 med cont; saddle or retaining ring mtg; 1¼" dia; Millen #33005.	Tube socket	2Z8675.29
X4, X5, X6, X7, X8.			(*)	(*)	(*)	SOCKET, electron tube: 8 cont; octal; one piece saddle mtg; 1⅝" lg x $1\frac{5}{32}$" wd x $\frac{33}{64}$" h; Amphenol #88–8XTM.	Tube sockets	2ZK8678–6
X3, X16					(*)	SOCKET, electron tube: 8 cont; octal; below chassis mtg; $1\frac{1}{16}$" dia x ½" thk; Cinch #51A14887.	Tube socket	2Z8670.24
					(*)	SPRING: flat type; catch for cover; $3\frac{9}{16}$" lg x $\frac{7}{16}$" wd x ½" h; also may be used for rec cover; Utility Electronics Corp dwg #PA–1258.	Cover catch spring	2Z8877.696
					(*)	STUD: SS; 3⅛" lg x ¼" dia; 1 end threaded $\frac{7}{16}$" lg w/#5–40 thk; #PB–3304–2.	Tube retainer support	6L31154–29

Ref. symbol	Model 1 T-193/VRC-2	2 T-193A/VRC-2	3 T-193B/VRC-2	4 T-193B/VRC-2	5 T-322/VRC-2X	Name of part and description	Function of part	Signal Corps stock No.
					(*)	STUD: SS; 4⅝" lg x ⅛" dia; 1 end threaded $\frac{7}{16}$" lg w/#5-40 thd; Utility Electronics Corp part/dwg #PB-3004-1.	Tube retainer support	6L31164-4
				(*)	(*)	STUD: 2½" lg x ¼" dia; one end 6-32 thd for $\frac{5}{16}$", other end tapped w/6-32 thd, ¼" d; Utility Electronics dwg #PA-1147.	Crystal retainer support	6L31150-7
SW1	(*)					SWITCH, rotary: single pole, 8 position; case 1¼" dia x $\frac{33}{32}$" d; Mallory part #3218.	Meter switch	3Z9825-55.10
SW1		(*)	(*)	(*)	(*)	SWITCH, rotary: 1 pole, 7 throws; 1 sect; $\frac{7}{16}$" thk x 1¼" dia; Mallory dwg B-120103, part #3217J.	------ do ------	3Z9825-70.13
					(*)	TERMINAL BOARD: general purpose; 2 double screw term.; 1⅝" lg x 1⅛" wd x ½" thk o/a; Jones HB division part #2-141.	Connecting block	2Z9402.44
					(*)	TERMINAL BOARD: general purpose; 2 double screw term.; 2½" lg x $1\frac{13}{16}$" wd x ¾" h; Jones HB division #2-150.	Dynamotor connector	2Z9402.59
				(*)	(*)	TERMINAL BOARD: 6 feedthrough swaged type term.; 2¾" lg x 2" wd x $\frac{31}{64}$" thk; marked C14, C18, C22; Utility Electronics Corp dwg #PA-1304.	Capacitor mounting	3Z770-6.124
				(*)	(*)	TERMINAL BOARD: 6 hallow swaged type term.; 3½" lg x 1⅞" thk; marked R26, R37; Utility Electronics Corp dwg #PA-1308.	Resistor mounting	3Z770-6.123
				(*)	(*)	TERMINAL BOARD: resistor and capacitor mtg; 8 feedthrough swaged type term.; 3¼" lg x 2½" wd x $\frac{31}{64}$" thk; marked R8, R27, R28, R30, C31, C32; Utility Electronics Corp dwg #PA-1302.	Resistor and capacitor mounting	3Z770-8.106
				(*)	(*)	TERMINAL BOARD: mtg for resistors, capacitors, coils; 15 feedthrough swaged type term.; 4½" lg x 2½" wd x ⅞" thk; Utility Electronics Corp dwg #PA-1314.	Resistor, capacitor, and coil mounting.	3Z770-15.29
				(*)	(*)	TERMINAL BOARD: resistor and capacitor mtg; 26 hollowed swaged type term.; $6\frac{3}{16}$" lg x 1½" wd x $\frac{17}{32}$" thk; Utility Electronics Corp dwg #PB-1263.	Resistor and capacitor mounting.	3Z770-26.29
	(*)	(*)	(*)	(*)		TERMINAL BOARD: 3' rotating link term.; 1⅞" wd x 1½" h x $\frac{1}{16}$" thk excluding term.; Eby part #9720-32 (Added per MWO 11-607-2.)	Mount for antenna load-limiting capacitor.	3Z770-3.69

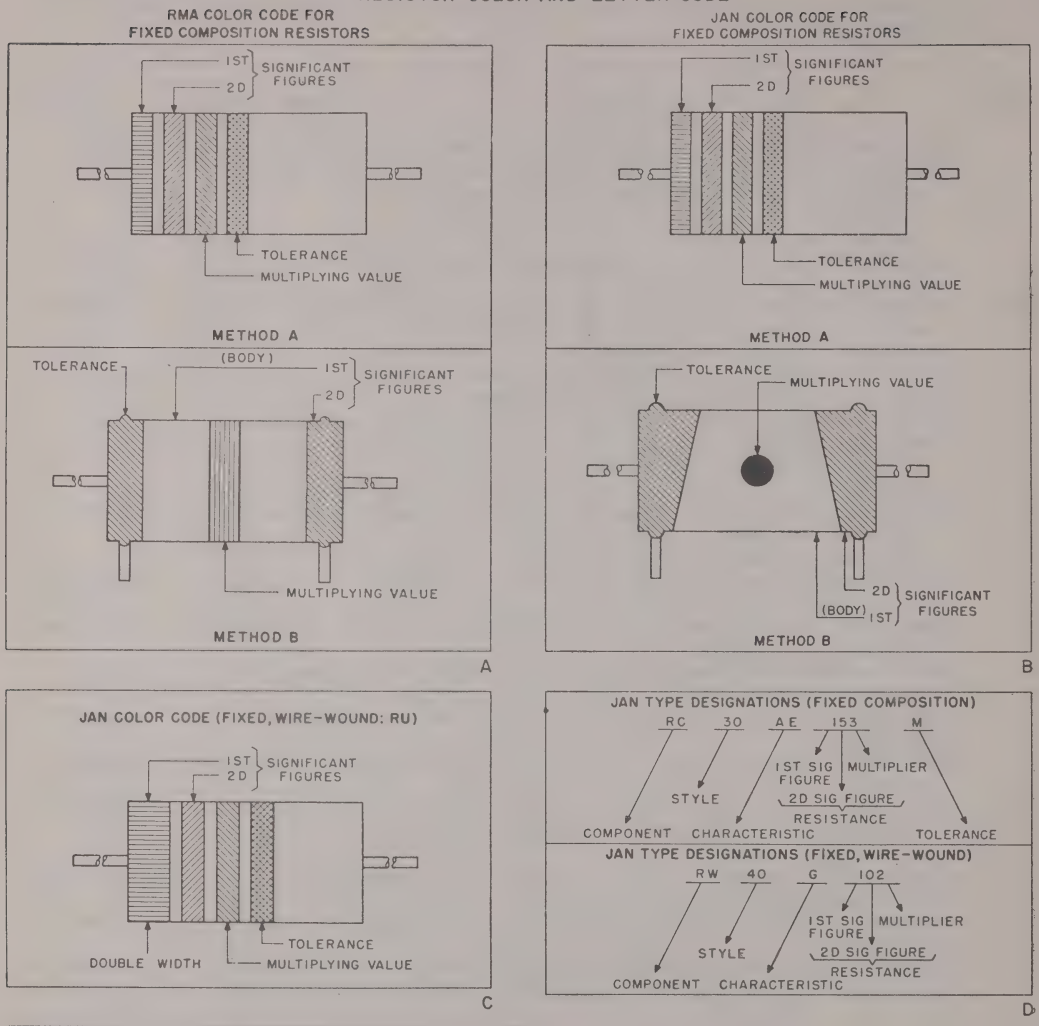
T6	(*)					TRANSFORMER, AF: 50 ohm pri, 50,000 ohm secd; steel case; 2 5/16" lg x 2 3/32" wd x 2 5/8" h; Chi Trans part #6945.	Microphone input	2Z9631.53
T6		(*)				TRANSFORMER, AF: 50 ohm pri, 50,000 ohm secd; steel case; 2 7/8" h x 2 1/8" dia; Espey part #TA15.032.	------ do	2Z9631.335
T6					(*)	TRANSFORMER, AF: line type; pri 50 ohms impedance, secd 50,000 ohms ct; HS steel case; 2 7/8" lg x 2 3/8" dia o/a; UTC #E4685.	Microphone input transformer	2Z9637.97
V6	(*)	(*)	(*)	(*)	(*)	TUBE, electron: type 6V6GTY	Doubler	2J6V6GTY
V2, V3	(*)	(*)	(*)	(*)	(*)	TUBE, electron: type 7A8	Modulators	2J7A8
V1, V4, V5	(*)	(*)	(*)	(*)	(*)	TUBE, electron: type 7C7	V1: Oscillator V4: First quadrupler. V5: Second quadrupler.	2J7C7
V7	(*)	(*)	(*)	(*)	(*)	TUBE, electron: type 807	Power amplifier	2J807
	(*)	(*)				POWER SUPPLY GROUP POWER SUPPLY: vibrator type; nonsynchronous; output 540 v at 150 ma; input 6 v at 25 amp; 8 3/4" lg x 6" wd x 4" h; incl 6X5GT tube; full wave; filter capacitor incl; Espey part #204–TPS.	Source of d-c power for transmitter.	3H4493–3
C5, C6	(*)	(*)				CAPACITOR, fixed: paper; 2 sect.; 800 μμf; 1000 vdcw; metal case 5/16" x 5/8" x 1 1/16"; Fast part #A6121.	Buffers	3D9800–17
C3, C4	(*)					CAPACITOR, fixed: paper; 4000 μμf; 1600 vdcw; metal case; 1 3/32" lg x 1/2" dia; Fast part #A6685.	------ do	3DA4–43.1
C3, C4		(*)				CAPACITOR, fixed: paper; 6000 μμf; 1000 vdcw; 1 5/16" lg x 11/16" dia; JAN type CP28A1EG602K.	------ do	3DA6–107
C1, C2	(*)	(*)				CAPACITOR, fixed: paper; 500,000 μμf; 200 vdcw; 2 1/8" lg x 1" dia; JAN type CP29A1EC504M.	Input filters	3DA500–582
C7, C8	(*)					CAPACITOR, fixed: electrolytic; 4 μf; 450 vdcw; metal can; cardboard sleeve; 2 1/4" h x 7/8" dia; Galvin part #23A81953.	B+ filters	3DB4–126
C7, C8		(*)				CAPACITOR, fixed: electrolytic; 10 μf; 450 vdcw; 2" h x 3/4" dia; metal can; metal mtg plate; Pyramid part #TM–10–450S.	B+ filter	3DB10–189
O1, O3, O4, O5		(*)				CLIP: fuse; for cartridge type fuse; silver pl beryllium copper; 50 amp rating; 23/64" h x 5/16" d; Littelfuse part #121001.	For fuses	3Z1013.6
M1, M2		(*)				COIL, RF: choke; single layer wound; unshielded; 2.9 mh at 1000 cps, 6.5 amp, .001-ohm resistance; 15/16" lg x 1 1/2" dia; Fast part #A6391.	Chokes	3C323–12J
M1, M2	(*)					COIL, RF: choke; double pi wound; unshielded; 2.9 mh at 1000 cps; 6.5 amp, .0032-ohm resistance; 15/16" lg x 1/2" dia; Fast part #A–6119.	------ do	3C323.12C
M5, M6	(*)	(*)				FUSE, cartridge: Sig C type FU–11; 20 amp at 25 v; 1 1/4" lg x 1/4" dia; 3AG type; Littelfuse part #311020.	Overload protection	3Z1911
	(*)					HOLDER, fuse: block type; for one 3AG fuse; 1 5/8" lg x 1/2" wd x 5/16" thk; Littelfuse part #353001.	For fuses	3Z3256

Ref. symbol	Model 1 T-193/VRC-2	Model 2 T-193A/VRC-2	Model 3 T-193B/VRC-2	Model 4 T-193B/VRC-2	Model 5 T-322/VRC-2X	Name of part and description	Function of part	Signal Corps stock No.
E1		(*)				HOLDER, fuse: block type; for two #3AG fuses; 50 amp at 250 v max; $2\frac{11}{16}$" lg x $1\frac{1}{4}$" wd x $1\frac{1}{8}$" h; hinged metal cover; Littelfuse part #351009.	For fuses	3Z3282-11.9
R1, R2, R3, R4	(*)	(*)				RESISTOR, fixed: comp; 47 ohms; ½ w; .655" lg x 0.249" dia; JAN type RC21BF470K.	Vibrator suppressors	3RC21BF470K
R5	(*)	(*)				RESISTOR, fixed: comp; 470,000 ohms; 1 w; 1.28" lg x .310" dia; JAN type RC31BF474K.	Bleeder	3RC31BF474K
O2		(*)				SLEEVE, insulating: used/w type FP capacitors; cardboard; 2" lg x ¾" dia; Mallory part #OF-1.	For formed-plate capacitors	2Z8552-58
X3, X4		(*)				SOCKET, tube: 4 cont; under chassis mtg; $1\frac{11}{16}$" x $1\frac{3}{16}$" o/a, $\frac{5}{16}$" thk; Amphenolic part #M1P-4T.	Hold and connect tube to circuit.	2Z8659-5.1
X3, X4	(*)					SOCKET, tube: 4 cont; 1 piece saddle mtg; $1\frac{3}{4}$" lg x $1\frac{9}{32}$" wd o/a, $\frac{31}{64}$" thk; Amphenol part #M1P-4.	do	2Z8654.1
X, X2		(*)				SOCKET, tube: octal; under chassis mtg; $1\frac{1}{16}$" dia x $\frac{5}{16}$" thk body, mtg plate $1\frac{11}{16}$" x $1\frac{5}{16}$" oval; Cinch part #51A12543.	do	2Z8678.298
	(*)					SOCKET, tube: octal; 1 piece saddle mtg; $1\frac{7}{8}$" lg x $1\frac{9}{32}$" wd x $\frac{31}{64}$" d; Amphenol part #M1P-8.	Holds and connects tube to circuit.	2Z8659-6
T1, T2		(*)				TRANSFORMER, power: vibrator type; input 6 v at 6.5 amp; output 480 v at 150 ma; sealed metal case; $4\frac{1}{8}$" h x $3\frac{1}{4}$" dia; Espey part #TA18.054.	Power transformers	2Z9625-53
T1, T2	(*)					TRANSFORMER, power: vibrator type; input 6 v at 7.5 amp; output 480 v ct at 94 ma; steel half shell; 2.84" lg x $3\frac{3}{16}$" wd x $3\frac{3}{4}$" h; Chi Trans part #5715A.	do	2Z9625-14
V1, V2	(*)	(*)				TUBE, electron: OZ4A/1003; rectifier	Rectifiers	2JOZ4A/1003
M3, M4	(*)	(*)				VIBRATOR, nonsynchronous: input 6 v at 6.5 amp; single reed; base type A1; aluminum can; $2\frac{7}{8}$" lg x $1\frac{1}{2}$" dia; Oak type #V-6126.	Converts 6 v ac to h-v ac	3H6693-3

7. Identification Table of Parts for Mast Base AB–15/GR (part of Radio Set AN/VRC–2X)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	MAST BASE AB–15/GR: ceramic, rubber, and steel; holds ant. by insertion of ant. sect. in female portion of base, mts in 2½" dia hole in panel or plate; marked "AB–15/GR"; incl binding post on bottom for wire lead; Sig C dwg SC–D–12517.	Antenna mast base	2A2081–15
	CAP, antenna base; dust cover for/mast base; $\frac{63}{64}$" lg x $\frac{13}{16}$" dia; Sig C dwg SC–D–19572.	Mast base cap	2A387.4–4
P34	CONNECTOR, plug: Plug PL–259–A; 1 round male cont; straight type; $1\frac{31}{32}$" lg x $\frac{11}{16}$" OD 1 end, ½" OD other end; ANRFCCC dwg #RE49F167.	R-f connector	2Z7226–259A
	GASKET: ins spacer; rubber; single hole; round, 3" OD x $1\frac{29}{32}$" ID x $\frac{1}{16}$" thk; Sig C dwg SC–D–12520–2.	Spacer	2A1173.2–17
	INSULATOR, bowl: round, corrugated; grade L2 ceramic, olive drab finish; $2\frac{31}{64}$" lg x 1½" ID x $1\frac{13}{32}$" OD w/2¾" max dia; Sig C dwg SC–D–19572 and SC–D–12517.	Insulator support	3G90–3
	INSULATOR, bowl: round, corrugated; grade L2 ceramic, olive drab finish; 2¼" lg x 2" ID x 2¾" OD w/$3\frac{1}{16}$" max dia; Sig C dwg SC–D–12517–11.	Insulator support	3G90–4
	INSULATOR, washer: round, $\frac{11}{16}$" OD x $\frac{7}{16}$" ID x $\frac{3}{64}$" thk; Sig C dwg SC–D–12520–3.	Spacer	2A1173.2–16
	MOUNTING: socket for ant. sect.; 5⅞" lg x .395" dia; Sig C dwg SC–D–12517–1.	Antenna section socket	2A281–30
	POST, binding: Binding Post TM–145; ¾" lg x $\frac{7}{16}$" OD; Sig C dwg SC–D–530.	Binding post	3Z245
	SUPPORT, antenna: steel; 4" lg x ¾" wd; Sig C dwg SC–D–12517–2.	Mast base body	2A3393A.1–149
	SUPPORT, antenna: 5½" lg x $\frac{11}{16}$" dia; Sig C dwg SC–D–21103.	Flexible antenna section	2A3393A.1–148
	RING, bonding: 3⅛" OD x 2" ID x 1" thk o/a, w/slotted term. $\frac{15}{16}$" lg x ¼" wd, bent at right angle; Sig C dwg SC–D–12517, group 25.	Bonding ring	2Z7855–3
	WASHER, "C": C-shape; $\frac{7}{16}$" ID x $\frac{11}{16}$" OD x $\frac{3}{64}$" thk w/⅛" opening; Sig C dwg SC–D–12520.	Spacer	2A1173.2–18
	WASHER, flat: brass $\frac{7}{16}$" screw size; $\frac{15}{32}$" ID x ¾" OD x $\frac{1}{16}$" thk.	Spacer	6L50030–2
	WASHER, shouldered: round w/beveled edge; 1½" dia x ¼" thk w/$\frac{33}{64}$" hole; Sig C dwg SC–D–19572.	Bushing and spacer	6L50530–6

RESISTOR COLOR AND LETTER CODE



STANDARDS

COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE	TOLERANCE (%)	JAN LETTER TOLERANCE
BLACK	0	1	—	—
BROWN	1	10	± 1	F
RED	2	100	± 2	G
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	J
SILVER	—	0.01	±10	K
NO COLOR	—	—	±20	M

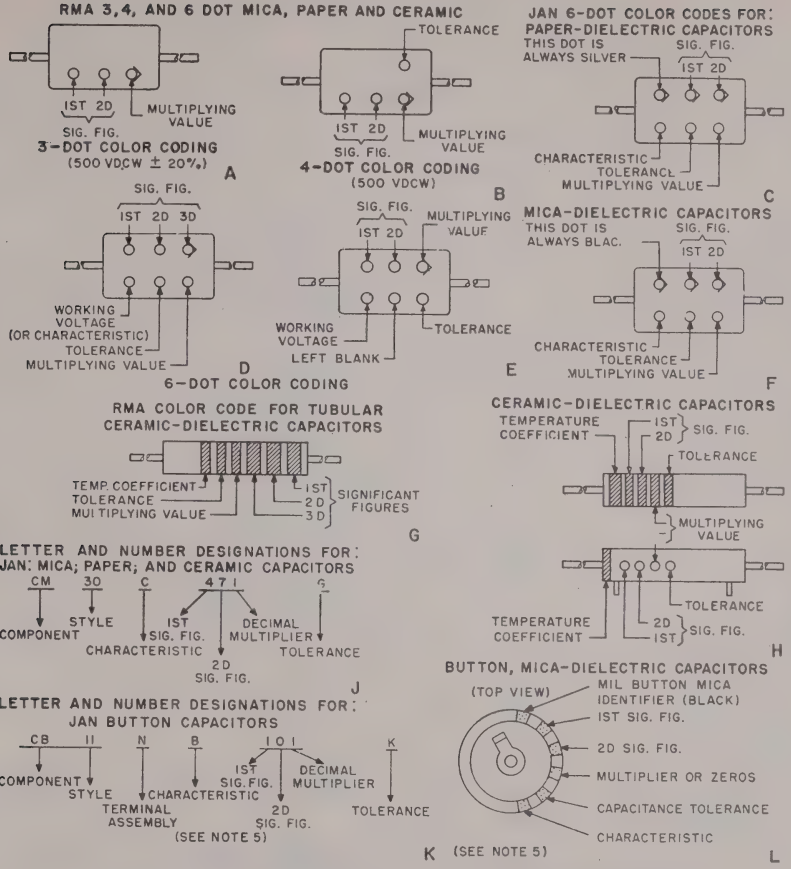
NOTES:

1. RESISTORS WITH AXIAL LEADS ARE INSULATED. RESISTORS WITH RADIAL LEADS ARE NON-INSULATED.
2. RMA: RADIO MANUFACTURERS ASSOCIATION.
3. JAN: JOINT ARMY-NAVY.
4. THESE COLOR AND NUMBER CODES GIVE ALL RESISTANCE VALUES IN OHMS.
5. RESISTIVE COMPONENTS USED FOR LETTER TOLERANCES ARE: RC, RN, AND RU.
6. WATTAGE FOR RW TYPES IS FOUND IN THE JAN SPECIFICATIONS UNDER CHARACTERISTICS.

TM RC

Figure 117. Resistor color codes.

CAPACITOR COLOR AND LETTER CODES



- STANDARDS -					JAN MICA-CM		JAN PAPER-CN		JAN CERAMIC-CC					
									CAP. TOL. FOR MORE THAN 10 UUF			CAP. TOL. FOR 10 UUF OR LESS		
COLOR	SIG. FIG.	DECIMAL MULTIPLIER	% TOL.	VDCW	LETTER TOL.	CHARAC-TERISTIC	LETTER TOL.	CHARAC-TERISTIC	DEC. MULT.	%	LETTER DESIG-NATION	UUF	LETTER DESIG-NATION	CHARAC-TERISTIC
BLACK	0	1	±20	500	M	A	M	A	1	±20	M	±2.0	G	C
BROWN	1	10	± 1	100	-	B	-	E	10	± 1	F	-	-	H
RED	2	100	± 2	200	G	C	-	H	100	± 2	G	-	-	L
ORANGE	3	1,000	± 3	300	-	D	N*	J	1,000	-	-	-	-	P
YELLOW	4	10,000	± 4	400	-	E	-	P	-	-	-	-	-	R
GREEN	5	100,000	± 5	500	-	F	-	R	-	± 5	J	±0.5	D	S
BLUE	6	1,000,000	± 6	600	-	G	-	S	-	-	-	-	-	T
VIOLET	7	10,000,000	± 7	700	-	-	-	T	-	-	-	-	-	U
GRAY	8	100,000,000	± 8	800	-	-	-	-	0.01	-	-	±0.25	C	B
WHITE	9	1,000,000,000	± 9	900	-	-	-	-	0.1	± 10	K	±1.0	F	SL
GOLD	-	0.1	± 5	1,000	J	-	-	-	-	-	-	-	-	A
SILVER	-	0.01	±10	2,000	K	-	K	-	-	-	-	-	-	-
NO COLOR	-		±20	500	-	-	-	-	-	-	-	-	-	-
* THE TOLERANCE OF THIS CAPACITOR IS ±30%, NOT ±3%														

NOTES

JAN: JOINT ARMY-NAVY
RMA: RADIO MANUFACTURERS ASSOCIATION

1. THESE COLOR AND LETTER CODES GIVE CAPACITANCES IN MICROMICROFARADS
2. THIS TABLE IS ADAPTED FOR JAN AND RMA COLOR AND JAN LETTER TYPE DESIGNATIONS
3. CERAMIC AND MICA CAPACITORS, BOTH JAN AND RMA, ARE GENERALLY 500 VDCW
4. BUTTON CAPACITORS ARE GENERALLY 300 VDCW
5. READ BUTTON CAPACITOR TOLERANCE UNDER CERAMICS OF MORE THAN 10 UUF
6. CHARACTERISTICS ARE AVAILABLE IN JAN CAPACITOR SPECIFICATION MANUALS
7. THE COMPONENTS USED ABOVE FOR JAN LETTER TYPE DESIGNATIONS ARE:
   CB MICA BUTTON: *CC* CERAMIC; *CM* MICA MOULDED: *CN* PAPER MOULDED

TM CC

Figure 118. Capacitor color codes.

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	Paragraph	Page
Alinement:		
Modulator	83*c*	120
Receiver	81	116
Transmitter	83	119
Amperite. (*See* Thermal resistor.)		
Antenna:		
Description	3*b*, 8*f*	2, 9
Dummy	72, 83, 93	84, 119, 123
Installation	15*f*	25
Wavelength	8*f*	9
Attenuation	59*c*	61
Audio-frequency amplifier	40	39
Band pass	47	45
Bandwidth, i-f	92	123
Base plate	9*c*, 15*b*	9, 23
Block diagram:		
Receiver	43	41
Transmitter	57	60
Bracket, speaker mounting	15*e*	25
Cables	9*a*, 16	9, 25
Cathode coil	45*a*	43
Chart, trouble-shooting:		
Receiver	74	93
Transmitter	75	94
Checklist, equipment performance	40, 41	39, 40
Coil:		
Plate	4*b*, 84*c*	2, 122
Voice	8*e*	9
Components:		
Description	8	8
Dimensions	7	7
Connectors	16, 19, 20	25, 29, 30
Control:		
Head	3*b*	2
Squelch	21, 22*b*	31, 32
Volume	21, 22*b*, 64	31, 32, 70
Converter	43, 48	41, 45
Cover, dust	16*e*	27
Crystals, h-f	3*b*, 9*d*, 15*a*, 22*a*	2, 10, 20, 32
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Difference frequency	46*a*, 48	44, 45
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Discriminator	42, 52	41, 52
Alinement	81*c*	117
Voltage curves	52*c*	53
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Double-conversion	42	41
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Dynamotor:		
Connections	15*c*	23
Inspection and repair	78	115
Lubrication	27, 34	33, 37
Feedback	58	60
Filament circuits	12*a*, 66	11, 74
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Forms, maintenance record	2, 32, 33	1, 34, 37
Frequencies, changing	84	122
Frequency modulation	3*b*, 59	2, 61
Fuse	22, 74, 75	32, 93, 94
Fuse box	7*a*, 9*b*	7, 9
Guard, switch	7*a*, 12*b*	7, 13
Harmonics	45*b*	44
High-frequency crystals	3*b*, 9*b*, 15*a*, 22*a*, 45*a*	2, 10, 20, 32, 43
I-f amplifier, 4.3-mc	47	45
I-f amplifier, 455-kc	49	49
Image rejection	47*a*	45
Installation components	9*c*	9
Installation of components	15	20
Intermittents	67*b*(6)	79
Jack:		
Meter	19, 20	29, 30
Speaker	19	29
Lamp:		
Red	21, 22*b*	31, 32
Green	21, 22*a*, 23	31, 32, 33
Light, pilot	8*c*	8
Limiter:		
First	43*c*	43
Second	43*d*	43
Loading coil	5, 9, 83*h*	4, 9, 121
Maintenance:		
Lubrication	34	37
Preventive	28–33	34–37
Rustproofing	36	38
Weatherproofing	35	38

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	Paragraph	Page
Alinement:		
Modulator	83*c*	120
Receiver	81	116
Transmitter	83	119
Amperite. (*See* Thermal resistor.)		
Antenna:		
Description	3*b*, 8*f*	2, 9
Dummy	72, 83, 93	84, 119, 123
Installation	15*f*	25
Wavelength	8*f*	9
Attenuation	59*c*	61
Audio-frequency amplifier	40	39
Band pass	47	45
Bandwidth, i-f	92	123
Base plate	9*c*, 15*b*	9, 23
Block diagram:		
Receiver	43	41
Transmitter	57	60
Bracket, speaker mounting	15*e*	25
Cables	9*a*, 16	9, 25
Cathode coil	45*a*	43
Chart, trouble-shooting:		
Receiver	74	93
Transmitter	75	94
Checklist, equipment performance	40, 41	39, 40
Coil:		
Plate	4*b*, 84*c*	2, 122
Voice	8*e*	9
Components:		
Description	8	8
Dimensions	7	7
Connectors	16, 19, 20	25, 29, 30
Control:		
Head	3*b*	2
Squelch	21, 22*b*	31, 32
Volume	21, 22*b*, 64	31, 32, 70
Converter	43, 48	41, 45
Cover, dust	16*e*	27
Crystals, h-f	3*b*, 9*d*, 15*a*, 22*a*	2, 10, 20, 32
Curves, discriminator voltage	52*c*	53
Demolition	96	125
Deviation	4*b*, 59, 60, 94	2, 61, 63, 124
Diaphragm, rubber	25	33
Difference frequency	46*a*, 48	44, 45
Dimensions of components	7	7
Discriminator	42, 52	41, 52
Alinement	81*c*	117
Voltage curves	52*c*	53
Distortion	76, 91	95, 123
Double-conversion	42	41
Dummy antenna	72, 83, 93	84, 119, 123
Dynamotor:		
Connections	15*c*	23
Inspection and repair	78	115
Lubrication	27, 34	33, 37
Feedback	58	60
Filament circuits	12*a*, 66	11, 74
Filter, low-pass	12*a*(5), *b*, 53	12, 13, 54
Forms, maintenance record	2, 32, 33	1, 34, 37
Frequencies, changing	84	122
Frequency modulation	3*b*, 59	2, 61
Fuse	22, 74, 75	32, 93, 94
Fuse box	7*a*, 9*b*	7, 9
Guard, switch	7*a*, 12*b*	7, 13
Harmonics	45*b*	44
High-frequency crystals	3*b*, 9*b*, 15*a*, 22*a*,45*a*	2, 10, 20, 32, 43
I-f amplifier, 4.3-mc	47	45
I-f amplifier, 455-kc	49	49
Image rejection	47*a*	45
Installation components	9*c*	9
Installation of components	15	20
Intermittents	67*b*(6)	79
Jack:		
Meter	19, 20	29, 30
Speaker	19	29
Lamp:		
Red	21, 22*b*	31, 32
Green	21, 22*a*, 23	31, 32, 33
Light, pilot	8*c*	8
Limiter:		
First	43*c*	43
Second	43*d*	43
Loading coil	5, 9, 83*h*	4, 9, 121
Maintenance:		
Lubrication	34	37
Preventive	28–33	34–37
Rustproofing	36	38
Weatherproofing	35	38

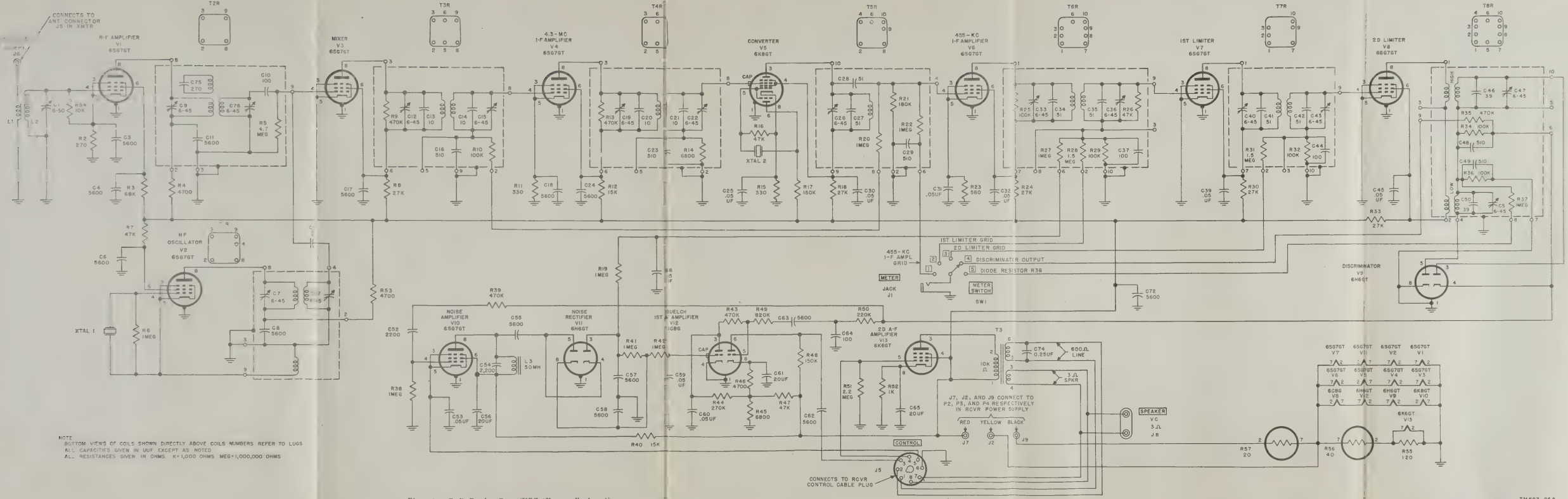


Figure 119. Radio Receiver R-435/VRC-2X, over-all schematic.

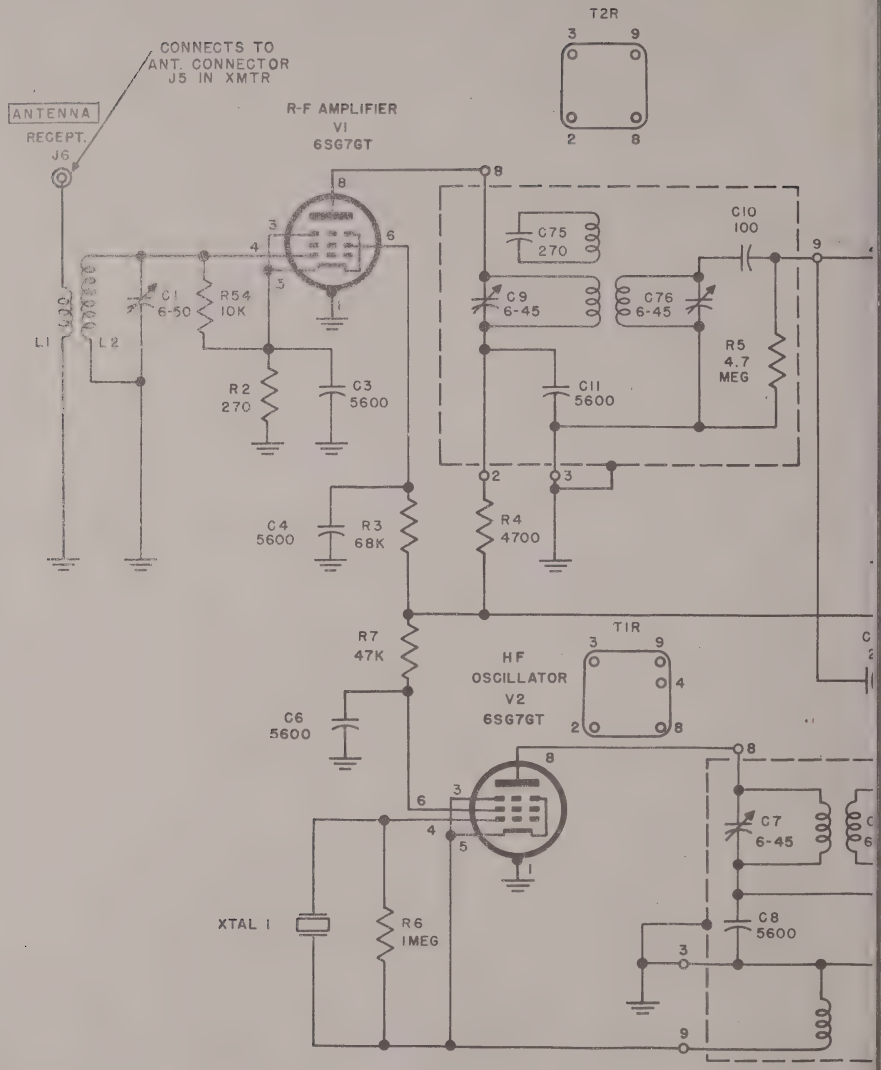
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	Paragraph	Page
Meter:		
Circuit	49b, 50a, 52b	49, 52
Readings, normal:		
Receiver	81	116
Transmitter	83	119
Shunt	58b, c, 59b, 60b	60, 63, 64
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Modulation	4b	2
Modulator	57a, b, 59, 83c	60, 61, 120
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Desert	27	33
Tropical	26	33
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Crystal	43a, b	41
Transmitter	58	60
Packaging	5	4
Phase modulation	59c	63
Pilot light	8c	8
Plate, base	9c, 15b	9, 23
Polarity, battery	15c, 16c	23, 26
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Amplifier	62, 83	65, 119
Output	5b, c, 93	4, 123
Supply, receiver	8a, 12a, 56	8, 11, 58
Supply, transmitter	63	66
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Second	60	63
Radio Set Control C-1060/VRC-2X	8c, 15	8, 20
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Records, maintenance	2, 32, 33	1, 34, 37
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Reports, unsatisfactory equipment	2	1
Resistance measurements	68, 71, 74	79, 84, 93
Resting frequency	59d	63
Sectionalization	39, 40, 41, 64	39, 40, 70
Selectivity	54, 49	55, 43
Sensitivity	44, 49a, 88	43, 49, 123
Shunt resistor. (*See* Meter shunt.)		
Signal substitution	76	95
Siting	13	20
Spares	7a, 10	7, 10
Speaker, dynamic	8c	8
Squelch:		
Circuit	21, 22b	31, 32
Maximum	90	123
Minimum	89	123
Stopping procedure	23	33
Switch:		
Guard	7a, 12b	7, 13
Meter	19, 20	29, 30
Microphone	22, 72b	32, 92
Test, operational	67b, 72	77, 84
Test equipment	69, 86	79, 122
Testing, final	85–94	122–124
Thermal resistors	10a, b	10
Tool, alinement	83a	120
Transconductance	59d	63
Transmitter alinement	83	119
Trimmer, antenna	81, 84b	116, 122
Trimmers, adjustment	81c	117
Trouble-shooting:		
Field and depot level	64–73	70–93
Organizational level	40	39
Unpacking	14	20
Vibrator power supply:		
Receiver	8a, 12a, 56	8, 11, 58
Transmitter	63	66
Voltage measurements	68	79
Volume control	19c, 22b, 64	30, 32, 70
Volume control, automatic	46a, 48b	44, 46
Wave trap	44a, b	43
Weak signals	39, 41	39, 40

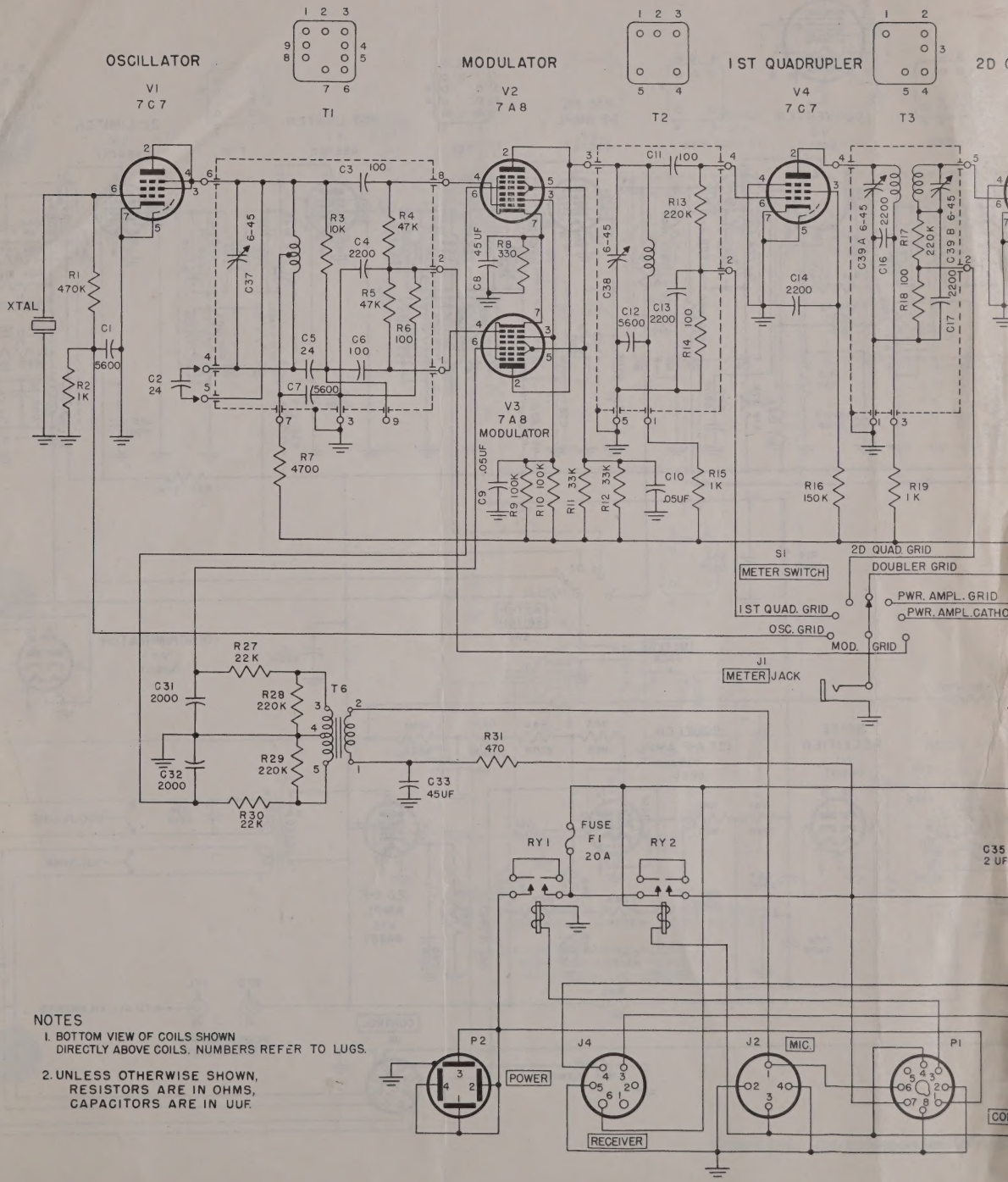
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	Paragraph	Page
Meter:		
Circuit	49*b*, 50*a*, 52*b*	49, 52
Readings, normal:		
Receiver	81	116
Transmitter	83	119
Shunt	58*b*, *c*, 59*b*, 60*b*	60, 63, 64
Microphone	8*d*	9
Modulation	4*b*	2
Modulator	57*a*, *b*, 59, 83*c*	60, 61, 120
Mounting plates	9*c*, 15	9, 20
Noise:		
Amplifier	43, 53	41, 54
Rectifier	43*f*, 53	43, 54
Nomenclature	1	1
Operating procedure	22	32
Operation:		
Arctic	25	33
Desert	27	33
Tropical	26	33
Oscillation	44, 81*f*	43, 118
Oscillator:		
Crystal	43*a*, *b*	41
Transmitter	58	60
Packaging	5	4
Phase modulation	59*c*	63
Pilot light	8*c*	8
Plate, base	9*c*, 15*b*	9, 23
Polarity, battery	15*c*, 16*c*	23, 26
Power:		
Amplifier	62, 83	65, 119
Output	5*b*, *c*, 93	4, 123
Supply, receiver	8*a*, 12*a*, 56	8, 11, 58
Supply, transmitter	63	66
Push-to-talk switch	3*b*, 22*b*	2, 32
Quadrupler:		
First	59, 60	61, 63
Second	60	63
Radio Set Control C-1060/VRC-2X	8*c*, 15	8, 20
Receptacles	16	25
Records, maintenance	2, 32, 33	1, 34, 37
Relay circuits	72	84
Reports, unsatisfactory equipment	2	1
Resistance measurements	68, 71, 74	79, 84, 93
Resting frequency	59*d*	63
Sectionalization	39, 40, 41, 64	39, 40, 70
Selectivity	54, 49	55, 43
Sensitivity	44, 49*a*, 88	43, 49, 123
Shunt resistor. (*See* Meter shunt.)		
Signal substitution	76	95
Siting	13	20
Spares	7*a*, 10	7, 10
Speaker, dynamic	8*c*	8
Squelch:		
Circuit	21, 22*b*	31, 32
Maximum	90	123
Minimum	89	123
Stopping procedure	23	33
Switch:		
Guard	7*a*, 12*b*	7, 13
Meter	19, 20	29, 30
Microphone	22, 72*b*	32, 92
Test, operational	67*b*, 72	77, 84
Test equipment	69, 86	79, 122
Testing, final	85–94	122–124
Thermal resistors	10*a*, *b*	10
Tool, alinement	83*a*	120
Transconductance	59*d*	63
Transmitter alinement	83	119
Trimmer, antenna	81, 84*b*	116, 122
Trimmers, adjustment	81*c*	117
Trouble-shooting:		
Field and depot level	64–73	70–93
Organizational level	40	39
Unpacking	14	20
Vibrator power supply:		
Receiver	8*a*, 12*a*, 56	8, 11, 58
Transmitter	63	66
Voltage measurements	68	79
Volume control	19*c*, 22*b*, 64	30, 32, 70
Volume control, automatic	46*a*, 48*b*	44, 46
Wave trap	44*a*, *b*	43
Weak signals	39, 41	39, 40

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NOTE:
BOTTOM VIEWS OF COILS SHOWN DIRECTLY ABOVE COILS NUMBERS REFER TO LUGS.
ALL CAPACITIES GIVEN IN UUF EXCEPT AS NOTED.
ALL RESISTANCES GIVEN IN OHMS. K=1,000 OHMS. MEG=1,000,000 OHMS.



NOTES

1. BOTTOM VIEW OF COILS SHOWN DIRECTLY ABOVE COILS. NUMBERS REFER TO LUGS.
2. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

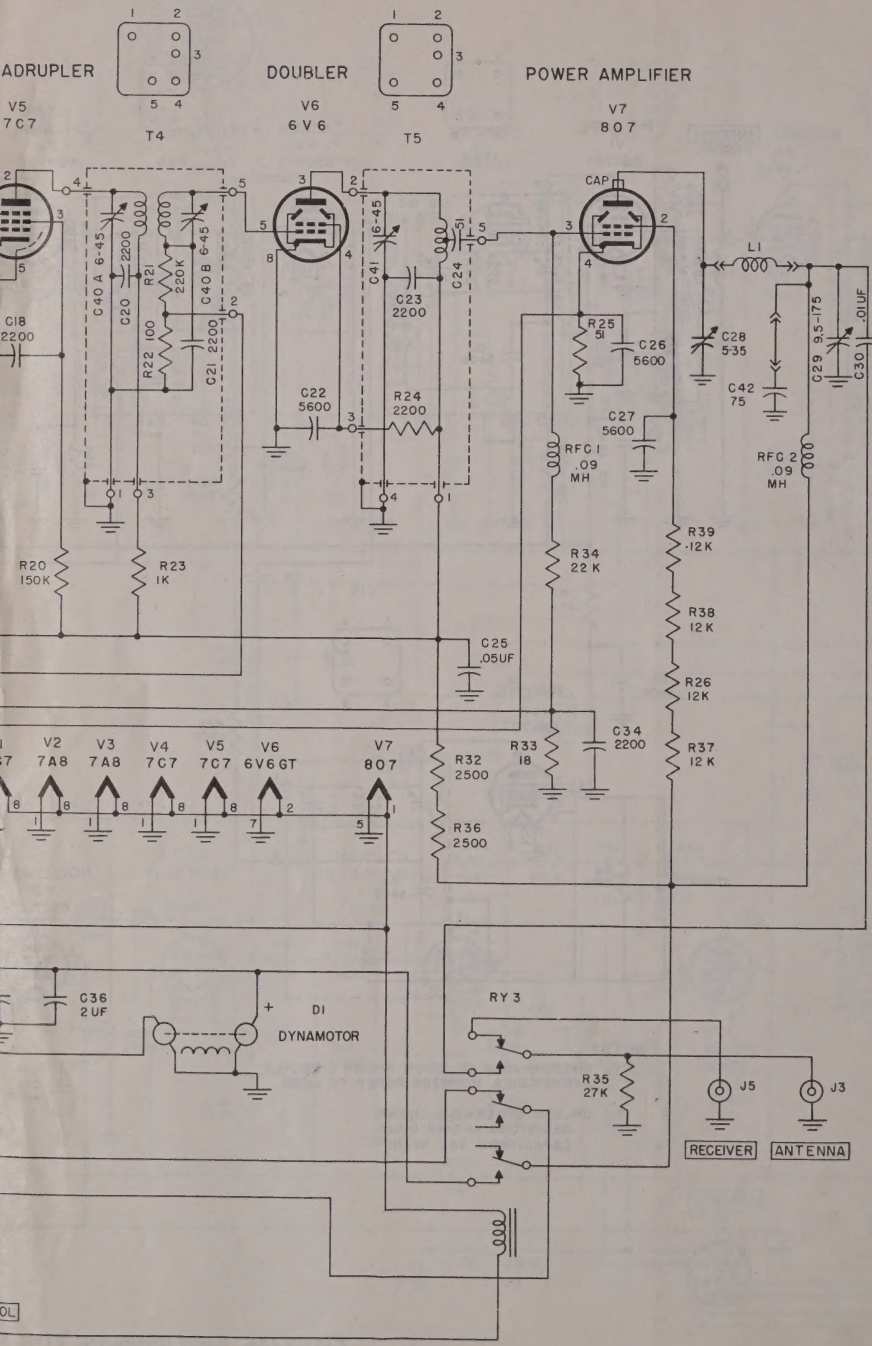
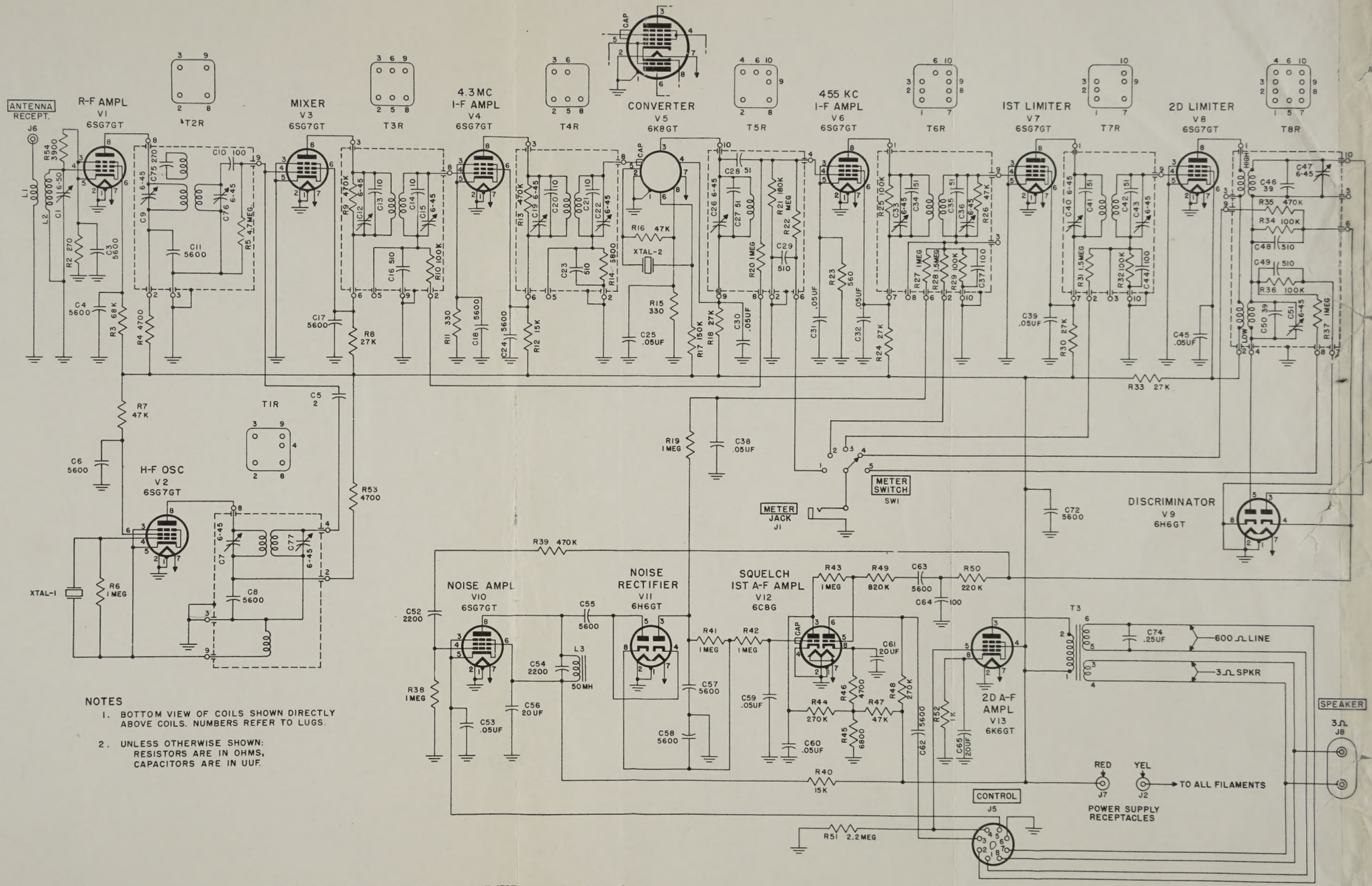


Figure 125. Radio Transmitter T–193B/VRC–2, over-all schematic.

TM607-334



NOTES

1. BOTTOM VIEW OF COILS SHOWN DIRECTLY ABOVE COILS. NUMBERS REFER TO LUGS.
2. UNLESS OTHERWISE SHOWN: RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

Figure 124. Radio Receiver R-237B/VR, over-all schematic.

TM 607-336

OSCILLATOR V1 7C7 — T1 — MODULATOR V2 7A8 — T2 — 1ST QUADRUPLER V4 7C7 — T3 — 2D QUADRUPLER V5 7C7 — T4 — DOUBLER V6 6V6 — T5 — POWER AMPLIFIER V7 807

V3 7A8 MODULATOR

XTAL

R1 470K, R2 1K, R3 10K, R4 47K, R5 47K, R6 100, R7 4700, R8 330, R9 100K, R10 100K, R11 33K, R12 33K, R13 220K, R14 100, R15 1K, R16 150K, R17 220K, R18 100, R19 1K, R20 150K, R21 220K, R22 100, R23 1K, R24 2200, R25 51, R26 12K, R27 22K, R28 220K, R29 220K, R30 22K, R31 470, R32 2500, R33 18, R34 22K, R35 27K, R36 2500, R37 12K, R38 12K, R39 12K

C1 5600, C2 24, C3 100, C4 2200, C5 24, C6 100, C7 5600, C8 45UF, C9 .05UF, C10 .05UF, C11 100, C12 5600, C13 2200, C14 2200, C16 2200, C17 2200, C18 2200, C20 2200, C21 2200, C22 5600, C23 2200, C25 .05UF, C26 5600, C27 5600, C28 5-35, C29 9.5-175, C30 .01UF, C31 2000, C32 2000, C33 45UF, C34 2200, C35 2 UF, C36 2 UF, C37 6-45, C38 6-45, C39A 6-45, C39B 6-45, C40A 6-45, C40B 6-45, C41 6-45, C42 75

L1, RFC1 .09 MH, RFC2 .09 MH

T6

S1 METER SWITCH

2D QUAD GRID, DOUBLER GRID, PWR. AMPL. GRID, PWR. AMPL. CATHODE, 1ST QUAD. GRID, OSC. GRID, MOD. GRID

J1 METER JACK

RY1, RY2, RY3

FUSE F1 20A

D1 DYNAMOTOR

J5 RECEIVER, J3 ANTENNA

P2 POWER, J4 RECEIVER, J2 MIC., P1 CONTROL

V1 7C7, V2 7A8, V3 7A8, V4 7C7, V5 7C7, V6 6V6GT, V7 807

NOTES
1. BOTTOM VIEW OF COILS SHOWN DIRECTLY ABOVE COILS. NUMBERS REFER TO LUGS.
2. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

Figure 125. Radio Transmitter T-193B/VRC-2, over-all schematic. TM607-334

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