TM 11-5030

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

SIGNAL GENERATOR TS-497A/URR

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SIGNAL GENERATOR

TS-497A/URR

DEPARTMENT OF THE ARMY *DECEMBER 1950*

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

CONTENTS

WARNING

Voltages as high as 300 volts

are used in the operation of

this equipment.

First Aid for Electric Shock

RESCUE.

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

SYMPTOMS.

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

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

TREATMENT.

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

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

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

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

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

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

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

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

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

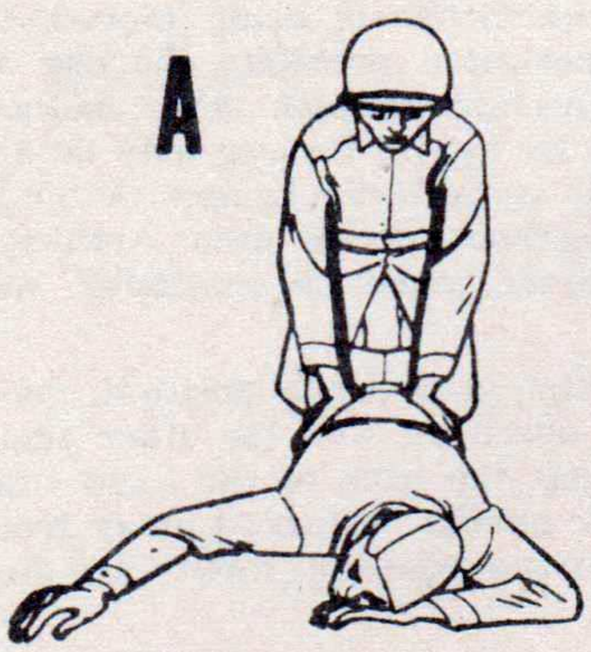
f. The resuscitation procedure is as follows:

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

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

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

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

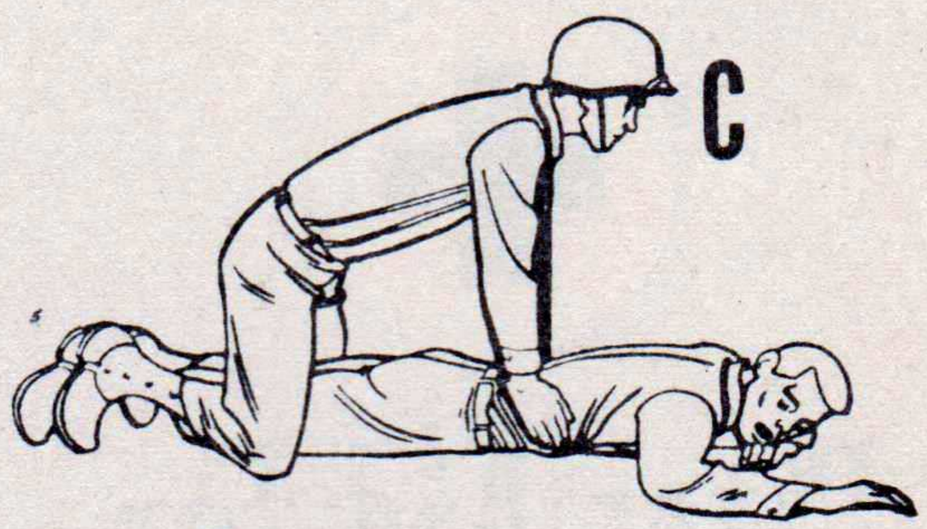


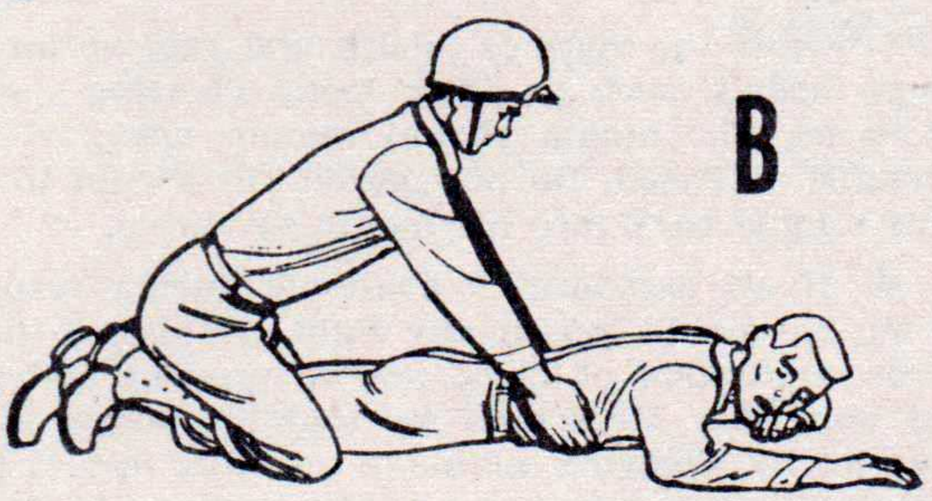
A. *CORRECT POSITION. Operator's elbows straight and locked. Victim's face turned away from bent elbow and resting on back of hand.*

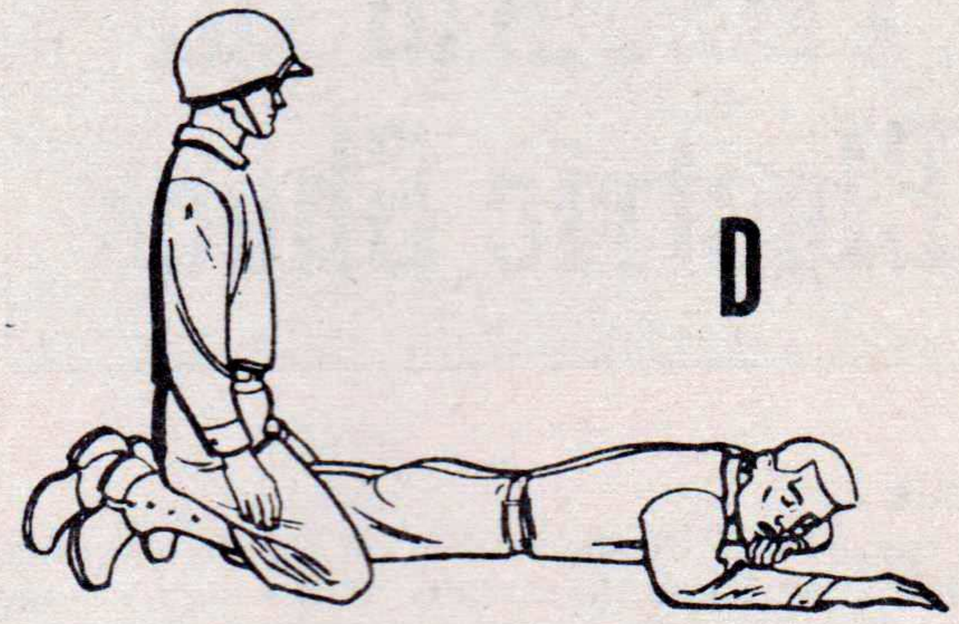
B. *FORWARD SWING AND POSITIONING OF HANDS. Little finger rests on last rib.*

C. *DOWNWARD PRESSURE. Arms and thighs vertical.*

D. *REST POSITION. Operator releases pressure suddenly, swings back on heels, and rests for 2 seconds.*







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

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

RELIEVING OPERATOR.

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

STIMULANTS.

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

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

CAUTIONS.

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

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

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

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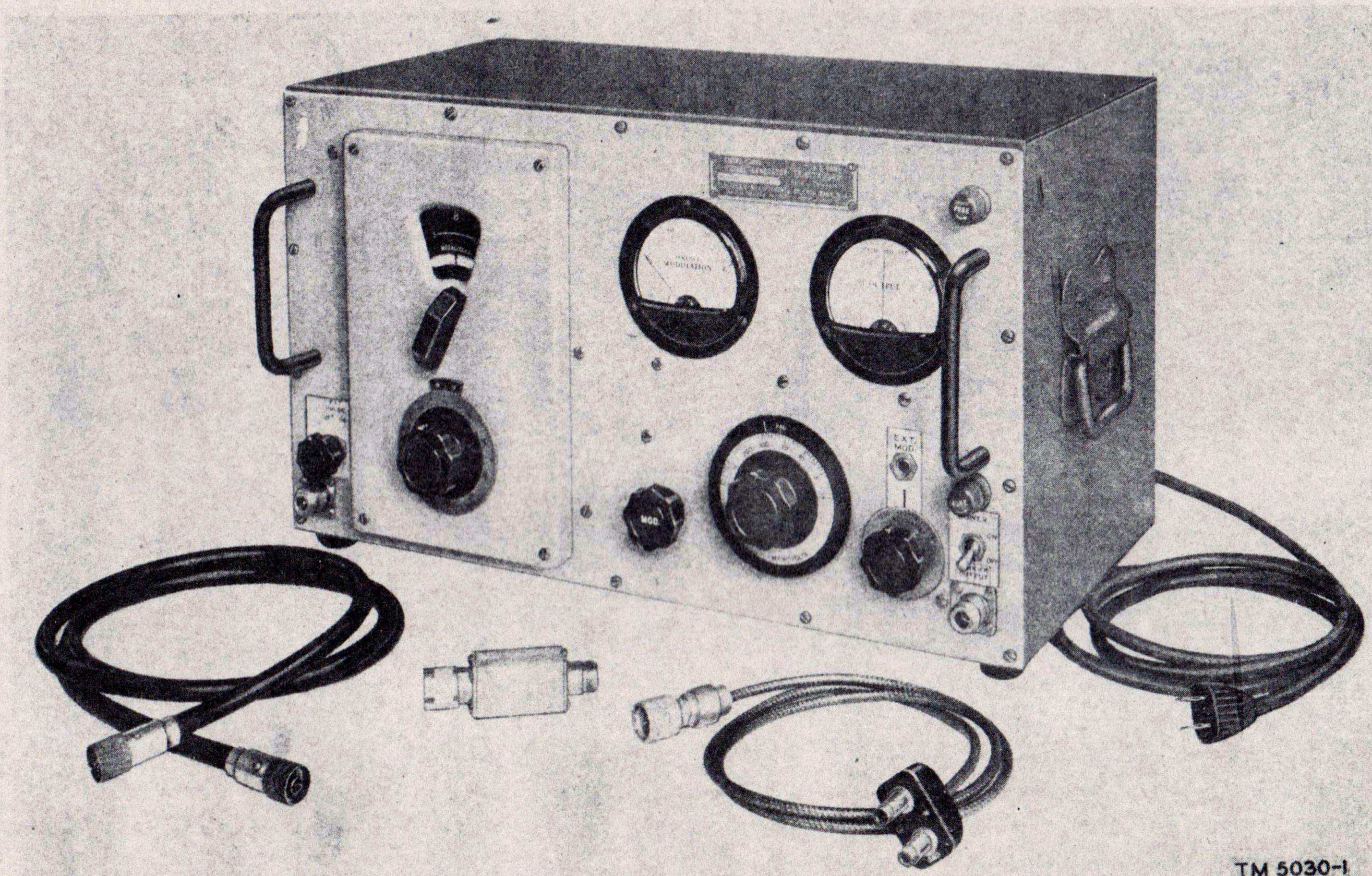


Figure 1. Signal Generator TS-497A/URR.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the information and guidance of the personnel to whom this equipment is issued. The instructions are for the installation, operation, maintenance, and repair of Signal Generator TS–497A/URR.

b. In addition to these instructions there are two appendixes covering a list of references and an identification table of parts.

2. Forms and Records

The following standard forms will be used for reporting unsatisfactory conditions of matériel and equipment, or improper preservation, packaging, packing, marking, loading, stowage, or handling thereof.

a. DD Form 6, Report of Damaged or Improper Shipment (Reports Control Symbols CS GLD–66), will be filled out and forwarded as prescribed in SR 745–45–5.

b. DA AGO Form 468, Unsatisfactory Equipment Report (Reports Control Symbol CS GLD–247), will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700–45–5.

c. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Purpose and Use

a. Signal Generator TS–497A/URR (fig. 1) is a portable unit which provides r-f (radio-frequency) test signals over a range of 2 to 400 mc (megacycles) in six bands.

b. The instrument is designed primarily for laboratory and field use in making the precise measurements required in development and maintenance of radio and video equipment.

c. The signal generator provides sine-wave amplitude-modulation of 400 or 1,000 cycles without the use of additional equipment. Provision is made for the use of an external sine-wave generator having an output of 10 volts or more and a frequency range from 50 to 10,000 cycles. An input jack is provided for pulse modulation from an external source. The pulse generator should provide a minimum of 150 peak volts and should have an output impedance of 1,000 ohms or less.

4. Technical Characteristics

Frequency range—	
Band A	2 mc to 5 mc.
Band B	5 mc to 13 mc.
Band C	13 mc to 30 mc.
Band D	30 mc to 78 mc.
Band E	78 mc to 180 mc.
Band F	180 mc to 400 mc.
Accuracy of frequency calibrations	±.5 percent on all ranges.
Output impedance	Approximately 50 ohms.
Sine-wave amplitude-modulation	0 to 30 percent.
Internal modulation	400 or 1,000 cps (cycles per second).
External modulation	50 to 10,000 cps.
Provision for pulse modulation from an external source.	
Input voltage	117 volts, 50/60 cycles.
Power input	65 watts.
Carrier output	Continuously variable .1 to 100,000 microvolts. (Attenuator leakage is less than .1 microvolt and the stray field is less than .2 microvolt at any point outside the case.)
Number of tubes	10.
Weight	48 pounds.

5. Packaging Data

a. Signal Generator TS–497A/URR is packaged in moistureproof-vaporproof containers and packed in a wooden shipping container. A cutaway view of a typical component packed for export is shown in figure 3. The packed equipment weighs approximately 75 pounds and displaces 3.5 cubic feet. For export shipment, the box is bound with two metal straps.

b. The following list indicates the contents of the case. See the packing list attached to each case for the exact contents.

Case dimensions (in.)	Contents	Notes
23¾ lg x 15 wd x 17 h.	1—Signal Generator TS-497A/URR. 1—Cord CG-55B/U..... 1—Radio Frequency Cable Assembly CG-683/U. 1—Impedance-matching pad..... 1—Set of running spares.....	Packed in a separate carton.

6. Table of Components

Component	Req'd No.	Height (in.)	Depth (in.)	Length (in.)	Volume (cu ft)	Unit Weight (lb)
Signal Generator TS-497A/URR.	1	9½	10⅝	19	1.45	48
Cord CG-55B/U.	1	.....	.....	50	.....	.75
Radio-Frequency Cable Assembly CG-683/U.	1	.....	.....	50	.....	.25
Impedance-matching pad.	1	1	1	3½	.....	.3
Set of running spares.	1	.....	.....	.....	.75	1
Technical manual.	2	10¼	.....	7⅞	.....	.....
Total.....	.....	.....	.....	.....	2.2	50.3

7. Description of Signal Generator

a. The signal generator consists of a panel-chassis assembly (fig. 16) contained in a steel case. The case (fig. 2) is equipped with two carrying handles and four protective feet; the panel mounting rim is notched to guide steel runners which are located on the power supply chassis. Ventilating louvers are located at the rear of the steel case behind the power supply chassis. The a-c (alternating-current) power cord attached to this chassis is accessible from the rear of the case.

b. All of the controls and assemblies of the signal generator are mounted on the front panel. The two guard handles located on each side of the panel provide a means of removing the unit from the case and also serve as a support to protect the meters and controls when the unit is turned on its face for checking and servicing. Two steel runners on the bottom of the power supply chassis permit easy removal from the case. A circuit label is in the top of the case.

c. A drum assembly to the left of the power supply chassis on the back of the front panel contains the carrier oscillator (fig. 16). The assembly consists of an inner and an outer drum, each of which has a cover or shield. A grounding wiper is fastened to the

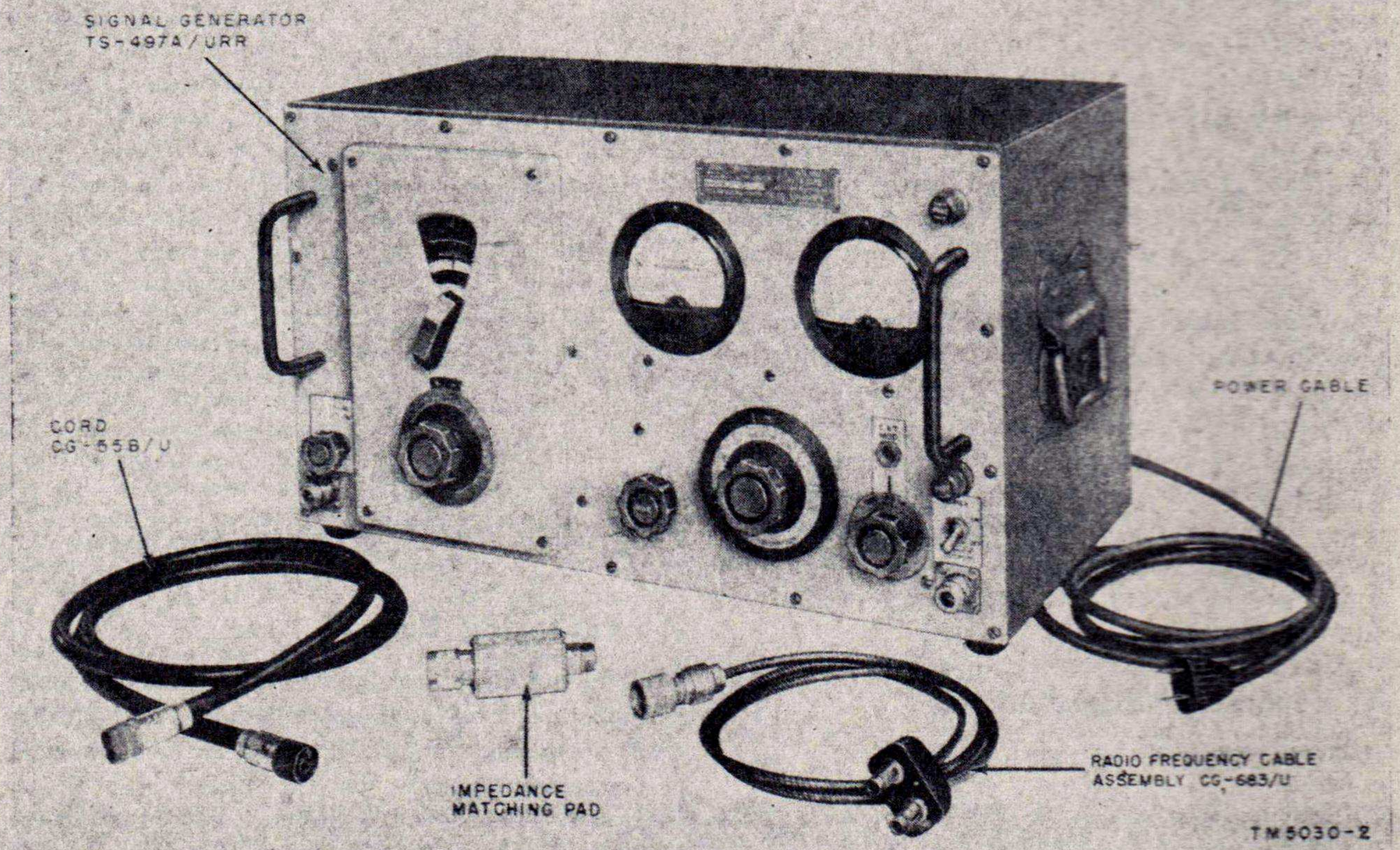


Figure 2. Signal Generator TS-497A/URR, front view.

inside of the inner shie'.' Three clamps secure the outer shield to the drum.

d. The following components are supplied with Signal Generator TS–497A/URR:

(1) Cord CG–55B/U: consists of a 4-foot length of Radio-Frequency Cable RG–8A/U with Radio-Frequency Plug UG–21B/U at each end.

(2) Radio-Frequency Cable Assembly CG–683/U: consists of a 4-foot length of Radio-Frequency Cable RG–58C/U with Plug Connector UG–536/U at one end and two binding posts and a 50-ohm termination in a metal housing at the other end.

Note. A cable assembly utilizing Radio-Frequency Cable RG–55/U, but similar in all other respects to Radio-Frequency Cable Assembly CG–683/U, is supplied with some units of Signal Generator TS–497A/URR.

(3) Impedance-matching pad: consists of a 50-ohm resistive network mounted in a cast aluminum housing and is terminated at the input end with Radio-Frequency Plug UG–21B/U and at the output end with Radio-Frequency Receptacle UG–58/U. The pad provides an attenuation of 6 db (decibels).

8. Running Spares

The following running spares are supplied with each signal generator:

5 lamps, 3 watts, 120 volts, GE #56.
5 lamps, .25 ampere, 6.3 volts, GE #51.
10 fuses, 1 ampere, type 4AG.
2 tubes type 6AQ5.
1 tube type OA3/VR75.
1 tube type 5Y3GT.
1 tube type OC3/VR105.
1 tube type 6AU6.
2 tubes type 12AU7.
1 tube type 12AX7.
1 tube type 955.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

9. Uncrating, Unpacking, and Checking New Equipment

a. GENERAL. Signal Generator TS–497A/URR is packed in a nailed wooden box. When new equipment is received, select a location where the equipment may be unpacked without exposure to dust, dirt, or excessive moisture. Use tools carefully; the equipment may be damaged if tools are thrust into the interior of the shipping container.

b. STEP-BY-STEP INSTRUCTIONS FOR UNCRATING AND UNPACKING (fig. 3).

(1) Place the packing case as near the operating position as is convenient.

(2) Cut and fold back the steel straps.

(3) Remove the nails with a nail puller, and remove the top cover.

(4) Remove the waterproof metal container and any filler material.

(5) Open the four flaps on the top of the corrugated box.

(6) Remove the box that contains the spare parts. Open the box and remove the output matching pad and the two cable assemblies. Do not remove the spare parts until they are required.

(7) Remove the equipment from its inner case and place it on the workbench.

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

(9) Check the contents of the packing case against the master packing slip.

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

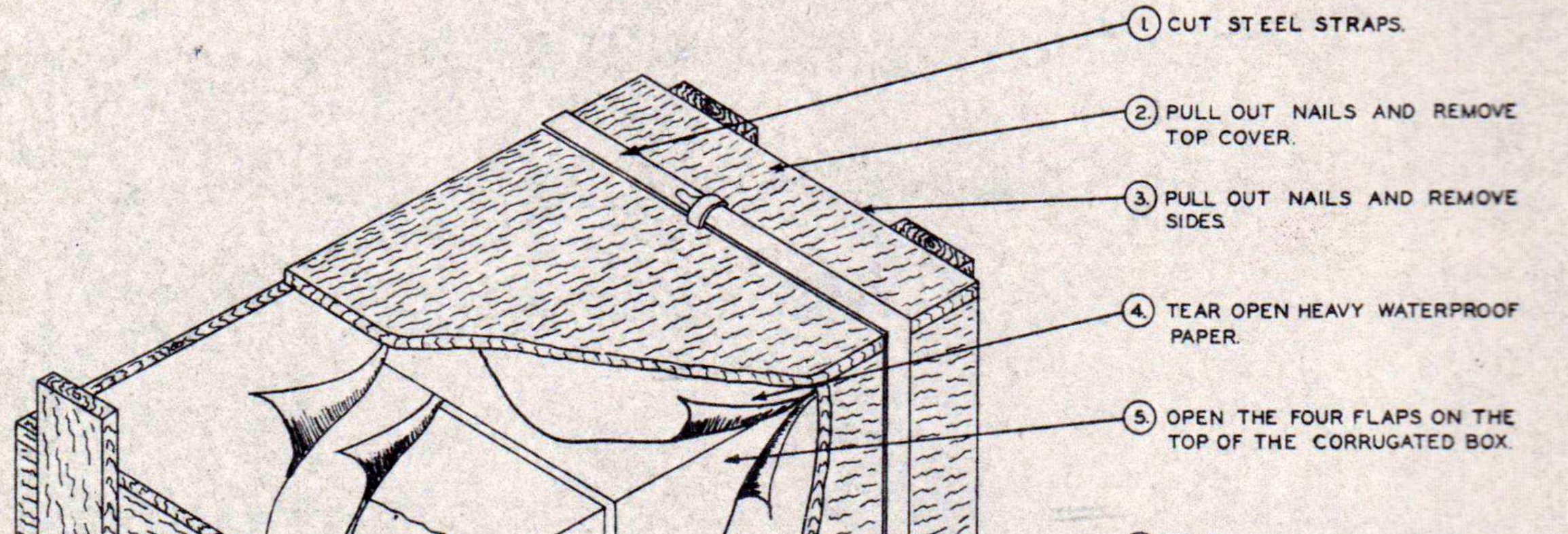


Figure 3. Typical packaging for export shipment.

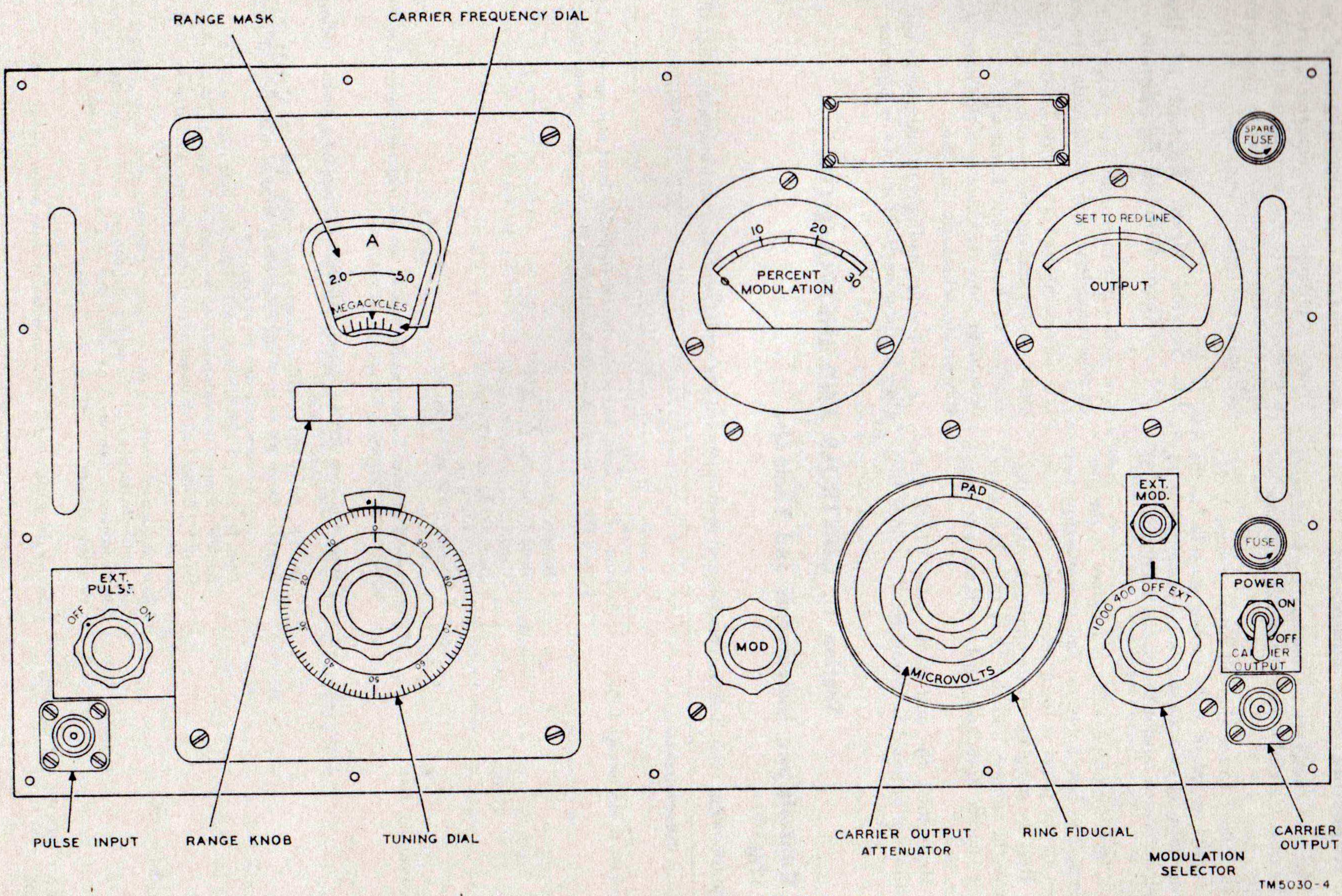


Figure 4. Signal Generator TS-497A/URR, front panel.

10. Inspecting New Equipment

a. Remove the 14 screws that hold the front panel to the case. Carefully slide the signal generator out of the case.

b. Check to see that all tubes (except V–11) are firmly seated in their proper sockets on the power supply chassis (fig. 6). *Do not check* tube V–11 which is located within the carrier oscillator drum shield.

c. Check for proper fuses (1 ampere) in the fuse holders. The fuse holder at the upper right-hand corner of the panel is for a spare fuse.

d. Rest the signal generator on the guard handles, remove the runners and the cover from the power supply chassis, and check for broken wires or loose connections.

e. Reassemble the unit in the case. Check the operation as outlined in paragraph 14. Since the signal generator is portable, it can be placed in any location convenient to the equipment under test. Be careful, however, not to obstruct the ventilating louvers in the rear of the case by placing the signal generator too close to other equipment or to a wall.

11. Service Upon Receipt of Used or Reconditioned Equipment

a. Follow the instructions in paragraph 9 for uncrating, unpacking, and checking the equipment.

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

c. Inspection and operational checks will be the same as those outlined for new equipment.

Section II. CONTROLS AND INSTRUMENTS

12. Controls and Instruments and Their Use (fig. 4)

The following table lists the controls and instruments of the signal generator and indicates what they do:

Control or instrument	Function
Range knob (L–6A through L–6F)	Rotation of the knob selects the desired frequency band and operates a mask to conceal the dial markings on the bands not in use. The various bands are as follows: Band A: 2 mc to 5 mc. Band B: 5 mc to 13 mc. Band C: 13 mc to 30 mc. Band D: 30 mc to 78 mc. Band E: 78 mc to 180 mc. Band F: 180 mc to 400 mc.
Carrier frequency dial	Indicates the carrier frequencies for each of the six frequency bands. The divisions of the carrier frequency dial are spaced as follows: Band A: Every 100 kc (kilocycles) with numbered frequencies indicated at every ½ mc. Band B: Every 200 kc with numbered frequencies indicated at every mc. Band C: Every 200 kc to 20 mc, every 500 kc from 20 to 30 mc, with numbered frequencies indicated at every mc. Band D: Every 1 mc with numbered frequencies indicated at every 5 mc. Band E: Every 2 mc with numbered frequencies indicated at every 10 mc. Band F: Every 5 mc with numbered frequencies indicated at every 10 mc.
Tuning dial (C–12)	Selects the desired frequency on the carrier frequency dial. When disengaged from the carrier frequency dial, the tuning dial can be reset to read zero. In this way, small frequency increments on either side of a main calibration may readily be obtained (par. 16*b*).
PERCENT MODULATION meter (M–2).	Indicates the percent of sine-wave modulation of the output signal.

Control or instrument	Function
MOD. knob (R–33)	Used to set the desired percent of modulation on the meter.
MODULATION selector switch (S–2)	Selects the type of modulation. The function of each switch position is as follows: 1000: Provides for internal sine-wave modulation at 1,000 cps. 400: Provides for internal sine-wave modulation at 400 cps. OFF: De-energizes sine-wave modulation circuits. EXT: Allows for sine-wave modulation by an external source of 50 to 10,000 cps when the source is connected to the EXT. MOD. jack.
EXT. MOD. jack (J–1)	Provides means for connecting an external audio oscillator to the modulation circuits of the signal generator.
Pulse input jack (J–2)	Provides means for connecting an external pulse generator for pulse modulation.
EXT. PULSE switch (S–3)	Connects the pulse input jack to the plate circuit of the carrier oscillator for pulse modulation.
Ring fiducial and OUTPUT meter (M–1).	Used to calibrate the output levels indicated on the MICROVOLTS dial. The ring fiducial must be adjusted so that the pointer on the OUTPUT meter rests opposite the red line when the MODULATION selector switch is in the OFF position.
MICROVOLTS carrier output dial	Used to set the carrier output to a desired value by setting the dial with reference to the white line or PAD mark on the ring fiducial. The PAD mark is used only when the 6-db pad is used between the CARRIER OUTPUT jack and the equipment under test.
POWER switch (S–1)	Controls the application of power to the signal generator.
CARRIER OUTPUT jack (J–3)	Provides means for connecting the output of the signal generator to the equipment under test.

13. Use of Accessory Equipment

a. The impedance-matching pad (fig. 2) may be connected to the CARRIER OUTPUT jack to attenuate the output signal. It provides an attenuation of 6 db.

b. Cord CG–55B/U and Radio-Frequency Cable Assembly CG–683/U (fig. 2) are provided for connection between the signal generator and the equipment under test. Cord CG–55B/U is more convenient for equipments with coaxial input jacks; Radio-Frequency Cable Assembly CG–683/U, equipped with binding posts, is more convenient when clip leads must be used. Either cable may be connected to the CARRIER OUTPUT jack directly or through the 6-db pad.

Section III. OPERATION UNDER USUAL CONDITIONS

14. Preliminary Starting Procedure

The following preliminary starting procedure should be performed when the equipment is first received or returned from a depot, to determine that the equipment is in proper operating condition. Unless the generator has not been used for an extended period of time, it will be unnecessary to follow the procedure before each operating period.

a. Connect the power plug to a 117-volt, 50/60-cycle, a-c source.

b. Turn the POWER switch to ON. Observe whether the carrier frequency dial is illuminated.

c. Turn the MODULATION selector switch to OFF.

d. Turn the EXT. PULSE switch counterclockwise to the OFF position.

e. Rotate the range knob until the letter A appears in the window above the knob. Rock the knob slightly from side to side to check that the range-change mechanism has locked into position.

f. Set the OUTPUT meter pointer to the red line by means of the ring fiducial. Rotate the carrier frequency dial from one end to the other by means of the tuning dial, and note whether it is possible to set the meter pointer to the red line over the entire range. The frequency dial is automatically disengaged when the usable part of the tuning is past. This disengagement causes a jumpy action of the control. Do not mistake this for faulty operation.

g. Rotate the range knob clockwise to each of the other ranges (B, C, D, E, and F), successively, while adjusting the ring fiducial and carrier frequency dial as outlined in *f* above. If the OUTPUT meter pointer does not set to the red line at any particular frequency or range, refer to paragraph 44*c*.

h. Turn the MOD. knob to the extreme counterclockwise position and set the MODULATION selector switch to 400. Turn the MOD. knob clockwise until the PERCENT MODULATION meter reads 30. The OUTPUT meter should deflect to the right of the red line as modulation is applied.

i. Turn the MODULATION selector switch to 1000. The PERCENT MODULATION meter should return to 30 without further adjustment of the MOD. knob.

Note. If an abnormal result is obtained during the preliminary adjustments, refer to paragraph 44. Do not change the setting of the ring fiducial unless the OUTPUT meter pointer remains off center when the MODULATION selector switch is in the OFF position.

Caution: Never adjust the ring fiducial when the MODULATION selector switch is ON.

15. Connection of Equipment for Test Purposes

a. CONNECTION TO EQUIPMENT UNDER TEST. Signal Generator TS-497A/URR may be connected to the equipment under test by Cord CG-55B/U or Radio-Frequency Cable Assembly CG-683/U, with or without the 6-db pad in series with the output. Several basic methods of connection are shown in figure 5 and are interpreted below.

(1) If Radio-Frequency Cable Assembly CG-683/U is used, the impedance at the output terminals of the cable is 25 ohms. To match any particular resistive input impedance (R) of the equipment under test, insert a resistance equal to *R minus 25* between the cable terminals and the equipment. If an unbalanced input is used, the entire resistance must be inserted in the high lead; for a balanced input, the resistance should be divided equally between the two leads.

(2) As indicated in figure 5, a capacitor must be used in series with the test cable when the input circuit of the equipment under test is capacitive. The reactance of the capacitor must be much larger than 25 ohms at the test frequency.

(3) If the impedance of the equipment under test is resistive and approximately 50 ohms, a direct connection may be made between the signal generator and the equipment with Cord CG-55B/U. If Cord CG-55B/U is used in test set-ups similar to that described in (1) above, note that the output impedance of the cable is 50 ohms. Under these conditions, any resistance inserted for matching purposes must be equal to *R minus 50*.

(4) A special matching pad should generally be used for any test set-up at frequencies above 100 mc.

b. CONNECTION OF EXTERNAL MODULATION SOURCE. If sine-wave modulation at other than 400 or 1,000 cycles is required, or if pulse modulation is required, auxiliary equipment must be connected as described in (1) or (2) below.

(1) Connect a sine-wave oscillator (such as Audio Oscillator TS-382A/U) to the EXT. MOD. jack.

(2) Connect a pulse generator (such as Signal Generator TS-155/UP) to the pulse input jack.

Note. Leave the MODULATION selector and EXT. PULSE switches in the OFF positions until the output level has been set (par. 16).

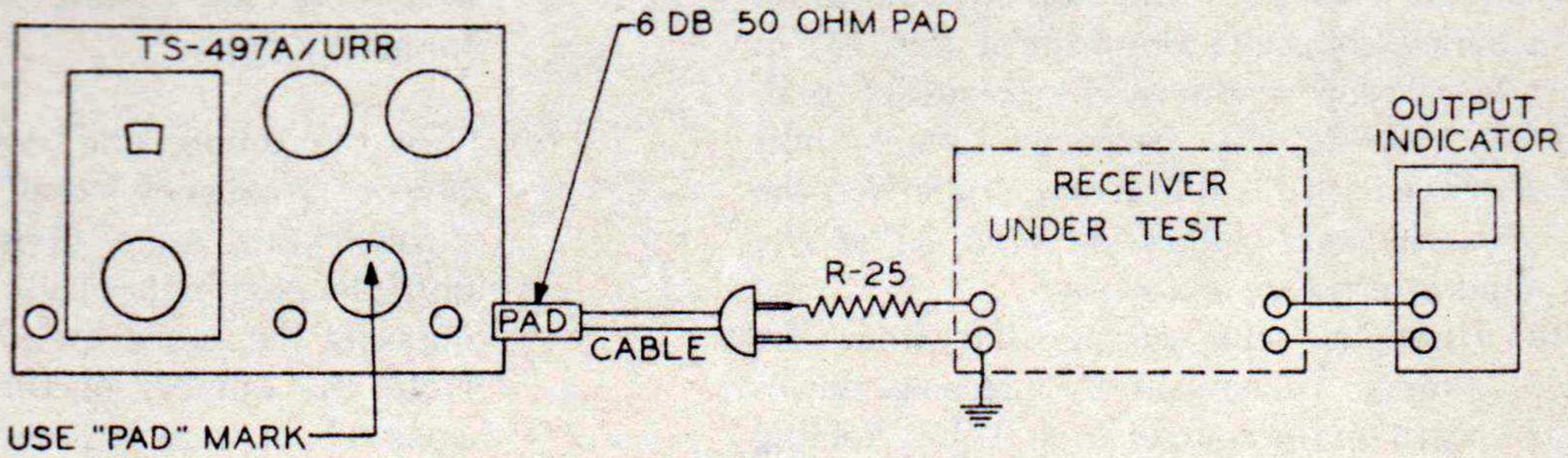
16. Operation

a. STARTING. Throw the POWER switch to ON. Allow a short period of time for the tubes to warm up. When accurate measurements are to be made, allow at least 15 minutes for warm-up time before completing the final tuning.

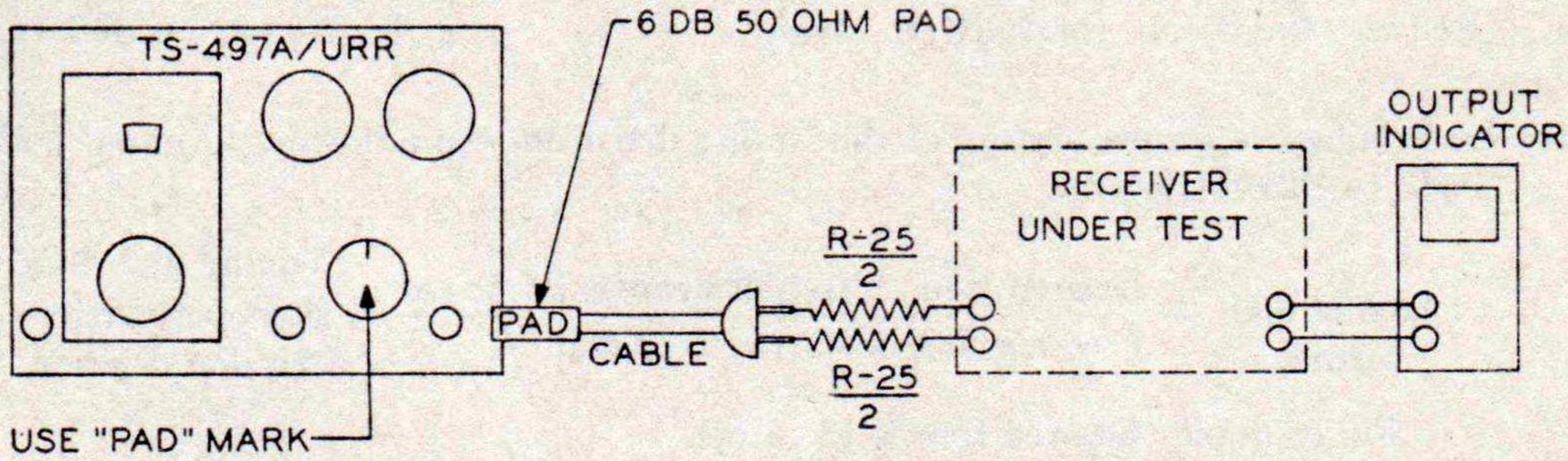
b. TUNING. Tuning the generator involves selecting a range and tuning within that range. Proceed as follows:

(1) Rotate the range knob until the desired frequency band appears in the dial window. Rock the range knob slightly to check the detent and to engage the desired frequency band coil contacts in position.

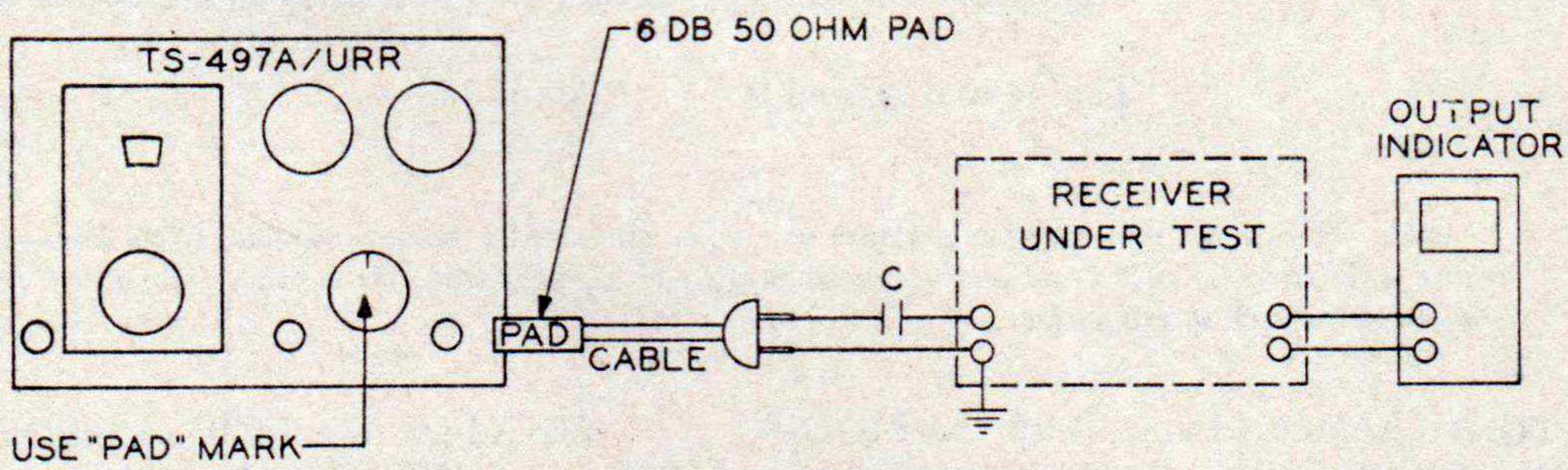
(2) To set the signal generator to any frequency represented by a calibration mark on the carrier frequency dial (par. 12), turn the



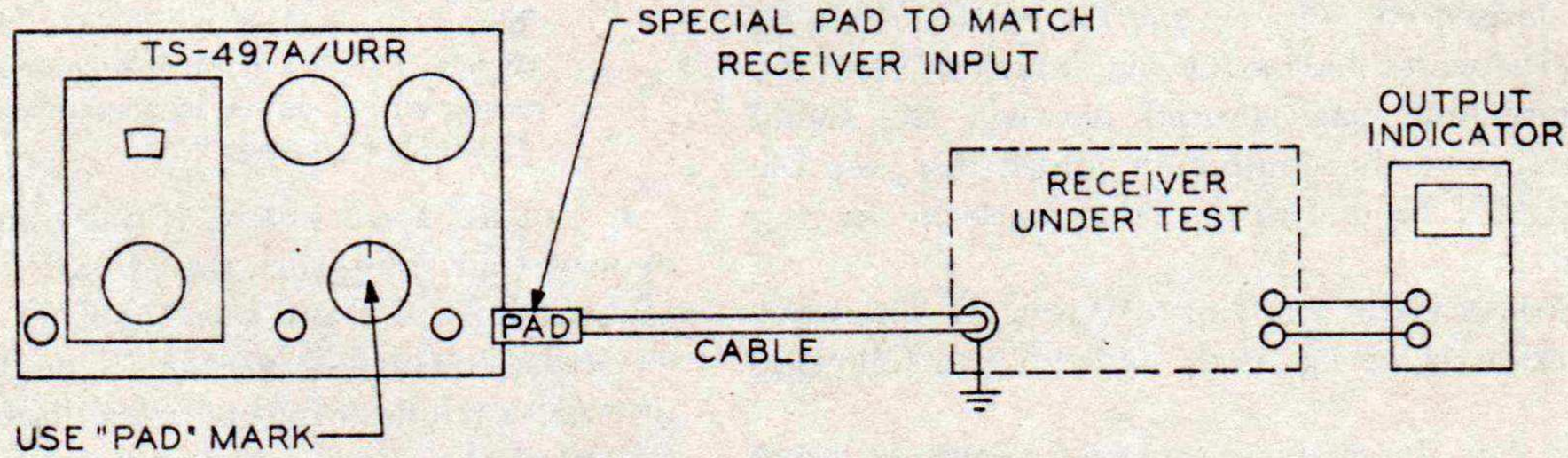
FOR UNBALANCED ANTENNA INPUTS AT FREQUENCIES BELOW 200 MC.
(R=RESISTANCE OF ANTENNA FROM WHICH RECEIVER IS DESIGNED TO WORK.)



FOR BALANCED ANTENNA INPUTS AT FREQUENCIES BELOW 200 MC.
(R=RESISTANCE OF ANTENNA FROM WHICH RECEIVER IS DESIGNED TO WORK.)



FOR SHORT, PURE CAPACITY ANTENNA AT FREQUENCIES BELOW 200 MC.
(X_C SHOULD BE MUCH GREATER THAN 25 OHMS.)



RECOMMENDED FOR FREQUENCIES ABOVE 100 MC.

TM 5030-5

Figure 5. Connections to equipment under test.

tuning dial until the desired calibration mark is opposite the fiducial (fig. 15) in the window of the carrier frequency dial.

(3) To tune to any frequency which falls between two calibrations, tune to the nearest lower calibration as in (2) above, and interpolate as follows:

(*a*) Disengage the tuning dial from the tuning mechanism by pressing downward on the control knob. While holding the knob down, rotate it until the zero calibration is opposite the white calibration mark (fig. 15) above the dial. Release the knob carefully to avoid disturbing the setting of the carrier frequency dial.

(*b*) Turn the tuning dial slowly until the carrier frequency dial has moved through one scale division, that is, until the next higher calibration mark is opposite the carrier-frequency fiducial. Note the number of tuning-dial divisions which were required for the one-division movement of the carrier frequency dial. Note also the frequency spacings between calibrations on the carrier frequency dial (par. 12).

(*c*) Determine the proper setting of the tuning dial from the following formula, and turn the dial back to this setting.

$$\text{Tuning dial setting} = \frac{\text{Desired freq} - \text{freq of nearest lower cal}}{\text{Freq spacing on carrier freq dial}} \times \begin{matrix}\text{Tuning dial divisions per carrier} \\ \text{freq dial division}\end{matrix}$$

For example: Desired freq is 13.15 mc.
Desired freq − freq of nearest lower cal is .15 mc.
Freq spacing on carrier freq dial is .2 mc.
Tuning dial divisions per carrier freq dial division are 20 (assumed).

$$\text{Tuning dial setting is } \frac{.15}{.20} \times 20 \text{ or } 15.$$

Note. The tuning dial rotation required to move the carrier frequency dial from one calibration to the next is different on each band and varies from one end of each band to the other. The above procedure must be followed for each interpolation.

c. SETTING CARRIER LEVEL. With the MODULATION selector switch in the OFF position, turn the ring fiducial until the pointer of the OUTPUT meter rests on the red line. Set the carrier output to the desired value by setting the MICROVOLTS dial to the white line on the ring fiducial. When the 6-db matching pad is used between the signal generator and the equipment under test, set the MICROVOLTS dial to the PAD mark on the ring fiducial.

d. MODULATING WITH SINE WAVE. If sine-wave modulation is to be used, perform the following steps:

(1) For sine-wave modulation at 400 or 1,000 cycles, set the MODULATION selector switch to either 400 or 1,000 cycles, as required.

(2) If external sine-wave modulation is to be used (par. 15*b*), set the MODULATION selector switch to the EXT. position.

(3) Adjust the MOD. knob until the PERCENT MODULATION meter indicates the desired degree of modulation.

Note. During the sine-wave modulation, the position of the pointer on the OUTPUT meter will change. This is a normal response to the changes in carrier output power accompanying modulation and it should be ignored.

e. PULSE MODULATION. If pulse modulation is to be used (par. 15*b*), turn the MODULATION selector switch to OFF and turn the EXT. PULSE knob clockwise to the ON position. This disconnects the internal modulator and permits direct pulse modulation of the carrier from an external pulse generator connected at the pulse input jack. Percentage modulation will not register on the PERCENT MODULATION meter.

Note. For detailed information on the calibration and operation of auxiliary equipment, refer to the technical manuals for the particular instruments.

17. Operation Under Unusual Conditions

If Signal Generator TS-497A/URR is required in performing tests under severe climatic conditions which prevail in tropical, arctic, or desert regions, or where excessive moisture, dust, or sand is present, the same precautions that apply to the equipment under test will apply to the signal generator. The manual covering the equipment under test tells how the equipment should be housed and gives methods of dustproofing, moistureproofing, ventilating, etc.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. ORGANIZATIONAL TOOLS AND EQUIPMENT

18. Tools and Materials

Organizational tools and materials required for the maintenance of Signal Generator TS-497A/URR are contained in Tool Equipment TE-41 and are listed in Department of the Army Supply Catalog SIG 6-TE-41. In addition to these tools, a 1-inch, open-end, flat wrench is required for removing the coil disk retaining nut in the oscillator coil disk assembly (fig. 17).

19. Special Tools Supplied

Four Allen wrenches, sizes No. 4, 6, 8 and 10 are supplied with the signal generator. These wrenches are located on the back of the power supply chassis (fig. 16).

Section II. PREVENTIVE MAINTENANCE SERVICE

20. 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 at a minimum. Preventive maintenance differs from trouble shooting and repair since its object is to prevent certain troubles from occurring See TM 38-650.

21. General Preventive Maintenance Techniques

a. Use No. 0000 sandpaper to remove corrosion.

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

c. If available, dry compressed air may be used at a line pressure not exceeding 60 pounds per square inch to remove dust from inaccessible places.

Caution: Be sure that both inner and outer shields of the carrier oscillator drum and the three filter covers are in place before applying air pressure. Do not direct the air stream at the attenuator tube (fig. 13).

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

22. Performing Preventive Maintenance

The preventive maintenance operations listed below should be performed by organizational personnel at the intervals indicated.

Caution: Signal Generator TS-497A/URR is a sensitive instrument designed for precision measurements. Use extreme caution in maintenance procedures. Careless removal of knobs, dials, covers, etc., may necessitate recalibration which can be accomplished only by skilled personnel and the use of special calibrating equipment. Do not attempt any replacements, except those outlined below:

WEEKLY.

1. Clean the exterior of the equipment.

2. Check the operation of the carrier frequency dial lamp. If further check of the equipment indicates that this lamp is burned out, refer to paragraph 47 before attempting to replace it or to clean the dial face. (DO NOT USE ANY LIQUIDS ON THE DIAL FACE.)

3. Check the dial knobs for ease in operation. Tighten any loose knobs by using the Allen wrenches (fig. 16) supplied for that purpose.

4. Check fuses and fuse holders for corrosion or cracks. Replace as necessary.

MONTHLY.

1. Disconnect the power cord from the a-c source.

2. Remove the 14 screws that secure the panel in the case. Slide the unit out of the case and rest it on the guard handles.

3. Remove the two runners on the base of the power supply. Remove the cover of the power supply chassis.

4. Make a visual inspection of the power supply chassis (fig. 13) for loose contacts, broken wires, dirt, or corrosion.

5. Check resistors for discoloration or other signs of overheating.

6. Wipe off the carrier oscillator drum if necessary, but do not remove the shields. Be extremely careful to avoid damage to the shields; even slight dents may cause serious leakage of the carrier.

7. Check MFP coatings for breaks. Retouch with a brush, if necessary.

8. Restore the cover and runners on the power supply chassis and turn the signal generator right side up. Check the vacuum tubes located on the power supply chassis (fig. 6) and replace them as necessary. Do not check V–11 which is located in the oscillator drum.

9. Clean the interior of the case and replace the signal generator in the case.

10. Reconnect the power and check for satisfactory operation (par. 14).

23. Lubrication

a. The attenuator tube is the only part of the signal generator which requires any lubrication. This is lubricated at the time of manufacture and should not require subsequent lubrication for at least 2 years. When lubrication is necessary, it should be performed at the same time that the dial cables are replaced (pars. 52 and 53). This procedure is advisable since a minimum of handling is recommended for the attenuator tube.

b. To lubricate, apply Grease, lubricating, special (GL) to the attenuator (inner) tube at a point near the open end of the outer tube (fig. 13).

Caution: Use grease sparingly.

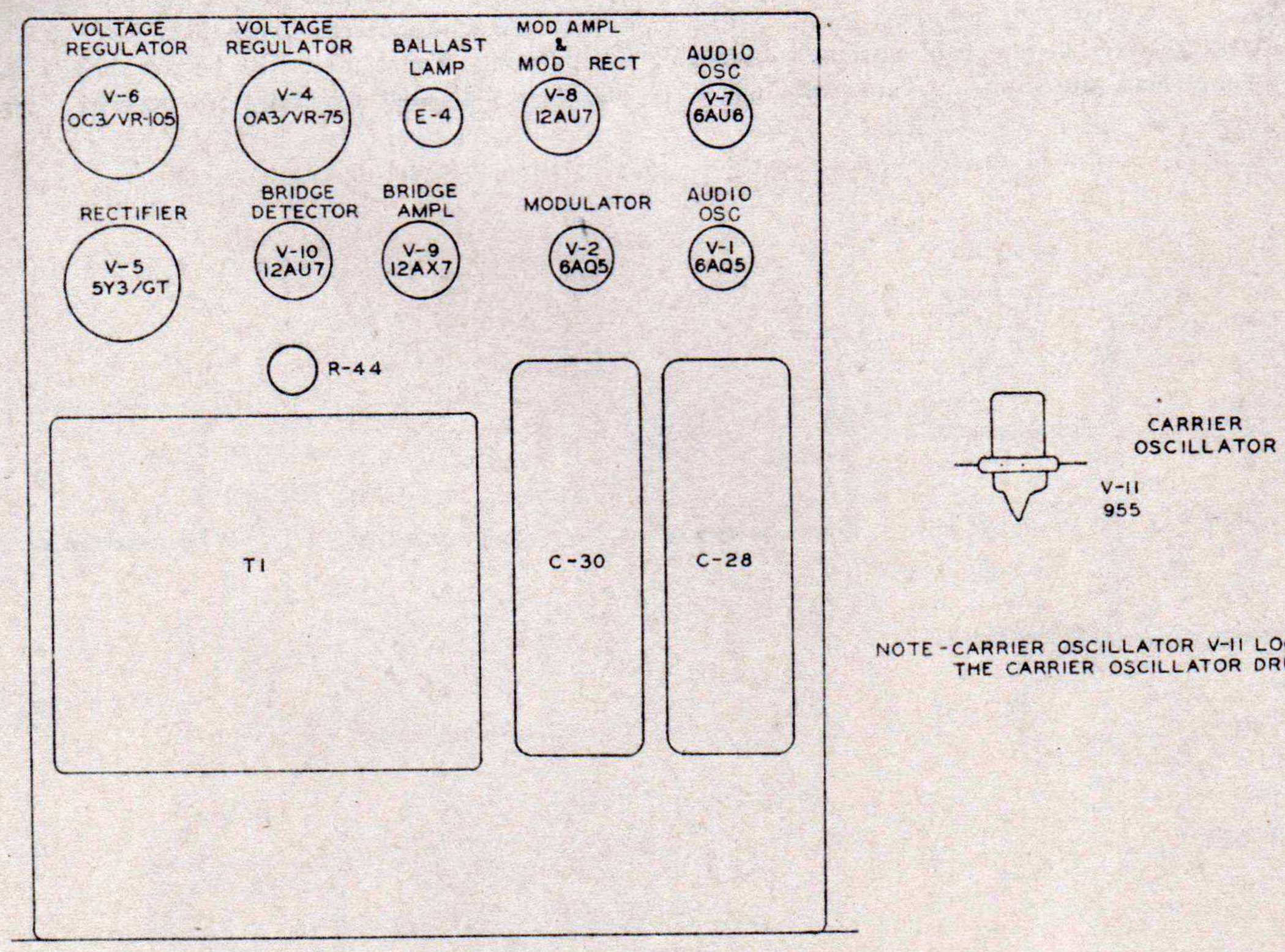


Figure 6. Tube location diagram.

Section III. WEATHERPROOFING

24. 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 moisture-proofing 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.

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 TB 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 and pay strict attention to all lubrication orders when operating equipment under conditions of extreme cold or heat.

25. 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, dry-cleaning (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 will be authorized and consistent with existing regulations. See TM 9-2851.

CHAPTER 4

THEORY OF SIGNAL GENERATOR TS-497A/URR

26. Block Diagram

Signal Generator TS–497A/URR consists essentially of a carrier frequency oscillator to provide r-f test signals covering a range of 2 to 400 mc. Functional diagrams for each stage of the signal generator are shown in figure 7. A complete schematic diagram is shown in figure 20.

a. AUDIO OSCILLATOR. The audio oscillator generates a sine-wave voltage of either 400 or 1,000 cycles for amplitude-modulation of the carrier oscillator. Either of these signals may be supplied to the modulator through a selector switch.

b. MODULATOR. The modulator circuit amplifies the output of the audio oscillator or an external audio oscillator and uses the amplified signal to modulate the plate voltage of the carrier oscillator. The metering portion of the circuit indicates the output of the modulator in terms of percent modulation.

c. CARRIER OSCILLATOR. The carrier oscillator generates an r-f signal between 2 and 400 mc. Six bands (par. 4) are used to cover the frequency range. The output of the carrier oscillator is metered and coupled to a CARRIER OUTPUT jack through an attenuator. The attenuator is of the mutual inductance type and is commonly referred to as a *piston attenuator*.

d. OUTPUT METERING SYSTEM.

(1) This circuit includes a barretter bridge, an amplifier, a detector, and an OUTPUT meter. The term *barretter* implies a power sensitive device. In this particular application, the bridge is sensitive to the r-f power developed in the output circuit of the carrier oscillator.

(2) When the power that is coupled to the bridge is sufficient to just balance the bridge, there is no 60-cycle output from the bridge and the pointer of the OUTPUT meter deflects to the red center line. The meter reading indicates that the calibrations of the MICROVOLTS dial (output attenuator) are a true indication of the carrier output voltage. (The correlation

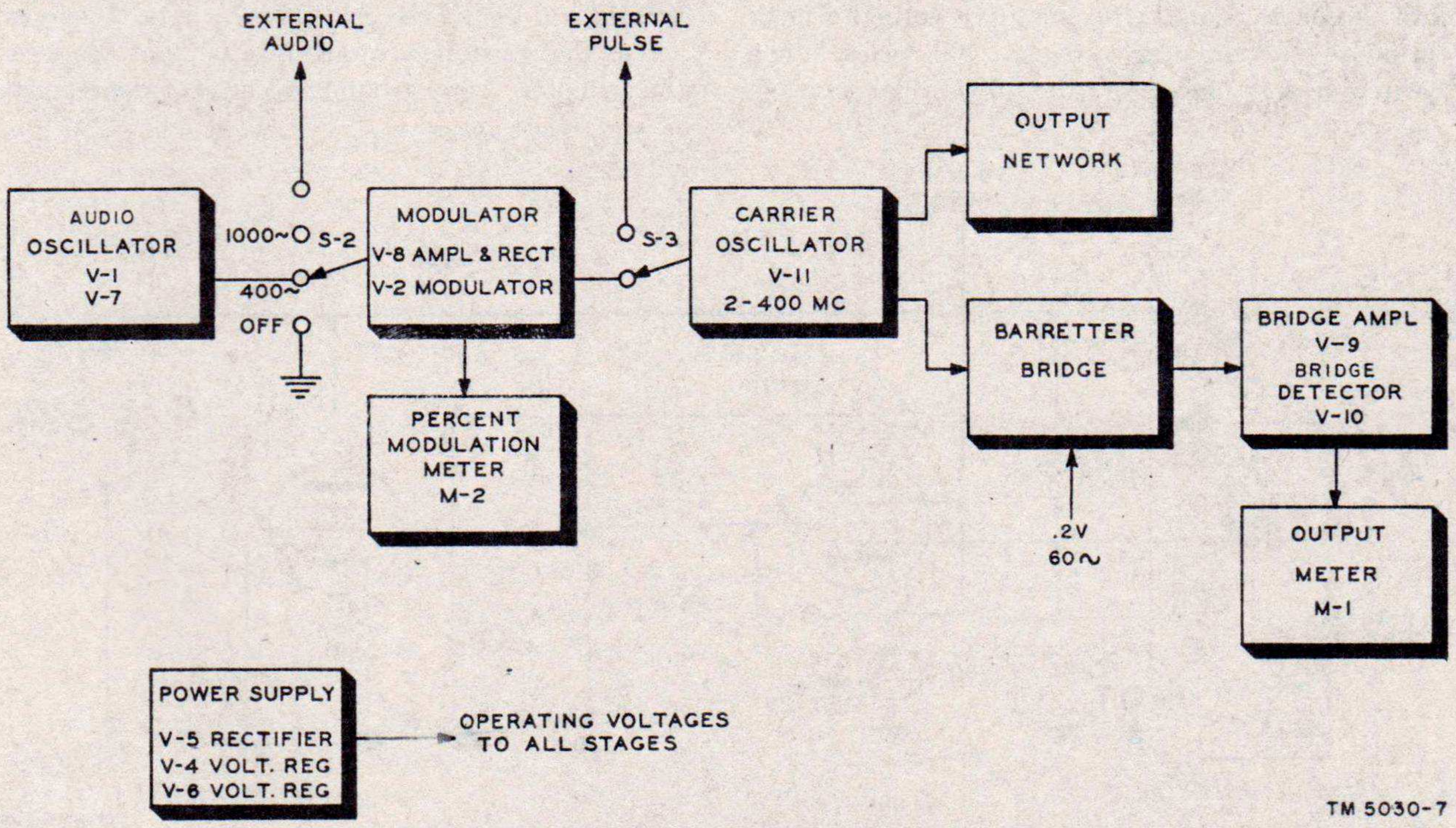


Figure 7. Signal Generator TS–497A/URR, block diagram.

between the OUTPUT meter reading and the reading of the MICROVOLTS dial depends on the calibration procedure described in paragraph 59.)

(3) An unbalance in the bridge circuit results in a 60-cycle output which is amplified and detected and registered on the OUTPUT meter as a deviation from the center scale (red line) reading. Under these conditions, the reading of the MICROVOLTS dial is not a true indication of the voltage output from the carrier oscillator.

27. Audio Oscillator
(fig. 8)

a. A resistance-capacitance type oscillator is used to generate a 400- or 1,000-cycle sine-wave modulating voltage for the carrier oscillator. The oscillator consists essentially of a two-stage resistance coupled amplifier (V–7 and V–1) with both regenerative and degenerative feedback from the second stage to the first stage.

b. When MODULATION selector switch S–2 is in the 400-cycle position, regenerative voltage is coupled from the plate of V–1 to the grid of V–7 through capacitor C–34 and the frequency-determining elements of the circuit (capacitor C–20, resistor R–23, resistor R–24, and capacitor C–21). The values of the frequency-determining elements are chosen so that the regenerative voltage will be in phase with the grid voltage at 400 cycles. When switch S–2 is placed in the 1,000-cycle position, resistors R–23 and R–24 are paralleled by resistors R–25 and R–26, respectively, and the regeneration occurs at 1,000 cycles.

c. Degenerative voltage is coupled from the plate of V–1 to the cathode of V–7 through capacitor C–34 and resistor R–31. E–4 is a 3-watt lamp which functions as a variable resistance to control the amplitude of output from the oscillator. If the amplitude tends to rise, the current through E–4 increases, raising the resistance of the lamp and causing increased degeneration. The increased degeneration offsets the tendency of the oscillator output to rise. Conversely, a tendency for the oscillator output to decrease will cause decreased degeneration and a corresponding increase in amplification through V–7.

d. Plate and screen voltages for V–7 are obtained from the 180-volt output of the power supply, the plate voltage through load resistor R–45, and the screen voltage through dropping resistor R–27. Capacitor C–22 bypasses the screen to the cathode. Plate voltage for V–1 is obtained from the 300-volt output of the power supply through parallel load resistors R–8 and R–28. The 180-volt output of the power supply is used as screen voltage.

e. Assuming that there is some output from V–7 (regardless of the amplitude or frequency), a signal will be developed across grid resistor R–29 and will be amplified by V–1. Regenerative feedback from the plate of V–1 to the grid of V–7 will be developed across the resistance-capacitance network between the grid of V–7 and ground. Because of the reactive

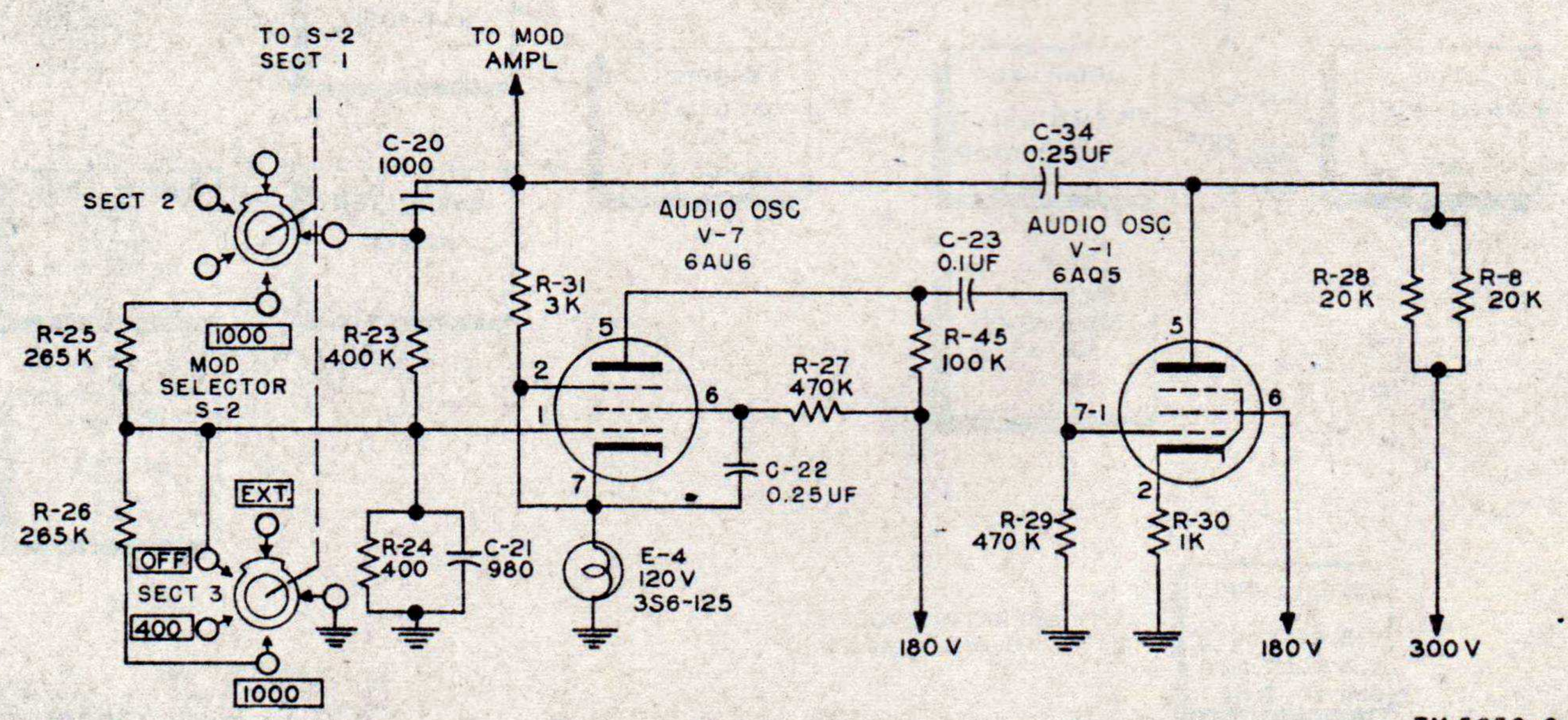


Figure 8. Audio oscillator, functional diagram.

nature of capacitors C–20 and C–21, the phase of the regenerative voltage, relative to the voltage at the grid of V–7, will vary with frequency. In-phase regeneration will occur at either 400 or 1,000 cycles, depending on the position of S–2. Degenerative feedback is independent of frequency, and minimizes harmonic distortion, in addition to maintaining a constant output.

f. The output from V–1 is developed across paralleled resistors R–8 and R–28. Capacitor C–34 and another section on MODULATION selector switch S–2 couple the output to the modulator section (fig. 20). When switch S–2 is in the OFF or EXT. MOD. position, the audio oscillator is inoperative.

28. Modulator (fig. 9)

The modulator circuit amplifies the sine-wave voltage generated by the internal audio oscillator or an external oscillator (par. 29), and impresses this energy upon the carrier plate supply. The circuit consists of a resistance-coupled voltage amplifier, a power amplifier, and a metering circuit.

a. The modulator circuit obtains its input voltage from the internal audio oscillator through the 400 or 1000 position of MODULATION selector switch S–2, depending on whether 400- or 1,000-cycle modulation is desired. The arm of the selector switch applies the voltage to modulation volume control R–33 (MOD.). R–33 permits adjusting the percentage of modulation from 0 to 30 percent. The voltage across R–33 is applied to the grid of the amplifier section of V–8B through capacitor C–33 which provides d-c (direct-current) isolation. The grid is returned through grid leak resistor R–46 to the junction of cathode resistors R–34 and R–35. Fixed bias for the amplifier is developed across resistor R–34 by the bleeder current which flows from ground through resistors R–35, R–34, and R–36, and modulation choke L–10 to B plus.

b. Plate voltage for V–8B is obtained from the 180-volt output of the power supply through load resistor R–32. The output of V–8B is coupled to the grid of modulator output tube V–2 through blocking capacitor C–26. The grid of V–2 is returned to ground through grid leak resistor R–37. Bias for tube V–2 is obtained by the voltage drop across cathode resistor R–38. Screen voltage is obtained from the 180-volt tap on the power supply. Plate voltage for V–2 and carrier oscillator tube V–11 (par. 30) are obtained from the 180-volt source through modulation choke L–10. Since the voltage across the choke varies in accordance with the sine-wave voltage at the grid of V–2, the plate voltage of the carrier oscillator will vary at the same audio frequency.

c. A portion of the output of V–2 is fed back through R–36 to the cathode of V–8B. This voltage is of the proper phase to supply a negative feedback which reduces the amount of distortion in the modulator.

d. Another portion of the output of V–2 is fed through blocking capacitor C–27 and voltage dividers R–39 and R–40 to the plate of V–8A. The plate and grid of V–8A are connected together so that the tube functions as a diode rectifier. PERCENT MODULATION meter M–2 is connected in the cathode of V–8A to indicate the amount of rectified audio-frequency voltage. When there is no audio variation at the plate of V–8A, the tube should be nonconductive and the meter should read zero. However, the contact potential of the tube would cause the tube to conduct (and the meter to read) without any input to the tube. To overcome an erroneous reading of this nature, a fixed bias is applied to the cathode from the junction of resistors R–42 and R–43 in the voltage divider between the positive 180-volt supply and ground. Resistor R–43 is a variable zero-set control which is adjusted (par. 55) so that V–8A is just cut off when there is no audio output.

29. External Modulation

a. Sine-Wave Modulation. Sine-wave modulation at any frequency between 50 and 10,000 cycles can be obtained by connecting an external audio oscillator to the EXT. MOD. jack and by turning MODULATION selector switch S–2 to the EXT. position. Under these conditions, the modulation circuit obtains its input voltage from the external generator through EXT. MOD. jack J–1, capacitor C–25, and the EXT. position contacts of MODULATION selector switch S–2.

b. Pulse Modulation. When EXT. PULSE switch S–3 is turned to the ON position, the plate circuit of the carrier oscillator is switched from the output of the modulator circuit to pulse input jack J–2 through resistor R–13 and capacitor C–7. Since V–11 is then deprived of its plate voltage, it will not oscillate unless an external supply is connected to the pulse input jack. (The requirements of the external supply are stated in paragraph 3*c*.)

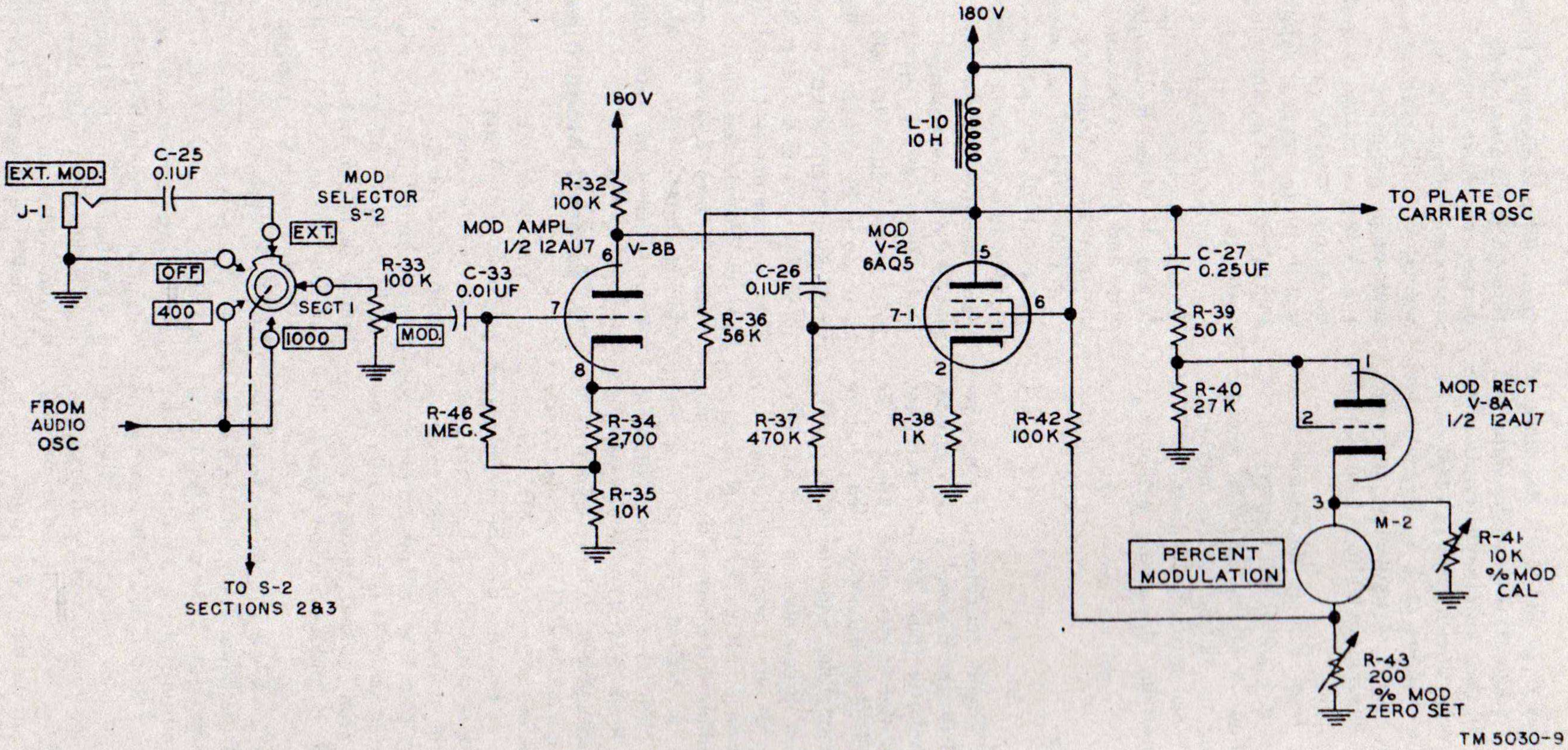


Figure 9. Sine-wave modulator, functional diagram.

30. Carrier Oscillator (fig. 10)

The carrier oscillator section of the signal generator uses an acorn type triode (V–11) in a modified Hartley plate-modulated circuit.

a. The oscillator tank includes one of six r-f coils (L–6A through L–6F) and a split-stator tuning capacitor (C–12). Band switching is controlled by the range knob and is accomplished by rotating a disk on which the six r-f coils are mounted (fig. 17). Three contacts on each coil assembly mate with three fixed contacts on the capacitor assembly. Detents on the edge of the coil disk engage a spring-loaded detent roller to position accurately the coil assembly for the desired frequency band. Plate voltage is supplied to the oscillator through the center contact (center tap of the coil assembly), and on bands C through F, through dropping resistor R–9C, R–9D, R–9E or R–9F. The resistor is selected with the coil assembly for a particular band.

b. Capacitor C–12 tunes the oscillator within each frequency band and is coupled mechanically to the carrier frequency dial. The carrier frequency dial is rotated by the tuning dial, which is pivoted to disengage when pressed downward. This permits resetting of the tuning dial zero to correspond with any desired frequency and is useful for interpolating between frequency calibrations (par. 16). It is impossible to force the tuning mechanism when the stop is reached, since the tuning dial will automatically jump down and slip. The resulting jumpy action indicates that the usable portion of the range has been passed. No moving contacts are used in the tuning capacitor and the rotor is insulated from ground to eliminate tuning noise. Spring loading of the tuning reduction gears provides smooth operation with a minimum of dial backlash.

c. An antiresonant circuit consisting of a detuning rod and resistor R–47 is located in the carrier oscillator drum shield (fig. 17). This serves to detune the oscillator coils not in use.

d. The modulated voltage from V–2 in the modulator circuit (or the output of an external pulse generator) is fed to the plate of V–11. Leakage from the carrier oscillator to the plate supply is prevented by a three-section filter comprised of choke coils L–3, L–4 and L–5, resistors R–12 and R–14, and bypass capacitors C–5, C–6, C–8 and C–9. Each section of this filter is isolated within a separate shield. R-f chokes L–3 and L–4 are in a two-section can; L–5 consists of three separate r-f choke coils wound on ceramic coil forms which are located between the inner and the outer shields (fig. 16).

e. The filament supply of V–11 is filtered in the same manner as the plate supply. The three-section filter is comprised of choke coils L–7, L–8 and L–9 and bypass capacitors C–13, C–14, C–15, C–16, C–31, and C–32. R-f chokes L–7 and L–8 are in a two-section can and L–9, a single-section r-f choke wound on a polystyrene coil form, is located between the inner and outer shields. Resistor R–11 provides cathode bias in addition to minimizing the effects of cathode lead inductance. Resistor R–10 provides grid-leak bias.

f. Output from the oscillator tank is supplied to CARRIER OUTPUT jack J–3 and to an output metering circuit through a piston attenuator (par. 31).

31. Carrier Output Circuit (figs. 10 and 13)

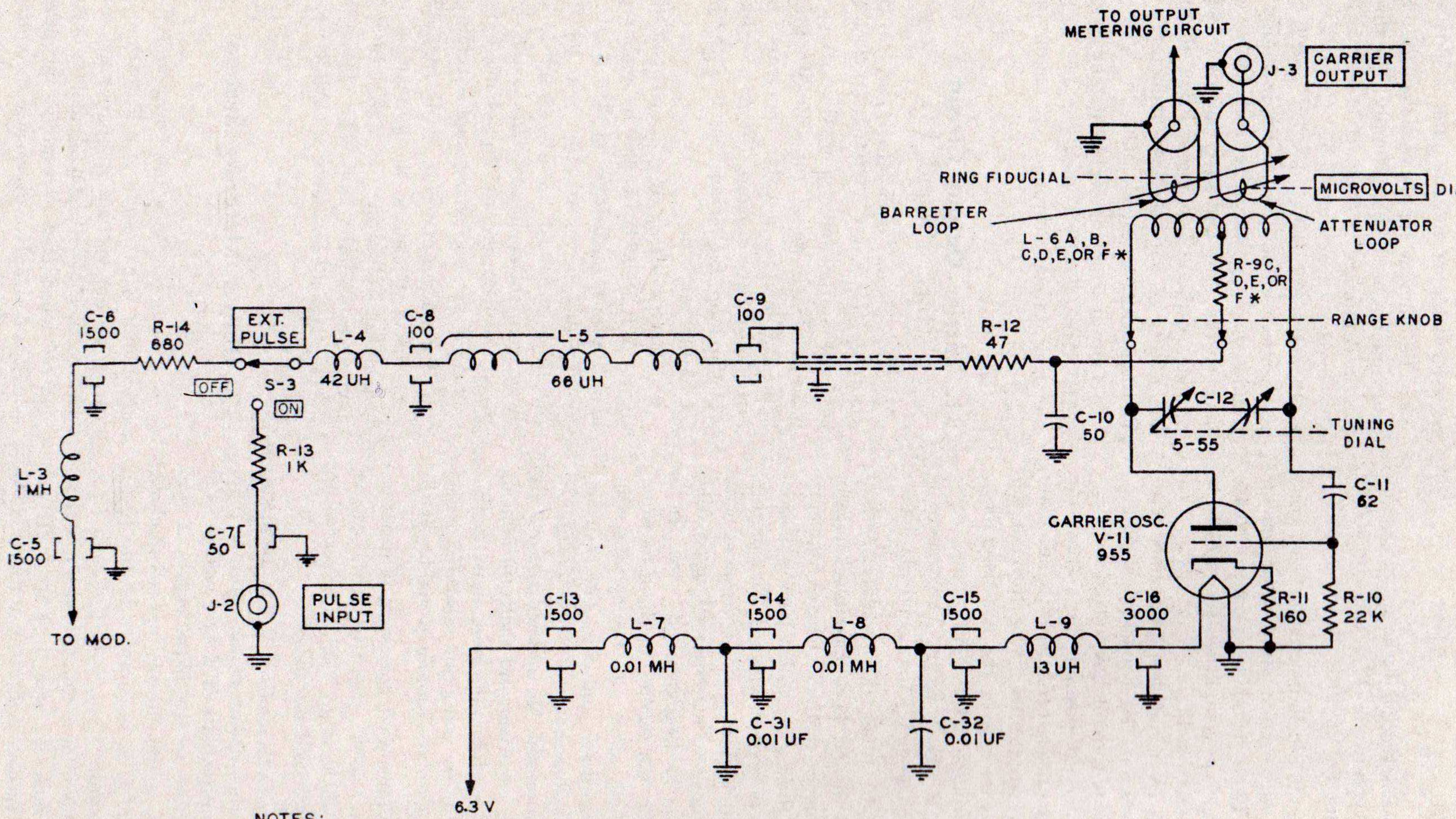
a. The piston attenuator used to couple the oscillator output to CARRIER OUTPUT jack J–3 is of the mutual inductance type. It consists of a fixed grounded metal tube (fixed outer tube in figure 13) and a movable concentric inner tube (attenuator tube in figure 13) on which is mounted a pickup loop; the pickup loop is in the field of the oscillator tank coil.

b. The attenuator tube is mechanically coupled to the MICROVOLTS dial by means of a cable looped around a capstan (fig. 13). As the MICROVOLTS dial is turned, the loop on the end of the tube is moved linearly closer to or farther away from the oscillator coil. As the distance between the loop and the coil changes linearly, the voltage in the loop changes logarithmically.

c. The output metering circuit (par. 32) provides a means of measuring the voltage induced in the loop and of calibrating the MICROVOLTS dial for any position of the loop. The voltage induced in the loop is made available at CARRIER OUTPUT jack J–3.

32. Output Metering System (fig. 11)

a. GENERAL. Since the linear movement of the attenuator loop results in a logarithmic change in carrier output voltage, a logarithmic scale may be used on the MICROVOLTS dial. If one calibration can be determined accurately, the others will be equally reliable. However, since the voltage induced



NOTES:

1. *L-6A,B,C,D,E OR F IS SELECTED BY THE RANGE KNOB ON BANDS A, C,D,E, OR F RESPECTIVELY. R-9C,D,E OR F IS SELECTED BY THE RANGE KNOB ON BAND C,D,E, OR F. NO RESISTOR IS USED ON BANDS A AND B.

TM 5030-10

Figure 10. Carrier oscillator, functional diagram.

in the attenuator loop at any one position may vary from band to band and from frequency to frequency within a single band, a single fixed calibration cannot be used; it is necessary to establish the accuracy of calibration at each frequency.

b. CIRCUIT ELEMENTS. The essential elements of the metering circuit include a second pickup coil in the field of the oscillator coil, a bridge circuit which is balanced or unbalanced by the voltage induced in the second loop, and an amplifier, a detector, and a meter to indicate the amplitude and phase of the bridge output.

c. MECHANICS. The second pickup loop is mounted on another sliding tube which is concentric with the attenuator and the fixed outer tubes. Because the power sensitivity of the circuit is the basis for measurement, the term *barretter* is used to describe most of the essential elements, that is, barretter loop, barretter tube, and barretter bridge. The ring fiducial on the front panel controls the position of the barretter tube and thus, the position of the barretter loop relative to the oscillator coil. The mechanical coupling between the barretter loop and the ring fiducial is similar to the coupling used for the attenuator loop and the MICROVOLTS dial (par. 31).

d. BASIS FOR MEASUREMENT. Since the attenuator and barretter loops move linearly with respect to each other, as well as with respect to the oscillator coil, the voltage induced in the attenuator loop may be determined for any position of the MICROVOLTS dial if the barretter loop output is known and the relative position of the two loops is known. The barretter loop output is supplied to a power sensitive barretter bridge whose initial balance depends on an absolute r-f level of .1 volt in the barretter loop. Thus, by balancing the bridge with the ring fiducial (setting the position of the barretter loop) and adjusting the MICROVOLTS dial (setting the position of the attenuator loop) with reference to the ring fiducial, it is possible to calibrate the carrier output voltage. To establish the correct reference mark on the ring fiducial, it is necessary to calibrate the equipment with an external bridge (par. 59).

e. BARRETTER BRIDGE. The barretter bridge is a conventional bridge circuit operating on 60-cycle voltage, with the exception that *bolometer* elements are used in two of its arms. The bolometers are thermal resistors with positive temperature coefficients, and are contained in small evacuated glass envelopes. The resistance of the elements changes with extremely small changes in current and ambient temperature. In the bridge circuit, one of the bolometer elements is coupled to the barretter loop so that its resistance depends on the current in the barretter loop. The other bolometer is used as a compensating device in another arm of the bridge so that temperature and 60-cycle current changes will have the same effect on all sections of the bridge. Ordinarily the bridge is operated in a balanced condition, and an unbalanced condition should result only from a change of current in the barretter loop. For this reason, the two bolometer elements must be matched. The four arms of the bridge are indicated in figure 11 and referred to in the following analysis by the letters A, B, C, and D.

(1) Arm A contains the measuring bolometer assembly R–48 and the barretter filter. (The complete filtering circuit is shown in the over-all schematic diagram, figure 20; only those elements essential to an understanding of the bridge are shown in figure 11.) Bolometer assembly R–48 includes a 60-cycle bypass capacitor (A, fig. 20), the bolometer element (B, fig. 20), and a resistive load (C, fig. 20) to terminate the coaxial line which couples the barretter loop to the bolometer element.

(2) Arm B consists of resistor R–3 and compensating bolometer R–49.

(3) Arm C contains R–4 and arm D contains R–6. Potentiometer R–5 is common to arms C and D and provides a means of balancing the bridge.

(4) Driving voltage for the bridge is supplied by a .2–volt winding on transformer T–1. Assuming that the resistance of the bolometer elements is constant, or that equal changes are occurring in each element. the bridge may be balanced to the 60-cycle voltage input by potentiometer R–5 so that there is no output to the bridge amplifier stage, V–9. During calibration of the equipment (par. 59), the bridge is balanced with an r-f potential of .1 volt across the barretter loop, a known potential across the attenuator loop, and the MICROVOLTS dial set so that the calibration for the known potential is opposite a reference mark on the ring fiducial. The calibrations of the MICROVOLTS dial are reliable indications of the carrier output, provided the bridge is balanced

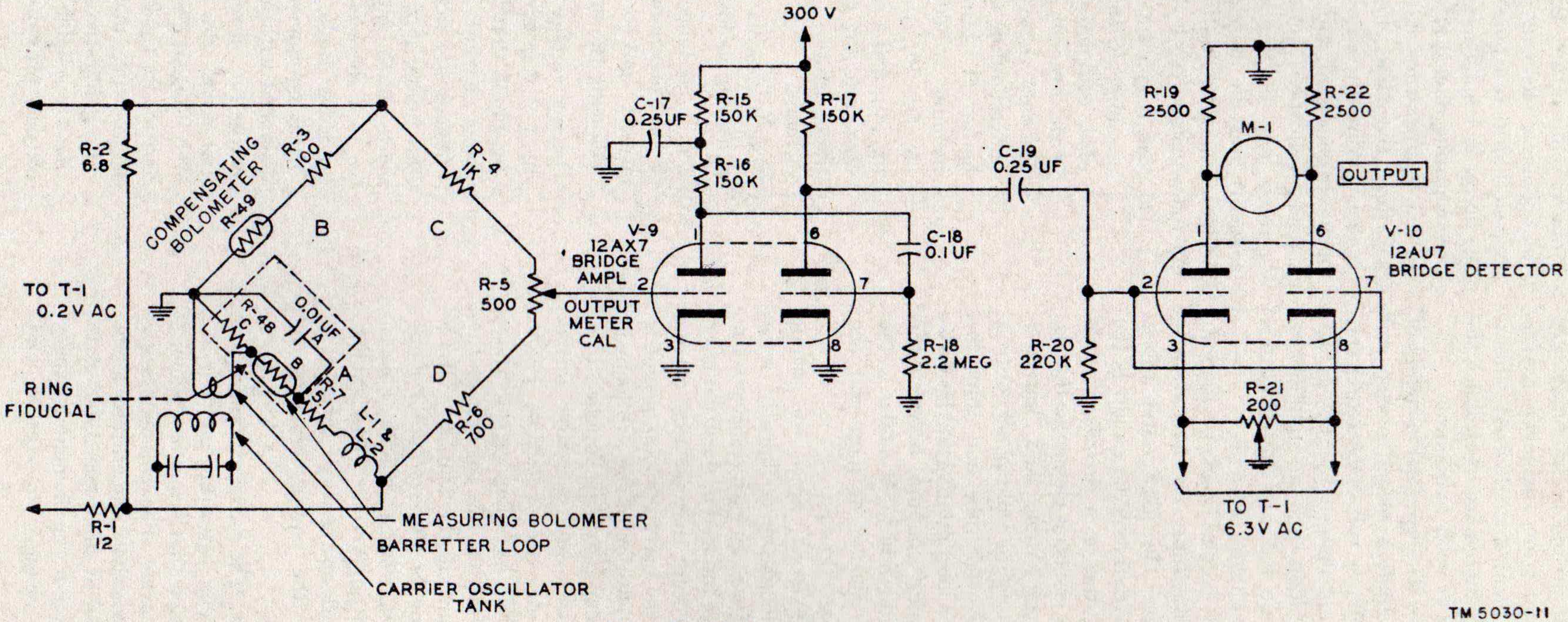


Figure 11. Carrier output metering system.

and the MICROVOLTS dial is moved relative to the reference mark.

Note. Any change in the setting of potentiometer R–5 or replacement of bridge components will necessitate recalibration by means of an external barretter bridge (par. 59).

(5) Any variation in the level of r-f power supplied to the measuring bolometer (above or below the .1-volt level) varies the resistance in arm A of the bridge and causes an unbalanced condition. This unbalance, in turn, causes a portion of the 60-cycle driving voltage to be applied to the grid of the bridge amplifier, V–9.

f. BRIDGE AMPLIFIER. A two-stage circuit uses two sections of a type 12AX7 dual triode tube, V-9, to amplify the a-c output from the barretter bridge. The output of the first stage is developed across resistor R–16 and is coupled to the grid of the second stage through capacitor C–18. A d-c grid return for the second stage is provided by R–18. Output from the second stage is coupled to the bridge detector through capacitor C–19. Plate voltage for the amplifier is obtained from the 300-volt output of the power supply; it is supplied through dropping resistor R–15 and load resistor R–16 to the first stage, and through load resistor R–17 to the second stage. Capacitor C–17 provides a low impedance ground return for the a-c signal.

g. BRIDGE DETECTOR. A type 12AU7 dual triode tube, V–10, is used in a detector circuit which is sensitive to the phase and amplitude of the barretter bridge output. Circuit details are given below.

(1) A 6.3-volt a-c potential is supplied to the cathodes of the stage, each cathode being driven 180° out of phase with respect to the other. The two grids are connected together and returned to ground through resistor R–20. Each plate is returned to ground through two 2,500-ohm resistors (R–19 and R–22), and OUTPUT meter M–1 is connected between the two plates.

(2) Potentiometer R–21 is connected between the cathodes to provide a means of balancing the circuit when there is no input to the stage. When a proper balance is obtained, each section of the stage conducts an equal amount of current over 1 cycle, the two plates are at the same potential, and no current flows through the meter.

(3) The meter has a d-c movement and deflects to the left or the right of a center-scale red line, depending on the direction of current flow through the meter. When there is output from V–9, because of an unbalanced barretter bridge, both grids of the detector are excited in phase. The combination of the in-phase grid excitation and the out-of-phase cathode excitation then results in a difference in current through each section of the tube. The difference in current results in a potential difference between the two plates and across the meter, with a resultant current flow through the meter. The direction and amount of deflection depends on the direction and the amount of unbalance on the barretter bridge.

(4) The barretter bridge is a power-operated device which corresponds to rms (root mean square) values. Therefore, the increase in power which accompanies amplitude-modulation will unbalance the bridge and cause deflection on the OUTPUT meter. However, the subsequent deflections under the modulated condition can be ignored, provided the bridge is balanced with the MODULATION selector switch set to OFF. The average value of output is not affected by the modulation.

33. Power Supply (fig. 12)

a. The a-c voltage required for operation is supplied from an external source through fuse F–1 and POWER switch S–1, to the primary winding of transformer T–1. Transformer T–1 has five secondary windings. A 6,3-volt secondary winding steps down the a-c line voltage for the filaments of dial lamp E–1 and all tubes except V–5. A 5-volt winding supplies the filament voltage to rectifier tube V–5. An h-v (high-voltage) winding steps up the a-c line voltage and is connected to the two plates of V–5. This tube rectifies the a-c voltage to a pulsating d-c which is filtered by capacitors C–28 and C–30, and choke L–11. A 300-volt d-c output from the filter is supplied to the plates of V–1 and V–9.

b. Two voltage regulator tubes (V–4 in series with V–6) in conjunction with current-limiting resistor R–44 regulate a 180-volt supply. This

supplies the plates of V–2, V–7, and V–11, the screens of V–1, V–2, and V–7, the plate (pin 6) of V–8, and the cathode bleeder circuit of the modulation amplifier section of V–8. Voltage regulator tubes V–4 and V–6 are wired in such a way that removal of either one will cut off the entire plate supply by opening the connection between the rectifier and the filter.

c. A second 6.3-volt winding on T–1 supplies voltage to the cathodes of bridge detector tube V–10. A .2-volt winding supplies driving voltage for the barretter bridge.

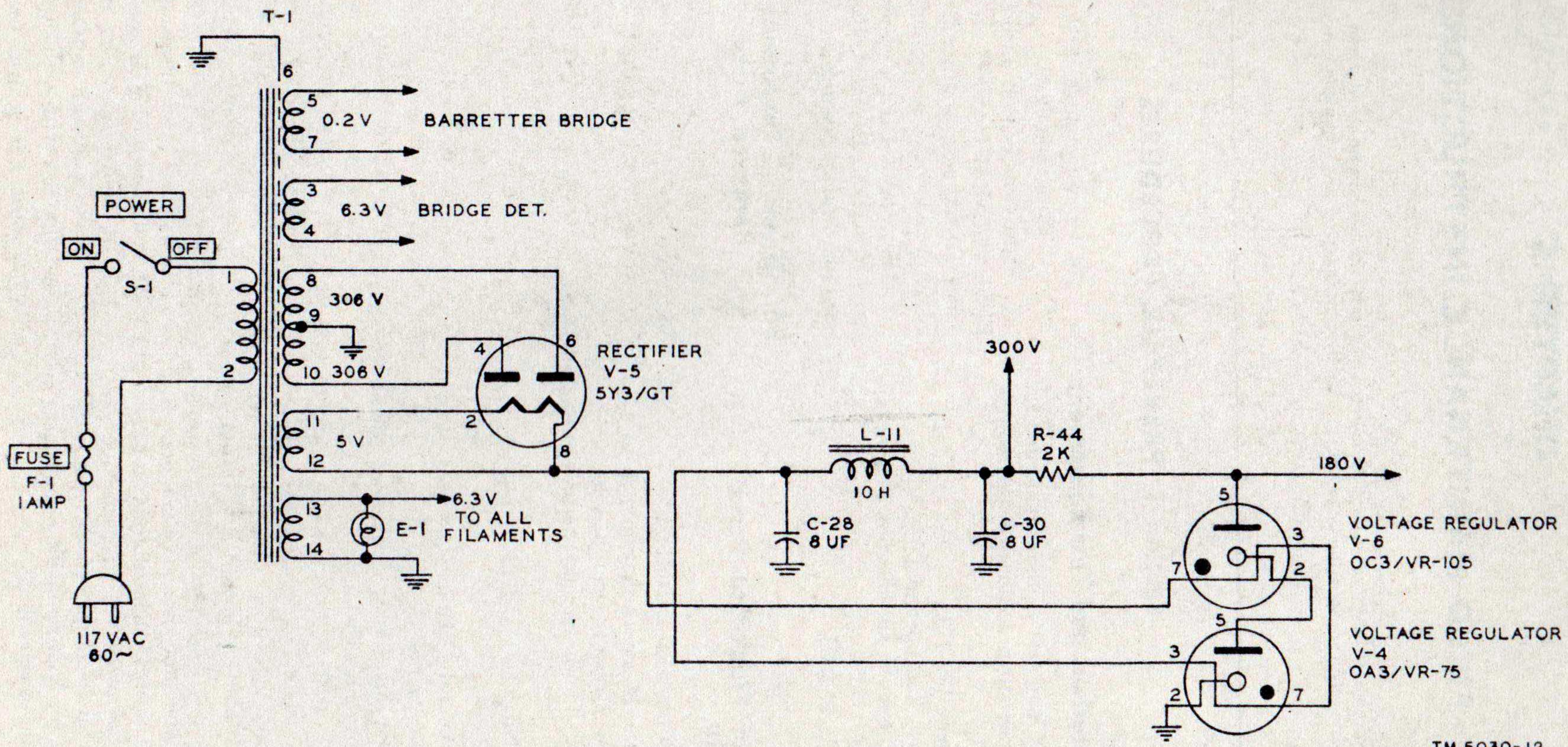


Figure 12. Power supply, functional diagram.

CHAPTER 5

FIELD MAINTENANCE INSTRUCTIONS

Note. This chapter contains information for field maintenance personnel. 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. PREREPAIR PROCEDURES

34. Tools, Materials, and Test Equipment

Tools, materials, and test equipment needed for performing the prerepair procedures in this section are listed below:

Tool Equipment TE–113.
Wrench, 1-inch, flat, open end.
Solvent (SD), Federal specification P–S–661a.
Tube Tester I–177.
Multimeter TS–352/U.
Crocus cloth.

35. Removal of Pluck-Out Parts (fig. 16)

a. Removing Tubes and Lamp E–4.

(1) Remove the 14 screws that hold the panel in the case. Grasp the pull handles on the panel and slide the signal generator out of the case.

(2) Unscrew lamp E–4 and lift it out of the socket.

(3) Remove the tube clamp that holds V–4 and V–6 in position.

(4) Remove the tube shields by pushing them down and turning them counterclockwise.

(5) Using Tube Puller TL–201, remove all of the tubes located on the power supply chassis. Do not rock the tube if it can be removed by a direct upward pull. If it does not release readily, rock it *gently* to avoid spreading the tube prongs or contacts of the socket. Label each tube as it is removed (*especially V–8*) to assure its replacement in its proper socket. (Any replacement for V–8 requires special aging as noted in paragraph 55.)

(6) Do not remove V–11. For replacement see paragraph 49.

b. Removing Fuses. Two fuse holders, labeled FUSE and SPARE FUSE, are located on the front panel. Turn the cap counterclockwise. The fuse will be extracted with the fuse-holder cap.

c. Dial Lamp. Do not remove the dial lamp unless it requires replacement. If replacement is necessary, follow the procedure outlined in paragraph 47.

36. Cleaning, Inspecting, and Testing Removed Parts

a. Cleaning, Inspecting, and Testing Tubes and Lamp E–4.

(1) *Cleaning.* Clean the tubes with a cloth moistened with solvent (SD); if necessary, clean the prongs with crocus cloth.

(2) *Inspecting.* Inspect the tubes for cracks in the glass and the base and for bent or broken prongs.

(3) *Testing.* Check E–4 with an ohmmeter. Resistance should be between 500 and 1,000 ohms. Note that the resistance increases as the filament warms up. Use the tube tester to test the tubes for short circuits, leakage, and proper emission.

b. Inspecting, Cleaning, and Testing Fuses.

(1) *Inspecting.* Inspect fuse ends for evidence of burning, corrosion, and looseness.

(2) *Cleaning.* Clean fuse ends with emery cloth and wipe with a clean cloth. If a file is used to remove deep pits, use crocus cloth to leave a smooth contact surface and then wipe dry with a clean cloth.

(3) *Testing.* Check fuses for continuity.

37. Cleaning and Inspecting Chassis Assembly

a. CLEANING. Rest the signal generator on the guard handles. Remove the two runners and the cover on the base of the power supply chassis. Remove loose dirt and dust from the power supply with a brush or blower. Be extremely careful when cleaning to prevent hitting the attenuator tube or cable assembly. Remove dirt and grease which adhere to the chassis or parts with a brush or cloth moistened with solvent (SD). Do not remove the oscillator drum shields or filter cover when cleaning the power supply chassis.

b. INSPECTING. After the chassis has been carefully cleaned, make a visual inspection of the parts and wiring for rust, corrosion, loose connections, frayed or burned insulation, loose screws, and charred resistors and coils. Inspect the tube sockets and switches for broken contacts, and inspect terminal boards for broken lugs and signs of burning.

38. Reassembling Signal Generator

a. Replace the cover and runners on the base of the power supply chassis. Turn the unit over and rest it on the chassis runners.

b. Replace the fuses and tubes. If it is necessary to replace V-8 with a new tube, refer to paragraph 55; a new tube will require aging for about 8 hours and will necessitate recalibration of the PERCENT MODULATION meter. Be sure that all tubes are placed in the correct sockets.

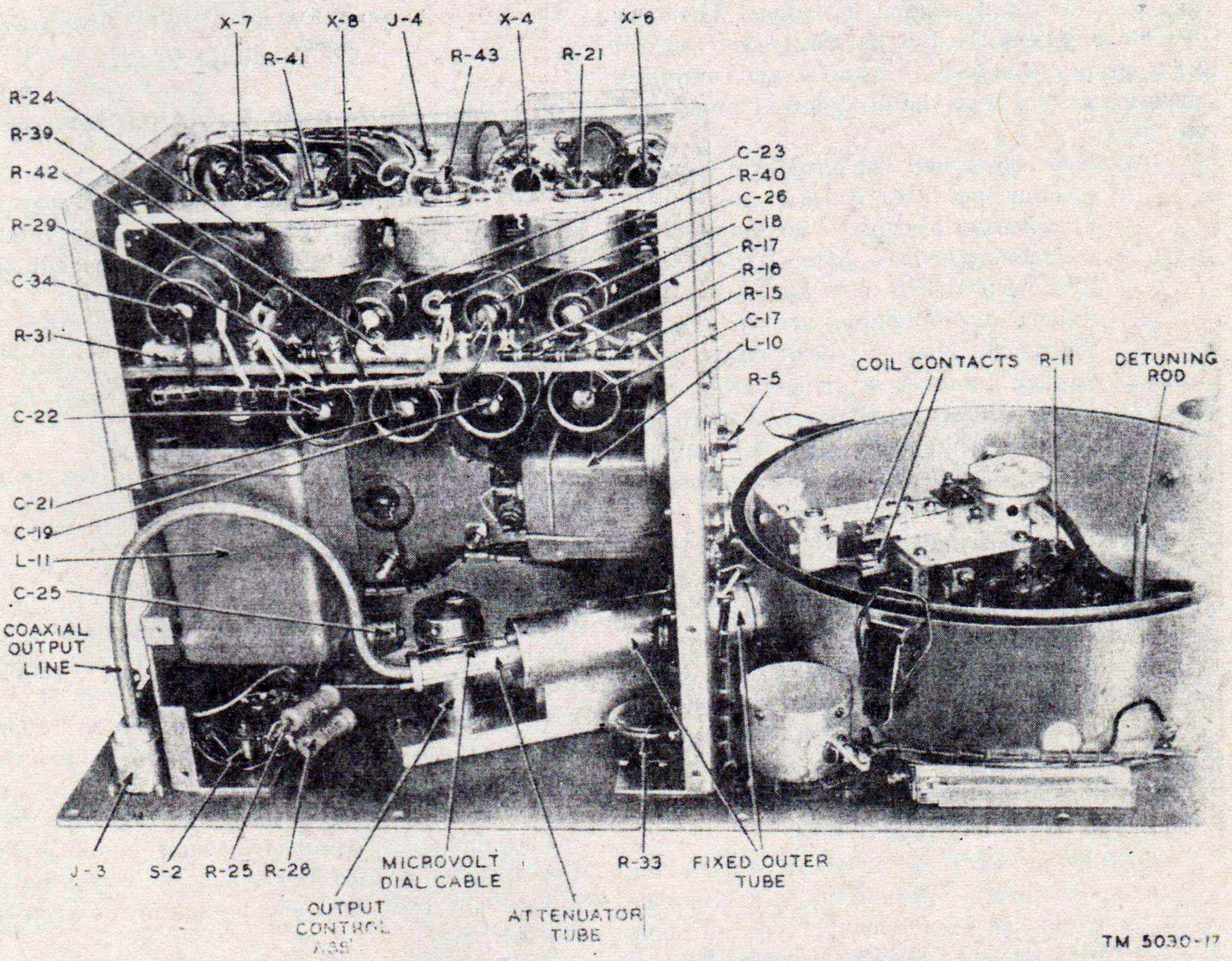


Figure 13. Power supply chassis, bottom view.

Section II. TROUBLE SHOOTING AT FIELD MAINTENANCE LEVEL

39. Trouble-Shooting Procedures

a. GENERAL. The first step in servicing the signal generator 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 can often be located by sight, smell, and hearing. The majority of faults, however, must be localized by *checking voltage and resistance.*

b. COMPONENT SECTIONALIZATION AND LOCALIZATION. The tests listed below aid in isolating the source of trouble. For maximum effect, follow the procedure in the order given. Remember that the servicing procedure should cause no further damage to the signal generator. First the 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. 37) is to locate any trouble. Frequently through this inspection alone, the repairman may discover the trouble. This inspection is valuable also in forestalling future failures and in avoiding additional damage which might occur through improper servicing methods.

(2) *Power supply resistance measurements.* These measurements (par. 43) prevent further damage to the signal generator from possible short circuits.

(3) *Operational check.* The operational check (par. 44) is important because it indicates, frequently, the general location of trouble and the nature of the fault. In order to utilize this information fully, each symptom of trouble must be interpreted with respect to its relation to other symptoms.

(4) *Trouble-shooting chart.* The trouble symptoms listed in this chart (par. 45) will aid greatly in localizing trouble.

(5) *Intermittents.* In all of the above tests, the possibility of intermittents should not be overlooked. If present, this type of trouble often may be forced to reappear by tapping or jarring the set. This trouble may not be caused by the set itself but by faulty cables or connectors. Check by substituting cables known to be in good working order.

40. Trouble-Shooting Data

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

Fig. or par. No.	Description
Par. 44	Operational test.
Fig. 7	Signal Generator TS–497A/URR, block diagram.
Fig. 13	Power supply chassis, bottom view.
Fig. 14	Tube socket voltage and resistance diagram.
Fig. 15	Dial mechanism, front view.
Fig. 16	Signal Generator TS–497A/URR, rear view.
Fig. 17	Oscillator assembly.
Fig. 20	Signal Generator TS–497A/URR, schematic diagram.

41. Test Equipment Required for Trouble Shooting

The test equipment required for trouble shooting Signal Generator TS–497A/URR is listed below. Available publications for the test equipment are also listed.

Test equipment	Publication
Tube Tester I–177	TM 11–2627.
Multimeter TS–352/U	TM 11–5527.
Barretter bridge (Measurements Corporation # 202 or equal).	
Frequency Meter TS–175/U	TO 16–35TS 175–2.
Spring scale: 5 to 15 pounds	

42. Precautions

a. Do not check the bolometer elements with an ohmmeter. These bolometer elements are easily burned out and are difficult to replace (par. 51).

b. Never use tools to pry off the oscillator shields. Slight dents in these shields may cause serious leakage of the carrier.

c. Exposed portions of the calibrated carrier frequency dial must be protected against handling. No liquids should be used for cleaning, since each dial is individually calibrated and liquids might remove the markings.

d. Do not disturb the adjustment of the output meter calibration control, R–5.

e. 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. Tag the leads to assure correct replacement.

(2) Do not allow drops of solder to fall into the set. They may cause short circuits.

(3) Be careful in making soldered connections; faults due to poorly soldered joints are difficult to find.

(4) When a part is replaced in r-f circuits, it must be placed exactly as was the original one, since a part having the same electrical value but different physical size may cause trouble in h-f (high-frequency) circuits. Give particular attention to proper grounding. Use the same ground as in the original wiring.

43. Power Supply Resistance Measurements

Trouble within the signal generator often may be detected by checking the resistance of the power supply circuit before applying power to the equipment. While the unit is fused, affording protection from shorts, preliminary checks will prevent needless blowing of fuses.

a. The d–c resistance of the input windings of T–1 should be approximately 6 ohms.

b. The resistance measurement from B+ to ground is 50,000 ohms. This measurement can readily be made between a terminal of coil L–11 and the chassis.

(1) If the resistance is zero or unusually low, check the h-v wiring and filter capacitors C–28 and C–30.

(2) If the resistance is low, check for a shorted bypass capacitor or a shorted wire in one of the plate or screen grid circuits.

(3) If the resistance is higher than normal, check R 34, R–35, R–36, R–42, R–43, R–44, and R–46 for continuity. The voltage and resistance chart (fig. 14) will aid in checking for the correct resistance values.

44. Operational Test

a. Connect the power plug to the a-c source and turn on the power. Note whether the carrier frequency dial is illuminated.

b. Turn the EXT. PULSE and the MODULATION selector switches to OFF.

(1) If the PERCENT MODULATION meter shows a reading when the MODULATION selector switch is off, the trouble may be due to a filament-cathode short (or leakage) in carrier oscillator tube V–11.

(2) Turn the EXT. PULSE knob to ON. If the PERCENT MODULATION meter returns to zero, the trouble is definitely due to a short circuit in V–11.

c. Set the OUTPUT meter pointer to the red line by means of the ring fiducial. Rotate the carrier frequency dial and note whether it is possible to set the meter pointer to the red line over the entire range. If not, the following checks will aid in sectionalizing the trouble:

(1) If the OUTPUT meter reads midway between the left and center marks and does not respond to adjustments of the ring fiducial, check all of the ranges successively.

(2) If some ranges are normal, note those which do not respond to adjustments of the ring fiducial. Refer to paragraph 50 for replacing defective oscillator coils.

(3) If the OUTPUT meter remains fixed on *all* ranges when turning the ring fiducial, turn the EXT. PULSE switch on and off.

(4) If no change occurs on the OUTPUT meter, turn the MODULATION selector switch to 400, turn the MOD. control until the PERCENT MODULATION meter reads 20 percent; and again turn the EXT. PULSE switch to both positions. If a drop occurs in the PERCENT MODULATION meter when the EXT. PULSE switch is on, it may be assumed that the carrier oscillator is working properly.

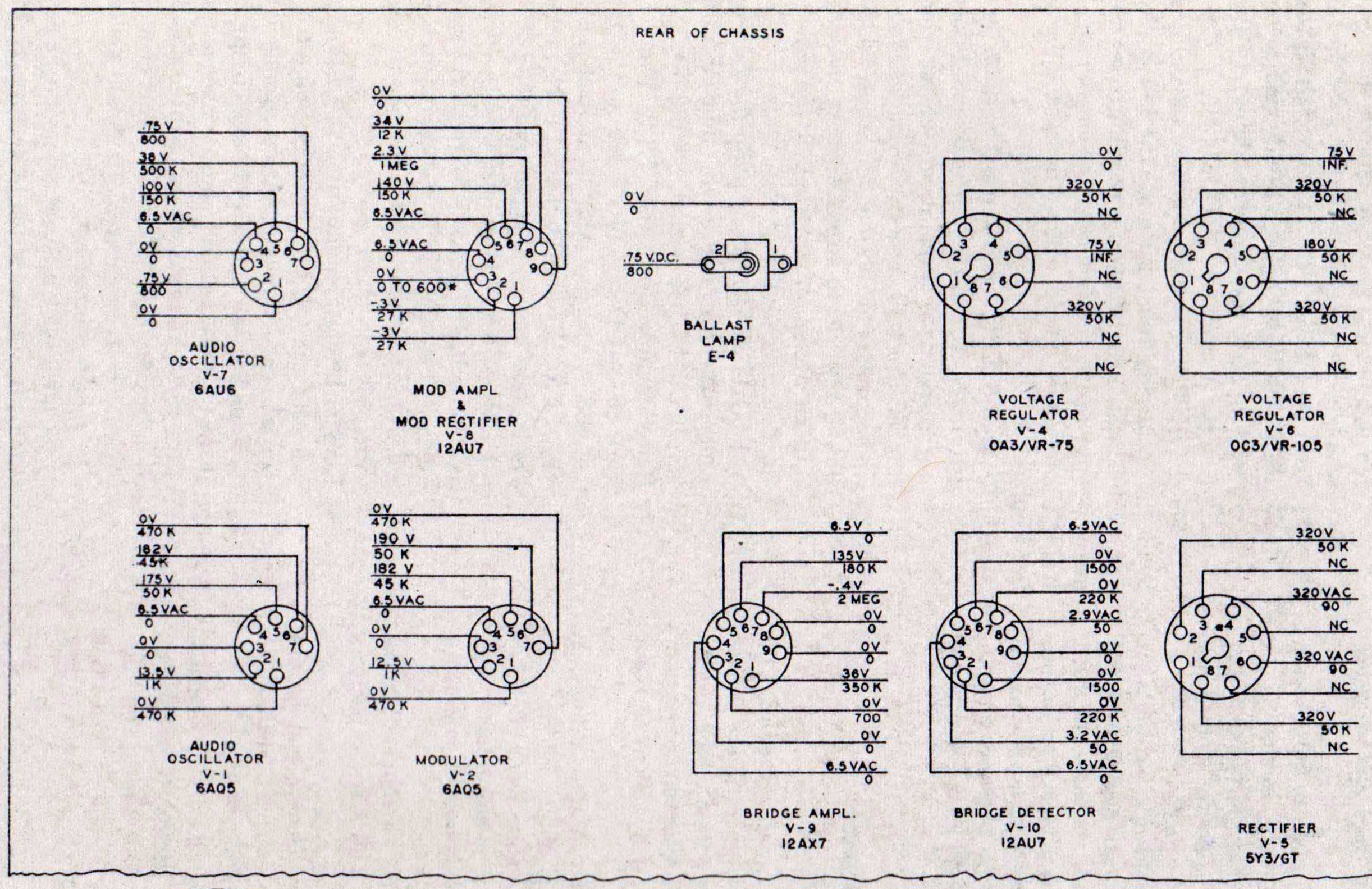
(5) Remove bridge amplifier tube V–9 and note whether the OUTPUT meter pointer returns to the red line. If it does, trouble will be found in the barretter bridge circuit.

(6) If the OUTPUT meter pointer does *not* return to the red line, an unbalanced condition in the bridge detector circuit is indicated. The removal of V–10 should center the meter pointer (par. 57).

(7) If the OUTPUT meter remains off-scale to the right, the measuring bolometer (R–48) may be open.

(8) If the OUTPUT meter remains off-scale to the left, the compensating bolometer (R–49) may be open.

d. Turn the MOD. knob to the extreme counterclockwise position and set the MODULATION



NOTES

ALL VOLTAGES ARE MEASURED TO GROUND AND ARE DC UNLESS INDICATED OTHERWISE.
NC INDICATES NO CONNECTION.
DC VOLTAGE MEASURED WITH 20000Ω/VOLT METER.
AC VOLTAGE MEASURED WITH 1000Ω/VOLT METER.
RESISTANCE MEASUREMENTS ARE MEASURED TO GROUND.
*DEPENDS ON SETTINGS OF R-41 AND R-43
MODULATION SELECTOR AND EXT. PULSE SWITCHES IN OFF POSITIONS.
POWER SWITCH ON FOR VOLTAGE MEASUREMENTS.
POWER CORD DISCONNECTED FOR RESISTANCE MEASUREMENTS.

TM 5030-18

Figure 14. Tube socket voltage and resistance diagram.

selector switch to 400. Turn the MOD. knob until the PERCENT MODULATION meter reads 30 percent. The OUTPUT meter should deflect to the right of the red line as modulation is applied.

(1) If there is no deflection of the PERCENT MODULATION meter, note whether the OUTPUT meter deflects to the right with increased modulation. Deflection of the OUTPUT meter indicates that the modulation is normal.

(2) Replace V–8 with a new 12AU7 tube. If there is no improvement, be sure to restore the original tube to its socket.

(3) If a new V–8 is required, it must be aged for about 8 hours before recalibrating (par. 55).

e. Turn the MODULATION selector switch to 1000. The PERCENT MODULATION meter should return to 30 percent without further adjustment of the MOD. knob.

f. Set the carrier output to the reference line on the ring fiducial. If the OUTPUT meter and PERCENT MODULATION meter readings appear normal, but no carrier output is obtained, make the following checks:

(1) Check all cables and external equipment, preferably by substituting equipment known to be in working condition.

(2) Measure the resistance from the center conductor of CARRIER OUTPUT jack J–3 to ground. This resistance will be zero unless the attenuator coaxial line is broken. In this case, resistance will be infinite.

(3) With the carrier output cable disconnected from the CARRIER OUTPUT jack, set the MICROVOLTS dial to 100K and tune the carrier oscillator slowly between 330 and 340 mc on the F band. At some point, a dip in the OUTPUT meter reading should occur. At this point, shorting the CARRIER OUTPUT jack should cause a considerable rise in the OUTPUT meter reading. This indicates that the attenuator line is not shorted internally and further check of the carrier output connections should be made.

45. Trouble-Shooting Chart

The following chart is supplied as an aid in locating trouble in the signal generator.

Symptom	Probable trouble	Correction
1. Dial lamp does not light. No meter indication. Blown fuse.	1. Shorted filter capacitor C–28 or C–30; grounded filament lead.	1. Replace faulty capacitor; clear short.
2. No carrier output or meter indication other than 10 percent on PERCENT MODULATION meter.	2. Shorted plate supply of V–11.....	2. Isolate with ohmmeter and clear short.
3. No output at CARRIER OUTPUT jack; meters operate properly.	3. Shorted CARRIER OUTPUT jack caused by using a connector with a projecting center pin.	3. Replace connector and open up output receptacle to clear short.
4. OUTPUT meter cannot be set to red line.	4. OUTPUT meter calibration out of adjustment.	4. Reset (par. 58).
5. OUTPUT meter off-scale to left.....	5. Compensating bolometer R–49 or bridge resistor R–3, R–5, or R–6 open.	5. Replace. Disconnect bolometers R–48 and R–49 before testing bridge circuit.
6. OUTPUT meter off-scale to right ...	6. Measuring bolometer R–48 or bridge resistor R–4 or R–5 open.	6. Replace. Disconnect bolometers R–48 and R–49 before testing bridge circuit
7. PERCENT MODULATION meter reads slightly off zero.	7. Variation in value of circuit elements due to heat.	7. Reset R–43 (% MOD ZERO SET) through hole in rear of power supply chassis.
8. OUTPUT meter pointer cannot be set to red line on one range only.	8. Oscillator coil or resistor on that range open.	8. Replace (par. 50).

Symptom	Probable trouble	Correction
9. OUTPUT meter pointer cannot be set to red line on two or more frequency ranges.	9. Tube V–11 weak or defective.....	9. Replace (par. 49).
10. Ring fiducial turns loosely without affecting OUTPUT meter indication.	10. Ring fiducial cable broken.....	10. Replace (par. 53).
11. MICROVOLTS dial turns loosely without controlling carrier output voltage.	11. Microvolt dial cable broken.....	11. Replace (par. 52).
12. PERCENT MODULATION meter shows deflection with MODULATION selector switch OFF.	12. Filament-cathode short in V–11.....	12. Replace (par. 49).

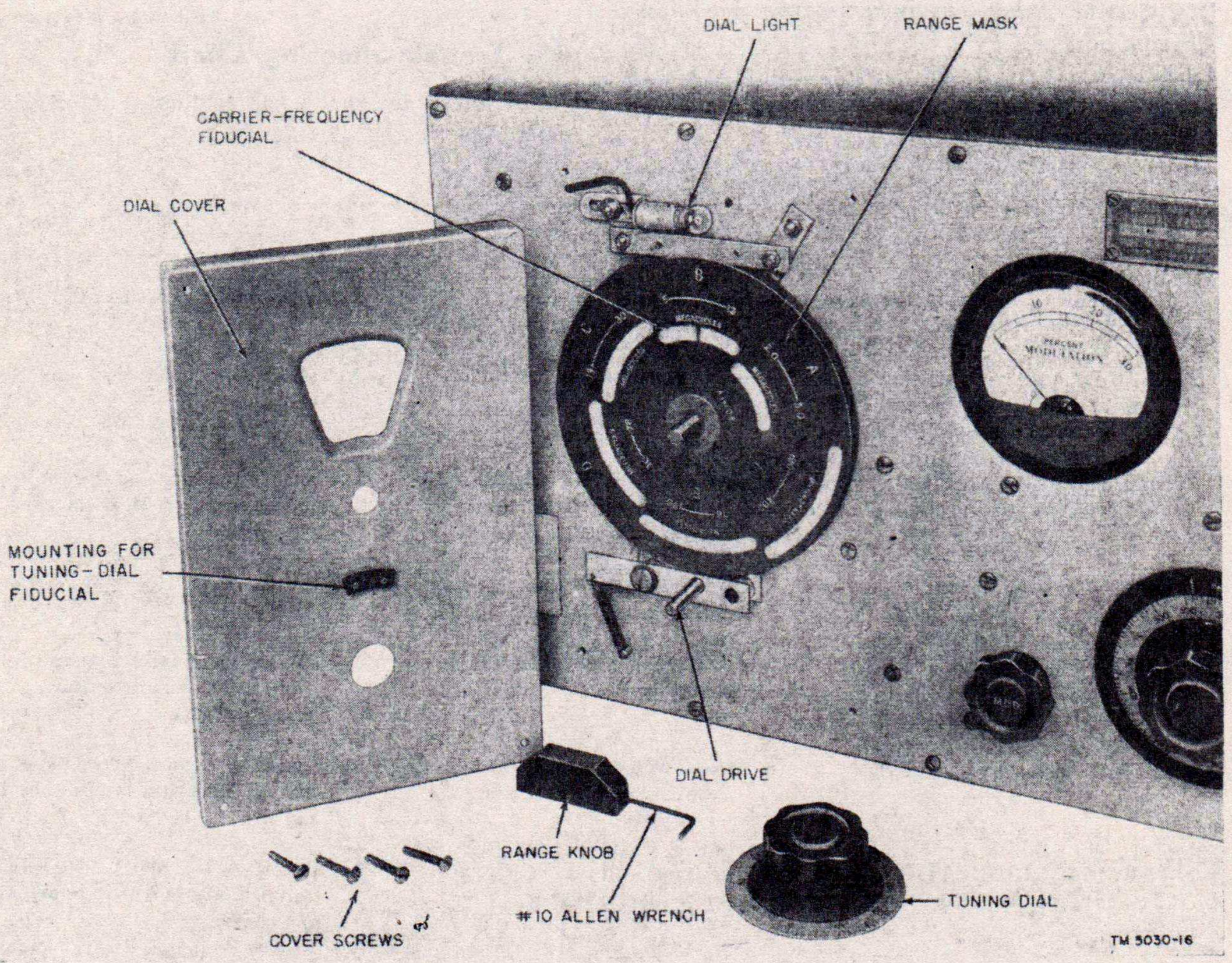


Figure 15. Dial mechanism, front view.

Section III. REPAIRS

46. General

Most of the electrical components in the power supply and modulator are readily accessible and are easily replaced if found to be faulty. Take care to tag each wire when removing a part to avoid errors where replacements are made. Some of the parts in the carrier oscillator and barretter bridge circuits require careful selection for the individual instrument as well as special replacement procedures and calibration. Observe the precautions outlined in paragraph 42.

47. Dial Lamp Replacement

To replace the dial lamp, it is necessary to remove the dial cover. Refer to figure 15 for location of parts and use the following procedure:

a. Turn the range knob until the "A" range appears in the window above the knob.

b. Remove the range knob by loosening the two No. 10 Allen setscrews. The No. 10 Allen wrench located on the power supply chassis is supplied for this purpose.

c. Remove the tuning dial knob by first loosening the two No. 10 Allen setscrews.

d. Remove the four screws from the corners of the dial cover and lift it off.

e. Remove the dial lamp and replace it with one of the same type.

f. Loosen the nut that secures the lampholder and adjust the holder so that the lamp filament is alined with the hairline on the carrier-frequency fiducial.

g. Replace the dial cover and check that the "A" range has sufficient illumination. Replace the tuning dial. Before tightening the dial cover screws, adjust the dial cover so that the tuning dial just clears the mounting for the tuning-dial fiducial and rotates freely.

h. Replace the range knob and tighten the setscrews on both knobs.

48. Removal and Replacement of Shields and Coil Disk

a. Drum Shields. When it is necessary to remove or replace the shields from the carrier oscillator drum, follow the pro cdures below:

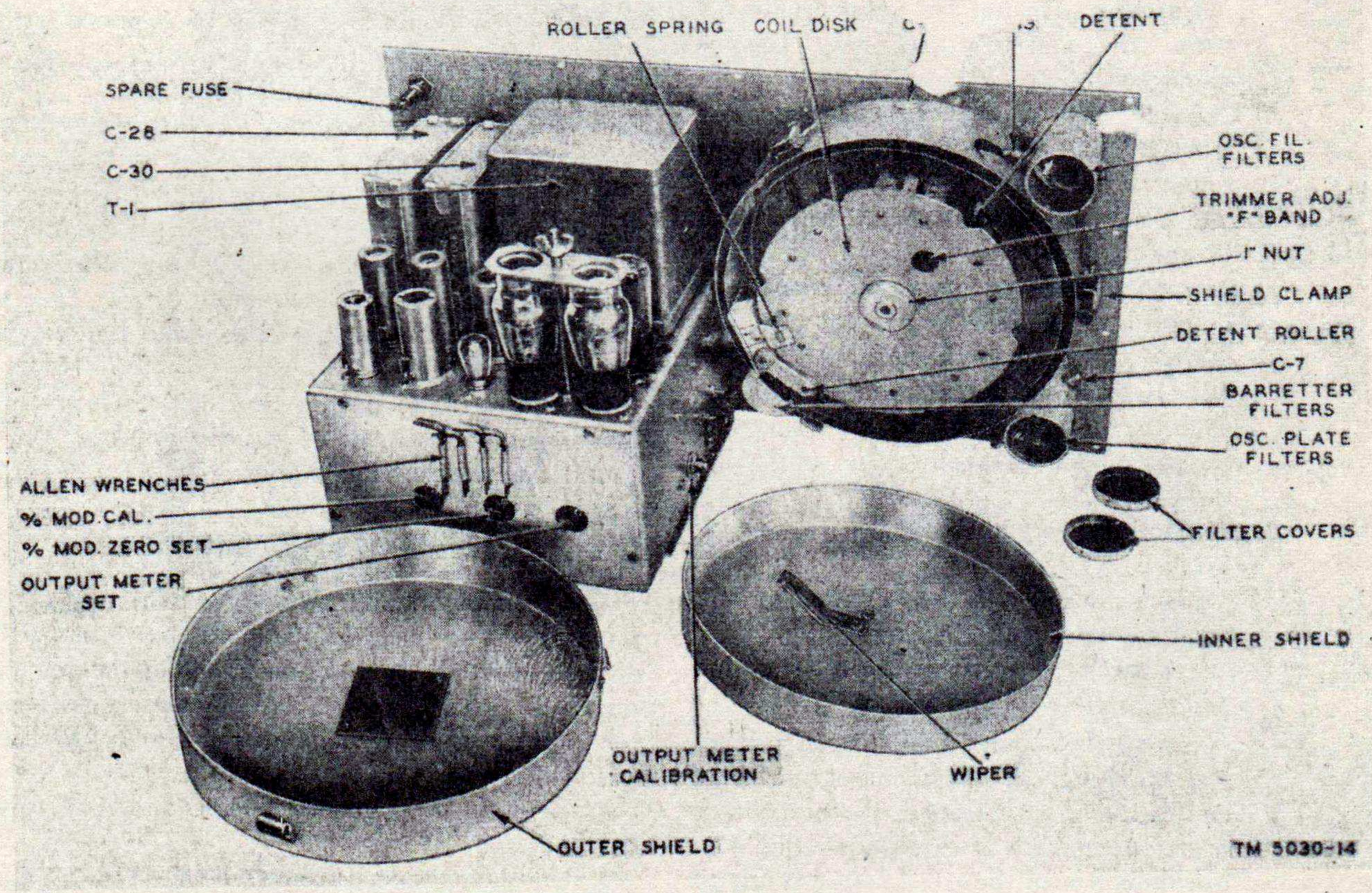


Figure 16. Signal Generator TS-497A/URR, rear view.

(1) Unlatch the three shield clamps and twist off the outer and inner shields. Never use tools to pry off these shields, since slight dents may cause serious leakage of the carrier.

(2) When replacing the shields, position the inner shield so that the grounding wiper lies opposite the roller spring (fig. 16).

(3) Replace the outer shield and latch.

b. Coil Disk Removal. With the drum shields removed, removal of the coil disk is accomplished in the following manner:

(1) Remove the lower screw from the roller spring. This screw is nearest to the roller spring (fig. 16).

(2) Retract the upper screw about ¼ inch (2 turns). Remove the roller from the spring. The roller is held in position by the pressure of the spring.

(3) Push the spring to the left far enough to clear the coil disk.

(4) Rotate the coil disk to place the detent rollers midway between two detents.

(5) Grip the coil disk firmly with one hand and remove the retaining nut with a 1-inch flat wrench.

Caution: Do not let the disk slip because the coil contacts may become damaged.

(6) Carefully lift off the coil disk assembly from the hub while clearing the detent roller.

c. Coil Disk Replacement. Replace the coil disk in the following manner:

(1) Retract the detent roller, making sure that its spring is engaged. Lower the coil disk in position to engage the flat portion of the hub. Release the detent roller against the edge of the coil disk and rock the disk slightly to seat it against the supporting bushing.

(2) Replace the retaining nut and tighten it firmly.

(3) Replace the roller in the roller spring and push the spring into position.

(4) Insert the lower screw in the roller spring and tighten both screws.

Caution: Do not rotate the coil disk before checking the alinement of the three coil contacts with respect to the contact posts on the capacitor assembly (fig. 17). Misalinement of these coil contacts due to improper seating of the coil disk on its bushing will cause serious damage to the contacts.

49. Replacement of Carrier Oscillator Tube

The carrier oscillator tube, V–11, is located on the side of the capacitor assembly, C–12 (fig. 17). Replace as follows:

a. Remove the drum shields and coil disk (par. 48).

b. Withdraw the cathode connector from the cathode pin. (Pull the connector straight; do not twist it.)

c. Remove the acorn-type tube with a sharp counterclockwise twist.

d. Insert the new tube in such a way that the three tube contacts are in line with the cathode connector. Carefully aline the pins before easing them into their contacts with a clockwise twist. Apply a screw driver to the upper right-hand pin to aid in seating it properly in the contacts.

e. Replace the cathode connector.

f. Replace the coil disk and drum shields (par. 48).

50. Replacement of Oscillator Coils

A defective oscillator coil can be removed without removing the entire disk assembly.

a. Remove the drum shields (par. 48).

b. Rotate the disk so that the defective coil can be reached with the fingers.

c. Remove the two retaining screws in the disk above the defective coil (fig. 16). In most cases, a defect in any part of the coil assembly will require replacement of the entire assembly.

d. Install the new coil assembly and tighten the screws.

Caution: Make certain that coil leads are not touching metallic parts of the coil bracket.

e. Replace the drum shields.

51. Replacement of Bolometers

Careful matching of the bolometers requires that replacement be made in pairs and that resistor R–48C be selected with relation to the bolometer elements. In order to replace the bolometer and resistor in the measuring bolometer assembly, proceed as follows:

a. Remove the drum shields and coil disk (par. 48).

b. Unsolder the lead from C–3 (fig. 17).

c. Remove the four screws on the top of the bo-

lometer assembly. (Two of these screws hold the bolometer assembly to the front panel.)

d. Lift out the bolometer assembly.

e. Remove the two upper screws securing the cable connector end plate.

f. Remove the two upper screws securing the end plate which holds the capacitor.

g. Remove the top securing the side plate.

h. Tip the bakelite terminal sufficiently to permit lifting the cover of the bolometer assembly.

Caution: Do not break the capacitor lead attached to the terminal board.

i. Unsolder the bolometer and resistor and replace them with the matched set.

j. Replace the bolometer assembly.

k. Remove the two screws from the compensating bolometer assembly (fig. 17) and lift off the cover.

l. Unsolder the bolometer leads and replace with the bolometer to match the measuring bolometer. Replace the compensating bolometer assembly cover.

m. Replace the drum shields and coil disk (par. 48).

52. Replacement of MICROVOLTS Dial Cable (fig. 13)

The barretter tube and the attenuator tube are moved in and out of the fixed outer tube by means of two separate cables which are looped around capstans. These capstans are independently rotated by the ring fiducial and the MICROVOLTS dial. If either cable breaks in service, replace it with wire that is identical to that which is removed or with wire of the same diameter. This cable must be prestretched for 8 hours by suspension from a clamp, with a weight attached to the free end by means of another clamp. The total suspended weight should be approximately 12 pounds. Apply weight gradually to avoid damaging the cable. Replace the MICROVOLTS dial cable as follows:

a. Remove the outer drum shields (par. 48), the runners, and the cover of the power supply chassis.

b. Unsolder the end of the broken cable at the end of the attenuator tube nearest the CARRIER OUTPUT jack.

c. Observe which end of the cable is soldered to the capstan to be sure replacement is made in the

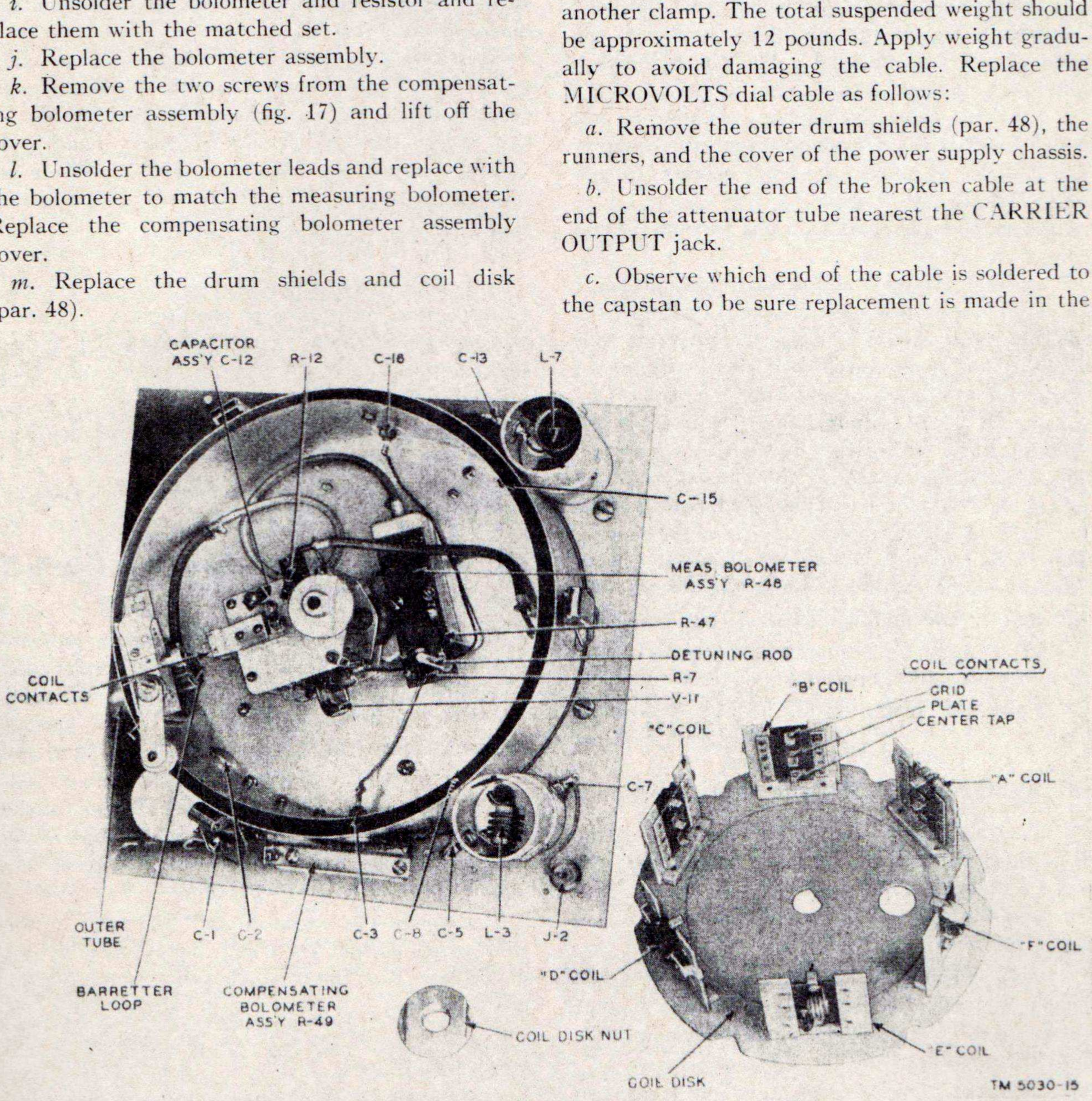


Figure 17. Oscillator assembly.

same manner. Apply heat to the capstan at the point where the cable is attached and remove the cable. Wipe the excess solder from the capstan.

d. Withdraw the attenuator tube until the other end of the cable is accessible. Apply heat to the point on the guide rod where the cables are inserted and gently pull the cables out of the hole.

e. Cut off 9 inches of the prestretched cable. Tin one end of the cable for about ½ inch.

f. Feed the cable through the hole in the guide rod while applying heat. Withdraw the cable until the tinned portion is visible; then pull it back again so that no tinned portion protrudes from the hole.

Caution: Be sure that no solder remains on the flexed portions of the dial cable, since breakage would occur when it was flexed in service.

g. Loop the cable around the capstan once and stretch to a tension of 7 pounds as measured with a spring scale. Resolder the end nearest to the CARRIER OUTPUT jack.

h. After allowing it to cool, test for tension and trim off the excess cable.

i. Observe the open end of the outer tube near the variable capacitor assembly (fig. 17). Rotate the ring fiducial clockwise to bring the barretter tube in toward the oscillator coils. Push the attenuator tube in carefully by hand until the attenuator loop (a straight piece of 1/16-inch diameter wire across the attenuator tube) is *exactly* in line with the barretter loop. They should appear as one continuous line.

j. While holding the two loops in alinement, turn the MICROVOLTS dial clockwise to the stop at 100K. Resolder the cable to the capstan in the identical manner as the one removed.

Caution: Never allow the barretter and attenuator loops to come in contact with an oscillator coil when making hand adjustments of these tubes.

k. Check the operation of the MICROVOLTS dial.

53. Replacement of Ring Fiducial Cable

Follow the same procedure for prestretching the ring fiducial cable as that outlined for the MICROVOLTS dial cable and replace it as follows:

a. Unsolder the end of broken cable nearest to the CARRIER OUTPUT jack.

b. Observe which end of the cable is soldered to the capstan. Apply heat to the capstan at the point where the cable is attached and remove the cable. Wipe excess solder from the capstan.

c. Withdraw the barretter tube until the two screws which secure the plug in the end of the tube can be removed. Withdraw the plug and unsolder the cable where it enters the slot in the plug.

d. Cut a 15-inch length of prestretched cable. Tin one end with solder for about 1 inch.

e. Feed the cable into the slot in the plug while applying heat. Allow the plug to cool, trim off the excess cable, and replace the plug with its two screws.

f. Observe the open end of the outer tube near the variable capacitor assembly, while carefully pushing the barretter tube by hand toward the oscillator assembly. The barretter loop (a straight piece of 1/16-inch diameter wire) will appear in the end of the outer tube (fig. 17).

Caution: Never allow the barretter and attenuator loops to come in contact with an oscillator coil when making hand adjustments of these tubes.

g. Select the "A" carrier frequency band and carefully adjust the barretter tube until there is about a 1/32-inch of clearance between the barretter loop and the "A" band coil.

h. Turn the ring fiducial clockwise to the stop.

i. Loop the dial cable around the ring fiducial capstan once and pull it to a tension of 7 pounds while soldering the free end. Be careful not to disturb the position of the barretter tube or the ring fiducial during this operation.

j. Solder the cable to the capstan in the identical manner as the one removed.

k. Replace the drum shields and the power supply cover.

54. Replacement of Filter Coils L-2, L-5 and L-9

If voltage and resistance measurements indicate a defective filter coil L-2, L-5, or L-9, complete disassembly of the oscillator drum assembly is necessary (*a* through *u* below). Observe all precautions (par. 42) while making the replacement. After the coils are replaced, readjustment of the carrier oscillator trimmer (par. 56) and/or recalibration of the barretter bridge (par. 59) will be necessary. Make an operational check (par. 44) to determine the amount of recalibration necessary.

a. Remove the screws around the edge of the front panel and pull the panel-chassis assembly out of the case. Rest the panel-chassis assembly on the guard handles.

b. Remove the cover from the modulator and power supply unit.

c. Remove the drum shields and coil disk (par. 48*a* and *b*).

d. Unsolder the coaxial cable to the measuring bolometer assembly R–48 (fig. 17).

e. Unsolder the leads from capacitors C–3, C–9, and C–16 on the inside of the inner drum (fig. 17). Remove the nuts which hold these capacitors.

f. Remove the measuring bolometer assembly (par. 51*c* and *d*).

g. Remove the dial cover, tuning dial, range knob (par. 47*a* through *d*), and the carrier frequency dial.

h. Remove the three screws which are uncovered by removal of the carrier frequency dial.

i. Remove the four screws from the flange of capacitor assembly C–12 (fig. 17).

j. Carefully and slowly lift capacitor assembly C–12 out of the drum assembly.

k. Remove the snap-in button shields, which cover capacitors C–2, C–8, and C–15, from the wall of the inner drum assembly (fig. 17).

l. Unsolder the connections to capacitors C–2, C–8, and C–15 and remove the nuts which secure these capacitors to the outer drum.

m. Remove the screws which hold the oscillator and barretter filters (fig. 16); these screws are accessible from the front panel.

n. Remove the oscillator and barretter filters from the rear of the front panel.

o. Unsolder all meter leads, input leads, and leads to the terminal board on the side of the power supply chassis.

p. Unsolder the connection from jack J–2 (fig. 17) and remove the nut which secures J–3 (fig. 13) to the panel.

q. Remove the knobs which remain on the front panel.

r. Remove the screws which secure the power supply chassis to the front panel. Remove the chassis.

s. Remove the screws which hold the attenuator assembly (fig. 13) to the back of the front panel.

t. Remove the nut which holds the inner drum to the fixed outer tube of the attenuator assembly.

u. Tilt the inner drum slightly and carefully lift it out of the outer drum. Avoid pulling on C–3, C–9, and C–16. The filter coils will be accessible.

v. Install the new coil (or coils) and reassemble the equipment by following the above instructions in reverse order. Before replacing the panel-chassis assembly in the case, perform steps *w* through *y* below.

w. Recalibrate the barretter bridge (par. 59).

x. Check the carrier oscillator frequency and readjust the oscillator trimmer (par. 56) if necessary.

y. Check for normal operation over the entire frequency range of the generator (par. 44) and make any additional adjustments that may be necessary.

Section IV. CALIBRATION PROCEDURE

55. Percent Modulation Meter

Since V–8 functions as a meter rectifier, it must be replaced by a tube that has been aged for about 8 hours. The filament of the tube must be energized for this period of time in order to stabilize the emission before checking or recalibrating the meter. Accomplish this by placing the tube in its socket and energizing the signal generator for the required period. Calibrate the meter as follows:

a. With the MODULATION selector switch off, connect a high resistance d-c voltmeter between capacitor C–5 and the chassis. Multiply the value obtained by the factor .212.

b. Connect an a-c voltmeter in series with a .5-uf (microfarad) capacitor between capacitor C–5 and the chassis. Turn the MODULATION selector switch to 400 and adjust the MOD. control until the a-c voltmeter reads the value obtained in *a* above (the d-c voltage multiplied by .212). Note the reading of the PERCENT MODULATION meter.

c. If the PERCENT MODULATION meter reads more than 30 percent, adjust R–41 (% MOD CAL) until the meter reads slightly less than 30 percent.

d. If the new tube causes a low reading, R–41 should be adjusted until the meter reads slightly less than 30 percent.

e. In either case the PERCENT MODULATION meter zero must be re-established by switching the MODULATION selector switch to OFF and setting the meter to zero by means of R–43 (% MOD ZERO SET).

f. Repeat *c*, *d*, and *e* above.

56. Carrier Oscillator Trimmer Adjustment

An oscillator trimmer adjustment is provided to compensate for frequency errors which may occur after changing the carrier oscillator tube, V–11. Use an external crystal frequency meter covering the

frequencies between 300 and 400 mc and proceed as follows:

a. Connect the signal generator output to the frequency meter.

b. Set the signal generator to a standard frequency on the F range.

c. Insert a ¼-inch socket wrench through the coil disk hole provided for this calibration (fig. 16).

d. Adjust the trimmer until the frequency meter indicates that the output of the signal generator is at the same frequency as that indicated on the carrier frequency dial.

57. Oscillator Coil Alinement

When the oscillator coil is replaced, the new coil must be alined with respect to the attenuator output and the barretter coupling loops. Proceed as follows:

a. Connect the CARRIER OUTPUT jack to an external output meter.

b. Note the readings of the external output meter when tuning over the range adjacent to the defective one. Keep the OUTPUT meter at the red line during this check. If there is an appreciable change in the external meter reading, a compromise reading must be selected as an output reference value.

c. Switch the new coil into operating position and set the OUTPUT meter to the red line. The external output meter should show the same reference value as in *b* above. In most cases the output from a new coil will be low. To increase the output, it is necessary to loosen the two screws on the coil mounting clips and make a very small adjustment of the coil by pushing it away from the coil disk and toward the front panel. A small offset-head screw driver will enable the screws to be released and tightened without removing the coil assembly. When the coil is adjusted toward the front panel, carrier output is increased while the OUTPUT meter reading is decreased. Then when the meter is again brought up to the red line, an additional increase in output occurs. Since the effect of coil adjustment on carrier output is therefore, magnified, this alinement process is critical.

d. If the available movement of the ring fiducial is not sufficient to bring the OUTPUT meter to the red line, loosen the two screws which hold the coil mounting brackets to the coil disk, and move the coil slightly toward the attenuator and away from the coil disk shaft. Realinement of the coils does not affect the output accuracy of the signal generator.

58. Output Meter Zero Adjustment

When the OUTPUT meter centers to the red line with V–9 and V–10 removed but reads off-center when V–10 is replaced, an unbalance in the bridge detector circuit is indicated. Correct as follows:

a. Remove V–9 from the socket. V–10 must be in its socket.

b. Adjust R–21 (OUTPUT METER ZERO adjustment control) until the meter pointer rests on the red line. R–21 is accessible through a hole in the rear of the power supply chassis (fig. 16).

c. Replace V–9. A deflection on the OUTPUT meter should occur when V–9 is touched, because of the hum pickup. This will indicate that V–10 is operating.

59. Barretter Bridge Recalibration

Replacement of the bolometers or any of the circuit elements in the barretter bridge will cause the output accuracy of the signal generator to be lost. This will necessitate restandardization of the OUTPUT metering system. This is done by readjusting the OUTPUT meter calibration control (R–5) as follows:

a. Connect an h-f barretter bridge to the CARRIER OUTPUT jack.

b. Set 50K on the MICROVOLTS dial to the white line on the ring fiducial.

c. Adjust the ring fiducial until a carrier output of exactly 50,000 microvolts (.05 volt) is indicated on the external barretter bridge.

d. Unscrew the cap nut of R–5. This is located on the side of the power supply chassis (figs. 13 and 16). Set the screw-driver adjustment so that the OUTPUT meter pointer is on the red center line.

e. Recheck this calibration at various frequencies on each band and make a compromise adjustment of R–5, if necessary. It should not be difficult to obtain carrier output levels within ±5 percent unless the measuring equipment is unreliable.

60. Final Checking

After replacement and recalibration of any parts, the signal generator must be given a final operational check (par. 44) before returning the unit to service.

CHAPTER 6

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

61. Repacking for Shipment or Storage

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 9 and reverse the instructions given in that paragraph.

62. Demolition of Matériel to Prevent Enemy Use

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

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

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

c. Bend. Bend panel case, shields, coaxial elements, and chassis.

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

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

f. DESTROY EVERYTHING.

APPENDIX I

REFERENCES

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

1. Army Regulations

AR 380–5	Safeguarding Military Information.

2. Supply Publications

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

3. Auxiliary Equipment and Testing Equipment Publications

TO 16–35TS 175–2	Frequency Meter TS–175/U.
TM 11–5527	Handbook of Maintenance Instructions for Multimeter TS–352/U.
TM 11–472	Repair and Calibration of Electrical Measuring Instruments.
TM 11–2627	Tube Tester I–177.
TM 11–2657	Signal Generators TS–155/UP and TS–155A/UP.
TM 11–2657B	Signal Generator TS–155B/UP.

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. Decontamination

TM 3–220	Decontamination.

6. Demolition

FM 5–25	Explosives and Demolitions.

7. Packaging and Packing Instructions

a. Joint Army-Navy Packaging Specifications.

JAN–D–169	Desiccants (activated).
JAN–P–100	General specification.
JAN–P–106A	Boxes; wood, nailed.
JAN–P–116	Preservation, methods of.
JAN–P–125	Barrier materials, waterproof, flexible.
JAN–P–131	Barrier material; moisture-vaporproof, flexible.
JAN–P–658	Packaging and packing of electrical equipment and spare parts.

b. U. S. Army Specifications.

100–2E	Marking shipments by contractors, standard specification for (and Signal Corps Supplement thereto).

c. Signal Corps Instructions.

720–7 ..... Standard Pack.
726–15 ..... Marking of Interior Containers.

8. Other Publications

SR 310–20–3 ..... Index to Field Manuals, Training Circulars, Firing Tables and Charts, Army Training Programs, Mobilization Training Programs, Graphic Training Aids, Joint-Army-Navy-Air Force Publications, and Combined Communications Board Publications.

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

TB SIG 25 ..... Preventive Maintenance of Power Cords.
TB SIG 66 ..... Winter Maintenance of Signal Equipment.
TB SIG 72 ..... Tropical Maintenance of Ground Signal Equipment.
TB SIG 75 ..... Desert Maintenance of Ground Signal Equipment.
TB SIG 123 ..... Preventive Maintenance Practices for Ground Signal Equipment.
TB SIG 178 ..... Preventive Maintenance Guide for Radio Communication Equipment.
TM 11–453 ..... Shop Work.
TM 11–455 ..... Radio Fundamentals.
TM 11–466 ..... Radar Electronic Fundamentals.
TM 11–4000 ..... Trouble Shooting and Repair of Radio Equipment.
TM 38–650 ..... Basic Maintenance Manual.

9. Abbreviations

a-c ..... alternating-current
a-f ..... audio-frequency
AMPL ..... amplifier
C ..... centigrade
cps ..... cycles per second
cyc ..... cycle
db ..... decibel
DET ..... detectors
EXT ..... external
h-f ..... high-frequency
h-v ..... high-voltage
mc ..... megacycle
MOD ..... modulation
r-f ..... radio-frequency
rms ..... root mean square
uf, uuf ..... microfarad, micromicrofarad

APPENDIX II

IDENTIFICATION TABLE OF PARTS

1. Requisitioning Parts

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

2. Identification Table of Parts for Signal Generator TS-497A/URR

Ref symbol	Name of part and description	Function of part
C–1, C–2, C–3, C–5, C–6, C–13, C–14, C–15.	CAPACITOR, fixed: ceramic dielectric; 1500 uuf +20% −10%; pos temp coef 100 (tol ±250) uuf/uf/°C; 500 vdcw; no case, ceramic coating; 11/16″ lg x 5/16″ wd o/a, incl hex head mtg bushing; 1/4″–28 thd bushing 11/32″ lg w/nut; solid curved axial leads; ceramic ins; feedthru type; Electrical Reactance Corp type #CFC–1.	C–1, C–2, and C–3: Barretter bridge r-f bypass. C–5, and C–6: R-f bypass in carrier oscillator plate circuit. C–13, C–14, and C–15: R-f bypass in carrier oscillator filament circuit.
R–48A.....	CAPACITOR, fixed: ceramic dielectric; 10,000 uuf +50% −20%; pos temp coef 100 (tol ±250) uuf/uf/°C; 500 vdcw; tubr case 7/8″ lg x 3/8″ wd o/a, incl hex head mtg bushing 5/16″–24 thd x 3/8″ lg w/nut; ceramic ins; feedthru; p/o Resistor Assembly R–48; Electrical Reactance Corp type #CF–3.	Barretter bridge a-f bypass.
C–7.....	CAPACITOR, fixed: ceramic dielectric; 50 uuf; +20% −10%; temp coef 100 (tol ±250) uuf/uf/°C; 500 vdcw; no case, ceramic coating; 11/16″ lg x 5/16″ wd o/a, incl hex head mtg bushing 1/4″–28 thd x 11/32″ lg w/nut; solid curved axial leads; ceramic ins; feedthru type; Electrical Reactance Corp type #CFC–1.	R-f bypass in pulse modulation input circuit.
C–8, C–9.....	CAPACITOR, fixed: ceramic dielectric; 100 uuf +20% −10%; temp coef 100 (tol ±250) uuf/uf/°C; 500 vdcw; no case, ceramic coating; 11/16″ lg x 5/16″ wd o/a, incl hex head mtg bushing 1/4″–28 thd x 11/32″ lg w/nut; solid curved axial leads; ceramic ins; feedthru type; Electrical Reactance Corp type #CFC–1.	R-f bypass in carrier oscillator plate circuit.
C–10, C–12.....	CAPACITOR ASSEMBLY: p/o Sig C Signal Generator TS–497A/URR; consists of 2 ea var capacitors, 1 bypass capacitor, C–10, 1 trimmer capacitor, 2 ea stator assem, 1 rotor assem, 1 dial shaft assem; mtd on common frame; 3″ lg x 2 3/4″ h x 2 1/4″ wd o/a excluding shaft; mtd by 3 posts #4–40 thd on off-set mtg/c; RCC #CN800240, Davenco part #6004.	C–10: R-f bypass in carrier oscillator plate circuit. C–12: Carrier oscillator tuning.
C–16.....	CAPACITOR, fixed: ceramic dielectric; 3000 uuf; +50% −10%; temp coef 100 (tol ±250) uuf/uf/°C; 500 vdcw; no case, ceramic coating; 11/16″ lg x 5/16″ wd o/a, incl hex head mtg bushing 1/4″–28 thd x 11/13″ lg w/nut; solid curved axial leads; ceramic ins; feedthru type; Electrical Reactance Corp type #CFC–1.	R-f bypass in carrier oscillator filament circuit.

Ref symbol	Name of part and description	Function of part
C–11.....	CAPACITOR, fixed: silver mica; button type; 62 uuf ±10%; 350 vdcw; Sangamo #M–730.	D–c blocking, carrier oscillator grid.
C–17, C–19, C–22, C–27, C–34.	CAPACITOR, fixed: paper dielectric; 250,000 uuf ±20%; 600 vdcw; JAN type CP28A1EF254M; per JAN–C–25.	C–17: A-f bypass, V–9 plate circuit. C–19: Couples V–9 plate to V–10 grid. C–22: Screen grid bypass for V–7. C–27: Couples V–2 to diode-connected portion of V–8. C–34: Couples V–1 plate to V–7 grid and cathode circuits.
C–18, C–23, C–25, C–26.	CAPACITOR, fixed: paper dielectric; 100,000 uuf ±20%; 600 vdcw; JAN type CP28A1EF104M; per JAN–C–25.	C–18: Bridge amplifier (V–9) interstage coupling. C–23: Couples V–7 plate to V–1 grid. C–25: Couples EXT. MOD. jack to switch S–2. C–26: Couples V–2 grid to V–8 plate (amplifier section).
C–20.....	CAPACITOR, fixed: mica dielectric; 1,000 uuf ±1%; 500 vdcw; temp coef letter D; 53/64" sq x 11/32" thk excluding term; molded bakelite case; 2 axial wire leads; Electro Motive type #603–M.	Audio oscillator frequency determination.
C–21.....	CAPACITOR, fixed: mica dielectric; 980 uuf ±1%; 500 vdcw; temp coef letter D; 53/64" sq x 11/32" thk excluding term; molded bakelite case; 2 axial wire leads; Electro Motive type #603–M.	Audio oscillator frequency determination.
C–28, C–30.....	CAPACITOR, fixed: paper dielectric; 8 uf +20% −10%; 600 vdcw; JAN type CP70B1EF805V; per JAN–C–25; w/2 brackets JAN type CP07SC2.	Power supply filter.
C–31, C–32, C–33.	CAPACITOR, fixed: ceramic dielectric; .01 uf −0% +20%; temp coef 100 (tol ±250) uuf/uf/°C; 500 vdcw; no case disk type 3/4" diam x 5/32" thk; radial wire leads; Durez and wax ins; Electrical Reactance Corp type #BPD–10.	C–31 and C–32: R-f bypass in carrier oscillator filament circuit. C–33: Coupling, MOD. control to V–8 grid.
L–1, L–3.....	COIL, RF: choke; single wnd, 4 pie universal wnd; unshielded; 1.0 mh at 1,000 cyc; 50 ma; 23 ohms DC resistance; 1 1/2" OD x 7/8" lg o/a; solid ceramic form; 7/16" OD x 3/4" lg; term mtg; 2 solder lug term mtd to ends of form by two #6–32 x 3/16" lg screws; Davenco part #6024.	Barretter bridge r-f filters.
L–2, L–5.....	COIL, RF: choke; single wnd; c/o 3 pie universal wnd; unshielded; 66 uh at 1,000 cyc; 50 ma; .5 ohm DC resistance; 15/32" OD x 5/16" lg o/a; solid ceramic form; 1/4" OD x 3/16" lg; mtd horizontally by one #6–32 brass screw 1/4" lg thru from ctr; 2 wire term; Davenco part #6025.	Barretter bridge r-f filters.
L–4.....	COIL, RF: choke; single wnd; 2 pie universal wnd; unshielded; 42 uh at 1,000 cyc; 50 ma; 3.4 ohms DC resistance; 9/16" OD x 15/32" lg o/a; solid ceramic form; 7/16" OD x 11/32" lg; term mtg; 1 solder lug term mtd to end of form by one #6–32 x 3/8" lg screw and one wire lead; Davenco part #6026.	Oscillator plate circuit r-f filter.

Ref symbol	Name of part and description	Function of part
L-6A.....	COIL SUBASSEMBLY: band A RF tank ckt inductance; p/o Army-Navy Signal Generator TS-497A/URR; c/o one "A" coil, 2 core caps, 1 mica ins plate w/3 cont, 2 coil mtg clips, and one bkt assem; range 2–5 mc, 123 uh ind; 1⅞" h x 1½" wd x ⅝" thk o/a; two .136" diam holes on 1" mtg/c on bottom of bkt; ind adjusted so that coil resonates with 55 uuf at 1.9 mc; Davenco part #6027.	Oscillator tuning, band A.
L-6B.....	COIL SUBASSEMBLY: band B RF tank ckt inductance; p/o Army-Navy Signal Generator TS-497A/URR; c/o one "B" coil, one mica ins plate w/3 cont, 2 coil mtg clips and one bkt assem; range 5 to 13 mc; 21.5 uh; ind; 1⅞" h x 1½" wd x ⅝" thk o/a; two .136" diam holes on 1" mtg/c on bottom of bkt; ind adjusted so that coil resonates with 55 uuf at 4.75 mc; Davenco part #6028.	Oscillator tuning, band B.
L-6C.....	COIL SUBASSEMBLY: band C RF tank ckt inductance; p/o Army-Navy Signal Generator TS-497A/URR; c/o one "C" coil, R-9C approx 1,000 ohms ½ w; one mica ins plate w/3 cont, 2 coil mtg clips and one bkt assem; range 13 to 33 mc, 3.3 uh ind; 1⅞" h x 1½" wd x ⅝" thk o/a; two .136" diam holes on 1" mtg/c on bottom of bkt; ind adjusted so that coil resonates with 55 uuf at 11.9 mc; Davenco part #6029.	Oscillator tuning, band C.
L-6D.....	COIL SUBASSEMBLY: band D RF tank ckt inductance; p/o Army-Navy Signal Generator TS-497A/URR; c/o one "D" coil, R-9D approx 10,000 ohms ½ w; one mica ins plate w/3 cont, 2 coil mtg clips and one bkt assem; range 30 to 80 mc, .55 uh ind; 1⅞" h x 1½" wd x ⅝" thk o/a; two .136" diam holes on 1" mtg/c on bottom of bkt; ind adjusted so that coil resonates with 55 uuf at 29 mc; Davenco part #6030.	Oscillator tuning, band D.
L-6E.....	COIL SUBASSEMBLY: band E RF tank ckt inductance; p/o Army-Navy Signal Generator TS-497A/URR; c/o one "E" coil, R-9E approx 1,000 ohms ½ w; one mica ins plate w/3 cont and one bkt assem; range 80 to 210 mc, .077 uh ind; 1⅞" h x 1½" wd x ⅝" thk o/a; two .136" diam holes on 1" mtg/c on bottom of bkt; ind adjusted so that coil resonates with 55 uuf at 78 mc; Davenco part #6031.	Oscillator tuning, band E.
L-6F.....	COIL SUBASSEMBLY: band F RF tank ckt inductance; p/o Army-Navy Signal Generator TS-497A/URR; c/o one "F" coil, R-9F approx 4,100 ohms ½ w; one mica ins plate w/3 cont and one bkt assem; range 210 to 400 mc; two .136" diam holes on 1" mtg/c on bottom of bkt; ind adjusted so that coil resonates with 55 uuf at 76 mc; Davenco part #6032.	Oscillator tuning, band F.
L-7, L-8.....	COIL, RF: choke; single wnd, 6 pie; spiral wnd; shielded cylindrical paper can; .01 mh at 1,000 cyc; .5-amp; ⅞" OD x 1" lg excluding term; term mtg; 2 wire leads; shield marked FAST P-32212; Fast part #32212.	Oscillator filament chokes.

Ref symbol	Name of part and description	Function of part
L-9.....	COIL, RF: choke; single wnd, single layer wnd; unshielded; 13 uh at 1,000 cyc; .5 amp; 39 turns #22 AWG wire; 3 11/16" lg x 1 9/16" wd x 3/16" thk o/a; solid plexiglass form; 3 11/16" lg x 1 1/2" wd x 1/8" thk; two .120" diam holes on 3.125" mtg/c; 2 wire leads 1 1/2" lg; Electronic Meas Co dwg #314-A-115; Davenco part #6034.	Oscillator filament choke.
J-2.....	CONNECTOR, receptacle: one round female cont; JAN type UG-58/U per JAN-C-71.	Pulse input jack.
J-3.....	CONNECTOR, receptacle: one round female cont; straight; .625" diam x 1 7/8" lg o/a; w/1" sq fl; 50 ohms characteristic impedance; cylindrical, silver pl brass body; Teflon ins; four .125" diam holes on .718" x .718" mtg/c; for use with Radio Frequency Cable RG-55/U; Industrial Products Co part #36000.	CARRIER OUTPUT jack.
F-1.....	FUSE, cartridge: 1 amp; 250 v; one time; glass body ferrule term; 1 1/4" lg x 1/4" diam o/a; Buss #4AG.	Overload protection.
E-2.....	HOLDER, fuse: extractor post; for single 4 AG fuse; brown bakelite body; 18 amp 125 v AC max; 2 1/2" lg x 11/16" diam; panel mtg, 5/8" hole; low-loss bakelite, marked FUSE; Buss #HCM-B-L.	Operating FUSE holder.
E-3.....	HOLDER, fuse: extractor post; for single 4 AG fuse; brown bakelite body; 18 amp 125 v AC max; 2 1/2" lg x 11/16" diam; panel mtg 5/8" hole; low-loss bakelite, marked SPARE FUSE; Buss #HCM-A-BL.	SPARE FUSE holder.
J-1.....	JACK, telephone: Sig C type JK-34A; for 2 cond plug .25" diam; 1 5/16" lg x 15/16" wd x 49/64" h o/a; incl two 3/4" bushings and one hex nut; 11/16" mtg hole; Sig C spec #71-852D.	EXT. MOD. jack.
J-4.....	LAMPHOLDER: candelabra; nickel pl brass body; 120 v, 3 w; 1/2" OD x 7/8" lg body with sq U-shaped bkt; mtd, two 5/32" diam holes on 1 1/16" mtg/c; Dialco part #611.	Ballast lamp (E-4) socket.
J-5.....	LAMPHOLDER: miniature bayonet; nickel pl brass body; 6 v, 2.5 amp; 3/8" OD x 3/4" lg body; w/1 1/8" lg horiz slotted bkt; bkt mtd; mtg bkt located parallel to end under socket; special #22 vinylite and copper braid covered wire lead 11" lg from bottom of socket; Drake Mfg #706-C.	Dial lamp (E-1) socket.
L-10.....	REACTOR, inductive: modulation choke; ind with .065 amp DC flowing is 10 hy; 460 ohms DC resistance; 1500 v RMS test; HS metal case; 3 17/32" lg x 2 1/16" h x 1 13/16" wd o/a; four #8-32 spade bolts 13/32" lg on 1 1/2" x 1 1/4" mtg/c; two porcelain term 5/8" lg protruding from end; Freed Trans part #17527; per JAN-T-27 grade 1; Electronic Meas Co dwg #314-A-40.	Modulation reactor.
E-1.....	LAMP, incandescent: 6 v; .25 amp; bulb G 3 1/2" clear; 7/8" lg o/a; miniature bayonet base; tungsten filament; burns any position; GE #51.	Carrier frequency dial illumination.

Ref symbol	Name of part and description	Function of part
L–11.....	REACTOR, inductive: power filter choke; inductance with .11 amp DC flowing is 10 hy; 200 ohms DC resistance; 1500 v RMS test; HS metal case; 4⅛" lg x 2¼" wd x 2⅝" h o/a; four #8–32 spade bolts 5/16" lg on 2 3/16" x 1¾" mtg/c; two porcelain term ⅝" lg protruding from side; Freed Trans part #17525; per JAN–T–27 grade 1; Electronic Meas Co dwg #314–A–39.	Power supply filter.
M–1.....	METER, ammeter: DC; 100–0–100 ua; round metal flush mtg case; 3 5/16" diam fl x 2½" diam body x 1" d behind fl; accuracy ±5%, D'Arsonval movement; 400 ohms resistance; calibrated for non-magnetic panel; single red centering line on white background; self-contained; 3 mtg holes 5/32" diam on 1 17/32" rad spaced 120 deg on fl; 2 solder lug term ⅜" lg; p/o Sig C Signal Generator TS–497A/URR; Marion Elec Inst; Davenco part #6040.	OUTPUT meter.
M–2.....	METER, ammeter: DC; 0–200 ua; round metal flush mtg case; 3 5/16" diam fl x 2½" diam body x 1" d behind fl; accuracy ±5%, D'Arsonval movement; 400 ohms resistance; calibrated for nonmagnetic panel, 6 scale divisions, black numerals on white background; self-contained; 3 mtg holes 5/32" diam on 1 17/32" rad spaced 120 deg on fl; 2 solder lug term ⅜" lg; special scale markings; Davenco dwg #B–3015–37–3; p/o Sig C Signal Generator TS–497A/URR; Marion Elec Inst.	PERCENT MODULATION meter.
R–1.....	RESISTOR, fixed: WW; 12 ohms ±10%; ½ w; JAN type RU3B120K; per JAN–R–184.	A–c voltage divider, T–1 :2-volt output.
R–2.....	RESISTOR, fixed: WW; 6.8 ohms ±10%; ½ w; JAN type RU3B6R8K; per JAN–R–184.	A–c voltage divider, T–1 .2-volt output.
R–3.....	RESISTOR, fixed: WW; 100 ohms ±5%; ½ w; JAN type RU3B101J; per JAN–R–184.	Barretter bridge element.
R–4.....	RESISTOR, fixed: WW; 1,000 ohms ±5%; 1 w; JAN type RU4B102J; per JAN–R–184.	Barretter bridge element.
R–5.....	RESISTOR, variable: WW; 500 ohms ±10% total resistance; JAN type RA25A1SA501AK; per JAN–R–19.	Barretter bridge balance adjustment for calibrating OUTPUT meter.
R–6.....	RESISTOR, fixed: WW; 700 ohms ±5%; 1 w.	Barretter bridge element.
R–7.....	RESISTOR, fixed: WW; 5.1 ohms ±10%; ½ w; JAN type RU3B5R1K; per JAN–R–184.	Barretter bridge element.
R–48, R–49.....	BOLOMETER KIT: used in bridge circuit; p/o Sig C Signal Generator TS–497A/URR; consists of R–48, R–49 RESISTOR, thermal; glass (bolometer) 200 ohms ±25% at .5 ma; 5/16" diam x 2" lg, incl 2 axial wire leads; platinum filament; RESISTOR, fixed, comp; JAN type RC10BF620J; 62 ohms; special; bolometers are matched pairs and R–48C is filed to the correct value for each pair of bolometers; *must be replaced as a set;* Davenco part #6082.	R–48: Measuring bolometer assembly. R–49: Compensating bolometer assembly.
R–9C, R–9D, R–9E, R–9F.	Part of Coil Assembly L–6C–D–E–F.....	Carrier oscillator plate voltage-dropping resistors for bands C, D, E, and F, respectively.

Ref symbol	Name of part and description	Function of part
R-10	RESISTOR, fixed: comp; 22,000 ohms ±10%; ½ w; JAN type RC20BF223K; per JAN-R-11.	Carrier oscillator grid return.
R-11	RESISTOR, fixed: comp; 160 ohms ±5%; ½ w; JAN type RC20BF161J; per JAN-R-11.	Carrier oscillator cathode resistor.
R-12	RESISTOR, fixed: comp; 47 ohms ±10%; ½ w; JAN type RC20BF470K; per JAN-R-11.	Carrier oscillator plate filter.
R-13, R-30, R-38.	RESISTOR, fixed: comp; 1,000 ohms ±10%; ½ w; JAN type RC20BF102K; per JAN-R-11.	R-13: Pulse modulation input filter. R-30: Cathode bias, V-1. R-38: Cathode bias, V-2.
R-14	RESISTOR, fixed: comp; 680 ohms ±10%; ½ w; JAN type RC20BF681K; per JAN-R-11.	Carrier oscillator plate filter.
R-15, R-16, R-17.	RESISTOR, fixed: comp; 150,000 ohms ±10%; ½ w; JAN type RC20BF154K; per JAN-R-11.	R-15: Voltage dropping, V-9 plate. R-16: V-9 plate load. R-17: V-9 plate load.
R-18	RESISTOR, fixed: comp; 2.2 meg ±10%; ½ w; JAN type RC20BF225K; per JAN-R-11.	V-9 grid return.
R-19, R-22	RESISTOR, fixed: comp; 2,500 ohms ±2%; 1 w; F characteristic; 1" lg x 9/32" diam; ins; 2 radial wire leads; special metallic film HS on ceramic tube; Concarbon type Nobleloy #X-1.	V-10 plate loads.
R-20	RESISTOR, fixed: comp; 220,000 ohms ±10%; ½ w; JAN type RC20BF224K; per JAN-R-11.	V-10 grid return.
R-21, R-43	RESISTOR, variable: WW; 200 ohms ±10%; total resistance; JAN type RA25A1SA201AK; per JAN-R-19.	R-21: OUTPUT meter zero adjustment. R-43: PERCENT MODULATION meter zero adjustment.
R-23, R-24	RESISTOR, fixed: comp; 400,000 ohms ±2%; 1 w; F characteristic; 1" lg x 9/32" diam; ins; 2 radial wire leads; special metallic film HS on ceramic tube; Concarbon type Nobleloy #X-1.	Audio oscillator frequency determination.
R-25, R-26	RESISTOR, fixed: comp; 265,000 ohms ±2%; 1 w; characteristic F; 1" lg x 3/8" diam; ins; 2 radial wire leads; special metallic film HS on ceramic tube; Concarbon type Nobleloy #X-1.	Audio oscillator frequency determination.
R-27, R-29, R-37.	RESISTOR, fixed: comp; 470,000 ohms ±10%; ½ w; JAN type RC20BF474K; per JAN-R-11.	R-27: Screen voltage dropping, V-7. R-29: V-1 grid return. R-37: D-c grid return, V-2.
R-8, R-28	RESISTOR, fixed: comp; 20,000 ohms ±5%; 2 w; JAN type RC42BF203J; per JAN-R-11.	V-1 plate loads.
R-31	RESISTOR, fixed: comp; 3,000 ohms ±2%; 1 w; characteristic F; 1" lg x 9/32" diam; ins; 2 radial wire leads; special metallic film HS on ceramic tube; Concarbon type Nobleloy #X-1.	Provides degeneration for audio oscillator.
R-32, R-45	RESISTOR, fixed: comp; 100,000 ohms ±10%; ½ w; JAN type RC20BF104K; per JAN-R-11.	R-32: V-8 plate load. R-45: V-7 plate load.

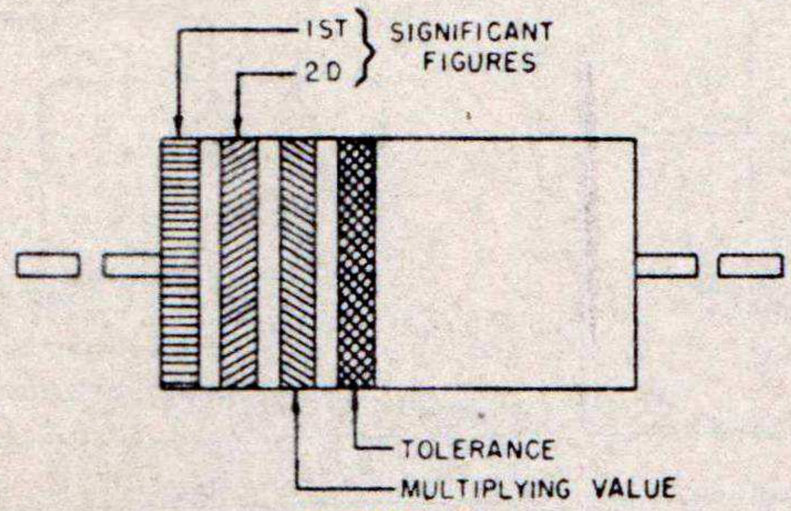
Ref symbol	Name of part and description	Function of part
R–33	RESISTOR, variable: comp; 100,000 ohms ±20% total resistance; 2.25 w; 70 deg max continuous oper; 3 solder lug term; enclosed metal case 1 1/16" diam x 9/16" d; round metal shaft 1/4" diam x 7/8" lg from mtg surface; AB clockwise log A, 4%, 10%, and 30% resistance at 35%, 50%, and 65% rotation, respectively; ins cont arm without off position; normal torque; bushing 3/8"–32 x 3/8" lg, nonturn device located on 17/32" rad at 45 deg; AB part #23248A, type J.	MOD. control.
R–34	RESISTOR, fixed: comp; 2,700 ohms ±10%; 1/2 w; JAN type RC20BF272K; per JAN–R–11.	Voltage divider for V–8 bias.
R–35	RESISTOR, fixed: comp; 10,000 ohms ±10%; 1 w; JAN type RC30BF103K; per JAN–R–11.	Voltage divider for V–8 bias.
R–36	RESISTOR, fixed: comp; 56,000 ohms ±10%; 1 w; JAN type RC30BF563K; per JAN–R–11.	Provides degeneration for modulation amplifier.
R–39	RESISTOR, fixed: comp; 50,000 ohms ±2%; 1 w; characteristic F; 1" lg x 9/32" diam; ins; 2 radial wire leads; special metallic film HS on ceramic tube; p/o Sig C Signal Generator TS–497A/URR; Concarbon type Nobleloy #X–1.	Voltage divider for V–8 input (metering section).
R–40	RESISTOR, fixed: comp; 27,000 ohms ±2%; 1 w; characteristic F; 1" lg x 9/32" diam; ins; 2 radial wire leads; special metallic film HS on ceramic tube; Concarbon type Nobleloy #X–1.	Voltage divider for V–8 input (metering section).
R–41	RESISTOR, variable: WW; 10,000 ohms ±10%; JAN type RA25A1SA103AK; per JAN–R–19.	Calibration adjustment for PERCENT MODULATION meter.
R–42	RESISTOR, fixed: comp; 100,000 ohms ±2%; 1 w; characteristic F; 1" lg x 9/32" diam; ins; 2 radial wire leads; special metallic film HS on ceramic tube; p/o Sig C Signal Generator TS–497A/URR; Concarbon type Nobleloy #X–1.	Voltage divider for V–8 bias (metering section).
R–44	RESISTOR, fixed: WW; 2,000 ohms; 12 w; JAN type RW32D202; per JAN–R–26A.	Current limiting for V–4 and V–6.
R–46	RESISTOR, fixed: comp; 1 meg ±10%; 1/2 w; JAN type RC20BF105R; per JAN–R–11.	V–8 (amplifier section) grid return.
R–47	RESISTOR, fixed: comp; 100 ohms ±10%; 1/2 w; JAN type RC20BF101K; per JAN–R–11.	Detuning rod.
X–1, X–2, X–7	SOCKET, tube: 7 cont, miniature; JAN type TSE7T101; w/bayonet type, shield type TSF0T103; per JAN–S–28A.	Sockets for V–1, V–2, and V–7.
X–4, X–5, X–6	SOCKET, tube: octal; one piece saddle mtg; two 1/8" mtg holes on 1 1/2" mtg/c; round ceramic body 1 1/8" OD x 1/2" h excluding term; silver pl bronze cont; Ucinite #115001–1.	Sockets for V–4, V–5, and V–6.
X–8, X–9, X–10.	SOCKET, tube: noval miniature; JAN type TSE9T101; w/shield, bayonet type TSF0T105; per JAN–S–28A.	Sockets for V–8, V–9, and V–10.
S–1	SWITCH, toggle: SPST; JAN type ST12A per JAN–S–23	POWER switch.

Ref symbol	Name of part and description	Function of part
S–2	SWITCH, rotary: 3 pole, 4 position; silver pl brass cont; phenolic body; 1⅞″ diam x ⅞″ d o/a; locking action, solder lug term; single hole mtg; ⅜″–32 x ⅜″ lg bushing; ¼″ diam shaft ⅞″ lg; Centralab per Electronic Meas Co dwg #314–B–36.	MODULATION selector.
S–3	SWITCH, rotary: SPDT; silver pl brass cont; phenolic body; 1⅛″ lg x 1″ wd x 9/16″ thk o/a; locking action; solder lug term; single hole mtg, ⅜″–32 x ⅜″ lg bushing; ¼″ diam shaft ⅞″ lg; Centralab #1460 modified per Davenco dwg #A–3015–260.	EXT. PULSE switch.
T–1	TRANSFORMER, power: filament and plate; input 117 v 60 cyc, single ph; 5 output wnd; secd #1, 6.3 v at .3 amp, secd #2, 6.3 v at 4 amp, secd #3, .2 v at 1 amp; secd #4, 5 v at 2 amp, secd #5, 6.12 v at .1 amp ct; 1,500 v ins; Robertson #366 potting compound; HS metal case; 4½″ lg x 3½″ wd x 4⅛″ h excluding term; 14 porcelain base solder lug term 13/16″ h on bottom of case; four #10–32 mtg studs 15/32″ lg on 3⅛″ x 2⅝″ mtg/c; Freed part #175–26; Electronic Meas Co dwg #314–A–38.	Power transformer.
E–4	LAMP, incandescent: 120 v, 3 w; bulb S6 clear; 1¾″ lg o/a; candelabra screw base, tungsten filament; burn any position; Mazda #S–6.	Provides degeneration for audio oscillator V–7.
V–1, V–2	TUBE, electron: JAN–6AQ5; per JAN–1A	V–1: Audio oscillator. V–2: Modulator.
V–4	TUBE, electron: JAN–OA3/VR75; per JAN–1A	Voltage regulator.
V–5	TUBE, electron: JAN–5Y3GT; per JAN–1A	Rectifier.
V–6	TUBE, electron: JAN–OC3/VR105; per JAN–1A	Voltage regulator.
V–7	TUBE, electron: JAN–6AU6; per JAN–1A	Audio oscillator.
V–8, V–10	TUBE, electron: JAN–12AU7; per JAN–1A	V–8: Modulator amplifier and metering stage. V–10: Bridge balance detector.
V–9	TUBE, electron: JAN–12AX7; per JAN–1A	Bridge amplifier.
V–11	TUBE, electron: JAN–955; per JAN–1A	Carrier oscillator.
	IMPEDANCE-MATCHING PAD: u/w Sig C Signal Generator TS–497A/URR; consists of 50 ohms resistive network; 6 db loss; in a cast aluminum housing; terminated at one end with Radio Frequency Receptacle UG–58/U and Radio Frequency Plug UG–21B/U (mod) at other; 3½″ lg x 1″ wd x 1″ h o/a; Davenco type #RFC–155–50–6.	Fixed output attenuator.
W–1	CABLE ASSEMBLY, special purpose: Sig C Cord GC–55B/U; consists of Radio Frequency Cable RG–8A/U, 4 ft lg excluding term; Radio Frequency Plug UG–21B/U at ea end; u/w Sig C Signal Generator TS–497A/URR.	Output cable.

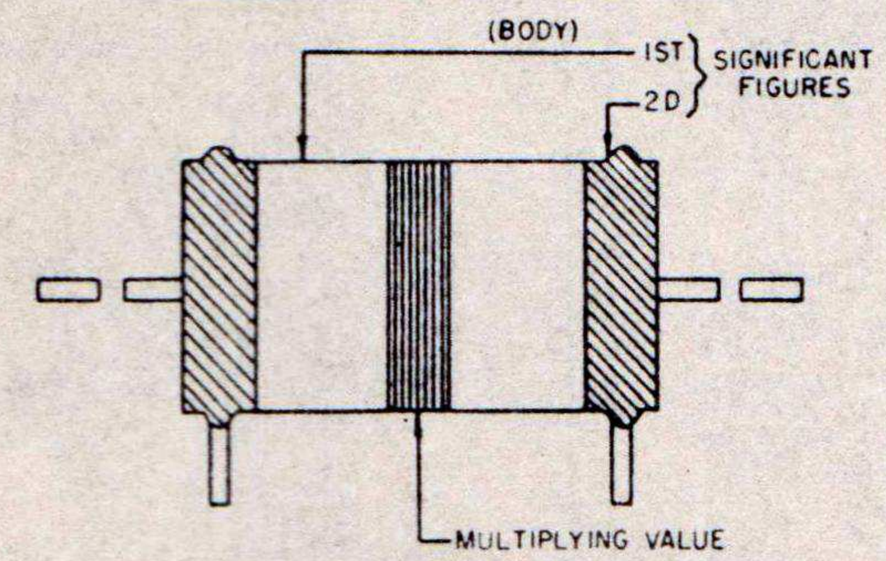
Ref symbol	Name of part and description	Function of part
W–2.....	CABLE ASSEMBLY, special purpose: consists of Radio Frequency Cable RG–55/U, 4 ft lg excluding term; Plug Connector UG–536/U on one end; 2 binding posts and one resistor in termination housing on the other end; u/w Sig C Signal Generator TS–497A/URR; Davenco dwg #B–3015–151.	Output cable.
	KNOB: bar; black alumilite finish on aluminum; for 5/16" shaft; two #10–32 Allen-head set screws; 2 1/4" lg x 1/2" wd x 3/4" h; shaft hole; 7/16" d; p/o Sig C Signal Generator TS–497A/URR; Davenco dwg #A–3015–310; Davenco part #6229.	Range knob.
	KNOB: hex; black bakelite; for 1/4" shaft; two #8–32 Allen-head set screws; single white dot; 1 1/8" diam x 5/8" h; brass insert; shaft hole 7/16" d; Davenco dwg #A–3015–328A–Pt–1; Davenco part #6269.	EXT. PULSE control.
	KNOB: hex; black bakelite; for 1/4" shaft; two #8–32 Allen-head set screws; marked MOD., 1 3/8" diam x 11/16" h; brass insert; shaft hole 7/16" d; Davenco dwg #A–3015–328–Pt–2; Davenco part #6270.	MOD. control.
	WRENCH: Allen type; fits #4 set screw.	
	WRENCH: Allen type; fits #6 set screw.	
	WRENCH: Allen type; fits #8 set screw.	
	WRENCH: Allen type; fits #10 set screw.	
	DIAL: microvolt, p/o Sig C Signal Generator TS–497A/-URR; c/o chromium pl dial staked to modified knob; hex; black bakelite for 1/4" shaft, single white indicator line; shaft hole 41/64" d; 2 3/4" diam x 15/16" h o/a; mtd with two #10–32 Allen-head set screws; Davenco part #6535.	MICROVOLTS dial
	DIAL: modulator; p/o Sig C Signal Generator TS–497A/-URR; c/o chromium pl dial staked to modified knob; hex; black bakelite for 1/4" shaft; shaft hole 7/16" diam; 1 7/8" diam x 12/16" h o/a; mtd with two #10–32 Allen-head set screws; Davenco part #6534.	MODULATION selector.
	DIAL: tuning; VF; p/o Sig C Signal Generator TS–497A/-URR; c/o chromium pl dial staked to modified knob; hex; black bakelite for 1/4" shaft; single white indicator line; shaft hole 41/64" d; 2 3/4" diam x 15/16" h o/a; mtd with two #10–32 Allen-head set screws; Davenco part #6547.	Tuning dial.

RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS*



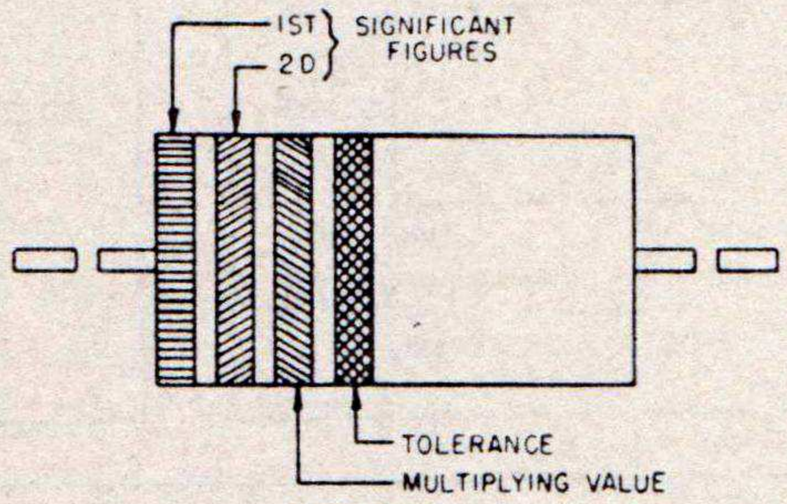
METHOD A



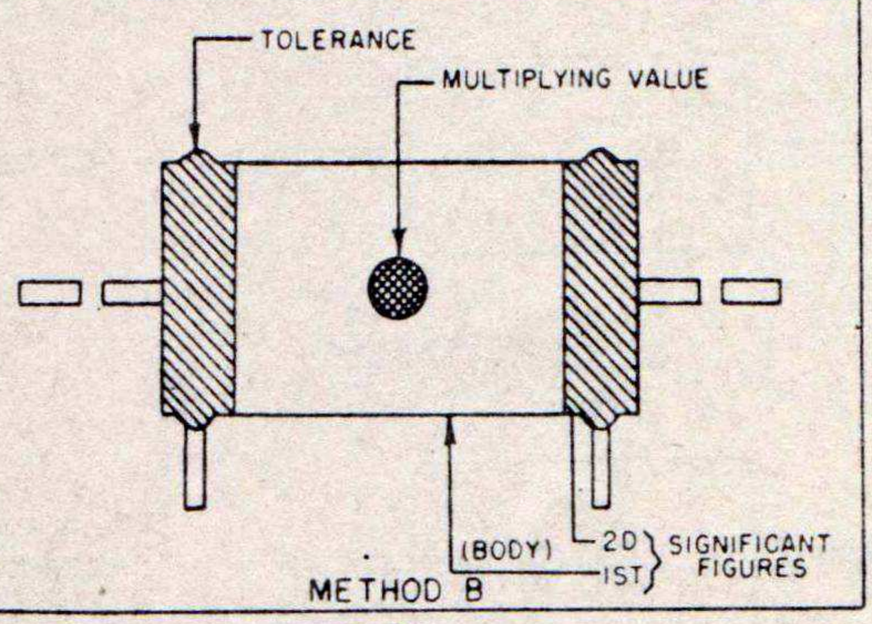
METHOD B

A

JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS†



METHOD A



METHOD B

B

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

NOTES

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

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

RMA: RADIO MANUFACTURERS ASSOCIATION

JAN: JOINT ARMY-NAVY

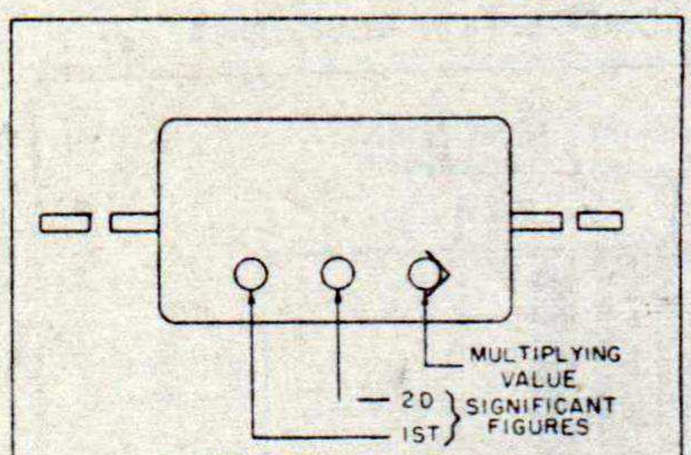
THESE COLOR CODES GIVE ALL RESISTANCE VALUES IN OHMS

TL/32454-S

Figure 18. Resistor color codes.

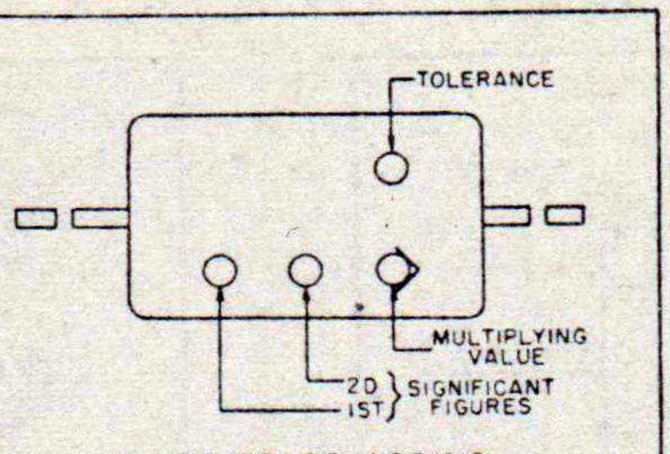
CAPACITOR COLOR CODES

RMA 3-,4-,5-,& 6-DOT COLOR CODES FOR MICA-DIELECTRIC CAPACITORS



3-DOT COLOR CODING
(500 VDCW ± 20%)

A

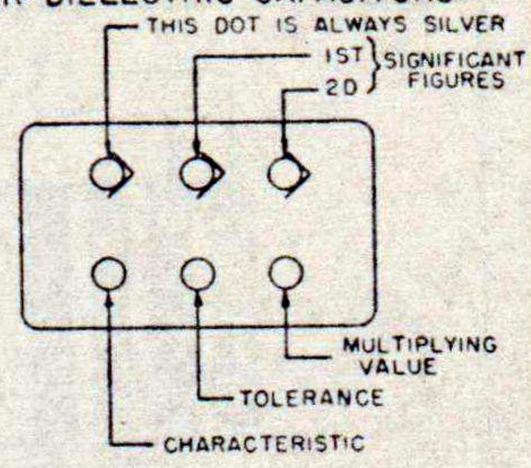


4-DOT COLOR CODING
(500 VDCW)

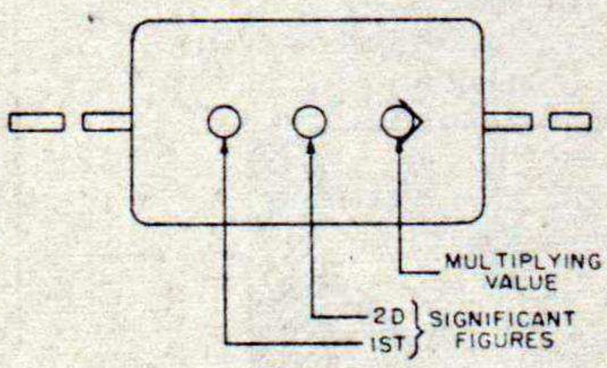
B

JAN 6-DOT COLOR CODES FOR:

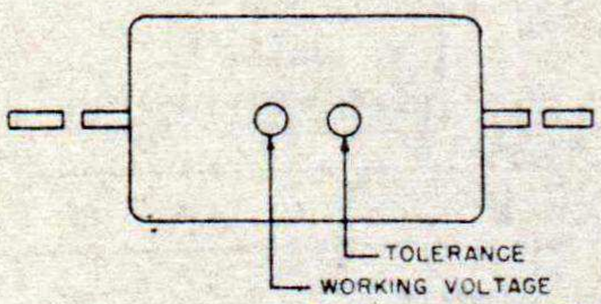
PAPER-DIELECTRIC CAPACITORS *



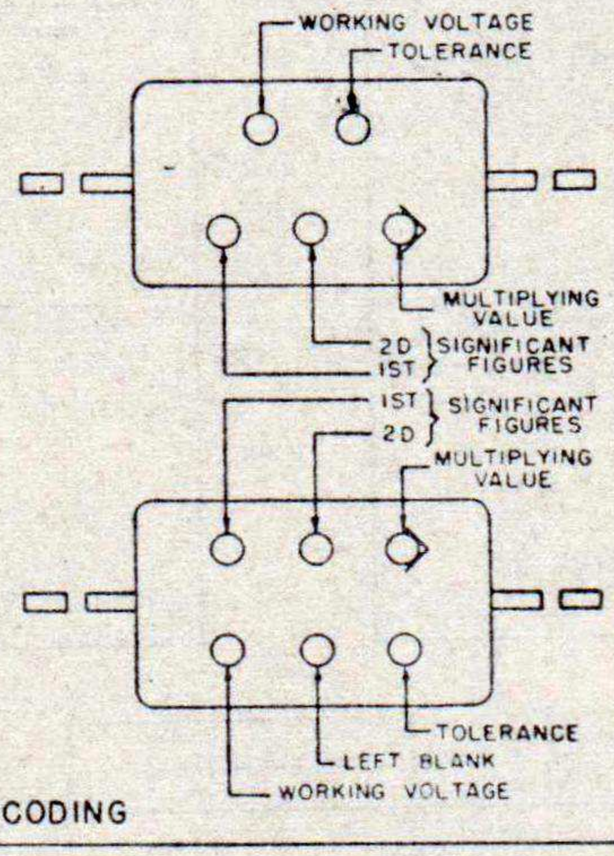
F



FRONT



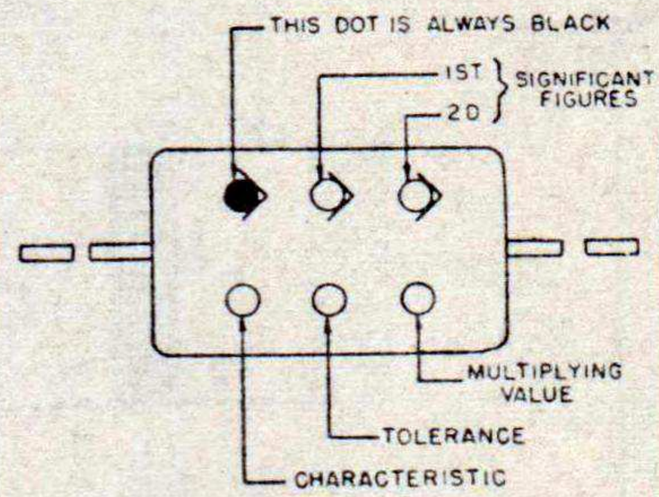
REAR



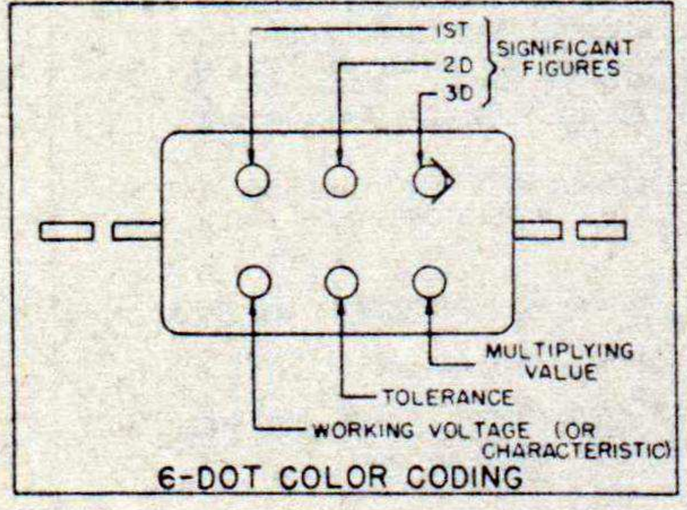
5-DOT COLOR CODING

C

MICA-DIELECTRIC CAPACITORS ≠



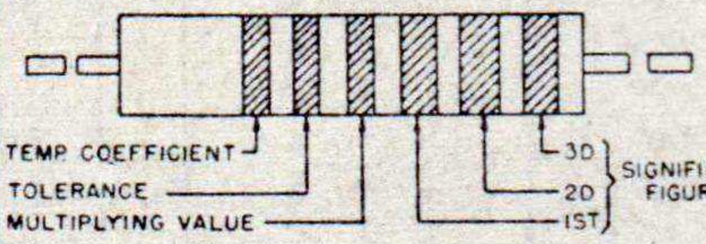
G



6-DOT COLOR CODING

D

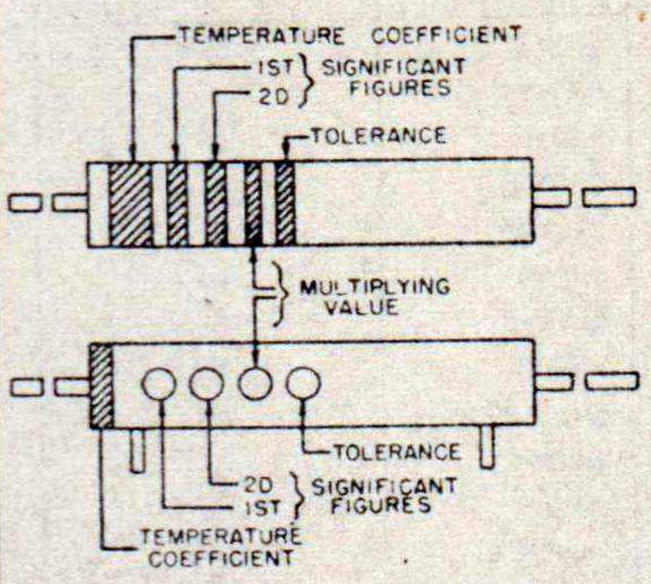
RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS



(500 VDCW)

E

CERAMIC-DIELECTRIC CAPACITORS **



H

COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE			RMA VOLTAGE RATING
		RMA MICA- AND CERAMIC-DIELECTRIC	JAN MICA- AND PAPER-DIELECTRIC	JAN CERAMIC-DIELECTRIC	
BLACK	0	1	1	1	-
BROWN	1	10	10	10	100
RED	2	100	100	100	200
ORANGE	3	1,000	1,000	1000	300
YELLOW	4	10,000	10,000		400
GREEN	5	100,000			500
BLUE	6	1,000,000			600
VIOLET	7	10,000,000			700
GRAY	8	100,000,000		0 01	800
WHITE	9	1,000,000,000		0 1	900
GOLD	-	0 1	0 1		1,000
SILVER	-	0 01	0 01		2,000
NO COLOR	-				500

NOTES

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

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

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

RMA RADIO MANUFACTURERS ASSOCIATION

JAN JOINT ARMY-NAVY

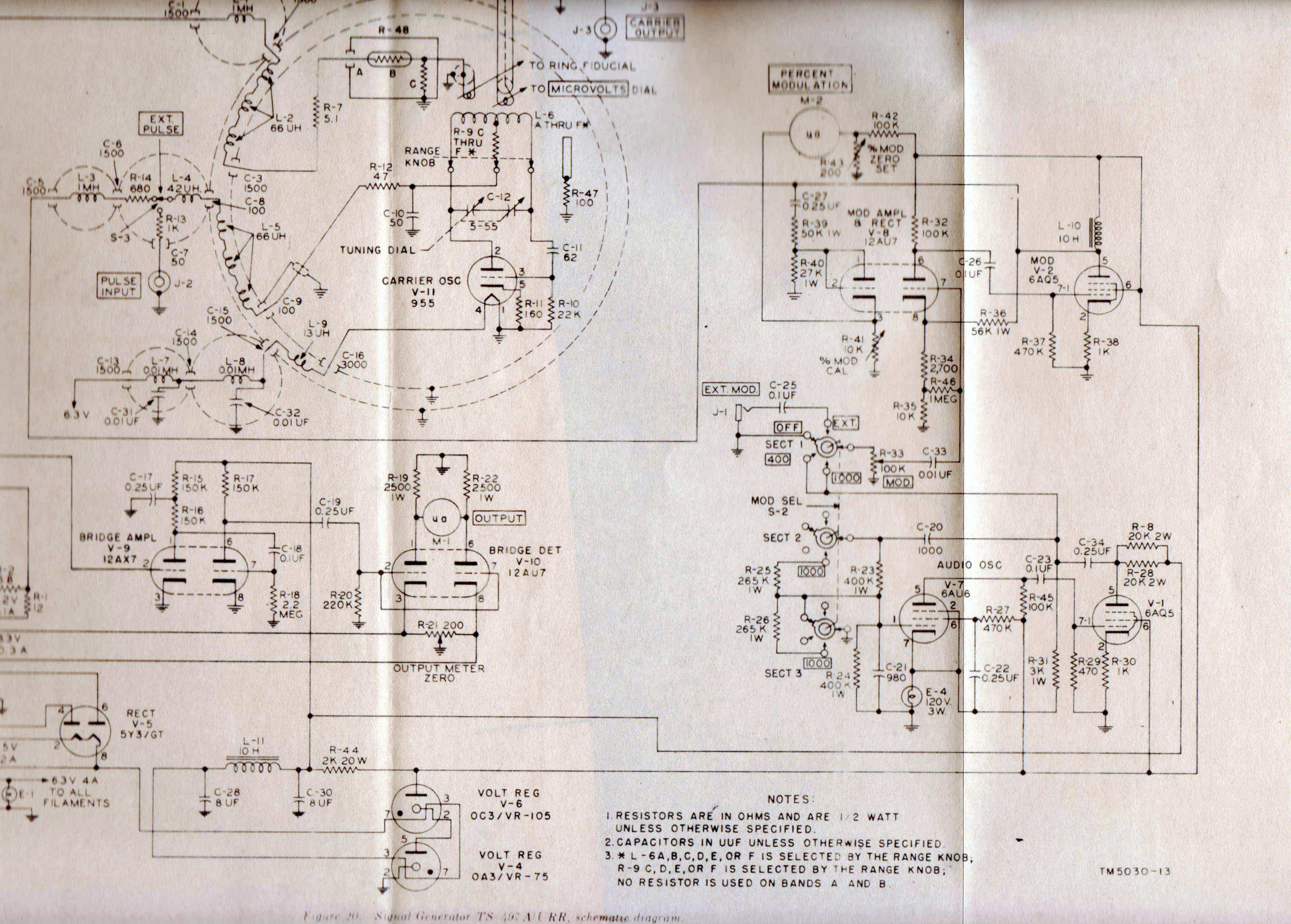
THESE COLOR CODES GIVE CAPACITANCES IN MICROMICROFARADS

TL 324535

Figure 19. Capacitor color codes.

C-1 1500
L-1 1MH
C-2 1500
R-48
A
B
C
J-3
J-3 CARRIER OUTPUT
TO RING FIDUCIAL
TO MICROVOLTS DIAL
PERCENT MODULATION
M-2
ua
R-42 100K
% MOD ZERO SET
R-43 200
R-7 5.1
L-2 66 UH
EXT. PULSE
C-6 1500
C-5 1500
L-3 1MH
R-14 680
L-4 42UH.
C-3 1500
C-8 100
R-13 1K
S-3
C-7 50
PULSE INPUT
J-2
L-5 66UH
C-9 100
R-49
R-3 100
R-4
R-5 500
R-6 700
OUTPUT METER CAL
L-6 A THRU F*
R-9 C THRU F*
RANGE KNOB
R-12 47
C-10 50
C-12 5-55
R-47 100
TUNING DIAL
C-11 62
CARRIER OSC V-11 955
R-11 160
R-10 22K
C-15 1500
L-9 13UH
C-16 3000
C-14 1500
C-13 1500
L-7 .001MH
L-8 .001MH
6.3 V
C-31 0.01UF
C-32 0.01UF
C-27 0.25UF
R-39 50K 1W
MOD AMPL & RECT V-8 12AU7
R-40 27K 1W
R-41 10K
% MOD CAL
EXT. MOD
C-25 0.1UF
J-1
OFF
EXT.
SECT 1
400
1000
R-33 100K
MOD
MOD SEL S-2
SECT 2
1000
R-25 265K 1W
R-23 400K 1W
R-26 265K 1W
1000
SECT 3
R-24 400K 1W
C-21 980
C-17 0.25UF
R-15 150K
R-17 150K
R-16 150K
BRIDGE AMPL V-9 12AX7
C-18 0.1UF
R-18 2.2 MEG
C-19 0.25UF
R-19 2500 1W
R-22 2500 1W
OUTPUT
M-1
BRIDGE DET V-10 12AU7
R-20 220K
R-21 200
OUTPUT METER ZERO
T-1
R-2 6.8
0.2V 0.1A
R-1 12
6.3V 0.3A
POWER
ON
OFF
S-1
FUSE
F-1 1 AMP
117 VAC 60~
RECT V-5 5Y3/GT
5V 2A
6.3V 4A TO ALL FILAMENTS
E-1
L-11 10 H
R-44 2K 20W
C-28 8 UF
C-30 8 UF
VOLT REG V-6 0C3/VR-105
VOLT REG V-4 0A3/VR-75

NOTES:
1. RESISTORS ARE IN OHMS AND ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED.
2. CAPACITORS IN UUF UNLESS OTHERWISE SPECIFIE
3. * L-6A,B,C,D,E, OR F IS SELECTED BY THE RANGE R-9 C,D,E, OR F IS SELECTED BY THE RANGE KNO NO RESISTOR IS USED ON RANGE

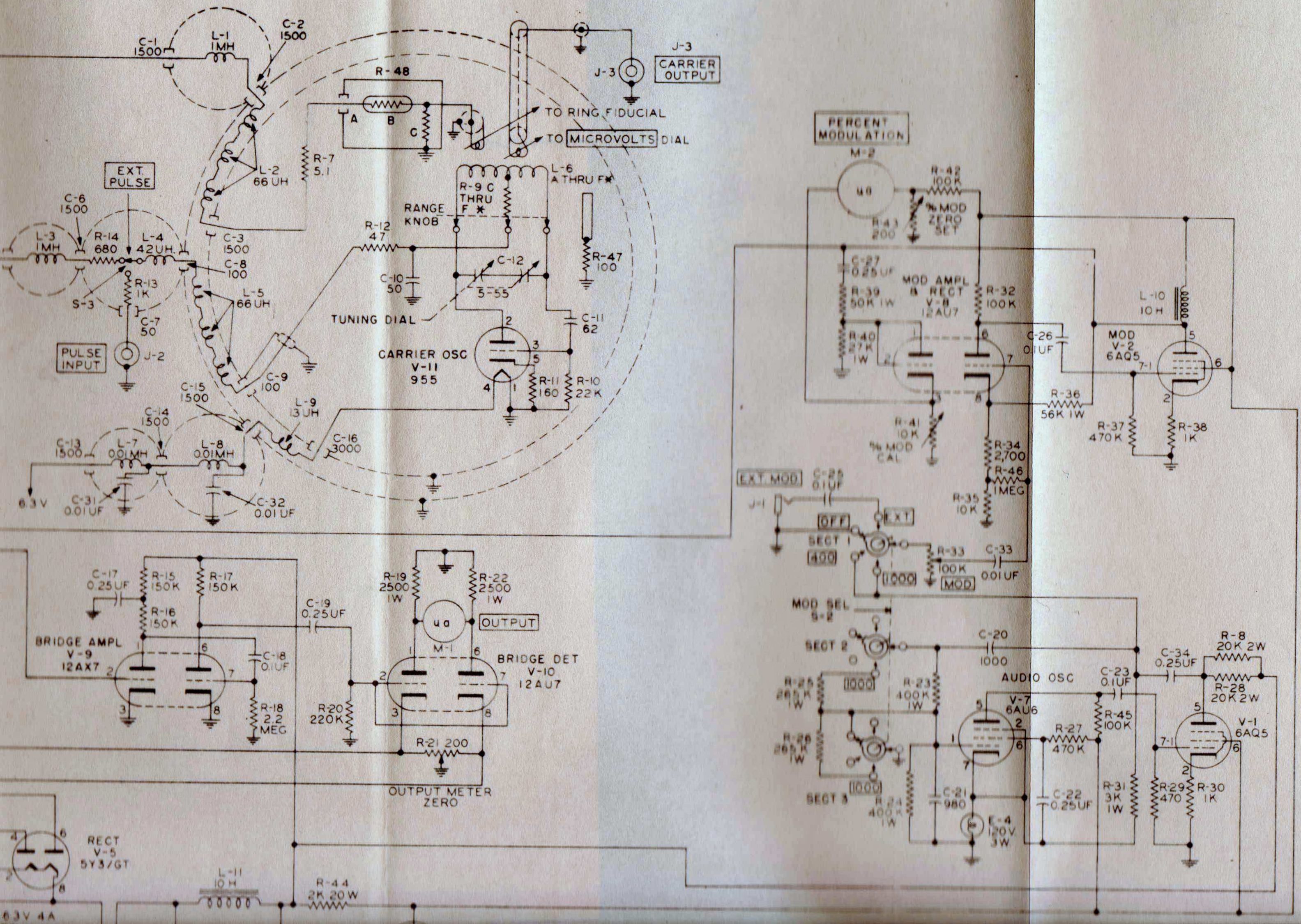


NOTES:

1. RESISTORS ARE IN OHMS AND ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED.
2. CAPACITORS IN UUF UNLESS OTHERWISE SPECIFIED.
3. * L-6A,B,C,D,E, OR F IS SELECTED BY THE RANGE KNOB; R-9 C, D, E, OR F IS SELECTED BY THE RANGE KNOB; NO RESISTOR IS USED ON BANDS A AND B.

TM5030-13

Figure 20. Signal Generator TS-497A/URR, schematic diagram.


C-1 1500
L-1 1MH
C-2 1500
R-48
A
B
C
J-3
J-3 CARRIER OUTPUT
TO RING FIDUCIAL
TO MICROVOLTS DIAL
EXT PULSE
R-7 5.1
L-2 66 UH
C-6 1500
L-3 1MH
R-14 680
L-4 42UH.
C-3 1500
C-8 100
R-13 1K
S-3
C-7 50
PULSE INPUT
J-2
L-5 66 UH
C-9 100
R-9 C THRU F *
L-6 A THRU F *
RANGE KNOB
R-12 47
C-10 50
C-12
5-55
R-47 100
TUNING DIAL
C-11 62
CARRIER OSC V-11 955
R-11 160
R-10 22K
C-15 1500
L-9 13 UH
C-14 1500
C-13 1500
L-7 0.01MH
L-8 0.01MH
C-16 3000
6.3 V
C-31 0.01UF
C-32 0.01UF
C-17 0.25UF
R-15 150K
R-17 150K
R-16 150K
C-19 0.25UF
BRIDGE AMPL V-9 12AX7
C-18 0.1UF
R-18 2.2 MEG
R-19 2500 1W
R-22 2500 1W
OUTPUT
M-1
BRIDGE DET V-10 12AU7
R-20 220K
R-21 200
OUTPUT METER ZERO
RECT V-5 5Y3/GT
6.3V 4A
L-11 10 H
R-44 2K 20W
PERCENT MODULATION
M-2
R-42 100K
% MOD ZERO SET
R-43 200
C-27 0.25UF
R-39 50K 1W
MOD AMPL & RECT V-8 12AU7
R-32 100K
R-40 27K 1W
C-26 0.1UF
MOD V-2 6AQ5
L-10 10 H
R-36 56K 1W
R-37 470K
R-38 1K
R-41 10K
% MOD CAL
R-34 2,700
R-46 1MEG
R-35 10K
EXT MOD
J-1
C-25 0.1UF
OFF
EXT
SECT 1
400
1000
R-33 100K
MOD
C-33 0.01UF
MOD SEL S-2
SECT 2
C-20 1000
R-25 265K 1W
R-23 400K 1W
R-26 265K 1W
SECT 3
R-24 400K 1W
C-21 980
E-4 120V 3W
AUDIO OSC
V-7 6AU6
C-23 0.1UF
R-27 470K
R-45 100K
C-22 0.25UF
R-31 3K 1W
C-34 0.25UF
R-8 20K 2W
R-28 20K 2W
V-1 6AQ5
R-29 470
R-30 1K