

TM 11-2509

ARMY DEPARTMENT TECHNICAL MANUAL

*U.S. Dept of Army*

# TRAINING GENERATOR AN/URA-TI



**RESTRICTED** DISSEMINATION OF RESTRICTED MATTER  
The information contained in restricted documents and the essential characteristics of restricted materiel may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work, but will not be communicated to the public or to the press except by authorized military public relations agencies. (See also par. 28. AR 380-5, 15 Mar 1944.)

ARMY DEPARTMENT 12 JUNE 1944

**WAR DEPARTMENT TECHNICAL MANUAL**  
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WAR DEPARTMENT,  
WASHINGTON 25, D. C., 12 June, 1944.

TM 11-2509, Training Generator AN/URA-T1, is published for the information and guidance of all concerned.

[A. G. 300.7 (26 Feb. 44).]

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(For explanation of symbols see FM 21-6.)

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# **DESTRUCTION NOTICE**

**WHY** — To prevent the enemy from using or salvaging this equipment for his benefit.

**WHEN**—When ordered by your commander.

- HOW** —
1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.
  2. Cut—Use axes, handaxes, machetes.
  3. Burn—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.
  4. Explosives—Use firearms, grenades, TNT.
  5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

## **USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT**

- WHAT**—
1. Smash—Radio tubes, transformers, switches, and chassis.
  2. Cut—Wires, cables, and accessory connectors.
  3. Bend and/or break—Chassis, case, transformer housings, and control shafts.
  4. Burn—Cables, diagram panel, and broken parts.
  5. Bury or scatter—Any or all of the above pieces after breaking.

# **DESTROY EVERYTHING**

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## **SAFETY NOTICE**

There is no danger of shock at any point on the outside of this set when it is in operation. When the chassis is out of the case and connected to the battery or a-c supply, be careful, as high voltages of 90 and 225 volts are present at many points on the bottom of the chassis.

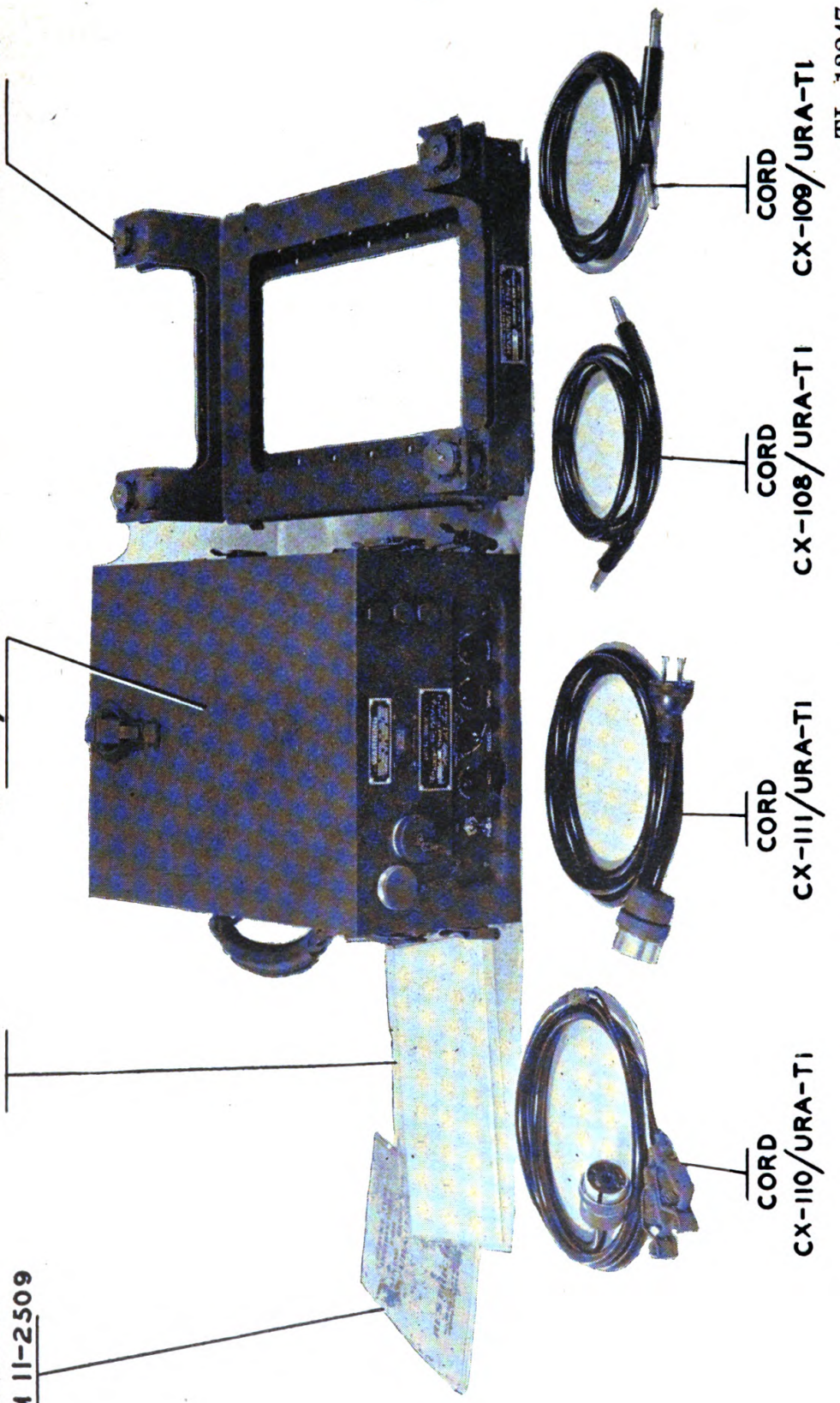


TECHNICAL  
MANUAL  
TM 11-2509

DIAGRAM  
PANEL

MODULATOR  
MD-22/URA-T1

MOUNTING  
FT-250-A



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Figure 1. Training Generator AN/URA-T1 components.

# RESTRICTED

## SECTION I DESCRIPTION

**1. USE.** Training Generator AN/URA-T1 is a device which provides several types of electrical interference encountered by a radio operator in receiving messages. It is designed to train the operator to read signals through this interference by mixing the generator's output with code-oscillator signals fed to a standard practice table. In field training, the generator may be used to modulate a standard radio transmitter, familiarizing operators in a net with several types of interference which may be encountered under combat conditions.

**2. PHYSICAL CHARACTERISTICS.** The main component of Training Generator AN/URA-T1, Modulator MD-22/URA-T1, weighs 36 pounds and is provided with a suitcase handle. It is supplied with Mounting FT-250-A for vehicular use or installations where vibration is encountered. Clip catches on the sides of the modulator unit are provided to secure it to Mounting FT-250-A.

**3. ELECTRICAL CHARACTERISTICS: INTERFERENCE.** Training Generator AN/URA-T1 produces three types of interference:

**a. Tones.** The tones consist of a repeated series of five notes creating a sound similar to that produced by bagpipes.

**b. Noise.** The noise consists of a hissing, crackling sound similar to static noise heard in a receiver operating near high-tension lines or sparking electrical equipment.

**c. Random Keying.** The random keying consists of a continuous series of meaningless dots and dashes. The random-keying circuit will either key an audio tone which is fed into a transmitter-microphone circuit or key the c-w circuit of a radio-telegraph transmitter. The first function produces m-c-w signals; the second c-w signals.

**4. JACKS.** Three jacks are provided:

**a.** The TRANSMITTER jack provides 1-volt output at 200 ohms for tone operation, and 1.25-volt output at 200 ohms for noise operation. This jack is used for all transmitter applications. It

has a fixed-output voltage and fixed impedance; no volume control is provided.

b. The OUTPUT jack provides an output power of 1.5 watts, at a variable impedance from 50 to 500 ohms, changed by shifting taps on transformer T3. The OUTPUT jack is used for code-table training and provides sufficient power to operate a large number of headsets. The output jack can only be used when the training generator is operated from a 110-volt, 60-cycle a-c source.

c. The MICROPHONE jack allows the operator to modulate a transmitter from a microphone plugged into the training generator which, in turn, modulates the transmitter.

5. **TUBES USED.** Training Generator AN/URA-T1 uses the following tubes:

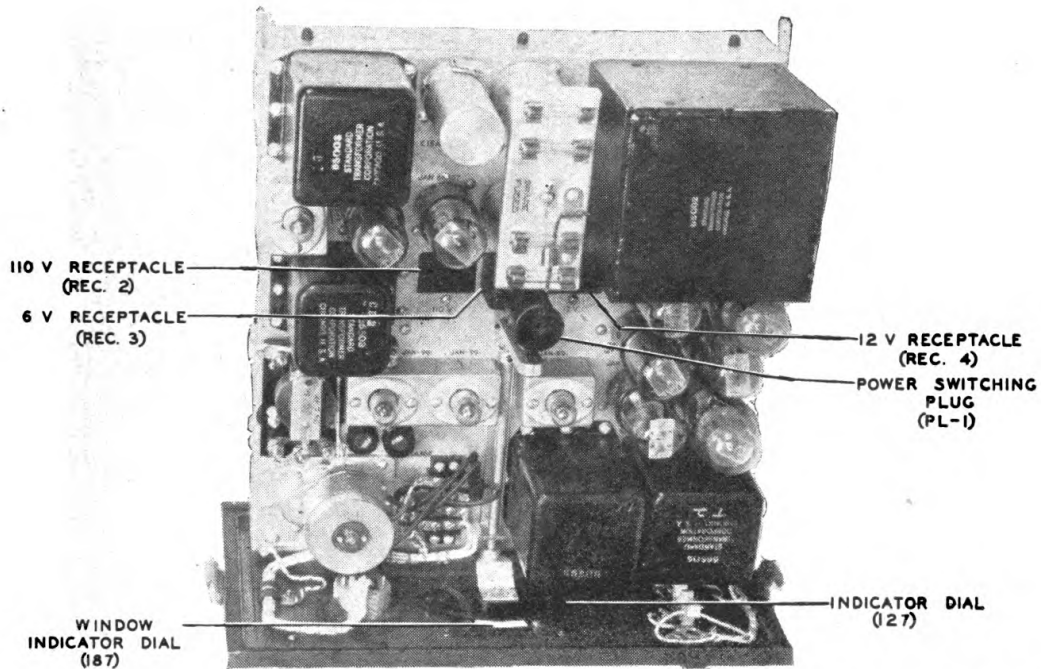
Joint Army-Navy nomenclature	Signal Corps nomenclature	Number in use	Spare
JAN-6SN7GT	VT-231	1	1
JAN-2050	VT-245	1	1
JAN-6X5GT	VT-126-B	1	1
JAN-6V6GT	VT-107-A	1	1
JAN-991	None	3	1

6. **POWER SUPPLY.** The training generator can be operated from three sources: 6-volt battery, 12-volt battery, or 110-volt, 50/60 cycle ac. A power-switching plug (PL1) located within the case provides the proper connections for each type of power input used. An indicator dial (127), visible through a window in the front panel, shows the setting of the plug. Note the dial setting before throwing power switch ON to prevent application of an incorrect power source to the generator.

7. **CURRENT DRAIN ON POWER SOURCE.** The training generator draws the following currents:

Supply voltage	Ampere drain	Watts
6 v dc	4.0	24
12 v dc	3.0	36
110 v ac	0.31	35

**8. COMPONENTS.** In addition to Modulator MD-22/URA-T1, the following components are supplied as part of Training Generator AN/URA-T1: a mounting base, FT-250-A, for vehicular mounting of the equipment, two types of output cords, CX-108/URA-T1 and CX-109/URA-T1, and two types of power supply cords, CX-110/URA-T1 and CX-111/URA-T1. The cords are stowed in a compartment at the back of the training generator case. Spare tubes and vibrator are carried in dummy sockets in the set, and spare fuses are carried in dummy fuse clips in the set. The diagram panel (148), which consists of transparent plastic sheet containing the schematic diagram and the practical wiring diagram for Modulator MD-22/URA-T1, slides into two grooves in the bakelite chassis-supporting tracks inside the training generator.



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*Figure 2. Modulator MD-22/URA-T1, chassis, top view, showing power-switching plug and indicator dial.*

9. TABLE OF COMPONENTS, DIMENSIONS, AND WEIGHTS.

Quantity	Name of component	Dimensions (in.)			Unit weight (lb.)
		Height	Width	Depth	
1	Cord CX-108/URA-T1				0.30
1	Cord CX-109/URA-T1				0.30
1	Cord CX-110/URA-T1				0.79
1	Cord CX-111/URA-T1				0.79
1	Modulator MD-22/URA-T1	7½	13¾	15½/16	36.38
3	Fuse FU-27				
3	Fuse 25 V. 10A.				
2	Tube JAN-2050(VT-245)				
2	Tube JAN-6SN7GT(VT-231)				
2	Tube JAN-6V6GT(VT-107A)				
2	Tube JAN-6X5GT(VT-126B)				
4	Tube JAN-991				
2	Vibrators				
1	Case				
1	Mounting FT-250-A	4⅞	12½	20	11.25
2	Technical Manual TM 11-2509	8½	5½		0.25

## SECTION II

### INSTALLATION AND OPERATION

**10. PREPARATION FOR USE.** Proceed as follows:

a. After unpacking Training Generator AN/URA-T1, unfasten the two clip catches on each side of the panel and pull the chassis out of the case.

b. Check to make certain that all tubes and vibrators are securely and properly seated in their sockets.

c. Check the position of the power-switching plug (PL1). This plug, located in a vertical position in the center of the chassis, has a round black handle to which a lever (131) is fastened. The plug fits into any of the three sockets, which are marked "12 V." (REC4), "6 V." (REC3), and "110 V" (REC2), and must be in the proper socket for the type of power used (fig. 2).

**WARNING:** Carefully check the position of the power-switching Plug PL1 before connecting to a power source. Otherwise the equipment may be severely damaged.

**11. VEHICULAR INSTALLATION.** When the training generator is to be used in a vehicle proceed as follows:

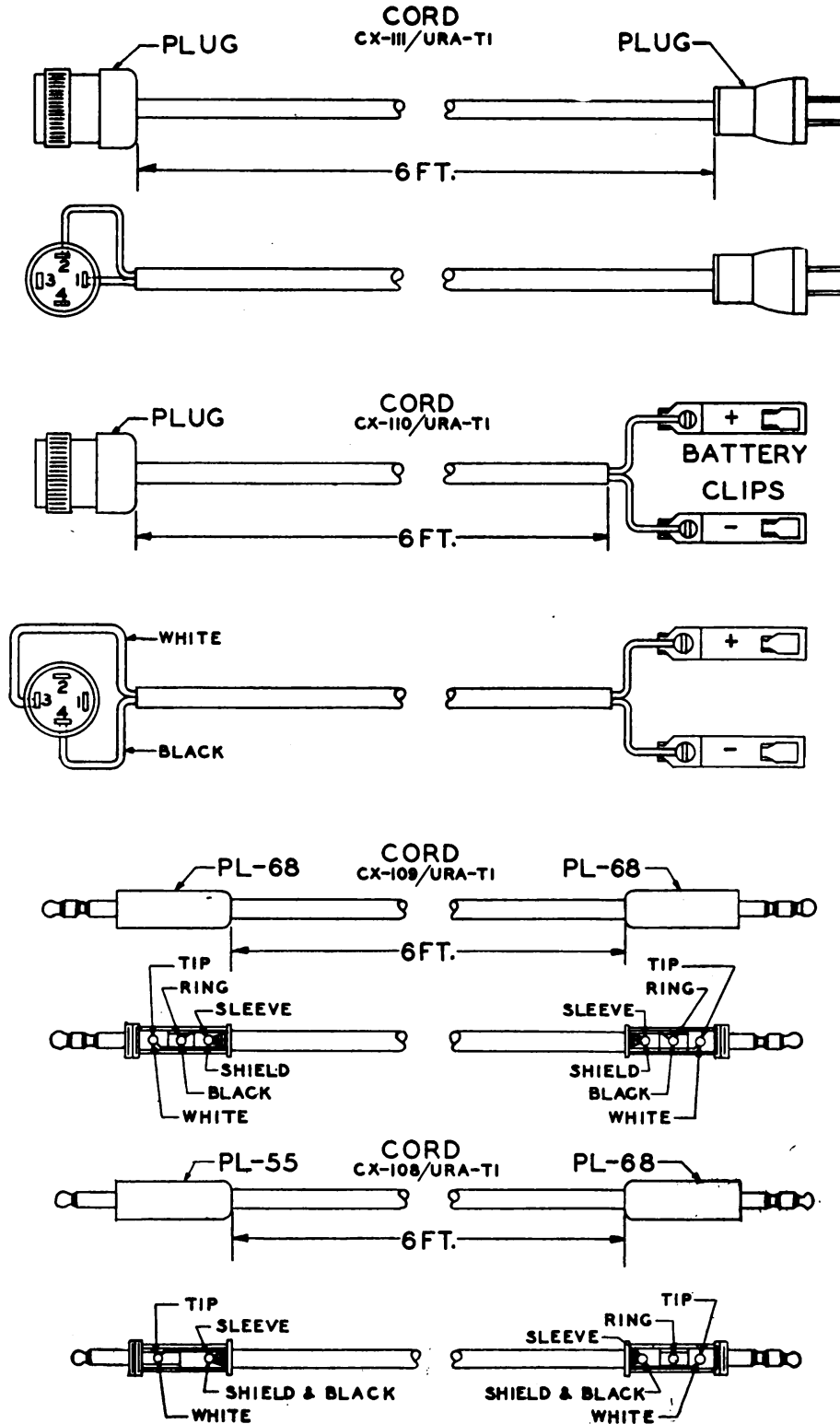
a. Locate the generator at a convenient place within reach of the operator so that the output cord (Cord CX-109/URA-T1, 6 feet) will reach from the training generator to the transmitter. Sufficient clearance must be allowed on the left and right sides of Mounting FT-250-A to allow the clip catches holding the generator in place to be fastened.

b. Secure Mounting FT-250-A, using the holes provided.

c. Recheck the setting of the power-switching plug.

d. Remove the water-seal cap from the power receptacle REC1 (fig. 4). Secure the cap to the cap mount that is provided to hold the cap in place when the vehicle is in motion.

e. Connect the proper power cord (Cord CX-111/URA-T1 when 110-volt ac is used; Cord CX-110/URA-T1 when 6- or 12-volt dc is used (fig. 3)).



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Figure 3. Cords detail, showing lengths and connections.

**CAUTION:** When using Cord CX-110/URA-T1 with battery power source, connect the black wire of the battery cable to the grounded terminal of the battery. If this connection is reversed the vehicular battery may be shorted.

f. Connect the output cord from the TRANSMITTER jack (JK-33A) on the training generator to either the microphone or key jack of the radio transmitter with which the generator will be used (fig. 4). The vehicular installation is now completed.

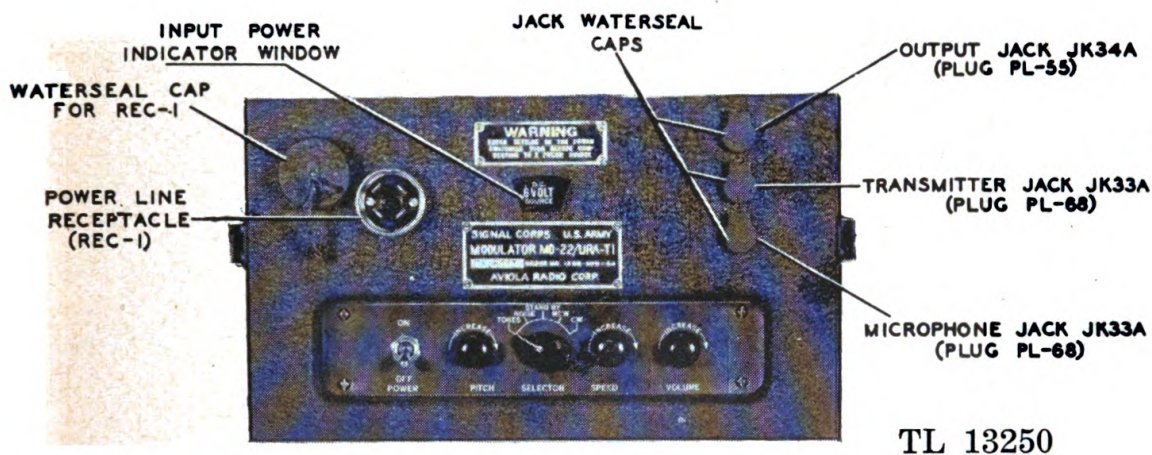


Figure 4. Modulator MD-22/URA-T1, front-panel view.

**12. CLASSROOM INSTALLATION.** When the training generator is to be used for code instruction in a classroom or at a code table and not for vehicular work, proceed as follows:

- a. Mounting FT-250-A is not used.
- b. Be sure that the mounting catches on the sides of the case are fastened into their spring clips to prevent damage to the catches.
- c. Check the power-switching-plug position to be sure that it is set for the supply voltage to be used.
- d. Connect the proper power cord.
- e. Connect the training generator output circuit to the desired headset circuit, using the cords furnished or any appropriate cord having a Plug PL-55 at one end.



f. The OUTPUT jack impedance has been set at the factory at 50 ohms. It may be changed to 125, 200, 250, 333, or 500 ohms by changing the taps on the secondary of transformer T3. Fifty ohms appear across leads marked 3 and 4, 125 ohms across leads 3 and 5, 200 ohms across leads 3 and 6, 250 ohms across leads 3 and 7, 333 ohms across leads 3 and 8, and 500 ohms across leads 3 and 9. See figure 15 for transformer wiring schematic.

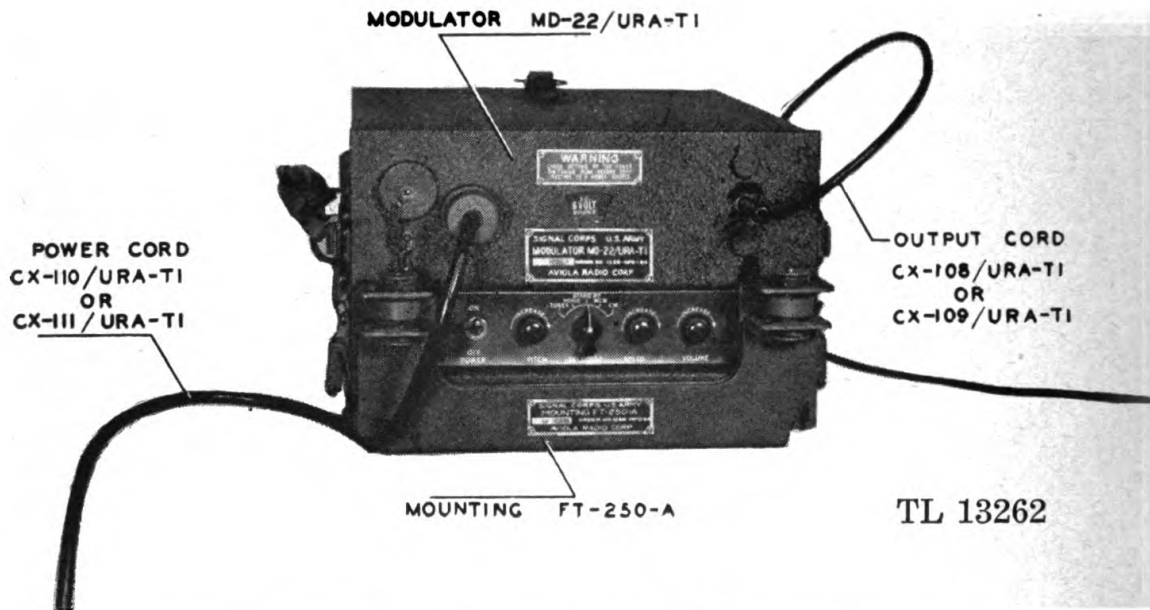


Figure 5. Training Generator AN/URA-T1, showing Modulator MD-22/URA-T1 mounted on Mounting FT-250-A.

**13. OPERATION OF CONTROLS.** Five controls are located on the lower recessed portion of the generator's front panel (fig. 4). They are marked POWER, PITCH, SELECTOR, SPEED, and VOLUME. Their functions are as follows:

- a. The POWER control is the master ON-OFF switch (S2) controlling the entire unit.
- b. The PITCH control (R27) varies the pitch of the keyed tone when the SELECTOR switch (S1) is turned to the MCW position.
- c. The SELECTOR switch (S1) selects the type of interference to be produced. The function of each position is as follows:

(1) **TONES.** This position produces the bagpipe-tone effect. There is no manual control. In this position the **SELECTOR** switch (S1) turns on the transmitter. Cord CX-109/URA-T1 is used.

(2) **NOISE.** This position produces the hissing, static-like sound. There is no manual control. In this position the **SELECTOR** switch turns on the transmitter. Cord CX-109/URA-T1 is used.

**NOTE:** When Training Generator AN/URA-T1 is used to modulate a transmitter with **NOISE**, **TONES**, or **MCW**, the volume control (R28) must be turned to **OFF** position, that is, to the extreme counterclockwise position.

(3) **STANDBY.** In this position the training generator produces no interference modulation. The tube filaments are heated and the unit is ready for instant operation. The transmitter is not turned on. If a microphone is plugged into the **MICROPHONE** jack of the training generator, and Cord CX-109/URA-T1 is used between the training generator and transmitter, the switch and voice circuits of the microphone are connected to the transmitter for direct operation.

(4) **MCW.** In this position, the training generator produces random-keyed audio tone, or modulated continuous wave. The transmitter is turned **ON**. The pitch of the audio tone produced can be varied by the control marked **PITCH** (R27), located between the **POWER** switch and **SELECTOR** controls on the front panel. The speed at which this variable audio tone may be random-keyed may be changed by the control (R29) marked **SPEED**. Cord CX-109/URA-T1 is used for **MCW** operation.

(5) **CW.** This position provides random keying of the (continuous wave) circuit of a radiotelegraph transmitter. The transmitter must be manually turned **ON** for normal c-w operation. The **SELECTOR** switch (S1) does not turn on the transmitter. The speed of the random keying produced is governed by the control (R29) marked **SPEED**. This cw keying function of the generator can be used only in conjunction with a transmitter. Cord CX-108/URA-T1 is used.

**d.** The **SPEED** control (R29) provides the speed adjustment of the **MCW** and **CW** positions of the **SELECTOR** switch as outlined above. Random-keying speed can be controlled from approximately 10 to 20 words per minute based on interruptions

per minute for the same speed international Morse code.

e. The VOLUME control (R28) controls the volume of the signal produced at the OUTPUT jack (JK-34A). It has no control over the volume produced at the TRANSMITTER jack (JK-33A). This control operates only when the training generator is powered by a 110-volt a-c source.

**14. OPERATION OF JACKS.** The three jacks provided on the right upper portion of the front panel (fig. 4) provide the following functions:

a. The OUTPUT jack, the topmost of the three, provides power for the operation of code-table headsets. Signal volume is adjusted by the control marked VOLUME. Output impedance is adjusted by changing taps on transformer T3. Output signal is available from the OUTPUT jack only when the training generator is operated from a 110-volt a-c source. Any suitable cable ended by Plug PL-55 may be adapted to this jack.

b. The TRANSMITTER jack, the middle of the three jacks, is used for all transmitter connections. It has a fixed-voltage output and a fixed impedance of 200 ohms to match the microphone-input circuit of Signal Corps transmitters. There is no volume control. Any suitable cable ended by Plug PL-68 will fit this jack.

c. The MICROPHONE jack, the lowest of the three, provides a direct microphone connection to the transmitter when the SELECTOR switch (S1) is in STANDBY position and Cord CX-109/URA-T1 is used between the training generator and the transmitter. This feature eliminates the need for changing cords at the transmitter for voice operation. Any suitable cord ended by Plug PL-68 may be adapted to this jack.

**15. OPERATION PROCEDURE.** To place Training Generator AN/URA-T1 in operation, proceed as follows:

a. Set SELECTOR switch (S1) at STANDBY.

b. Turn POWER switch (S2) to ON.

c. Allow tubes 30 seconds to warm up.

d. Turn SELECTOR SWITCH (S1) to type of interference desired. With SELECTOR switch on TONES, NOISE, or MCW positions, the transmitter is turned ON by the SELECTOR switch when transmitter is set for PHONE operation. When the SELEC-

TOR switch is set for CW, the transmitter must be manually set for c-w operation.

e. For MCW adjust SPEED and PITCH controls as desired. For CW adjust SPEED as desired.

f. To use microphone, set the SELECTOR switch at STANDBY. Push microphone button and talk.

## SECTION III

### FUNCTIONING OF PARTS

**16. GENERAL CIRCUIT DESCRIPTION.** Three separate but interrelated circuits are used to generate the three types of interference produced by Modulator MD-22/URA-T1.

a. **Tones.** For tone generation, one triode section of the 6SN7GT tube (V5) is used as an audio oscillator and the other triode section as an amplifier. The frequency of oscillation of the first section is determined by five grid resistors of different values. These resistors are continuously switched by the tone switch (S3) which consists of a motor-driven commutator. Paragraph 17 describes this in detail.

b. **Noise.** For noise generation, the 2050 tube (V4) is connected as a diode, and the noise created by the gas ions is amplified by the two sections of V5 after being passed through a low-pass filter. Paragraph 18 covers noise generation in further detail.

c. **MCW.** For m-c-w operation, one triode section of the 6NS7GT tube (V5) is keyed by the random-keying circuit through relay RE1. Paragraph 19 describes this action in detail. During c-w operation the random-keying circuit operates relay RE1 only, which then keys the transmitter.

### 17. FUNCTIONING OF TONE CIRCUIT.

a. As stated in paragraph 16 a, one section of the 6 SN7GT tube (V5) is used in an audio-oscillator circuit. Referring to figure 6, it will be seen that a Hartley-type circuit is used in which choke CH1B is the tapped tank inductor, capacitor C6 is the tank capacitor, and resistor R17, R18, R19, R20, or R21 is the grid leak, depending on the position of the rotor of S3. In brief, the theory of the Hartley oscillator is as follows: When

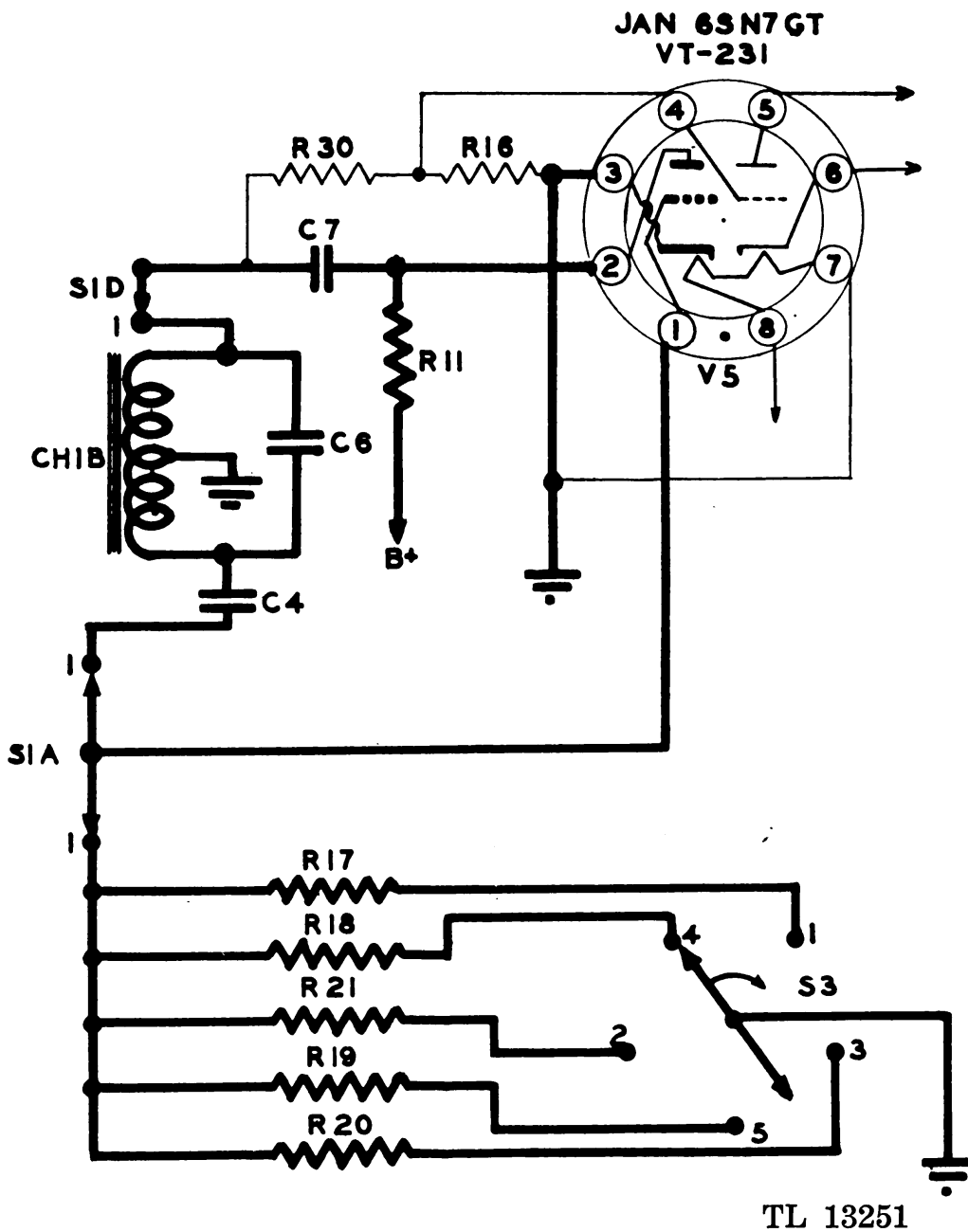


Figure 6. Audio-oscillator circuit, functional schematic diagram.

voltage is applied to the plate of the 6SN7GT tube (V5) current flows from cathode to plate. This same current flows through plate resistor R11, causing the plate voltage to fall. The change in plate voltage divides between blocking capacitor (C7) and the

tuned circuit (C6 and CH1B) with the larger percentage of the voltage appearing across the tuned circuit. The charge appearing on C6 causes a current to flow in the plate coil (represented by the portion of CH1B appearing above the center tap) which magnetically induces a voltage in the grid coil (represented by the portion of CH1B appearing below the center tap). The induced voltage appears on the grid of the tube through capacitor C4. This grid impulse is a positive voltage which causes the plate current to rise rapidly until the tube saturation point is reached.

**b.** It is at this point in the cycle that capacitor C6, having been energized fully in one direction, tries to return to a resting position. When the electrons start this equalizing process they constitute a flow of current in the inductor which is opposite in direction to the initial impulse. Thus a negative pulse will be induced in the grid coil and onto the grid, causing the plate current of the tube to decrease until C6 is fully charged in the opposite direction; at this point the cycle will repeat, and oscillation has started.

**c.** The charging and discharging of capacitor C6 through the inductor CH1B takes the form of a fly-wheel effect, with the impulse from the plate circuit once during each cycle supplying the necessary impulse to sustain oscillation and provide the required energy to the grid. The frequency at which the oscillator operates is determined primarily by the inductance value of CH1B (in this case 33 henrys) and by the capacitance of C6 (which is 0.002 microfarad); secondarily by the value of the grid leak resistors (R17, R18, R19, R20 and R21). The grid leak value determines the length of time necessary for the charge, which has accumulated on the grid and capacitor C4 during the positive grid swing, to leak off.

**d.** In this equipment, to create the five tones for the bagpipe effect, five values of grid resistors are continuously switched by a motor-driven switch S3. See figure 11 for an exploded view of the switch mechanism. The nominal frequency of the five tones are 335, 430, 570, 505 and 625 cycles per second, and are produced in that order. The frequency values given are only nominal because of tolerances present in the values of choke CH1B, C6, and the grid resistors R17, R18, R19, R20 and R21; in addition, tolerance in the characteristic of various 6SN7GT tubes may

change the oscillator frequency. When Modulator MD-22/URA-T1 is operated from a 110-volt 60-cycle a-c power source, the five-tone cycle is repeated 80 times per minute; when using a 6-volt or 12-volt d-c power source, the five-tone cycle is repeated 133 times per minute. This faster operation of the motor is due to the vibrator (VB-7C) frequency of 100 cycles per second. The motor runs only when the SELECTOR switch is in the TONES position.

e. In the modulator the oscillator output has intentionally been made rich in harmonics, as is shown by ragged waveshape on an oscilloscope screen. Because the various circuit elements, such as the amplifier tubes and transformers, change the phase relationship of the harmonic frequencies relative to the fundamental frequency, the waveshape at the output jacks differs in appearance from that at the oscillator output. The harmonic condition is obtained by impressing on the grid a voltage in excess of the optimum voltage required for sine wave performance. The tank coil inductance also acts as transformer between the plate and grid circuits. In this particular circuit excess grid voltage was obtained by making the voltage ratio between the two sections of the inductance equal to 1. For sine wave operation the ground tap would be located on another section of the inductance so that the voltage ratio between plate and grid would be greater than one.

**18. FUNCTIONING OF NOISE CIRCUIT.** In this operating position, the 2050 tube (V4) is operated as a diode; that is, the plate and the grid are connected together to form the anode of the tube. A positive voltage is applied to the anode, which causes a stream of electrons (plate current) to flow from the cathode to the tied elements. The 2050 tube is filled with a gas after being evacuated of all air. The presence of gas ions in the tube impedes the normal flow of the electrons comprising the plate current. The resulting collisions between electrons and gas ions, when the tube is operating, generates noise of all frequencies. This noise is passed through a low-pass electric wave filter, composed of choke CH1A and capacitors C9, C10, and C11. This filter removes all frequencies of the noise above 3,000 cycles per second. The noise is then amplified by both sections of the 6SN7GT tube (V5).

**19. FUNCTIONING OF MCW AND CW CIRCUITS.** a. The JAN-991 neon tube, V1, with its associated components, capacitor C1 and resistor R3 comprises a relaxation oscillator. When a high voltage is applied through voltage-dropping resistor R2 to one plate of capacitor C1, a voltage builds up across the capacitor plates until it reaches a voltage high enough to discharge through the neon tube V1 and resistors R3 and R6 to ground. The length of time that the discharge lasts depends upon the capacity of the discharging capacitor (C1) and the value of resistors R3 and R6. When such a discharge occurs through neon tube V1, a positive charge is impressed on the grid of the 2050 tube V4. This grid charge acts as a trigger and allows plate current to flow in the 2050 tube V4. The coil of relay RE1, being in the plate circuit of the 2050 tube, receives an impulse whenever the 2050 tube is triggered by the relaxation oscillator. This impulse in the relay coil causes the relay contacts to close. Capacitor C18, which shunts the coil of relay RE1, serves to lengthen the time the relay remains closed.

b. Because a-c voltage is applied to the plate of the 2050 tube, the relay would tend to chatter without the inclusion of capacitor C18 in the circuit. Neon tube V2 with C2 and R5, and neon tube V3 with C3 and R8, comprise two more relaxation oscillators. The three relaxation oscillators operate in parallel, that is, they all are used to trigger the grid of the 2050 tube V4.

c. The time constants of two of the oscillators are similar, but different from the time constant of the third oscillator. In order to operate the 2050 tube as a control tube, it is necessary to use a-c voltage on the plate. A negative bias on the grid prevents the tube from ionizing. However, once the gas in the tube ionizes and passes current, no amount of negative grid voltage will stop the process and only by reducing the plate voltage below the ionizing potential of the gas is the process stopped. The negative part of the a-c plate voltage cycle provides this condition every half cycle, causing the tube to de-ionize, and permitting the grid to recover control. Ionization occurs from collisions of electrons emitted by the hot cathode with the gas molecules. A negative grid voltage prevents the electrons from leaving the cathode and causing ionization. A positive grid voltage aids the emission of electrons. The collision knocks an electron out of a gas molecule, leaving a positive-charged ion. The flow of the electrons



to the positive plate results in the flow of plate current. The positive ions tend to gather around the cathode and being opposite polarity aid in the emission of electrons. When the grid is negative the positive ions go to the grid and neutralize the effect of the grid voltage which prevents the grid from stopping the emission of electrons. Only by reducing plate voltage and allowing de-ionization to take place can the grid resume control.

d. When the SELECTOR switch (S1) is set for c-w operation, one contact of relay RE1 is connected directly to the TRANSMITTER jack (JK-33A) and the dc in the transmitter CW circuit is keyed. When the SELECTOR switch (S1) is set for MCW operation, the relay RE1 completes the grid circuit of the audio-oscillator section of the 6SN7GT tube (V5) to ground, allowing the oscillator to operate. The oscillator-grid resistor, during m-c-w operation, is potentiometer R27, which is the PITCH control, and which regulates this oscillator tone. The speed of the random keying during m-c-w and c-w operation is regulated by potentiometer R29, the SPEED control. This control regulates the voltage applied to the neon tube V1, V2, and V3 in the relaxation-oscillator circuits. During the random-keying function, dots are created by the firing of a single JAN-991 neon tube; dashes are formed by two or more of the relaxation oscillators operating nearly at the same instant.

**20. FUNCTIONING OF STANDBY CIRCUIT.** In the STANDBY position of the SELECTOR switch (S1) the grid of the first section of the 6 SN7GT tube (V5) is grounded, and plate voltage is removed from the 2050 tube (V4), but tube filaments are heated, and the equipment is ready for instant operation.

#### **21. FUNCTIONING OF AMPLIFIER STAGES.**

a. The second section of the 6 SN7GT tube (V5) is permanently connected as an amplifier. Resistor R14 causes a voltage drop in the plate circuit to the point where some plate limiting occurs. Resistor R12 is the tube bias resistor. By use of plate limiting and grid biasing, both excessive positive and negative peaks of a signal are limited. Some additional peak limiting is provided by the selenium rectifier SE1. Limiting of this sort is necessary to avoid overmodulation of the transmitter which might be caused by high peaks from the noise or the oscillator source. An inter-stage transformer (T2) couples the output of the 6SN7GT tube

(V5) to the grid of the 6V6GT tube (V6) and to the TRANSMITTER jack (JK-33A). Two separate secondary windings are used on T2 for this purpose. The secondary winding which supplies power to the TRANSMITTER jack is shunted by the selenium rectifier SE1 which provides additional peak limiting. This winding has an impedance of 200 ohms. The grid winding of transformer T2 is shunted by the VOLUME control (R28). This winding provides the signal voltage for the grid of the 6V6GT tube (V6), the power-amplifier stage.

**NOTE:** This power-amplifier stage operates only when Modulator MD-22/URA-T1 is connected to a 110-volt a-c power source. This permits the power drain to be kept to a minimum when the equipment is operated from a battery power source, such as in field training, where V6 is not needed.

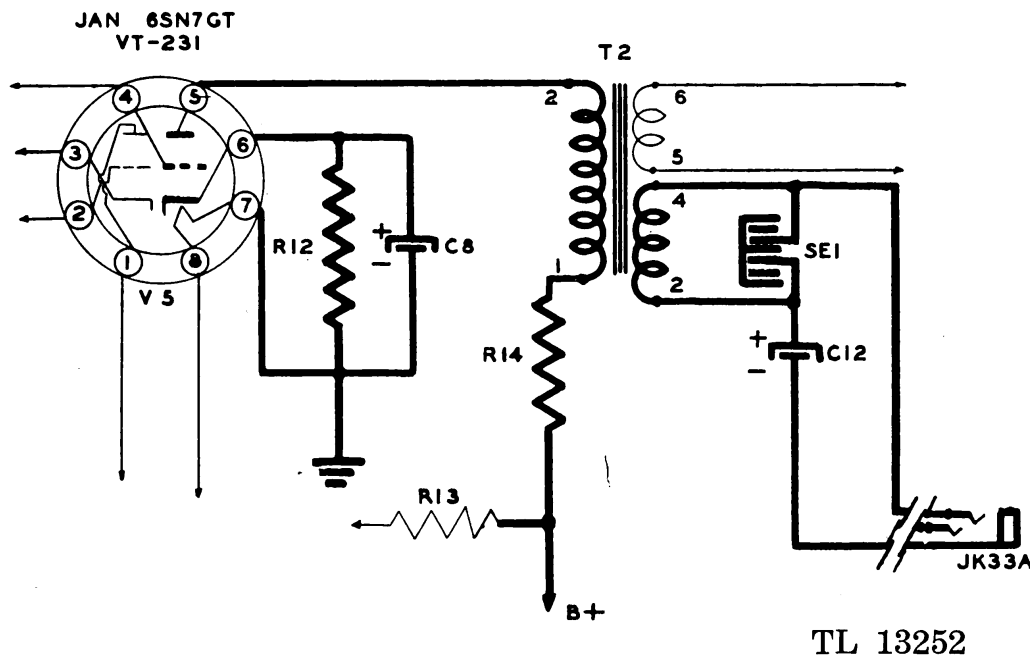


Figure 7. Peak-limiting circuit, functional schematic diagram.

b. The output transformer T3 couples V6 to the OUTPUT jack (JK-34A). The secondary winding of T3 is tapped to permit output impedances of 50 ohms, 125 ohms, 200 ohms, 250 ohms, 333 ohms, and 500 ohms. The equipment is shipped from the factory with

the output impedance set at 50 ohms. See figure 15 and paragraph 12 f for instructions for changing the output impedance. Resistor R33, which shunts the output transformer (T3) secondary winding, eliminates transient voltages which might otherwise appear across the primary winding when no load is connected to the secondary.

**22. FUNCTIONING OF POWER SUPPLY CIRCUIT.** Training Generator AN/URA-T1 is capable of operation from 110-volt a-c, 6-volt d-c, or 12-volts d-c power sources. Circuit switching for the various power sources is accomplished by placement of plug PL1 in the correct receptacle, REC2 for 110-volt a-c operation, REC3 for 6-volt d-c operation, or REC4 for 12-volt d-c operation. During 110-volt a-c operation, the tube filaments receive power from a filament winding on the power transformer T4, and the motor (M1) which is a part of switch S3 operates directly from the input power line. During 6- or 12-volt d-c operation, a vibrator (VB-7C) is used to interrupt the flow of current and make the input suitable for impressing on the transformer primary. The tube filaments are powered directly from the d-c power source; during 12-volt d-c operation a series-voltage-dropping resistor R26 is inserted in the filament circuit. The vibrator supplies voltage of an alternating frequency of 100 cycles per second on d-c operation. In order to operate the motor M1 at this frequency, it is connected to a 150-volt tap on the power transformer. Because the vibrator supplies a frequency higher than that from a-c power sources, the tone switch S3 revolves at a higher speed.

**23. INSULATION OF JACKS.** The jacks are not grounded to the chassis of the training generator. This feature is necessary for operation with transmitters which have floating-power circuits such as Radio Set SCR-284.

## SECTION IV

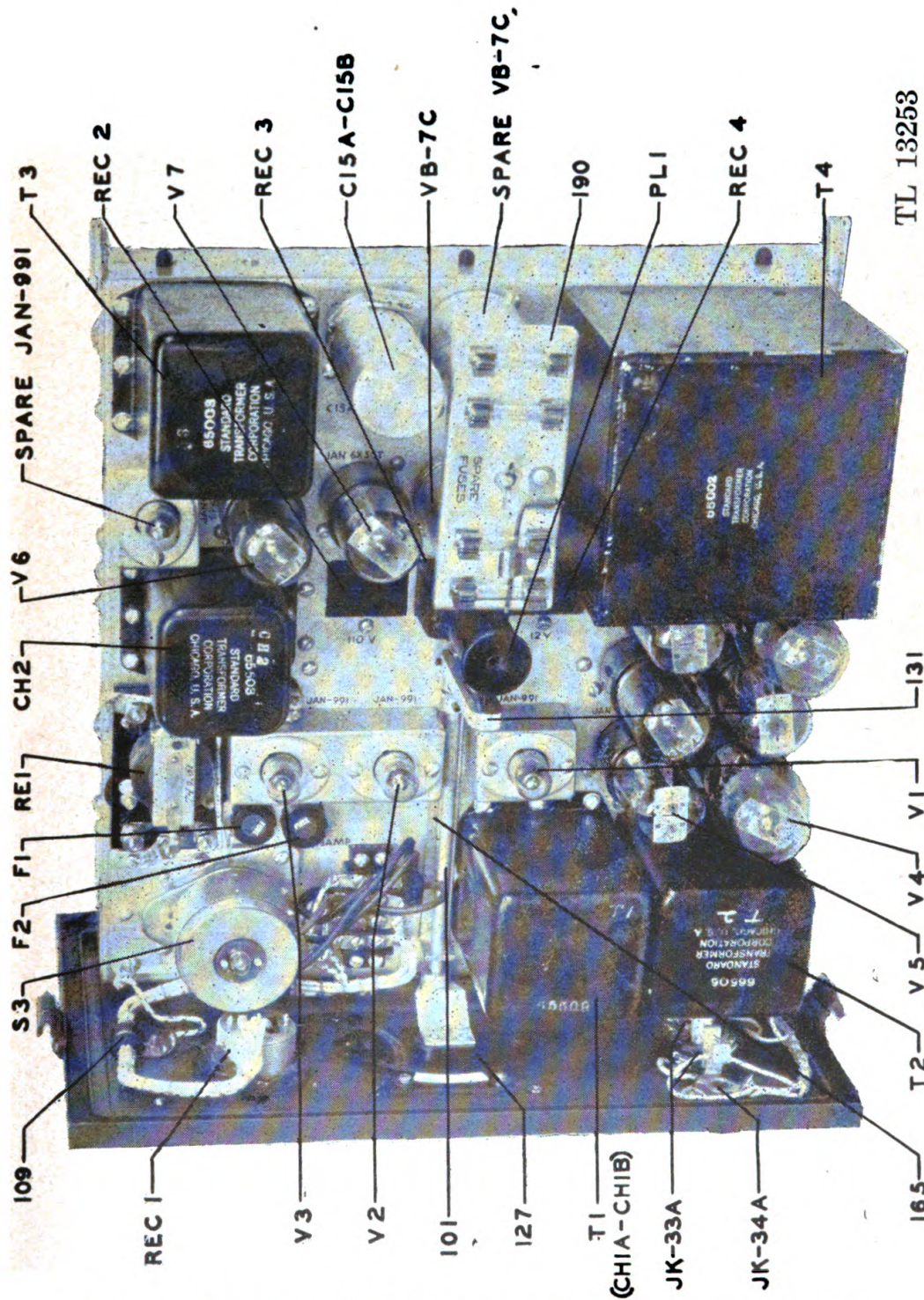
### MAINTENANCE

**NOTE:** Unsatisfactory performance of this equipment will be reported immediately on W. D., A. G. O. Form No. 468. If Form No. 468 is not available see TM 38-250.

**24. GENERAL.** Training Generator AN/URA-T1 is a sturdy piece of equipment, built to withstand considerable mechanical vibration and electrical overload. Occasionally, however, there will be a failure in one or more of the component parts. When such a failure occurs, servicing and repair should be attempted only by authorized and competent personnel equipped with adequate tools and instruments. An inexperienced operator, in attempting to locate and repair troubles, may damage the equipment further.

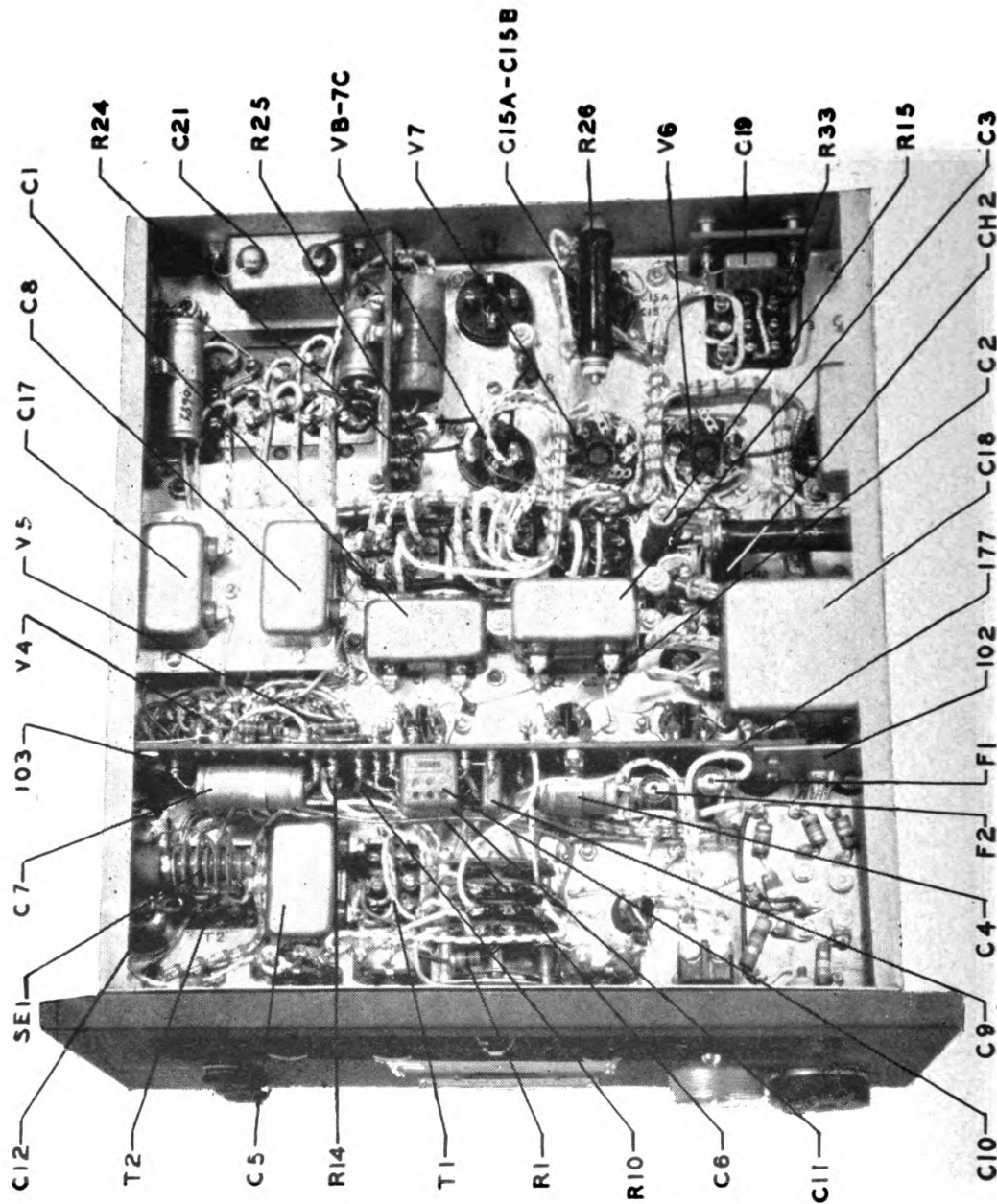
**25. TROUBLE SHOOTING WITH FRONT PANEL CONTROLS.** If trouble occurs in Modulator MD-22/URA-T1 but the equipment still produces at least one type of interference, the source of the trouble may generally be located with the aid of the following table. Find in the table the condition which applies; the parts to be checked are then listed in the right hand column. A headset with a Plug PL-68 should be plugged into the TRANSMITTER jack (JK-33A) during this test.

If equipment operates on	But not on	Look for trouble in
TONES	NOISE, MCW, CW	S1, V4, R9
NOISE	TONES, MCW, CW	S1
MCW	TONES, NOISE, CW	S1
CW	TONES, NOISE, MCW	S1, V5, V7, R11, R12, R14, R16, R30, C5, C7, C12, SE1, T2
TONES, NOISE	MCW, CW	S1, V4, RE1, R1, R29, R31, R6, C18
TONES, MCW	NOISE, CW	S1
TONES, CW	NOISE, MCW	S1
NOISE, MCW	TONES, CW	S1
MCW, CW	TONES, NOISE	S1
TONES, NOISE, MCW	CW	S1, Wiring—RE1 to TRANSMITTER Jack (JK-33A)
TONES, NOISE, CW	MCW	S1, R27
TONES, MCW, CW	NOISE	S1, V4, CH1A, C10, C11, R10
NOISE, MCW, CW	TONES	S1, S3



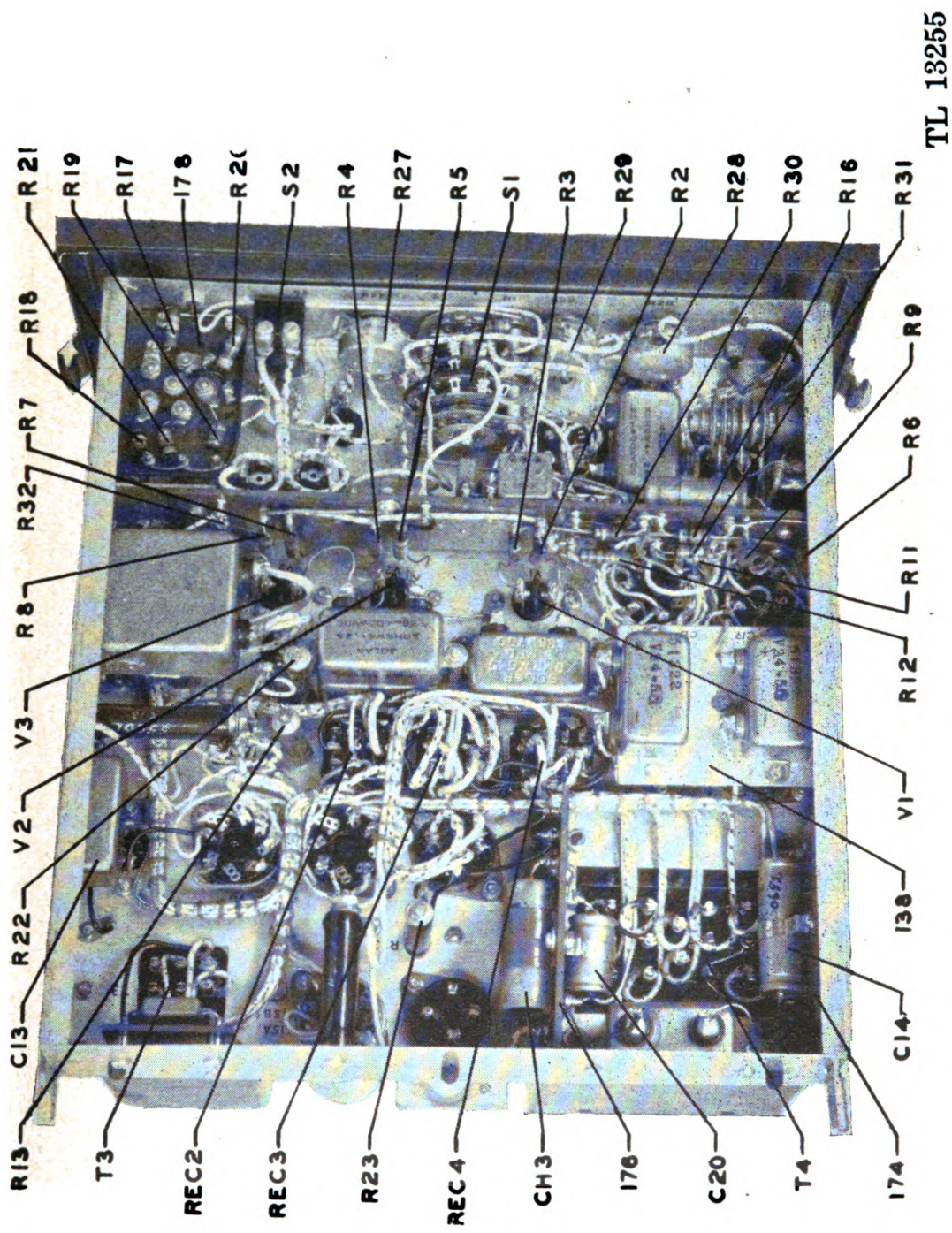
TL 13253

Figure 8. Modulator MD-22/URA-T-1, chassis, top view, showing location of major parts.



TL 13254

*Figure 9. Modulator MD-22/URA-T1, chassis, bottom view, showing location of major parts and front view of main terminal board.*



TL 13255

Figure 10. Modulator MD-22/URA-T1, chassis, bottom view, showing location of major parts and rear view of main terminal board.



**26. TROUBLE CHART.** In case the equipment is **completely inoperative**, the items in the trouble chart below should be checked.

### TROUBLE CHART

Probable causes	Remedy
Power switch (S2) OFF.	Turn switch to ON.
Power-switching plug (PL1) in wrong position for power source used.	Place power-switching plug in correct receptacle.
Dead or low battery.	Recharge or replace battery.
Open output cord.	Repair or replace cord.
Defective or burned-out tube.	Replace—See paragraph 27.
Vibrator VB-7C will not start.	Replace vibrator.
Blown fuse on a-c operation.	Replace fuse after checking as noted.
<p>Check for shorts in following parts:</p> <p style="padding-left: 2em;">Tube sockets.</p> <p style="padding-left: 2em;">Tubes.</p> <p style="padding-left: 2em;">Power transformer T4.</p> <p style="padding-left: 2em;">Capacitors C15A and C15B.</p> <p style="padding-left: 2em;">Choke CH2.</p> <p style="padding-left: 2em;">REC2, REC3, REC4,</p>	<p>Clear short—replace socket if necessary.</p> <p>Replace tube—see paragraph 27</p> <p>Replace transformer.</p> <p>Replace capacitor assembly.</p> <p>Replace choke.</p> <p>Repair or replace receptacle.</p>

## TROUBLE CHART (contd)

Probable causes	Remedy
Blown fuse on d-c operation.	Replace fuse after checking as instructed.
Power-switching plug (PL1) positioned wrong.	Place power-switching plug in correct receptacle.
Vibrator (VB-7C) points sticking.	Replace vibrator.
Check for shorts in following parts:	
Tube sockets.	Clear short if in wiring or replace socket.
Tubes.	Replace tubes—see paragraph 27.
Power transformer T4	Replace transformer.
Capacitors C15A and C15B	Replace capacitor assembly.
Choke CH2	Replace choke.
Choke CH3	Replace choke.
Capacitor C14	Replace capacitor.

**27. TUBE REPLACEMENT.** Replacement of burned-out or otherwise defective tubes with new tubes will not affect the normal performance of the equipment with the following exceptions.

**a.** Replacement of V5 (6SN7GT-VT-231) will affect the pitch of the TONES slightly. This is a normal condition.

**b.** Occasionally a 2050 tube (VT-245) (V4) is encountered which will not provide a satisfactory output during NOISE operation. If this condition occurs, replace with another 2050 tube.

## **28. MAINTENANCE AND REPLACEMENT OF TONE SWITCH S3.**

**a.** If the tones become fuzzy or erratic during TONES operation, clean commutator. To clean commutator follow this procedure:  
(1) On the underside of the chassis, remove the six 6-32 nuts which fasten terminal board 178 to the switch commutator housing and rotate the terminal board clear.

(2) Disconnect the two motor leads from terminal strip 180 located on the top of the chassis.

(3) Remove the four 6-32 screws which mount the tone switch S3 assembly to the chassis and remove the tone switch assembly from the chassis.

(4) Remove the three 5-40 screws mounting the commutator housing to the mounting plate, noting the manner in which the unit is assembled.

(5) Clean the two contact balls and the entire inside surface of the commutator housing with carbon tetrachloride making sure that the five silver contacts, which are inlaid in the housing, and the center cup are free of all dust particles and oil.

(6) Reassemble unit (figs. 11 and 12), replace assembly in chassis, connect motor wires to terminal strip, and replace terminal board 178 onto commutator-housing studs.

**b.** No provision is made for replacing individual parts of the tone switch (S3) assembly. If any trouble develops other than erratic and fuzzy tones, the entire unit must be replaced.

**c.** No lubrication is necessary in this assembly. The main motor bearings are an oilless type with some additional lubrication sealed in the motor at the factory. The gears are clock-type and require no attention. If the motor fails to operate at normal speed, check the commutator for dirty contacts.

**NOTE:** The mechanism will not operate at normal speed when temperature is below 15° F.

**d.** If it is necessary to replace a tone resistor and no resistor of correct tolerance is available, a resistor of greater tolerance may be used. However, in order to obtain correct frequency when using a resistor of greater tolerance, a trial selection is made in the following manner:

(1) Disconnect ground lead (center terminal) from the tone resistor board.

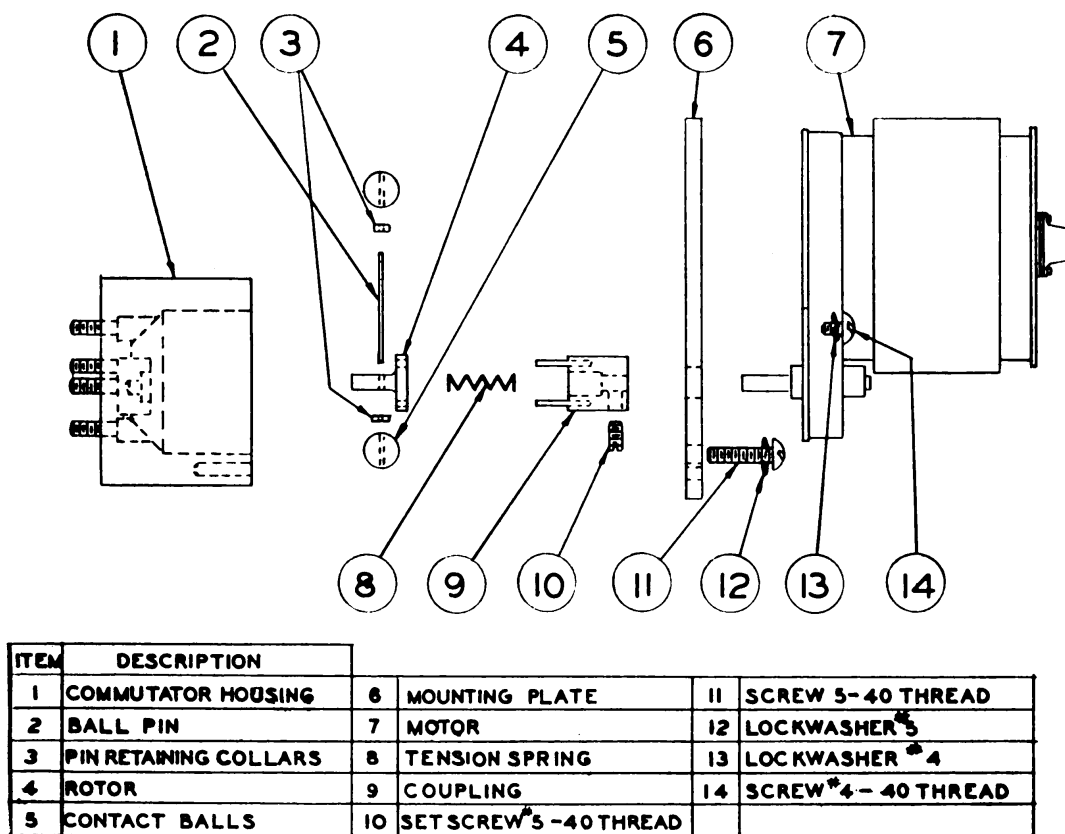
(2) Connect one end of the trial resistor to a ground point; the other end to the outer terminal of the resistor being replaced.

(3) Check tones by comparison to another tone source. An audio-frequency signal generator provides the best source of tone for checking the tone frequencies. Another method of checking is to compare the tone with that from another training generator, being careful to listen to the fundamental frequency instead of the harmonic.

## 29. NORMAL VOLTAGE AND RESISTANCE READING.

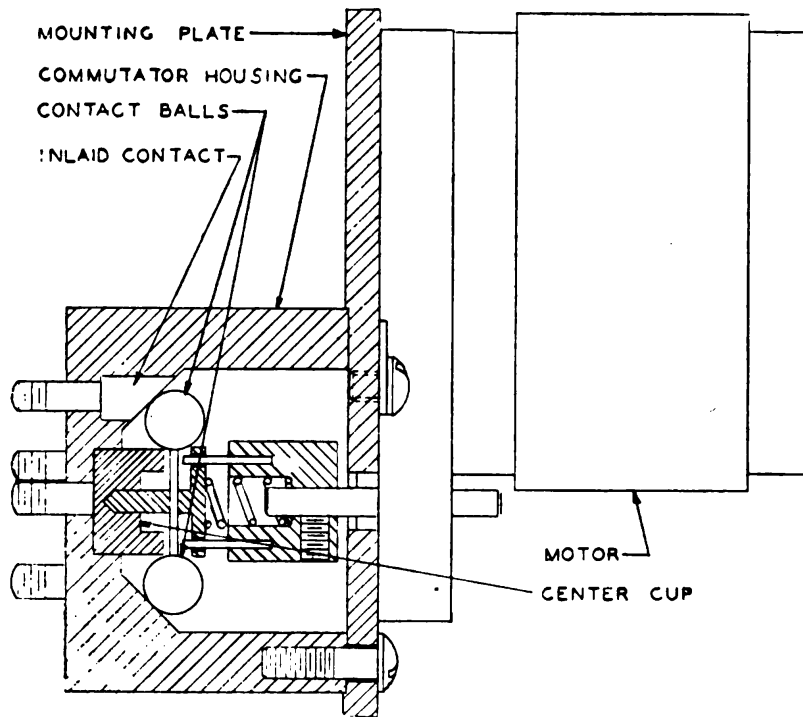
a. The tube socket layout diagrams showing voltages and resistance to ground (figs. 13 and 14) are furnished for the information and guidance of servicing personnel. The values are approximate and will vary slightly with different units and different measuring equipment. The voltage readings represent those to

NOTE: THIS UNIT IS REPLACEABLE ONLY AS A COMPLETE ASSEMBLY



TL 13256

Figure 11. Tone switch, S3, exploded view.



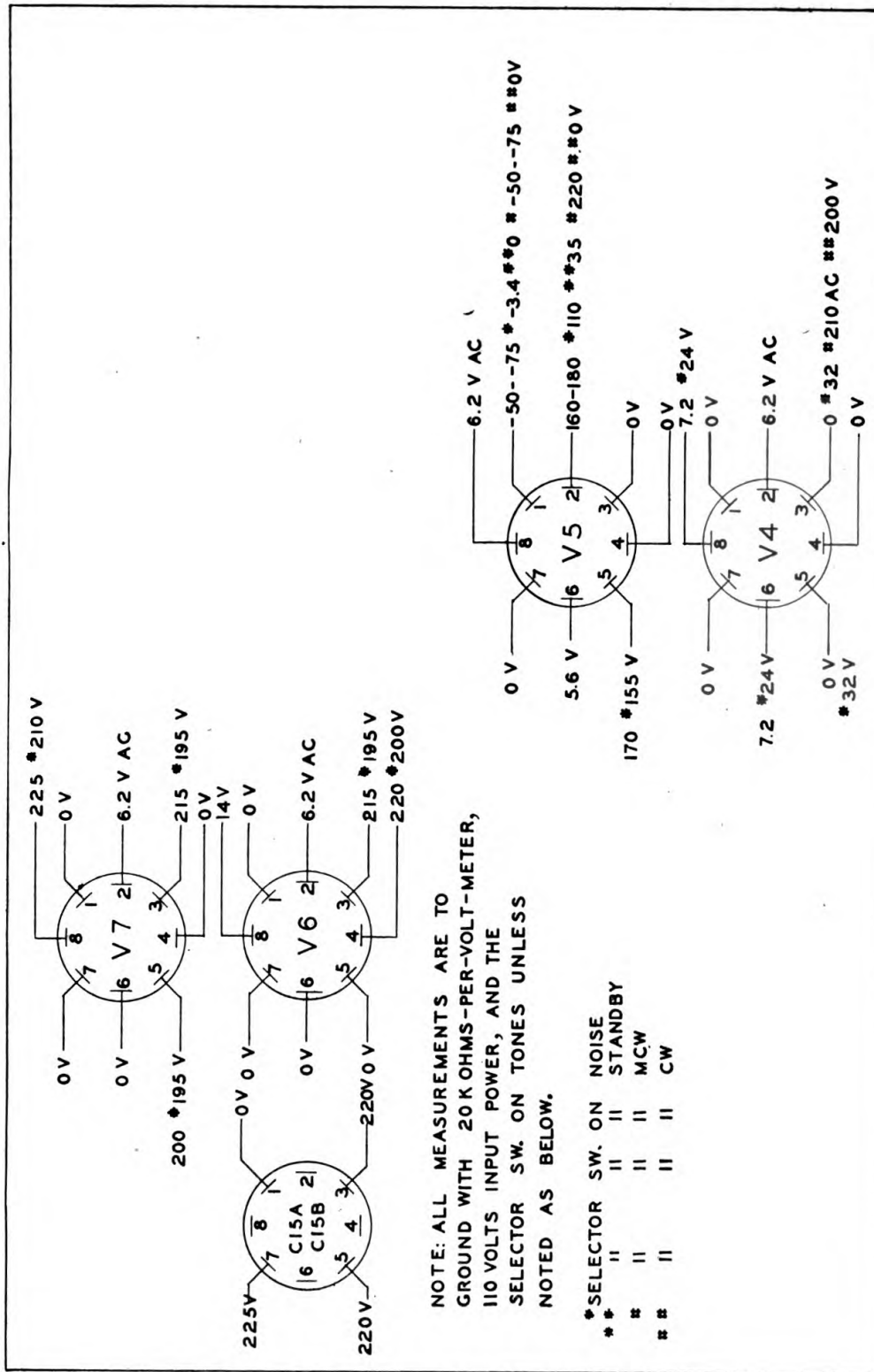
TL 13257

Figure 12. Tone switch S3 assembly, section view.

be found in normal operation with a 110-volt a-c power source. The resistance values represent measurements to ground with all tubes removed from their sockets, and the power-switching plug PL1 removed from its receptacle. The use of this data, along with logical analysis of the circuit, will generally expose the source of trouble, should trouble develop.

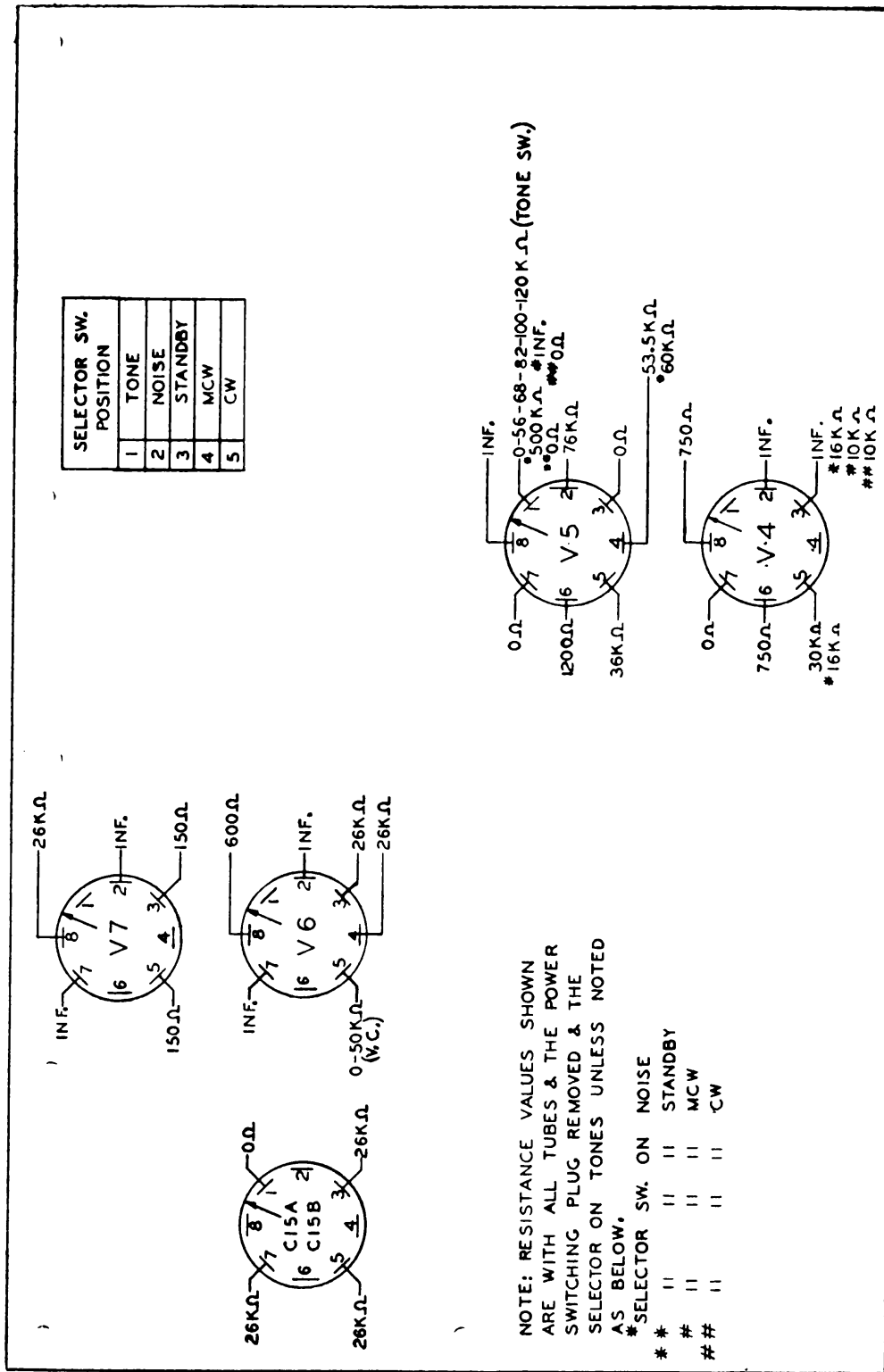
b. Trouble shooting requires common sense, patience, and thoroughness. Localizing the circuit in which the trouble lies is the first step. From there on, point-to-point resistance and voltage measurements will lead to the defective part.

**NOTE:** If the interstage transformer T-2 requires replacement and a regular replacement is not available, the Signal Corps transformer type C-159, which is used in Radio Set SCR-194 may be substituted. This transformer is similar electrically but differs mechanically, necessitating a different mounting arrangement. Terminals 1-2 are the jack, 3-4 are the plate, and 5-6 are the grid connections.



TL 13258

Figure 13. Modulator MD-22/URA-T1, chassis, tube-socket voltage diagram.

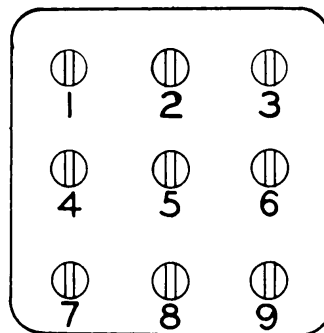
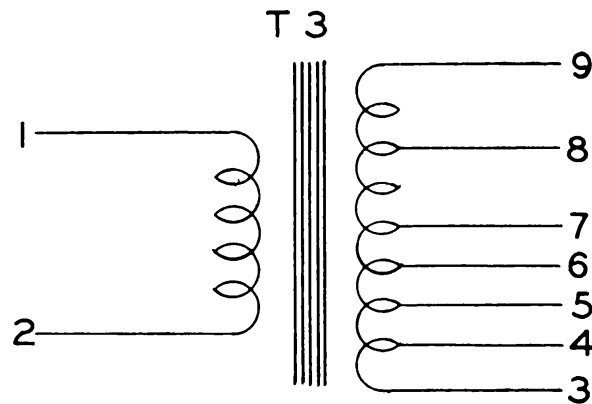


TL 13259

Figure 14. Modulator MD-22/URA-T1, chassis tube-socket resistance diagram.

WINDING	* RESISTANCE	LEADS
PRI.	5500 OHMS	1 - 2
SEC.	50 OHMS	3 - 4
	125 OHMS	3 - 5
	200 OHMS	3 - 6
	250 OHMS	3 - 7
	333 OHMS	3 - 8
	500 OHMS	3 - 9

\* AC IMPEDANCE AT 400 CPS

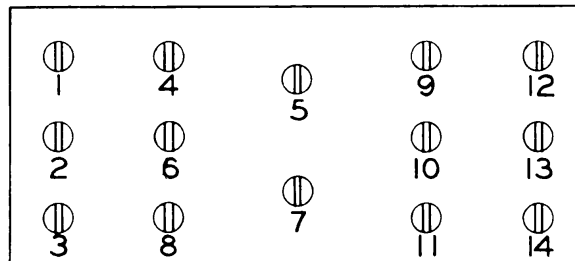
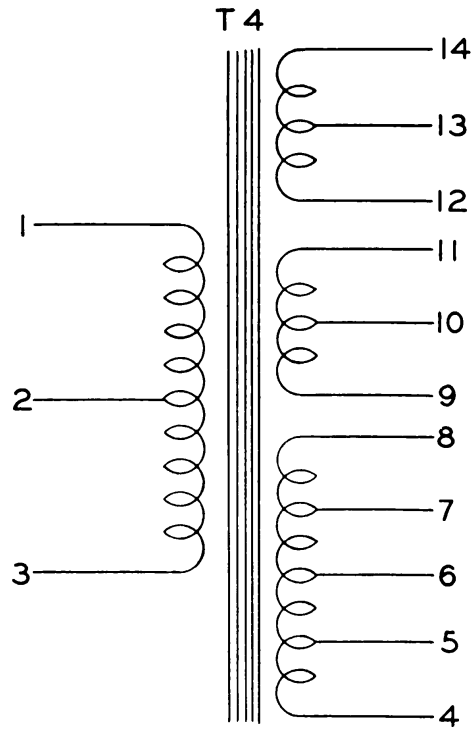


TL 13260

Figure 15. Output transformer T3.



WINDING	VOLTAGE	LEADS
PRI. I	110 VOLTS A.C.	1 & 2
PRI. II	6 VOLT VIBRATOR PRI.	5, 6 CT, 7.
	12 VOLT VIBATOR PRI.	4, 6 CT, 8
SEC. I	450 VOLT A.C. C.T.	12, 13 CT, 14
SEC. II	6 VOLT A.C. FILAMENT	9, 10 CT, 11
SEC. III	150 VOLT BATT. OPER. SEC.	1 & 3



TL 13261

Figure 16. Power transformer T4.

### **30. MOISTUREPROOFING AND FUNGIPROOFING.**

**a. General.** Communication failures commonly occur when Signal Corps equipment is operated in tropical areas where temperature and relative humidity are extremely high. The following problems are typical:

- (1) Resistors and capacitors fail.
- (2) Electrolytic action takes place in coils, chokes, transformer windings, etc., causing eventual breakdown.
- (3) Hook-up wire and cable insulation breakdown. Fungus growth accelerates deterioration.

**b. Treatment.** A moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection against fungus growth, insects, corrosion, salt spray, and moisture. The treatment involves the use of moisture- and fungi-resistant varnish applied by means of a spray gun and/or a brush.

**c. Step-by-step Instructions. (1) PREPARATION.**

(a) All repairs and adjustments necessary for the proper operation of the equipment are made.

(b) Thoroughly clean all dirt, dust, rust, fungus, oil, and grease from the equipment.

(2) **DISASSEMBLY.** Loosen two catches holding chassis to cabinet and remove chassis.

(3) **MASKING.**

(a) Mask the selector switch with masking tape.

(b) If tubes are removed, mask top portions of sockets:

(4) **DRYING.** Place unit in drying oven and bake for approximately 2 to 3 hours at 160°F. DO NOT EXCEED THIS TEMPERATURE.

(5) **VARNISHING.**

(a) Spray three coats of moisture and fungiproofing varnish on all components on underside of chassis.

(b) Do not spray top side of chassis.

(c) Brush three coats of varnish on coil of relay.

(6) **REASSEMBLY.** Reassemble unit and check operation.

(7) **MARKING.** Mark unit MFP and date it was accomplished.

(8) **REFERENCE.** For a full description of the varnish-spray method of moistureproofing and fungiproofing refer to TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment.

## **SECTION V**

### **SUPPLEMENTARY DATA**

#### **31. LOCATION OF MECHANICAL AND ELECTRICAL PARTS.**

Figures 8, 9, 10, and 11 will assist in locating and replacing mechanical and electrical parts. The reference numbers tie-in with the reference symbols in the Maintenance Parts List, (par. 32).

### 32. MAINTENANCE PARTS LIST FOR TRAINING GENERATOR AN/URA-T1.

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts listed can be requisitioned.

Ref Symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
C1	3DA500-171	CAPACITOR: paper; 0.5 mfd. -6% +14%; 400-v dcw; (rectangular can).	2			*	*	*	*
C2	3DA250-21.5	CAPACITOR: paper; 0.25-mfd. -6% +14%; 400-v dcw; (rectangular can).	3			*	*	*	*
C3	Same as C2								
C4	3DA10-21	CAPACITOR: paper; 0.01-mfd. -6% +14%; 400-v dcw; (tubular can).	2			*	*	*	*
C5	Same as C2								
C6	3DA20H3	CAPACITOR: mica; 0.002-mfd. ±5%; 500-v dcw.	1			*	*	*	*
C7	3DA20-97	CAPACITOR: paper; 0.02-mfd. -6% +14%; 600-v dcw; (tubular can).	1			*	*	*	*

\* Indicates stock available.

## MAINTENANCE PARTS LIST FOR TRAINING GENERATOR AN/URA-T1 (contd).

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts listed can be requisitioned.

Ref Symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
C8	3DKB25-18	CAPACITOR: electrolytic; 25-mfd. 50-v dcw; (rectangular can).	4			*	*	*	*
C9	3K4091233	CAPACITOR: mica; 0.009-mfd. $\pm 5\%$ ; 300-v dcw.	1			*	*	*	*
C10	3DA10-86	CAPACITOR: mica; 0.01-mfd. $\pm 5\%$ ; 300-v dcw.	2			*	*	*	*
C11	Same as C10								
C12	Same as C8								
C13	Same as C8								
C14	3DA20-98	CAPACITOR: paper; 0.02-mfd. $-6\%$ $+14\%$ ; 1,600-v dcw; (tubular can).	1			*	*	*	*
C15A	3DB20-37	CAPACITOR: electrolytic; plug-in type; octal base; 2-section; 10-mfd. to 20-mfd. $\pm 10\%$ ; 300-v dcw.	1			*	*	*	*

C15B	Same as C15A									
C17	Same as C8									
C18	3DB2-20		1	CAPACITOR: paper; 2-mfd. -6% +14%; 200-v dcw; (rec- tangular metal can).	*	*	*	*	*	*
C19	3K6051262		1	CAPACITOR: mica; 0.005-mfd. +5%; 500-v dcw.	*	*	*	*	*	*
C20	Same as C4									
C21	Same as C1									
CH2	3C344-13		1	CHOKe: 6-h $\pm$ 25%; 80-ma dc; d-c resistance, 150 ohms; (in- closed in can).	*	*	*	*	*	*
PL1	2Z7104-22		1	PLUG: power switching (as- sembly); modified Jones plug with wooden handle; bushing for mounting lever.	*	*	*	*	*	*
R1	3Z6675-20		3	RESISTOR: carbon; 75,000- ohm $\pm$ 10%; 1/2-w; insulated.	*	*	*	*	*	*

\* Indicates stock available.

## MAINTENANCE PARTS LIST FOR TRAINING GENERATOR AN/URA-T1 (contd).

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts listed can be requisitioned.

Ref Symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
R2	3Z6802-27	RESISTOR: carbon; 2-megohm $\pm 10\%$ ; $\frac{1}{2}$ -w; insulated.	1			*	*	*	*
R3	3Z6617-4	RESISTOR: carbon; 17,000-ohm $\pm 10\%$ ; $\frac{1}{2}$ -w; insulated.	1			*	*	*	*
R4	Same as R2								
R5	Same as R1								
R6	3Z6630-19	RESISTOR: carbon; 30,000-ohm $\pm 10\%$ ; $\frac{1}{2}$ -w.	1			*	*	*	*
R7	Same as R2								
R8	Same as R1								
R9	3Z6075-36	RESISTOR: carbon; 750-ohm $\pm 10\%$ ; 1-w; insulated.	1			*	*	*	*
R10	3ZK6750-39	RESISTOR: carbon; 0.5-meg-ohm $\pm 10\%$ ; $\frac{1}{2}$ -w; insulated.	2			*	*	*	*

R11	3ZK6650-75	RESISTOR: carbon; 50,000-ohm $\pm$ 10%; $\frac{1}{2}$ -w; insulated.	1	*	*	*	*	*
R12	3RC31AE122K	RESISTOR: carbon; 1,200-ohm $\pm$ 10%; 1-w; insulated.	1	*	*	*	*	*
R13	3Z6570-26	RESISTOR: wire-wound; 7,000-ohm $\pm$ 10%; 20-w.	1	*	*	*	*	*
R14	3RC30BE103K	RESISTOR: carbon; 10,000-ohm $\pm$ 10%; 1-w; insulated.	1	*	*	*	*	*
R15	3Z5605.3	RESISTOR: wire-wound; 25,000-ohm $\pm$ 10%; 10-w.	1	*	*	*	*	*
R16	3Z6662-1	RESISTOR: carbon; 62,000-ohm $\pm$ 5%; $\frac{1}{2}$ -w; insulated.	2	*	*	*	*	*
R17	3ZK6712-16	RESISTOR: carbon; 0.12-meg-ohm $\pm$ 5%; $\frac{1}{2}$ -w; insulated.	1	*	*	*	*	*
R18	3RC21BE823	RESISTOR: carbon; 82,000-ohm $\pm$ 5%; $\frac{1}{2}$ -w; insulated.	1	*	*	*	*	*
R19	3Z6656-8	RESISTOR: carbon; 56,000-ohm $\pm$ 5%; $\frac{1}{2}$ -w; insulated.	1	*	*	*	*	*
R20	3Z6668-18	RESISTOR: carbon; 68,000-ohm $\pm$ 5%; $\frac{1}{2}$ -w; insulated.	1	*	*	*	*	*

\* Indicates stock available.



**MAINTENANCE PARTS LIST FOR TRAINING GENERATOR AN/URA-T1 (contd).**

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts listed can be requisitioned.

Ref Symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
R21	3Z6700-7	RESISTOR: carbon; 0.1-meg-ohm $\pm 5\%$ ; $\frac{1}{2}$ -w; insulated.	1			*	*	*	*
R22	3Z6060-59	RESISTOR: wire-wound; 600-ohm $\pm 10\%$ ; 10-w.	1			*	*	*	*
R23	3ZK6003-27	RESISTOR: wire-wound; 30-ohm $\pm 10\%$ ; 10-w.	1			*	*	*	*
R24	3Z6020-84	RESISTOR: carbon; 200-ohm $\pm 10\%$ ; 1-w; insulated.	2			*	*	*	*
R25	Same as R24								
R26	3Z6001B2-19	RESISTOR: wire-wound; 12-ohm $\pm 5\%$ ; 20-w.	1			*	*	*	*
R27	2Z7272-90	POTENTIOMETER: 0.25-megohm; $\frac{1}{2}$ -w; linear-taper; $\frac{1}{4}$ - $\#$ shaft.	1			*	*	*	*
R28	2Z7271-86	POTENTIOMETER: 0.1-megohm; $\frac{1}{2}$ -w; linear-taper; $\frac{1}{4}$ - $\#$ shaft.	1			*	*	*	*

R29	2Z7271-85	POTENTIOMETER: 75,000-ohm; 1/2-w; linear-taper; 1/4"-shaft.	1	*	*	*	*	*
R30	Same as R10							
R31	Same as R16							
R32	3Z6200-100	RESISTOR: carbon; 2,000-ohm $\pm 10\%$ ; 1/2-w; insulated.	1	*	*	*	*	*
R33	3Z6470-11	RESISTOR: carbon; 4,700-ohm $\pm 10\%$ ; 1-w; insulated.	1	*	*	*	*	*
REC1	2Z7114.27	RECEPTACLE: input-power; 4-prong; 1 3/4" max OD; 1 3/8" long.	1	*	*	*	*	*
REC2	2Z7403-3	RECEPTACLE: power-switching; (for Jones plug PL1).	3	*	*	*	*	*
REC3	Same as REC2							
REC4	Same as REC2							
RE1	2Z7585-3	RELAY: 1-pole; 2-throw contact assembly; contacts rated 2 amps, at 115 v ac; coil resistance 10,000 ohms; 2 3/4" x 1 3/4" x 1 5/16".	1	*	*	*	*	*

\* Indicates stock available.

**MAINTENANCE PARTS LIST FOR TRAINING GENERATOR AN/URA-T1 (contd).**

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts listed can be requisitioned.

Ref Symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
S1	3Z9825-62.98	SWITCH: 8-pole; 5-position; 4-wafer, non-shortng contacts.	1			*	*	*	*
S2	3Z9508	SWITCH: toggle; 2-pole, single-throw.	1			*	*	*	*
S3	3Z9903A-26	SWITCH: tone-selector; (driven by a 7-w synchronous motor 110- to 150-v, 60- to 100-c; switch contacts housed in 1 <sup>5</sup> / <sub>8</sub> " diameter, round commutator cap 1 <sup>3</sup> / <sub>16</sub> " high).	1			*	*	*	*
SE1	3H4859-14	RECTIFIER: selenium; 1 <sup>1</sup> / <sub>16</sub> " OD; 1 <sup>9</sup> / <sub>16</sub> " long; 10-32 threaded mounting stud.	1			*	*	*	*
T1	2Z9638-22	TRANSFORMER: consists of choke CH1A, (0.1 h, d-c resistance 20 ohms); choke CH1B, (33 h, center-tapped, d-c resistance 700 ohms); in same case.	1			*	*	*	*

T2	2Z9631.112	TRANSFORMER: interstage; primary taps 1 to 2, 700 ohms; secondary taps 3 to 4, 10 ohms; secondary taps 5 to 6, 2,000 ohms; (in can 3 $\frac{1}{32}$ " x 2 $\frac{1}{2}$ " x 3").	1	*	*	*	*	*
T3	2Z9632.150	TRANSFORMER: output; primary taps 1 to 2, 200 ohms; secondary taps 3 to 4, 5 ohms; secondary taps 3 to 5, 8.5 ohms; secondary taps 3 to 6, 13 ohms; secondary taps 3 to 7, 16 ohms; secondary taps 3 to 8, 20 ohms; secondary taps 3 to 9, 27 ohms; (in can 3 $\frac{1}{16}$ " x 3" x 2 $\frac{1}{2}$ ").	1	*	*	*	*	*

\* Indicates stock available.

**MAINTENANCE PARTS LIST FOR TRAINING GENERATOR AN/URA-T1 (contd).**

**NOTE:** Order maintenance parts by stock number, name, and description. Only maintenance parts listed can be requisitioned.

Ref Symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
T4	2Z9608-19	TRANSFORMER: power; primary No. 1 (terminals 1 & 2) 495 turns No. 28 enamelled wire; primary No. 2 (terminals 2 & 3) 180 turns No. 34 enamelled wire; secondary No. 1 (terminals 12, 13, 14) 1,800 turns No. 35 enamelled wire, center-tapped; secondary No. 2 (terminals 4, 5, 6, 7, 8) vibrator-winding. (Windings from terminals 4 to 5 and 7 to 8 consist of 21 turns of No. 21 enamelled wire. Winding from terminals 5 to 7 consists of 42 turns of No. 18 enamelled wire, center-tapped.) Secondary No. 3 (terminal 9 to 11) 29 turns No. 19 enamelled wire; (in can 3 $\frac{3}{4}$ " x 4").	1			*	*	*	*
V1	2J991	LAMP: neon; $\frac{1}{2}$ -w; JAN-991; bayonet base.	3	1	*	*	*	*	*
V2	Same as V1								



### MAINTENANCE PARTS LIST FOR TRAINING GENERATOR AN/URA-T1 (contd).

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts listed can be requisitioned.

Ref Symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
116	3E6000-111	CORD CX-111/URA-T1: 2-conductor, No. 18, AWG, rubber-sheathed cable; 6' long; (2-prong plug on one end, 4-terminal receptacle on other end).	1			*	*	*	*
117	3Z3275	FUSE HOLDER: extractor-type; $2\frac{9}{16}$ " long, $1\frac{1}{16}$ " max diam; (holds 3AG size fuse, green-colored top); Littelfuse type No. 1075.	1			*	*	*	*
118	3Z3275	FUSE HOLDER: extractor-type; $2\frac{9}{16}$ " long, $1\frac{1}{16}$ " max diam; (holds 3AG size fuse; red-colored top); Littelfuse type No. 1075.	1			*	*	*	*
119	2Z4867.64	GASKET: panel and chassis; black synthetic rubber; $9\frac{1}{4}$ " x $2$ " x $\frac{1}{16}$ "; (has 5 large holes for control bushings; 4 0.172-" holes for panel mounting screws).	1			*	*	*	*

121	2Z4867.63	GASKET: indicator window; black synthetic rubber; outside dimensions $1\frac{7}{8}$ " x $1\frac{3}{16}$ "; opening dimensions $1\frac{1}{2}$ " x $0.876$ "; (has 4 0.120 diam holes, $\frac{1}{64}$ " thick).	1	*	*	*	*	*
122	2Z4867.65	GASKET: jack cap; black synthetic rubber; $\frac{1}{16}$ " thick, $\frac{5}{8}$ " diam; (cemented into spring jack cover).	3	*	*	*	*	*
123	2Z4867.62	GASKET: power receptacle cap; black synthetic rubber; $\frac{1}{16}$ " thick, $1\frac{5}{16}$ " OD x $1\frac{5}{16}$ " ID; (cemented into power receptacle cap).	1	*	*	*	*	*
127	2Z3764.19	INDICATOR DIAL (ASSEMBLY): semicircular - shaped; black phenolic with white lettering; (riveted to steel arm $1\frac{3}{16}$ " wide, $1\frac{17}{32}$ " long; bushing $\frac{1}{2}$ " OD, $\frac{1}{4}$ " thick staked to arm for mounting on shaft; tapped for 6-32 Allenhead setscrew).	1	*	*	*	*	*
128	2Z3352.30	JACK COVER: (spring lid for jacks); rubber-gasketed; (water seal, dust seal).	3	*	*	*	*	*

\* Indicates stock available.



**MAINTENANCE PARTS LIST FOR TRAINING GENERATOR AN/URA-T1 (contd).**

**NOTE:** Order maintenance parts by stock number, name, and description. Only maintenance parts listed can be requisitioned.

Ref Symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
129	2Z5821-22	KNOB: lever-type; selector-switch; black bakelite.	1			*	*	*	*
130	2Z5821-23	KNOB: round; knurled; black bakelite.	3			*	*	*	*
131	2Z6190-3	LEVER: power switch plug; 3 1/4" x 1/2" x 1/4"; (0.257" diam hole at one end with 6-32 set-screw-slot at other end).	1			*	*	*	*
147	6L3706-32E1	NUT: wing; 6-32.	1			*	*	*	*
148	2Z3352.31	DIAGRAM PANEL: transparent plastic; 10 3/4" x 10 1/4" x 1/16" thick; (slides into grooves in case tracks).	1			*	*	*	*
166	2Z8659-6	SOCKET: tube; 8-prong; octal; black bakelite.	1	1		*	*	*	*
167	2Z8659-5	SOCKET: vibrator; 4-prong; bakelite.	1	1		*	*	*	*

168	6Z8335	SOCKET: neon-tube.	3	1	*	*	*	*	*
169	3G1837-24.8	SPACER: natural; bakelite; $\frac{3}{4}$ " long, $\frac{5}{8}$ " diam; (tapped with 6-32 thread in one end, 10-32 thread in other end).	1		*	*	*	*	*
173	6D13202	TECHNICAL MANUAL TM 11-2509 for TRAINING GENERATOR AN/URA-T1.	2						
181	6L35008	WASHER: asbestos; No. 8; $\frac{3}{8}$ " OD, $\frac{3}{32}$ " thick.	10		*	*	*	*	*
183	3G1838-10.13	WASHER: extruded; bakelite; $\frac{5}{8}$ " OD x $\frac{3}{8}$ " ID x 0.032".	3		*	*	*	*	*
184	3G1838-10.12	WASHER: bakelite; flat; $\frac{5}{8}$ " OD x $\frac{3}{8}$ " ID x 0.032".	3		*	*	*	*	*
185	3G1838-9.8	WASHER: dished $\frac{1}{8}$ " ; $\frac{9}{16}$ " OD, $\frac{5}{32}$ " ID.	4		*	*	*	*	*
187	2Z3352.31	WINDOW: indicator; transparent lucite; $1\frac{7}{8}$ " x $1\frac{3}{16}$ " x $\frac{1}{16}$ "; (4 0.120 mounting holes).	1		*	*	*	*	*
188	6R57400-6	WRENCH: Allen; hex; $1\frac{3}{4}$ " x $\frac{1}{16}$ ".	1		*	*	*	*	*

\* Indicates stock available.

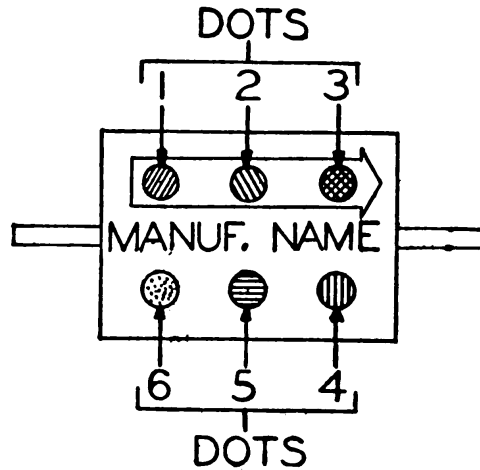
## MAINTENANCE PARTS LIST FOR TRAINING GENERATOR AN/URA-T1 (contd).

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts listed can be requisitioned.

Ref Symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
190	2Z2635.45	FUSE MOUNT AND VIBRATOR HOLDOWN CLAMP ASSEMBLY: 4 $\frac{3}{16}$ " x 1 $\frac{11}{16}$ ", with $\frac{1}{4}$ " lip on all sides; (8 fuse clips riveted on top to hold spare fuses; 2 spring clips to secure Allenhead wrench).	1			*	*	*	*

\* Indicates stock available.

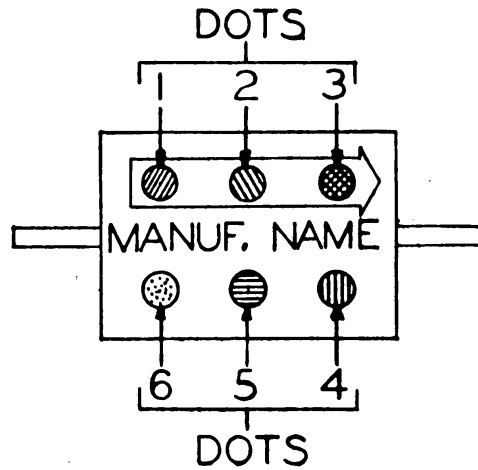
**33. COLOR CODES FOR CAPACITORS AND RESISTORS.  
AMERICAN WAR STANDARD 6-DOT COLOR CODE CHART  
For Capacitors (molded mica)**



	1st dot	2nd dot	3rd dot	4th dot	5th dot	6th dot
Color	<i>1st digit</i>	<i>2nd digit</i>	<i>3rd digit</i>	<i>Decimal multiplier</i>	<i>Tolerance</i>	<i>Characteristics</i>
Black	0	0	0	1	$\pm 20\%$	*A
Brown	1	1	1	10		B
Red	2	2	2	100	$\pm 2\%$	C
Orange	3	3	3	1,000		D
Yellow	4	4	4	10,000		E
Green	5	5	5	100,000		F
Blue	6	6	6	1,000,000		G
Violet	7	7	7	10,000,000		
Gray	8	8	8	100,000,000		
White	9	9	9	1,000,000,000		
Gold	..	..	..	0.1	$\pm 5\%$	
Silver	..	..	..	0.01	$\pm 10\%$	

- \* A—Ordinary mica bypass.
- B—Same as A—low loss case.
- C—Bypass or silver mica capacitor ( $-200$  parts/million/C)
- D—Silver mica capacitor ( $\pm 100$  parts/million/C)
- E—Silver mica capacitor (0 to  $-100$  parts/million/C)
- F—Silver mica capacitor (0 to  $-50$  parts/million/C)
- G—Silver mica capacitor (0 to  $-50$  parts/million/C)

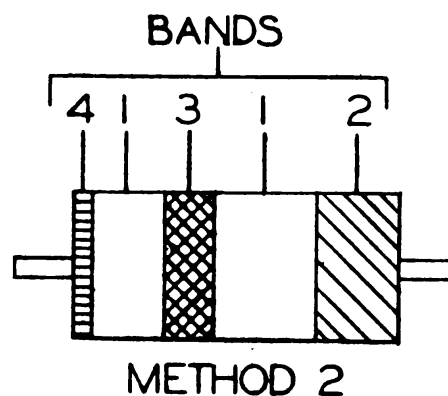
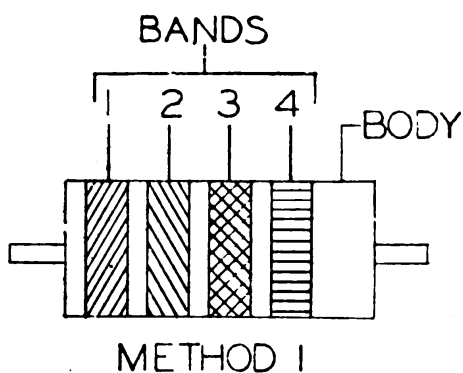
## RMA STANDARD 6-DOT COLOR CODE CHART For Capacitors (molded mica)



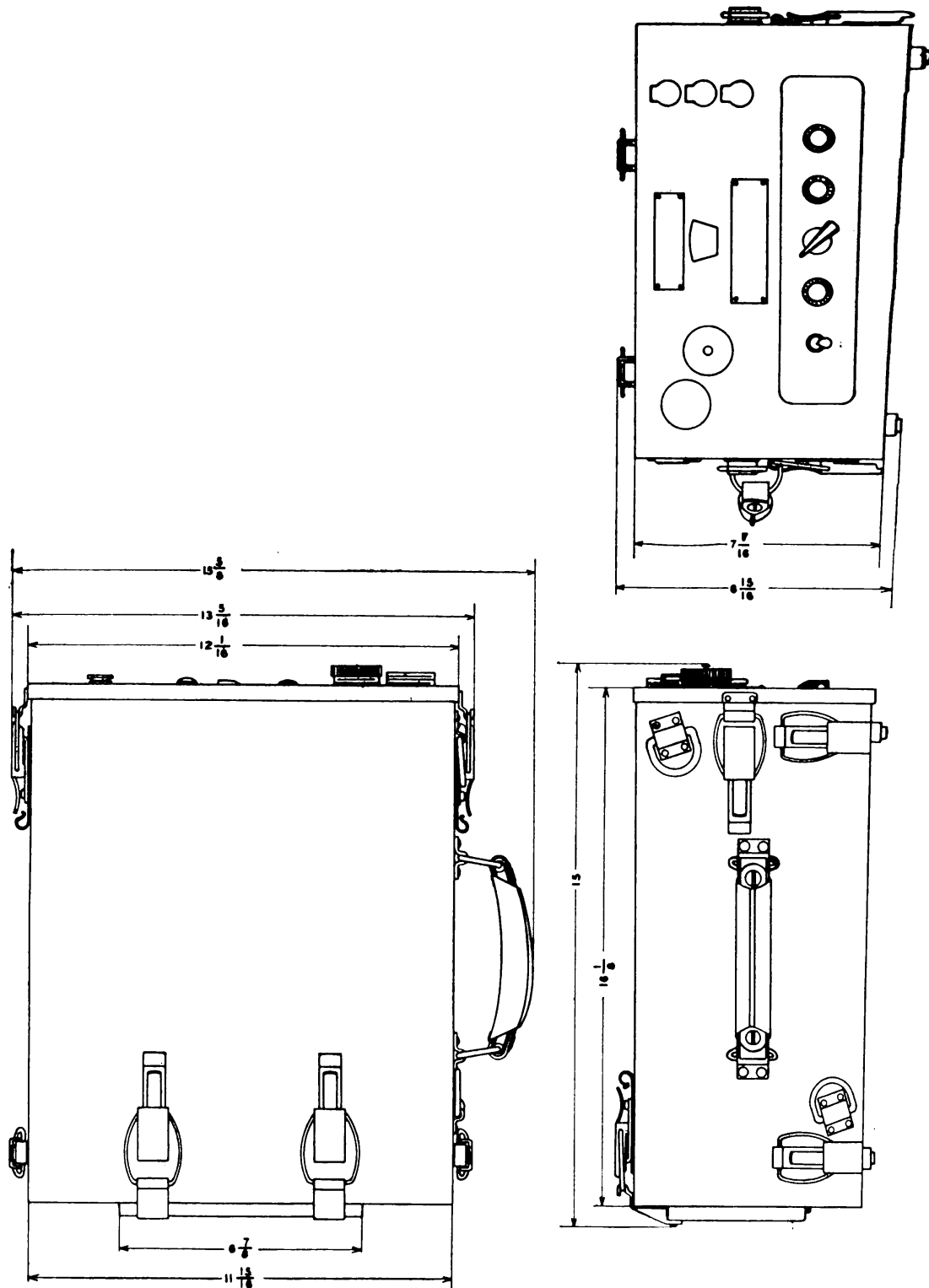
Color	1st dot	2nd dot	3rd dot	4th dot	5th dot	6th dot
	<i>1st digit</i>	<i>2nd digit</i>	<i>3rd digit</i>	<i>Decimal multiplier</i>	<i>Tolerance</i>	<i>Voltage</i>
Black	0	0	0	1	....	.....
Brown	1	1	1	10	1%	100v.
Red	2	2	2	100	2%	200v.
Orange	3	3	3	1,000	3%	300v.
Yellow	4	4	4	10,000	4%	400v.
Green	5	5	5	100,000	5%	500v.
Blue	6	6	6	1,000,000	6%	600v.
Violet	7	7	7	10,000,000	7%	700v.
Gray	8	8	8	100,000,000	8%	800v.
White	9	9	9	1,000,000,000	9%	900v.
Gold	..	..	..	0.1	....	1,000v.
Silver	..	..	..	0.01	10%	2,000v.
Body	..	..	..	.....	20%	500v.

# RMA STANDARD COLOR CODE CHART

## For Resistors

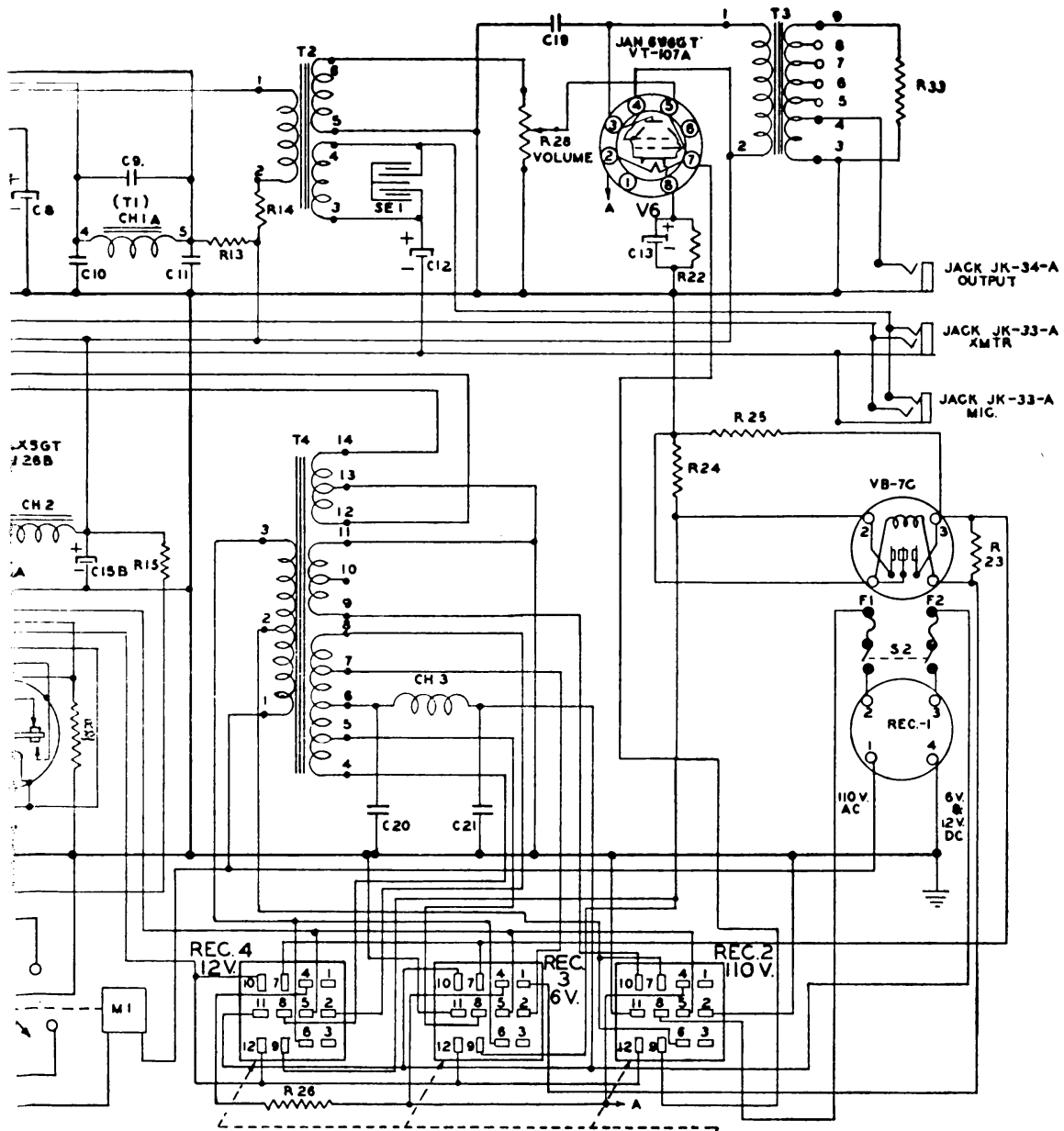


Color	1st band	2nd band	3rd band	4th band
	<i>1st digit</i>	<i>2nd digit</i>	<i>Decimal multiplier</i>	<i>Tolerance</i>
Black	0	0	1	
Brown	1	1	10	
Red	2	2	100	
Orange	3	3	1,000	
Yellow	4	4	10,000	
Green	5	5	100,000	
Blue	6	6	1,000,000	
Violet	7	7	10,000,000	
Gray	8	8	100,000,000	
White	9	9	1,000,000,000	
Gold	..	..	.....	± 5%
Silver	..	..	.....	± 10%
No Color	..	..	.....	± 20%

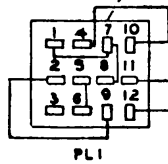


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Figure 17. Outline dimensional detail.



TONE SW.	M 1	MOTOR	V 3	JAN-991
CHOKE ASSEM.	VB-7C	VIBRATOR	V 4	JAN-2050
TRANS.	F 1	2 AMP FUSE	V 5	JAN-6SN7GT
TRANS.	F 2	10AMP. FUSE	V 6	JAN-6V6GT
TRANS.	SE1	SEL. RECT.	V 7	JAN-6X5GT
1MY. CHOKE	JK-34A	JACK	REC-1	POWER REC.
33HY. CHOKE	JK-33A	JACK	REC-2	110V. SOCKET
6 HY. CHOKE	JK-33A	JACK	REC-3	6V. SOCKET
R.F. CHOKE	V 1	JAN-991	REC-4	12V SOCKET
RELAY	V 2	JAN-991	PL 1	SW. PLUG



Modulator MD-22/URA-T1, schematic diagram.

TL 13264



