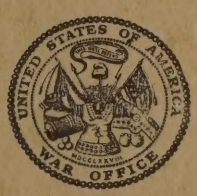
DEPARTMENT OF THE ARMY
TECHNICAL MANUAL

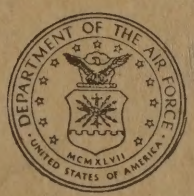
TM 11-437A

DEPARTMENT OF THE AIR
FORCE TECHNICAL ORDER

TO 28-30GSCT1-6

CODE
TRAINING SET
AN/GSC-T1A





DEPARTMENTS OF THE ARMY AND THE AIR FORCE

NOVEMBER 1954

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

Be careful when working on the power connections of this equipment.

DON'T TAKE CHANCES!

TECHNICAL MANUAL No. 11-437A
TECHNICAL ORDER No. 28-30GSCT1-6

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

WASHINGON 25, D. C., *1 November 1954*

CODE TRAINING SET AN/GSC-T1A

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

This technical manual contains information on operation, theory, repair, and maintenance of Code Training Set AN/GSC–T1A. The manual also contains information and procedure for repacking the equipment for shipment or limited storage, and for demolishing the equipment to prevent enemy use. An index is also included. The common name of the subject equipment used throughout this manual is code training set.

2. Forms and Records

The forms listed below will be used for reporting unsatisfactory conditions of Army equipment, and in performing preventive maintenance.

a. DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745–45–5 (Army), Navy Shipping Guide, Article 1850–4 (Navy), and AFR 71–4 (Air Force).

b. DA Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer, as prescribed in SR 745–45–5.

c. DD Form 535, Unsatisfactory Report, will be filled out and forwarded as prescribed in SR 700–45–5 and TO 00–35D–54.

d. DA Form 11–238, Operator First Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with instructions on the back of the form (fig. 5).

e. DA Form 11–239, Second and Third Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with instructions on the back of the form (fig. 6).

f. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Application

Code Training Set AN/GSC–T1A (fig. 1) provides student operators with a device for practicing transmission and reception of International Morse Code signals by audio or visual methods. Practice groups may be placed as far as 40 feet from the equipment, provided the surrounding noise levels do not exceed 60 decibels (db).

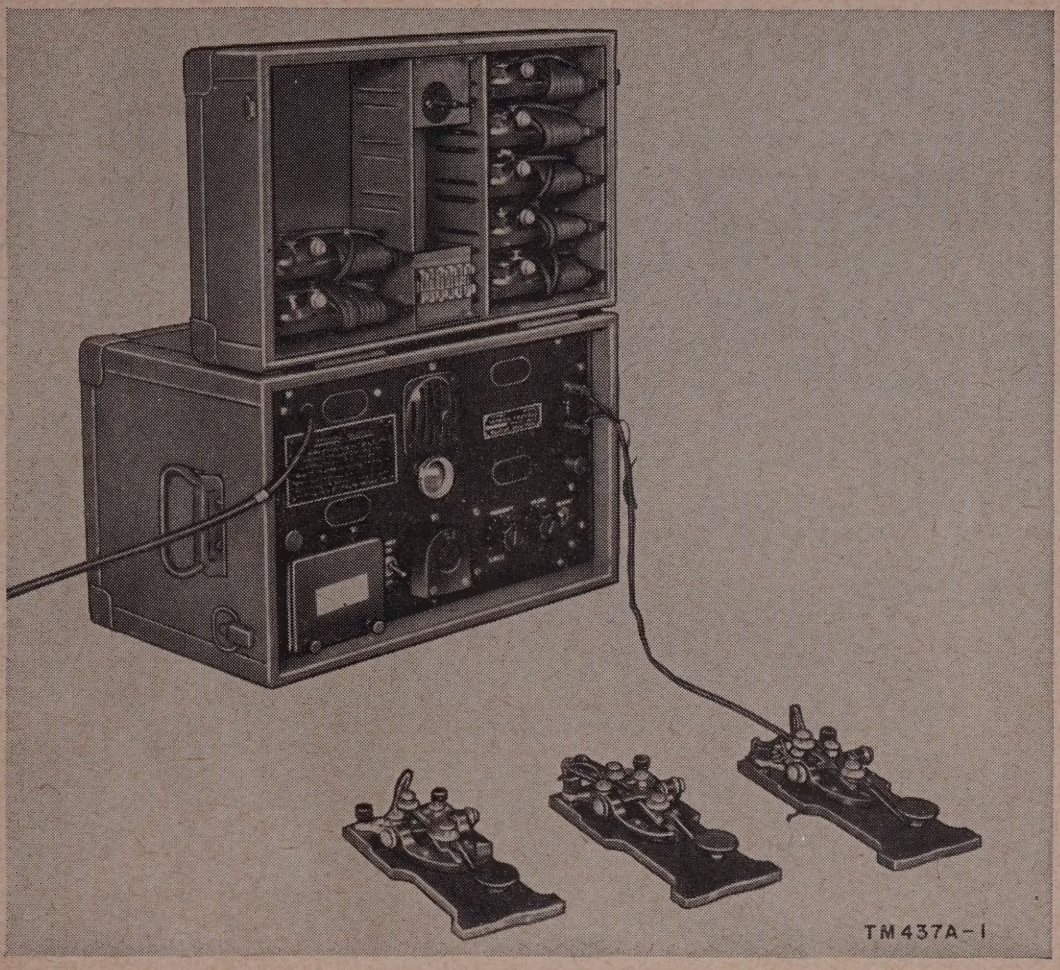


Figure 1. Code Training Set AN/GSC–T1A.

4. Technical Characteristics

Power requirements	6, 12, 24, or 115 volts d. c. or 115 or 230 volts a. c. 60 c. p. s.
Medium of communication	
Audible	2½-inch permanent magnet loudspeaker for tone.
Visual	1 watt neon gas lamp for visual signal.
Frequency of tone	600–1,000 cycles ±20 percent.
Sound range	Approximately 40 feet, if local noise is below the 60 db noise level.
Number and type of tubes	
1	6AK6 (oscillator)
1	6AK6 (amplifier)
1	6X5 (rectifier)
Number and types of fuses	
1	3 amp for 6 volts d. c.
1	1½ amp for 12 volts d. c.
1	¾ amp for 24 volts d. c.
1	¼ amp for 115 volts d. c.
1	¼ amp for 115 volts a. c.
1	⅛ amp for 230 volts a. c.
Vibrators	
No. 1	115 volts d. c.
No. 2	6, 12, and 24 volts d. c.

5. Packaging Data

(fig. 2)

a. Domestic. When packaged for domestic shipment, *one* Code Training Set AN/GSC–T1A, is placed in a corrugated carton containing desiccant and corrugated fillers. This inner carton is sealed with tape and placed within an outer corrugated carton. The outer carton has a moistureproof barrier. This barrier is heat sealed and the flaps of the carton are sealed with tape.

b. Export. When packaged for export shipment, the code training set, described above for domestic shipment, is placed in a wooden packing case containing a waterproof case liner, which is heat sealed. The case is then nailed shut and bound with metal straps (fig. 2). The size, weight, and volume for domestic and export shipment are shown in the table below.

	No. of units	Height (in.)	Width (in.)	Depth (in.)	Volume (cu. ft.)	Weight of case (lb.)
Domestic	1	20	22	15	3. 8	62
Export	1	22	24	17	5. 1	76

6. Table of Components

The following table lists the weights and dimensions of the components of Code Training Set AN/GSC-T1A (fig. 3).

Quantity	Component	Height (in.)	Width (in.)	Length (in.)	Weight (lb.)
1	Control unit	13¼	18	11	52. 0
10	Transmitting keys	1½	3	6	1. 9
10	Transmitting key cords	---	---	120	. 5
1	Power cord and auxiliary battery cord.	---	---	96	1. 8

7. Description

Code Training Set AN/GSC–T1A may be operated from a 6-, 12-, 24-, or 115-volt direct current (d. c.) supply, or from a 115- or 230-volt alternating current (a. c.) supply. Components that may cause interference with nearby communications equipment are shielded. The code training set consists of a control unit, 10 transmitting keys, and 10 key cords which are used to connect the first key to the unit and to interconnect the other keys. During operation, hand keying produces either an audio tone adjustable in pitch and volume or a

blinker flash visible to a practice group. The tone is delivered by a loudspeaker and the blinker flash by a 1 watt neon gas lamp.

a. Control Panel (fig. 4). All operating controls are mounted on the front panel. At the top center of the panel is a 2½-inch permanent magnet (PM) loudspeaker. A speaker resonance adjustment screw is located in the center of the loudspeaker. The neon blinker lamp is positioned directly below the loudspeaker. Two binding posts

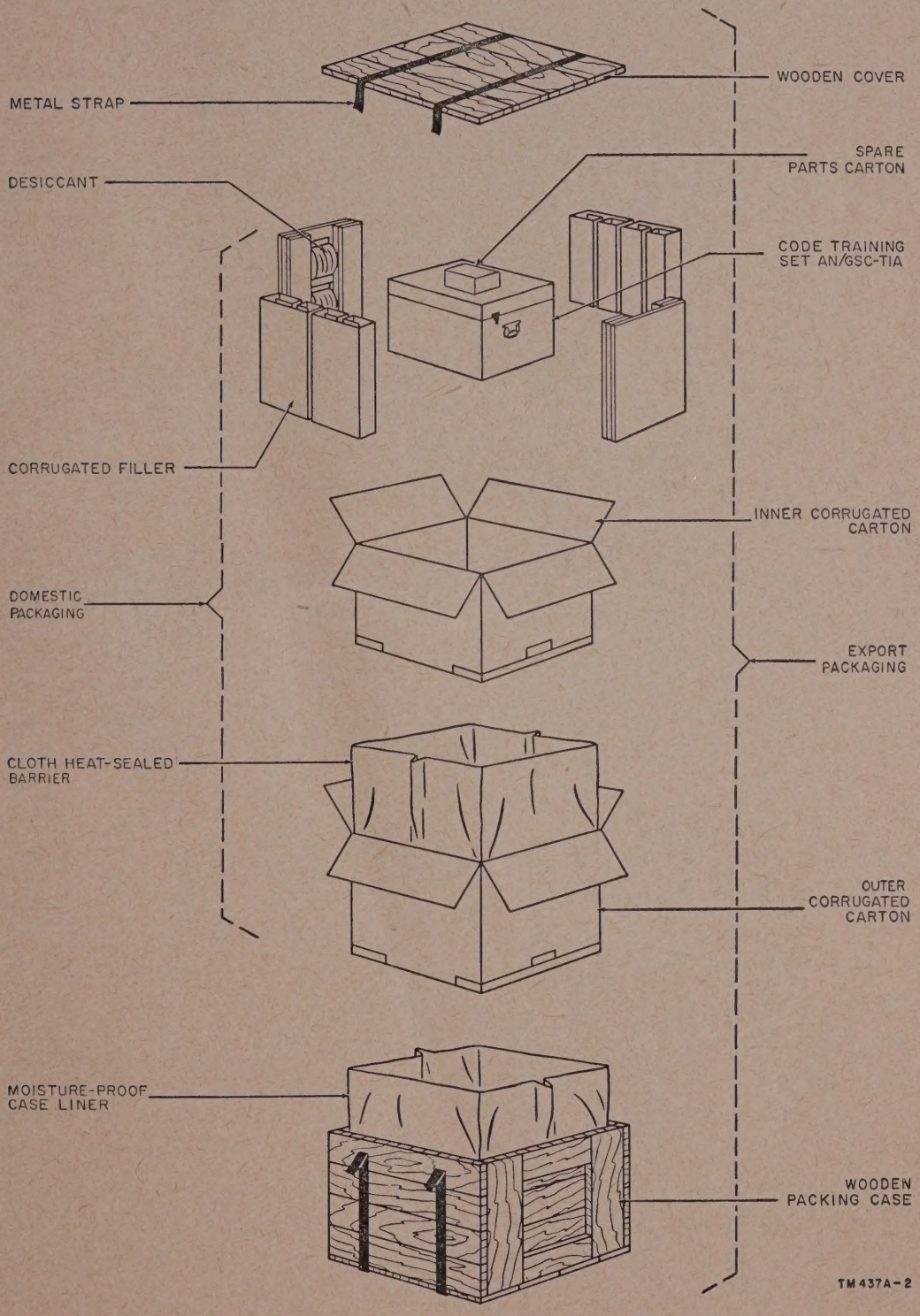


Figure 2. Code Training Set AN/GSC-T1A, packaging diagram.

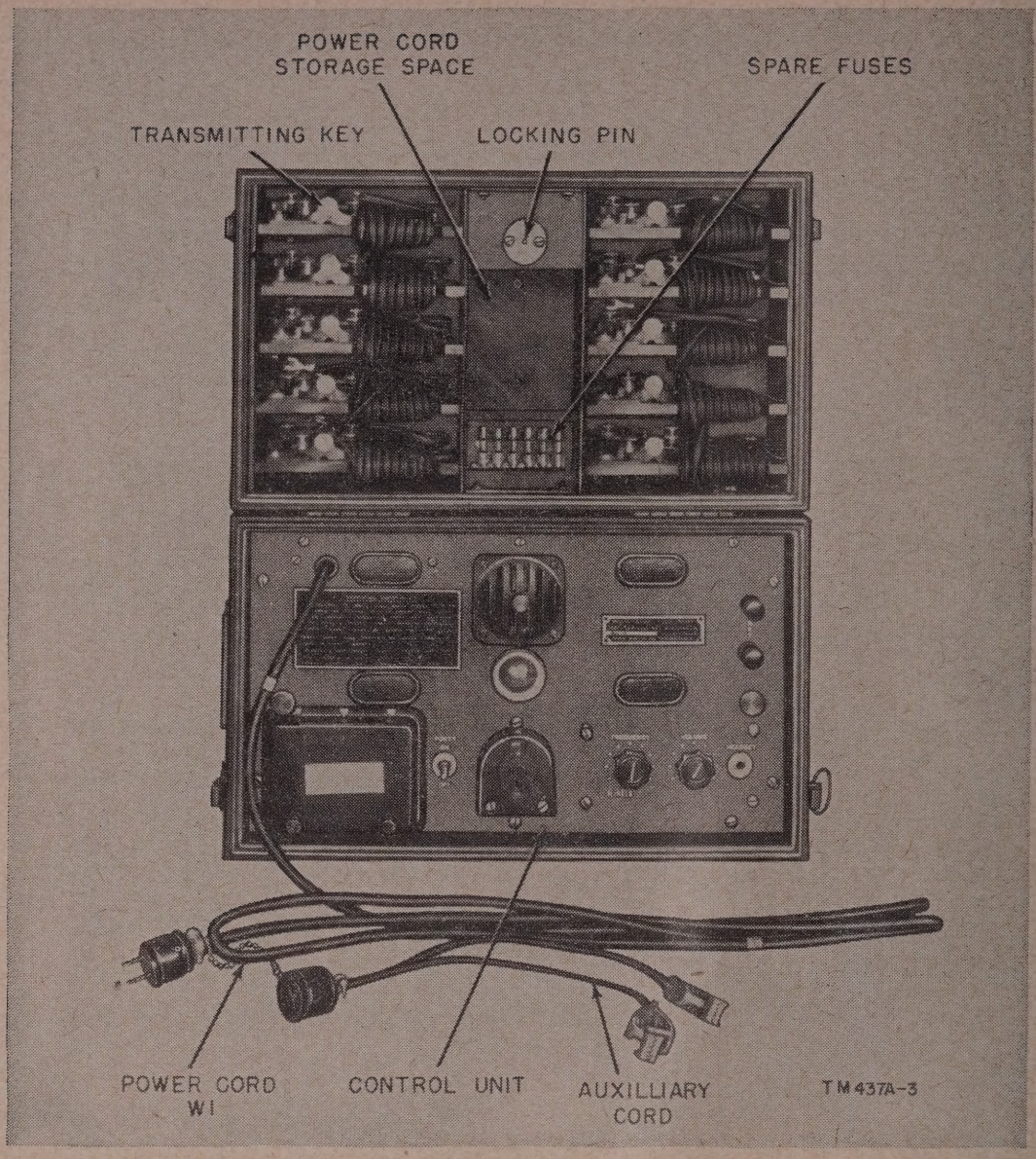


Figure 3. Code Training Set AN/GSC–T1A, components.

marked KEY are located on the right-hand side of the panel. Below the two KEY binding posts is a HEADSET jack. The control unit chassis (fig. 12) is mounted in a metal carrying case and consists of a Hartley oscillator, an amplifier, a universal input type power supply, and two d. c. vibrators. The carrying case cover serves as a storage place for the transmitting keys, the power cords, and six spare fuses.

b. Transmitting Keys. Ten transmitting keys (fig. 3) are provided with the code training set. These keys, when connected to the KEY terminals and operated, cause the oscillator to generate tone or to produce a flash of the neon blinker lamp, depending on the position of the FREQUENCY-BLINKER control.

c. Power Cord. The permanently-attached power cord is used to connect the code training set to a regular power source such as a 115-volt a. c. outlet. If a storage battery is to be used as a power source,

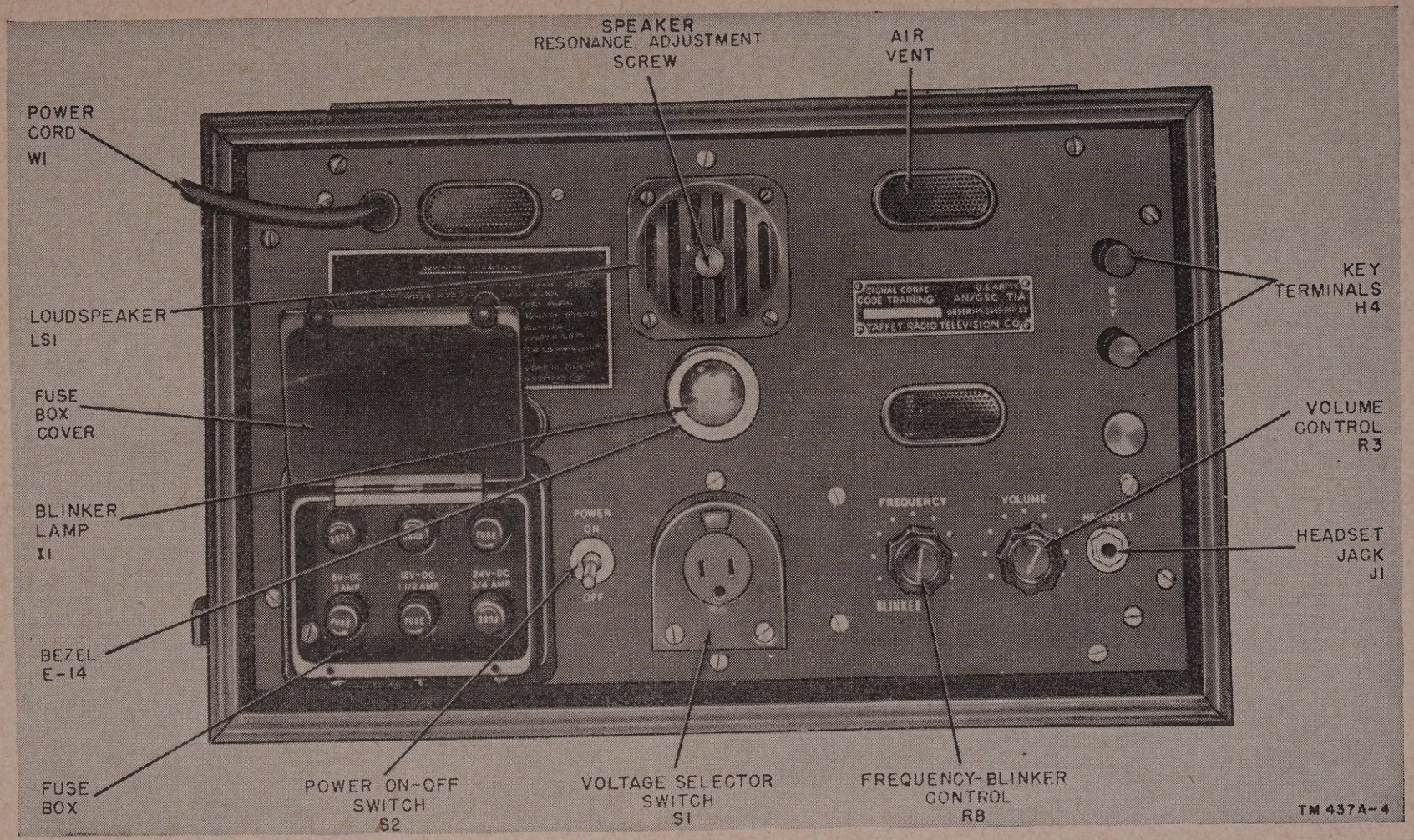


Figure 4. Control unit panel.

the auxiliary cord is joined to the permanently-attached power cord, and the battery clips are connected to the storage battery.

8. Running Spares

The following spare parts are supplied with each code training set.

Quantity	Item name	Rating	Ref. symbol
1	Bezel: Light indicator		E14
2	Cable assembly: special purpose		W1
2	Electron tube		V1, V2
1	Electron tube		V3
1	Fuse	⅛-amp, 250 v	F5
2	Fuse	¼-amp, 125 v	F1, F3
1	Fuse	¾-amp, 250 v	F2
1	Fuse	1½-amp, 250 v	F4
1	Fuse	3-amp, 250 v	F6
1	Lamp, glow	1 w, 60 v	I 1
1	Vibrator, nonsynchronous	115 v. d. c	1
1	Vibrator, nonsynchronous	6 v. d. c	2

CHAPTER 2

INSTALLATION

9. Siting

Code Training Set AN/GSC–T1A performs satisfactorily indoors and outdoors. When used indoors, place the code training set on a flat level surface. Use a desk or table top, if available, so that blinker flashes will be visible to all members of a practice group. Normal room noises do not interfere with practice operation. The code training set may be used outdoors if the noise level does not exceed 60 db. If the blinker system is to be used outdoors, locate the code training set and the members of the practice training group in a shady area.

10. Uncrating, Unpacking, and Checking New Equipment

Code Training Set AN/GSC–T1A may be packaged for either domestic or oversea shipment as described in paragraph 5. When uncrating and unpacking the equipment, avoid thrusting tools into the interior of the shipping container. Be careful not to damage packaging materials and containers any more than is necessary; these items may be required for future repacking. Carefully store the interior packing materials. When uncrating and unpacking, proceed as follows:

a. Unpack the equipment where it will not be exposed to excessive dust, dirt, or moisture.

b. Cut the metal straps with a suitable cutting tool.

c. Remove the nails from the top of the wooden shipping container (fig. 2) with a nail puller.

d. Carefully slit the moistureproof case liner.

e. Lift out the packaged equipment.

f. Carefully cut the tape which is used to seal the flaps of the carton so that the carton will not be damaged.

g. Cut the barriers and carefully remove the inner carton.

h. Open the inner carton and remove the cushioning material and the desiccant.

i. Return all interior packaging materials to the inner carton for use in repacking the equipment.

j. Check the equipment against the shipping list. Thoroughly inspect the equipment for signs of possible damage during shipment.

11. Installation of Equipment

a. Place the code training set on any suitable flat surface. Unclamp the cover and swing it up until the cover holding latch is engaged. This gives access to the oscillator unit and the 10 transmitting

keys which are stored in the racks built into the cover. Remove only as many of these keys as required.

b. Connect the cord of the first key to the KEY terminals on the panel of the code training set. Connect the cord of the second key to the terminals at the base of the first key, etc. In this manner, all keys to be used are connected in parallel, and may be separated from each other by 10 feet of cord.

c. After the keys have been connected to the code training set, ascertain the voltage of the available power source (par. 4).

d. When the voltage is known, use the prongs of the power cord plug to rotate the voltage selector switch to the correct position.

e. Connect the plug of the power cord to an a. c. or d. c. power source or if a battery is used, connect the battery clamps to the battery terminals; then insert the long power cord plug into the battery cord connector. Disregard the polarity of d. c. power supplies.

12. Service Upon Receipt of Used or Reconditioned Equipment

a. Follow the instructions given in paragraphs 10 and 11 for uncrating, unpacking, checking, and installing the equipment.

b. Operate the equipment according to the procedures outlined in the equipment performance check list (par. 34*c*) to make certain that the unit is functioning correctly.

CHAPTER 3

OPERATION

Section I. CONTROLS AND INSTRUMENTS

13. Controls and Their Uses

The table below lists the controls of Code Training Set AN/GSC–T1A and their functions. The location of these controls is shown in figure 4.

Control	Function
Voltage selector switch S1	To select circuits to vibrator 1, vibrator 2, or primary of power transformer T3, in accordance with the voltage and type of power source.
POWER ON-OFF switch S2	In the ON position, to connect power source to circuit selected by switch S1.
FREQENCY-BLINKER control.	To select loudspeaker or blinker circuit, whichever is desired. In the extreme counterclockwise or BLINKER position, the signals are transmitted by the blinker lamp; in the FREQUENCY position, the signals are transmitted by the loudspeaker. The frequency of the tone is increased as the FREQUENCY-BLINKER control is turned clockwise.
VOLUME control R3	To control the intensity of the tone emitted by the loudspeaker.
Speaker resonance adjustment screw.	To adjust the mechanical resonance of the loudspeaker diaphragm.

14. Panel Connections and Their Uses

The table below lists the front panel connections of Code Training Set AN/GSC–T1A and their functions. The KEY terminals and the HEADSET jack are shown in figure 4.

Connection	Function
KEY terminals H4	To connect the transmitting key to the oscillator circuit.
HEADSET jack J1	To receive headset plug for headset operation.
Power cord W1 and auxiliary battery cord (fig. 3).	To connect the code training set to a source of power.

Section II. OPERATION UNDER USUAL CONDITIONS

15. Starting Procedure

a. Set the POWER ON-OFF switch to the ON position. Allow approximately 5 minutes warm-up time for frequency stabilization before making adjustments.

b. To adjust the tone, proceed as follows:

(1) Turn the speaker resonance adjustment screw out until the stop is reached.

(2) With one of the transmitting keys in the closed or contact position, turn the FREQUENCY-BLINKER control until a suitable tone is heard.

(3) Turn the VOLUME control to adjust the intensity of the signals to local operating conditions.

(4) To increase the intensity of the audible signals, turn the speaker resonance adjustment screw on the loudspeaker (fig. 4) until the end of the screw begins to press the resonator button. The point of resonance is critical; adjust the screw carefully to produce resonance.

c. To operate the blinker, proceed as follows:

(1) Turn the FREQUENCY-BLINKER control to its extreme counterclockwise (BLINKER) position.

(2) Advance the VOLUME control to the extreme clockwise position.

d. If headset operation is desired insert plug in HEADSET jack J1.

e. The code training set now is ready for use. Keying will produce audio (sound) or visual (light) signals, whichever has been selected by the operator.

16. Stopping Procedures

a. Set the POWER ON-OFF switch to the OFF position.

Caution: Do not rotate the voltage selector switch with the POWER ON-OFF switch in the ON position. Damage to the equipment may result.

b. Disconnect the power cord from the power source.

c. Use the plug at the end of the power cord to rotate the voltage selector switch to the OFF position. Any other position of the voltage selector switch will not allow the locking pin in the cover to engage the hole in the voltage selector switch and will prevent the lid from closing properly (fig. 3).

Section III. OPERATION UNDER UNUSUAL CONDITIONS

17. General

When operating the code training set in regions where extreme cold, heat, humidity, moisture, and sand conditions prevail, take spe-

cial precautions to keep the equipment in good operating condition. Paragraphs 18, 19, and 20 contain instructions for minimizing the effects of these extreme conditions.

18. Operation in Arctic Climates

The code training set is designed for indoor or outdoor use, however, outdoor operation in arctic areas requires special attention. Make sure that the code training set is protected from snow and ice. If possible, keep the code training set off the ground. Try at all times to operate the code training set from a shelter.

19. Operation in Desert Climates

The difficulty encountered when operating the code training set in desert climates results from the large amount of sand and dust present in the air. When using the code training set outdoors, protect it from sand and dust by operating from a sheltered area. Always wipe surfaces with a dry cloth after operation.

20. Operation in Tropical Climates

Because of high humidity, operation in tropical areas requires special considerations. Be sure that the code training set is protected from rainfall. All electrical connections must be kept dry. Always wipe exposed surfaces with a dry cloth after the code training set has been used. Be sure that it is kept off the ground.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE

Section I. ORGANIZATIONAL TOOLS AND MATERIALS

21. General

Before starting preventive maintenance procedures, make available all required tools and materials. Select a location free from excessive dust, dirt, and sand. Refer to DA Form 11–238 (fig. 5) or DA Form 11–239 (fig. 6).

22. Tools and Materials

Special tool or test sets are not supplied with Code Training Set AN/GSC–T1A. Tools and materials required for organizational maintenance are contained in Tool Equipment TE–41, which may be procured through regular supply channels.

Note. Do not use gasoline as a cleaning agent for any purpose.

Section II. PREVENTIVE MAINTENANCE SERVICES

23. Definition of Preventive Maintenance

Preventive maintenance means making systematic checks and adjustments at regular intervals to keep the equipment operating at top efficiency. It differs from troubleshooting and repair in that the purpose of preventive maintenance is to *prevent* breakdowns and, therefore, the need for repair. The purpose of trouble shooting and repair is to locate and *correct existing defects.* Failure or inefficient operation of one piece of the equipment may cause the failure of an entire communication system. It is vitally important, therefore, that the equipment be maintained properly.

24. 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.

(1) If necessary, except for electrical contacts, moisten or brush with solvent, dry cleaning (SD) (Sig C stock No. 6G236.1), and then wipe the parts dry with a cloth.

(2) Clean electrical contacts with an orange stick dipped in carbon tetrachloride. Wipe away surplus cleaning fluid with a dry cloth.

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

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

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE: CODE TRAINING SET AN/GSC-TIA | EQUIPMENT SERIAL NO.

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

DAILY

NO.	ITEM	CONDITION S	M	T	W	T	F	S
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT (*receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories*). PAR. 26 C (1 AND 2)							
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR. 9							
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS. PAR. 26 d (3, 4 AND 5)							
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS. PAR. 26 b (5)							
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION. PAR. 26 d							
6	CHECK FOR NORMAL OPERATION. PAR. 26 j							

WEEKLY

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS. PAR. 26 C		13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.	
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE. PAR. 26 C		14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES.	
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 26 C		15	INSPECT METERS FOR DAMAGED GLASS AND CASES.	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS.		16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHERPROOFING. PAR. 2 AND 30	
11	INSPECT CANVAS-ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.		17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES. PAR. 26 a, c, d, e, h		18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE. PAR. 26 g	
19	IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION. PAR. 26 k				

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

TM 437A-238

Figure 5. DA Form 11–238.

c. If available, dry compressed air may be used at a line pressure not exceeding 60 pounds per square inch to remove dust. Be careful, however, or mechanical damage from the air blast may result.

d. For further information on preventive maintenance techniques, refer to TB SIG 123.

25. Use of Preventive Maintenance Forms (figs. 5 and 6)

a. The decision as to which items on DA Forms 11–238 and 11–239 apply to this equipment is to be made in the case of first echelon

SECOND AND THIRD ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT

RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE: CODE TRAINING SET AN/GSC-TIA

EQUIPMENT SERIAL NO.

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

NO.	ITEM	CONDITION
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT *(receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories).* PAR. 26 a (1 AND 2)	
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR. 9	
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS. PAR. 26 d (3,4 AND 5)	
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS. PAR. 26 b (5)	
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION. PAR. 26 d	
6	CHECK FOR NORMAL OPERATION. PAR. 26 j	
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS. PAR. 26 c	
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE. PAR. 26 c	
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 26 c	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS.	
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES. PAR. 26 a,d,e,h,j	
13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.	
14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES.	
15	INSPECT METERS FOR DAMAGED GLASS AND CASES.	
16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHERPROOFING. PAR. 2 AND 30	
17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.	
18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE. PAR. 26 o	

NO.	ITEM	CONDITION
19	ELECTRON TUBES - INSPECT FOR LOOSE ENVELOPES, CAP CONNECTORS, CRACKED SOCKETS; INSUFFICIENT SOCKET SPRING TENSION; CLEAN DUST AND DIRT CAREFULLY; CHECK EMISSION OF RECEIVER TYPE TUBES. PAR. 26 b (5)	
20	INSPECT FILM CUT-OUTS FOR LOOSE PARTS, DIRT, MISALIGNMENT AND CORROSION.	
21	INSPECT FIXED CAPACITORS FOR LEAKS, BULGES, AND DISCOLORATION. PAR. 26 b (5)	
22	INSPECT RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR LOOSE MOUNTINGS; BURNED, PITTED, CORRODED CONTACTS; MISALIGNMENT OF CONTACTS AND SPRINGS; INSUFFICIENT SPRING TENSION; BINDING OF PLUNGERS AND HINGE PARTS.	
23	INSPECT VARIABLE CAPACITORS FOR DIRT, MOISTURE, MISALIGNMENT OF PLATES, AND LOOSE MOUNTINGS.	
24	INSPECT RESISTORS, BUSHINGS, AND INSULATORS, FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE. PAR. 26b(6)	
25	INSPECT TERMINALS OF LARGE FIXED CAPACITORS AND RESISTORS FOR CORROSION, DIRT AND LOOSE CONTACTS.	
26	CLEAN AND TIGHTEN SWITCHES, TERMINAL BLOCKS, BLOWERS, RELAY CASES, AND INTERIORS OF CHASSIS AND CABINETS NOT READILY ACCESSIBLE. PAR. 26b	
27	INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS. PAR. 26 b	
28	CHECK SETTINGS OF ADJUSTABLE RELAYS.	
29	LUBRICATE EQUIPMENT IN ACCORDANCE WITH APPLICABLE DEPARTMENT OF THE ARMY LUBRICATION ORDER.	
30	INSPECT GENERATORS, AMPLIDYNES, DYNAMOTORS, FOR BRUSH WEAR, SPRING TENSION, ARCING, AND FITTING OF COMMUTATOR.	
31	CLEAN AND TIGHTEN CONNECTIONS AND MOUNTINGS FOR TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS. PAR. 26 d (1 AND 2)	
32	INSPECT TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS FOR OVERHEATING AND OIL-LEAKAGE. PAR. 26 b (5)	
33	BEFORE SHIPPING OR STORING - REMOVE BATTERIES.	
34	INSPECT CATHODE RAY TUBES FOR BURNT SCREEN SPOTS.	
35	INSPECT BATTERIES FOR SHORTS AND DEAD CELLS.	
36	INSPECT FOR LEAKING WATERPROOF GASKETS, WORN OR LOOSE PARTS. PAR. 26 o	
37	MOISTURE AND FUNGIPROOF. PAR. 26b(3)	
38	IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION. PAR. 26 k	

DA FORM 1 MAY 51 11-239 REPLACES DA FORM 419, 1 DEC 50, WHICH IS OBSOLETE. 16—64382-1

TM 437A-239

Figure 6. DA Form 11-239.

(operator) maintenance by the communications officer/chief, or by his designated representative; in the case of second and third echelon (organizational) maintenance, by the individual making the inspection. Instructions for the use of each form appear on the reverse side of the form.

b. Circled items in figures 5 and 6 are partially or totally applicable to Code Training Set AN/GSC–T1A. Paragraph references in the ITEM block refer to paragraphs in the text which contain additional maintenance information.

26. Performing Preventive Maintenance

The following preventive maintenance operations should be performed at the intervals indicated, unless these intervals are reduced or increased by the local commander.

Caution: Screws, bolts, and nuts should not be tightened carelessly. Fittings tightened beyond the pressure for which they are designed may become damaged or broken.

a. Exterior of the Unit. Inspect for dirt, dust, grease, corrosion, damaged or loose controls, and loose or missing screws.

(1) Tighten all loose screws and replace any that are missing. Tighten set screws on control knobs.

(2) Remove dirt with a dry, clean cloth. Use a cloth slightly moistened with solvent (SD) to remove grease, oil, or corrosion which cannot be removed with a dry cloth. Remove rust and corrosion (which cannot be removed with solvent (SD)) with No. 0000 sandpaper and remove residue with a dry cloth.

b. Back of Panel and Chassis. Remove the front panel and chassis assembly from the carrying case by removing the screws and washers from the front panel and from the bottom of the carrying case. Inspect the back of the panel for dust, dirt, fungus growth, corrosion, loose or missing screws, loose connections at the terminals, broken leads, and defective insulation.

(1) Tighten loose mounting screws and nuts. Repair defective insulation on wires. Wipe the interior of the carrying case with a dry cloth, and remove dirt adhering to the case with a cloth dampened with solvent (SD).

(2) Remove dirt and dust from the apparatus and wiring with a soft bristle brush, or as described in *c* below. Wipe exposed parts with a clean dry cloth.

(3) If fungus growth is present, be sure that the equipment is thoroughly dry before brushing it off. Remove heavy fungus growth with an orange stick and wipe the apparatus with a clean cloth moistened with solvent (SD).

(4) Loosen corrosion (that cannot be removed with solvent (SD)) with No. 0000 sandpaper.

(5) Inspect the following:

(*a*) Capacitors for leakage, bulging, and overheating.

(*b*) Resistors for blistering and discoloration.

(*c*) Vibrators for overheating or improper seating.

(*d*) Tubes for loose envelopes or improper seating.

c. Power Cable. Inspect power cable for cuts, cracks, and frayed insulation. Inspect contacts at both ends for dirt, corrosion or loose connections.

(1) Repair frayed insulation with friction tape.

(2) Clean dirty or corroded contacts with No. 0000 sandpaper or crocus cloth.

(3) Tighten all loose connections.

d. Switches, Controls, and Jacks. Inspect the mechanical action of the POWER ON-OFF and voltage selector switches, FREQUENCY-BLINKER, VOLUME, and speaker resonator controls by operating them several times.

(1) Be sure that the contacts close when the switches are operated.

(2) Be sure that the shaft does not stick or that the shaft is not loose on both switches and controls.

(3) Insert the headset plug in the HEADSET jack and test for tightness. Inspect plug for bent or broken tip. Clean plug with crocus cloth if necessary.

(4) Inspect and clean the KEY terminals.

(5) Tighten all loose assembly screws.

e. Transmitting Keys. Inspect transmitting keys for cut or broken cords, broken parts or assembly plate, loose or missing nuts or bolts, and corroded parts.

(1) Repair cut or broken insulation with friction tape.

(2) Report all broken or missing parts for replacement or repair.

(3) Clean all corroded parts with solvent (SD).

f. Spare Parts Container. Inspect the container for missing or broken parts, refer to paragraph 8, and order replacement when necessary.

g. Spare Fuses. Inspect and test all spare fuses. Refer to the table in paragraph 8 for rating. Inspect spare fuse holders for loose, broken, or corroded parts.

(1) Order replacement for all broken or missing fuses.

(2) Clean corroded fuses with solvent (SD) or crocus cloth.

(3) Clean, repair, or replace dirty, broken, or defective fuse holders.

h. Working Fuses. Turn POWER ON-OFF switch S2 to the OFF position, unscrew the two bolts at the bottom of the fuse compartment door, and lift open the door as shown in figure 4. Inspect the inside of the fuse compartment for dirt, corrosion, and fungus growth.

Remove the fuse cap and inspect the fuses for correct rating, broken glass, and corrosion.

(1) Clean the inside of the compartment with solvent (SD). Use an orange stick or a brush to clean inaccessible places.

(2) Replace defective fuses and order replacements.

i. Batteries. If storage or dry batteries are used, inspect the terminals and all connections for looseness, dirt, and corrosion. Inspect all cabling and wires for cuts, worn insulation, and other defects that may cause improper operation of the equipment.

(1) Wipe the terminals of the storage battery with a cloth moistened with solvent (SD).

(2) Use No. 0000 sandpaper to obtain a bright finish on the lead terminals and connectors.

(3) Check the level of the battery electrolyte. Add water if necessary.

(4) Clean the terminals of the dry battery and wire connections with No. 0000 sandpaper or crocus cloth.

(5) Repair defective insulation with friction tape.

(6) Order battery replacement at first sign of battery deterioration.

(7) After completion of any of the above items, the code training set should be thoroughly tested for normal operation.

(8) Any deficiencies noted, but *not corrected*, during the inspection, should be indicated in the space provided at the bottom of the form, item 19 on DA Form 11–238, and item 38 on DA Form 11–239.

27. Lubrication

No lubrication is necessary for Code Training Set AN/GSC–T1A. The only moving parts are the FREQUENCY-BLINKER control and the VOLUME control shafts, which do not require lubrication.

28. Weatherproofing

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.

29. Maintenance

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

b. Winter. Special precautions necessary to prevent poor perform-

ance or total operational failure of equipment in extremely low temperatures are explained in TB SIG 66 and TB SIG 219.

c. Desert. Special precautions necessary to prevent equipment failures in areas subject to extremely high temperatures, low humidity, and excessive sand or dust are explained in TB SIG 75.

30. Rustproofing and Painting

When painted finishes have been badly marred or damaged, prevent rust and corrosion by touching up bared surfaces as follows:

a. Use No. 0000 sandpaper to clean the surface. Obtain a bright, smooth finish.

Caution: Do not use steel wool to remove rust. Small particles of metal may fall into the equipment and cause shorting or grounding of circuits.

b. Remove rust by cleaning corroded metal with solvent (SD). In severe cases it may be necessary to use solvent (SD) to soften rust, and sandpaper to complete the preparation for painting.

c. For a touch-up job, use a small brush to apply paint to the bared surfaces. Use authorized paint consistent with existing specifications. Apply one coat of clear lacquer to parts having a bright metal finish.

Section III. TROUBLESHOOTING AT ORGANIZATIONAL LEVELS

31. General

The troubleshooting and repair work that can be performed at the organizational level is limited in scope by the tools, test equipment, and replaceable parts issued. Information in this section will help the operator determine some causes of faulty operation and to make minor repairs.

32. Inspection

If the code training set fails to operate properly, inspect the equipment for the following:

a. Power cord for improper connections.

b. Transmitting keys and key cords for wear, breaks, and poor connections.

c. Jack and plug for improper connections.

d. Wiring for loose or poorly soldered connections, frayed or burned insulation, stretched leads, and breaks.

e. Switches and controls for broken knobs and improper settings.

f. Defective tubes.

g. Burned-out or corroded fuses.

h. Broken bezel.

i. Broken connectors.

33. Tools and Test Equipment Required for Organizational Maintenance

The equipment required for testing Code Training Set AN/GSC–T1A consists of Multimeter TS–297/U, Signal Corps stock No. 3F4325–297 and Tool Equipment TE–73. If this equipment is not available, other equipment having equal accuracy and corresponding characteristics may be used.

34. Troubleshooting at Organizational Maintenance Level

a. Using Equipment Performance Check List. This check list (*c* below) lists the item to be checked, the normal indications, and the corrective measures that can be taken by the operator. To use this list, follow the items in numerical sequence.

(1) *Action or condition.* For some items, the information given in the action or condition column consists of various switch and control settings with which the code training set is to be checked. For some items, it represents an action that must be taken to check the normal indication given in the normal indications column.

(2) *Normal indications.* The normal indications listed include the visible and audible signals that the operator should perceive when he checks the items. If the indications are not correct, the operator should apply the recommended corrective measure.

(3) *Corrective measures.* The corrective measures listed are those that the operator can make. If the indications obtained are insufficient to localize the trouble, the corrective measures column indicates that troubleshooting is necessary, and the equipment must be turned in for repairs. However, if the situation requires that service be maintained and if the code training set is not completely inoperative, the operator must keep the set in operation as long as possible.

b. Troubleshooting Chart. This chart (*d* below) indicates the corrective measures which may be applied at the organizational maintenance level. Use Multimeter TS–297/U to make continuity tests as indicated in the chart. If corrective measures do not yield the results required for operation, troubleshooting at the field maintenance level is required.

Note. Substitute a pluck-out part, such as a vacuum tube or a vibrator, with one known to be in good condition. If the part which was substituted for the original part restores normal operation, the original part is defective.

c. Equipment Performance Checklist.

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	1	Transmitting key	Connect to front panel KEY terminals H4.		
	2	Power source	Check to determine voltage.		
	3	Voltage selector switch S1	Set to position indicated by voltage of power source.		
	4	Power cord W1	Connect to power source.		
START	5	POWER ON-OFF switch S2.	Set to ON position. Allow 5-minute warm-up period for frequency stabilization.		
EQUIPMENT PERFORMANCE	6	VOLUME control R3	Move to maximum output.		
	7	FREQUENCY-BLINKER control.	Set at BLINKER position.		
	8	Transmitting key	Operate for blinker flashes	Blinker lamp I 1 flashes	*a.* Be sure POWER switch S2 is in ON position. *b.* Check power cable or adapter cord to be sure it is connected properly to the power source. *c.* Check key and panel connections. *d.* Check fuse by substituting spare fuse. *e.* If none of the corrective measures noted above yield the required results, trouble shoot the equipment in accordance with the troubleshooting chart given in *d* above.

EQUIPMENT PERFORMANCE	9	Resonance adjustment screw.	Turn out until stop is reached.		
	10	FREQUENCY-BLINKER control.	Set to one of the FREQUENCY positions.		
	11	Transmitting key	Operate	Audio signals are heard.	Follow the corrective measures listed in *a* through *e* in item 8 above.
	12	HEADSET jack J1	Insert headset plug	Audio signals are heard.	*a.* Check plug to see if proper connection has been made. *b.* Check headset wiring for breaks.
STOP	13	POWER ON-OFF switch S2.	Set to OFF position	Audio signals cease	
	14	Power cord W1	Disconnect from power source.		
	15	Voltage selector switch S1	Set to OFF position		
	16	Transmitting key	Disconnect from KEY terminals H4.		

d. Troubleshooting Chart (Organizational Maintenance Level).

Symptom	Probable cause	Correction
Keying fails to produce audio or visual signal.	Defective fuse	Check fuses, one at a time, by substituting a spare fuse of the correct rating.
	Defective tube	Check tubes, one at a time, by substituting a spare tube of the correct type.
	Defective vibrator (d. c. operation)	Check vibrators, one at a time, by substituting a spare vibrator of the correct type.
	Defective key cord or transmitting key	Check key and cord connections by shorting terminals at the front panel. If shorted terminals produce a signal, make a continuity test of keys and cords. Replace defective key or cord. If keys and cords are not defective, make a continuity check between terminals at the panel. An open circuit indicates a necessity for field maintenance repair.
	Defective power cord, plug, connector, or battery clips.	Make a continuity test of the power input line. Replace defective parts.
	Defective voltage selector switch S1 or POWER switch S2.	Make a continuity test of switch circuits (figs. 10 and 14). Replace defective switch.
	Defective tube sockets	Test tube sockets for continuity.
Keying operations fail to produce blinker flashes. Audio signals are heard when FREQUENCY-BLINKER control is set to a FREQUENCY position.	Defective blinker lamp I 1	Check lamp by substituting spare lamp.
Fuses blow when power is applied	Defective vibrator (when using d. c. input).	Replace defective vibrator.
	Circuitry of equipment is shorted	Troubleshooting at the field maintenance level is required. Refer to chapter 6.

CHAPTER 5

THEORY

Section I. THEORY OF CODE TRAINING SET AN/GSC–T1A

35. General

Code Training Set AN/GSC–T1A produces sound or blinker flashes for use by a student group practicing transmission and reception of code signals. Any of six external power sources may be used to operate the equipment; 6, 12, 24, or 115 volts d. c. or 115 or 230 volts a. c.

36. Block Diagram

(fig. 7)

a. Audio-frequency oscillations are produced by tube V1 when the KEY terminals (H4) on the front panel are shorted by keying operations. The output of tube V1 is fed to the control grid of amplifier tube V2. The amplitude of this signal voltage is controlled by VOLUME control potentiometer R3. After amplification, the signal is fed to output transformer T2. Loudspeaker LS1, and HEADSET jack J1 are connected to the output transformer T2. Blinker lamp I 1 is connected to the plate of V2 through resistor R1 and capacitor C2.

b. Power from any one of the six primary sources noted in paragraph 39 is applied through the noise suppressor (3, fig. 7) to voltage selector switch S1 when POWER switch S2 is operated to the ON position. The 6-, 12-, or 24-volt d. c. sources are applied to *vibrator 2* through the voltage selector switch S1. The 115-volt d. c. source is applied to *vibrator 1* through the voltage selector switch. A. c. voltages of 115 volts and 230 volts are applied directly to the primary winding of transformer T3 from the selector switch. Vibrator 2 supplies 6, 12, and 24 volts pulsating d. c. to the primary of T3. Vibrator 1 supplies 115 volts pulsating d. c. to the primary of T3. Power transformer T3 provides high-voltage a. c. power to duo-diode rectifier tube V3 for full-wave rectification. This tube supplies the high-voltage d. c. for the plate and screen circuits of the amplifier and for the plate circuit of the oscillator.

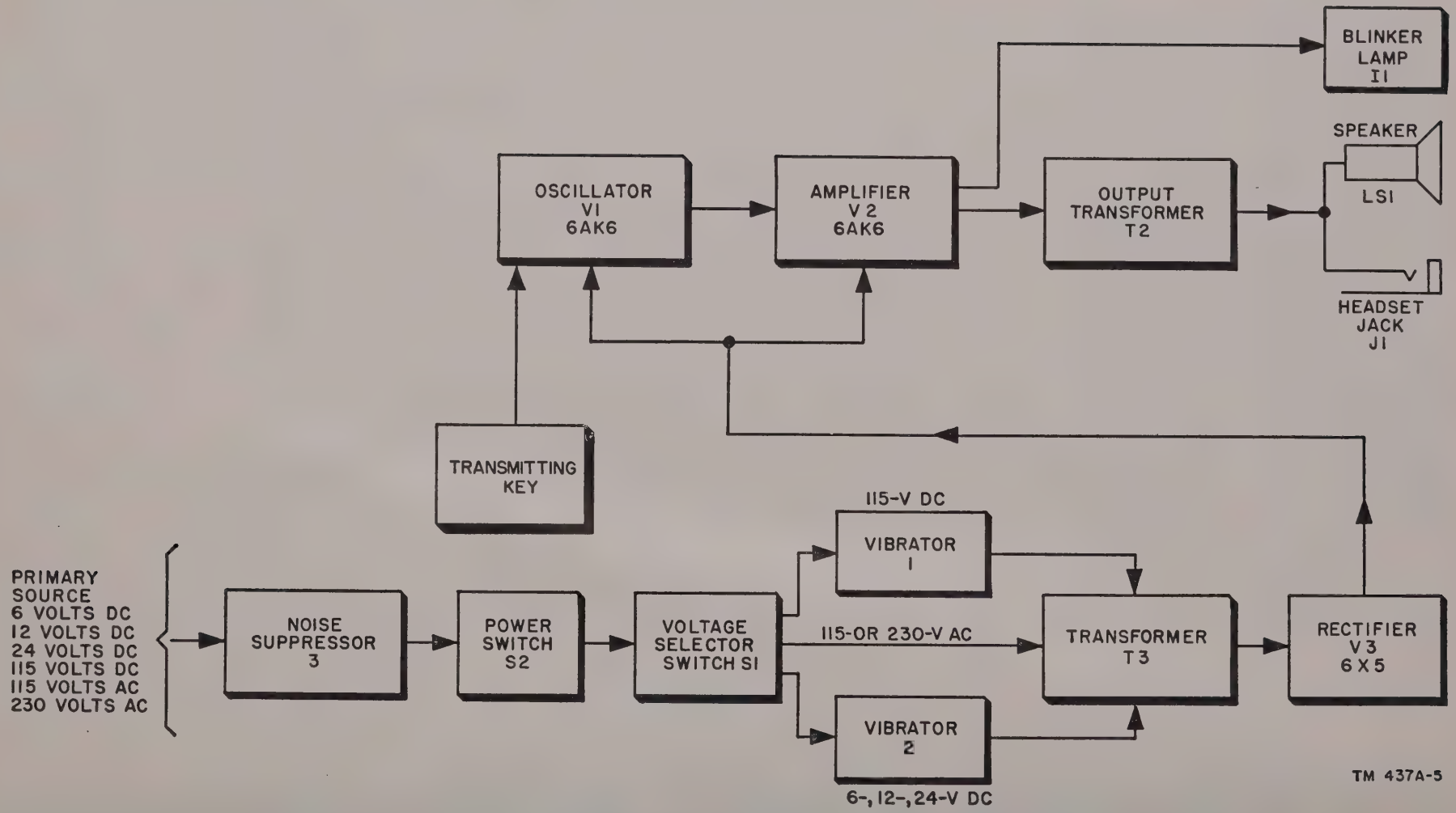


Figure 7. Code Training Set AN/GSC-T1A, block diagram.

Section II. CIRCUIT ANALYSIS

37. Oscillator Section

(fig. 8)

a. Audio-frequency oscillations are produced when the cathode circuit of oscillator tube V1 is completed to ground when KEY terminals H4 on the front panel are shorted by keying operations. Feedback from plate to grid is made through the secondary winding of transformer T1. The inductance and distributed capacitance of the secondary winding, together with capacitor C3, determine the frequency of the oscillations produced by the circuit.

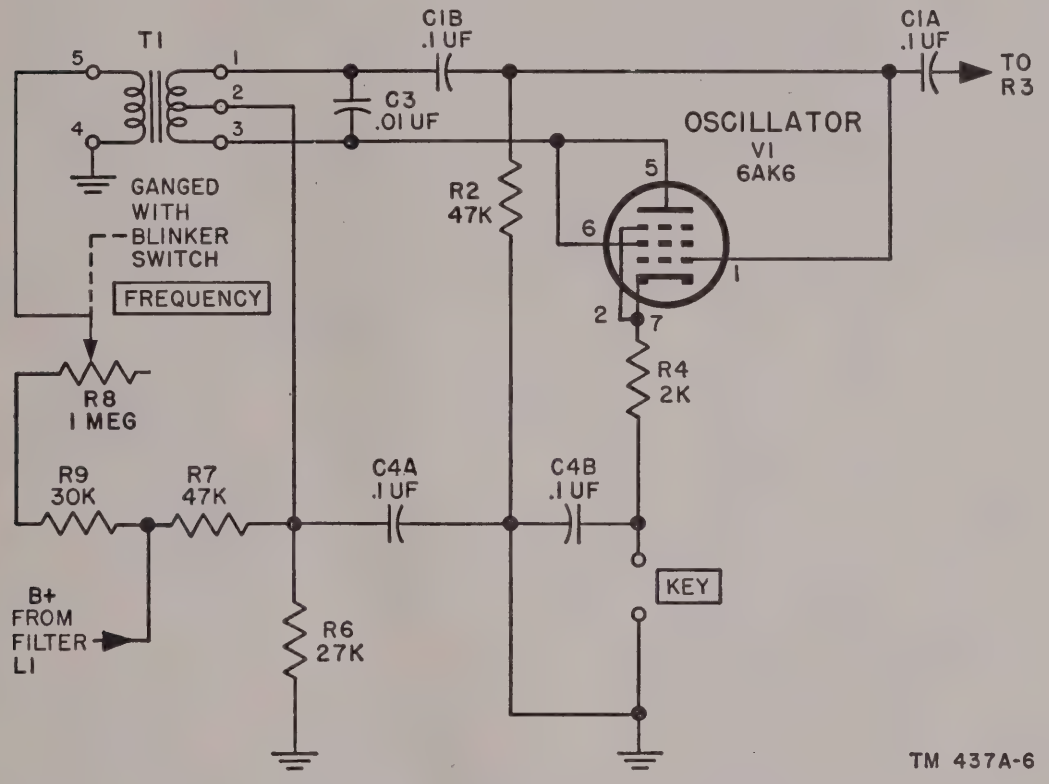


Figure 8. Oscillator circuit, simplified schematic diagram.

b. The frequency of oscillation of tube V1 is changed by varying the current flow through the primary winding of transformer T1. The amount of current flowing to this winding is determined by resistor R9 and the setting of FREQUENCY control potentiometer R8, which is controlled by the FREQUENCY-BLINKER control on the front panel. A change in current varies the inductance of the secondary winding and the frequency of oscillation of tube V1. This method of frequency control permits frequency variation without volume change.

c. When the oscillator section is keyed, the cathode return circuit to ground is completed. The keying circuit is shunted by capacitor C4B which prevents key clicks. Capacitor C4A places the center tap

of transformer T1 at signal ground potential. Blocking capacitor C1B provides a plate-to-grid feedback path and also prevents plate voltage from being applied to the control grid of tube V1. Resistor R6 acts as a bleeder and voltage regulator. Resistor R7 and capacitor C4A decouple the plate of the oscillator from the B supply. Grid bias is developed by cathode resistor R4 and grid-leak resistor R2. The output of the oscillator tank circuit is fed through coupling capacitor C1A to the control grid of tube V2.

38. Amplifier and Output Sections

(fig. 9)

a. Tube V2 amplifies the oscillations developed in the oscillator section. The VOLUME control on the front panel is used to operate potentiometer R3 which controls the amplitude of the signal applied to the control grid of amplifier tube V2, and therefore, the tube output. The bias for amplifier tube V2 is developed across 510-ohm resistor R5. Capacitor C5 acts as a cathode audio bypass and is a low-impedance path to ground for the range of frequencies developed by the oscillator.

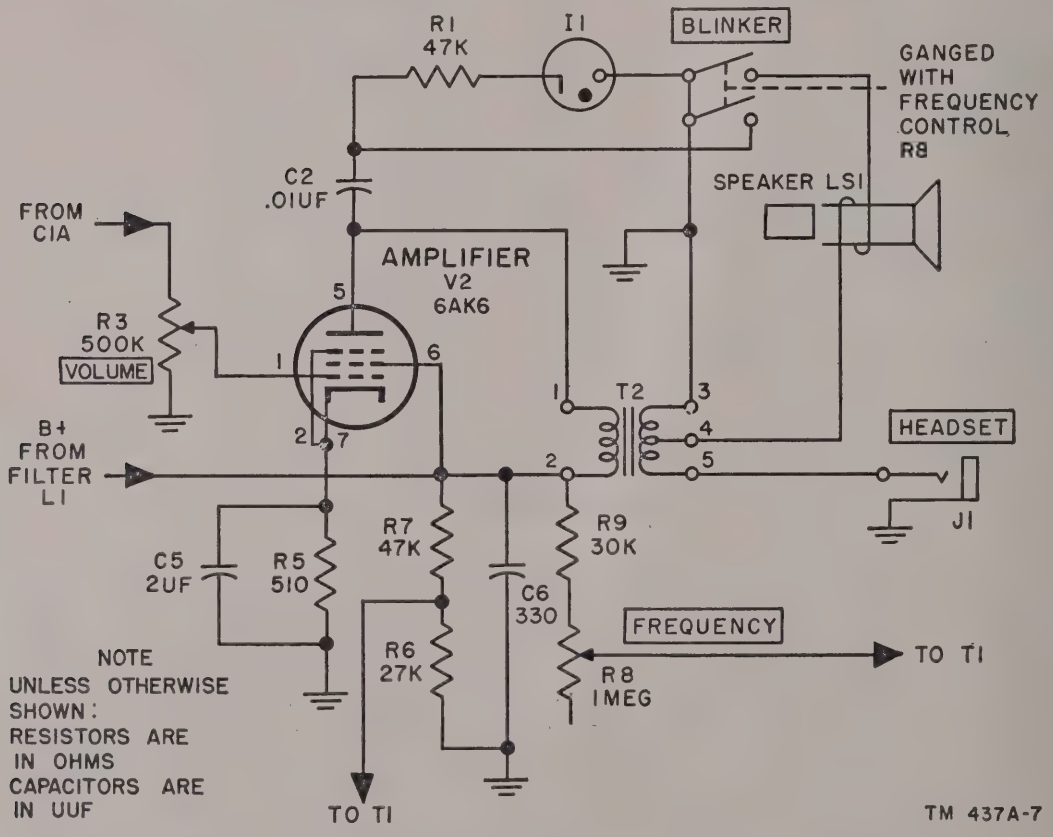


Figure 9. Amplifier circuit, simplified schematic diagram.

Output transformer T2 secondary matches the impedance of loudspeaker LS1, or of the headset connected to jack J1.

b. The output of amplifier tube V2 is applied to blinker lamp I 1 through capacitor C2 and resistor R1 when the FREQUENCY-

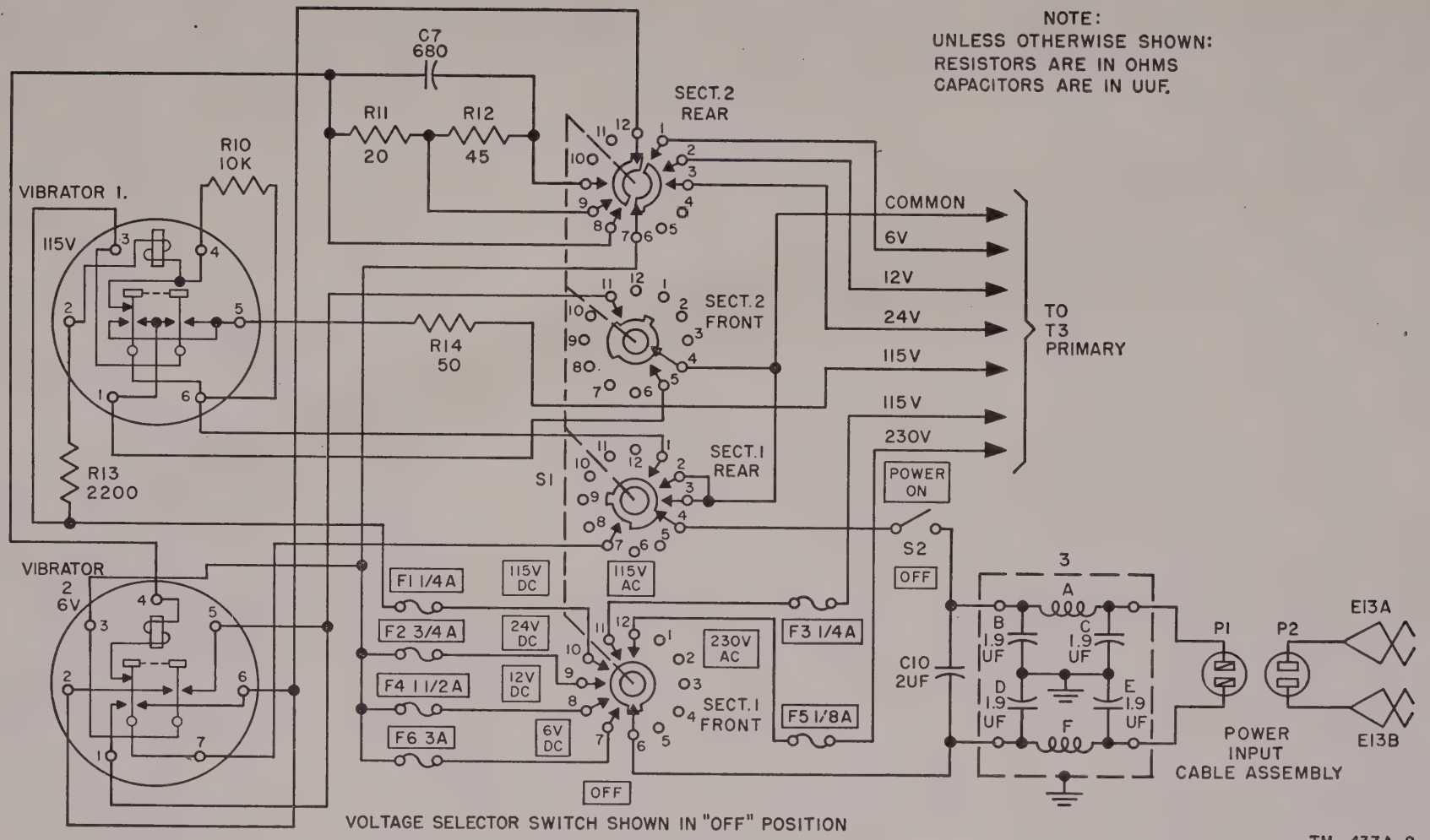


Figure 10. Selector switch and power input circuit, simplified schematic diagram.

BLINKER control R8 on the front panel is set at its extreme *counter-clockwise* position. With FREQUENCY-BLINKER control R8 in its extreme *clockwise* position the blinker lamp I 1 is short circuited and speaker LS1 voice coil is connected to ground and completes the speaker circuit. This action extinguishes the blinker lamp and provides for sound operation. The HEADSET jack is always in the circuit. High-frequency parasitic oscillations are bypassed to ground through capacitor C6.

39. Power Input Section

(fig. 10)

Electrical noise suppressor (3) is a low-pass filter which blocks high-frequency interference from the power input. Capacitor C10 acts as an additional power line filter. Power to the unit is turned on and off with POWER switch S2.

40. Vibrator Section

(fig. 10)

Vibrators 1 and 2 supply pulsating direct current to the primary of power transformer T3 when a d. c. power source is used to operate the equipment. Vibrator 1 operates from a 115-volt d. c. source, and vibrator 2 operates from power sources of 6, 12, and 24 volts d. c. Current from point 5 of vibrator 1 is fed through resistor R14 to a special 115-volt winding on the primary of power transformer T3. This circuit is used because the pulsating 115-volt d. c. does not have the peak voltage of the 115-volt, 60-cycle power which is fed to the other 115-volt winding. Resistors R10 and R13 for vibrator 1, and capacitor C7 for vibrator 2 aid the suppression of arcing at the vibrator contacts.

41. Rectifier Section

(fig. 11)

a. Tube V3 is a duo-diode used in a full-wave rectifier circuit. Choke L1 and capacitors C9A and C9B constitute a pi-type filter.

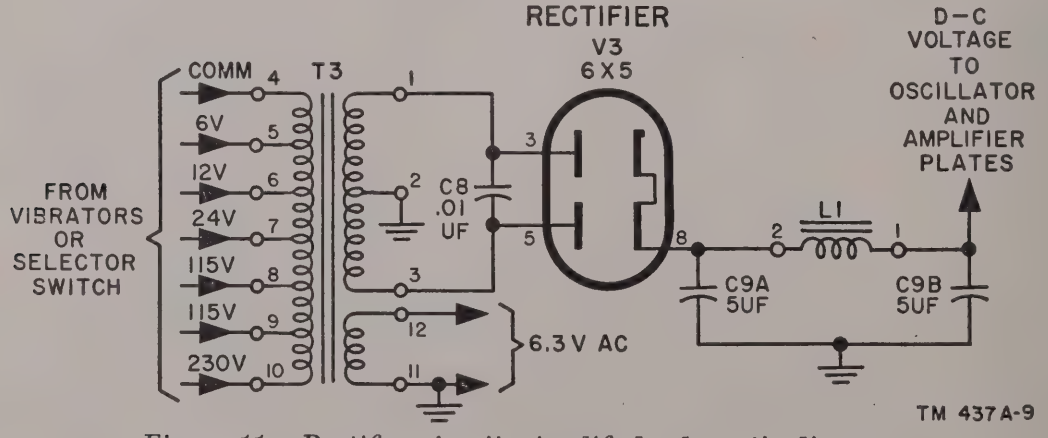


Figure 11. Rectifier circuit, simplified schematic diagram.

Capacitor C8, (buffer capacitor), connected across the plates of the rectifier tube, prevents transformer damage from the high-frequency voltages developed by the vibrators. Tube V3 rectifies the high-voltage a. c. supplied by power transformer T3, and provides d. c. plate voltage for oscillator tube V1 and amplifier tube V2. Filament voltage for the three tubes is provided by a separate winding on transformer T3.

b. The primary of power transformer T3 is multitapped to provide the proper turn ratio required so that the same secondary voltage may be available from any of the six input voltages.

CHAPTER 6

FIELD MAINTENANCE

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

Section I. PREREPAIR PROCEDURES

42. Tools, Materials, and Test Equipment

In addition to Tool Equipment TE–41 (par. 22) and Multimeter TS–297/U (par. 33), the tools, materials, and test equipment required for reconditioning, adjusting, and repairing Code Training Set AN/GSC–T1A are listed in *a* and *b* below.

a. Tools and Materials.

Signal Corps stock No.	Name of item and description	Purpose
NSNA	Burnisher, jack sleeve: hardwood pin	To burnish jack sleeves.
6R41065C	Burnisher TL–557/U: contact burnisher	To clean and burnish switch and jack contacts.
6Z2000	Cloth, crocus: 9″ x 11″	To clean tube and vibrator prongs.
6G1516	Paste, metal polish	To clean headset plugs.
6N7531	Solder M–31	To resolder equipment wiring.
6R24617	Soldering Iron TL–117	To resolder equipment wiring.
6G236.1	Solvent, dry cleaning (SD)	Cleaning agent.
6R38073	Tool Equipment TE–73	Miscellaneous tool set.
6Z8666	Toothpicks: hardwood; flat, one end, pointed other end	To clean switch contacts.

b. Test Equipment.

Signal Corps stock No.	Item	Use
3F4325–352	Multimeter TS–352/U	To make resistance measurements and a. c. and d. c. voltage measurements.
3F3936–3	Analyzer ZM–3/U	To test capacitors.
	Electron Tube Test Set TV–2/U	To test vacuum tubes.
4A920	Headset HS–20	For monitoring.

43. Removal of Pluck-out Parts

(fig. 12)

Vacuum tubes, vibrators, fuses, and the signal lamp may be removed without breaking soldered connections. These parts are called pluck-out parts because they do not require complicated disconnection procedures. The front panel and chassis assembly, however, must be removed from the carrying case before these parts can be reached.

a. Vacuum Tubes. To remove a vacuum tube, grasp the tube near the base and pull up. Do not rock the tube in its socket if it cannot be removed readily with a straight upward pull. Rocking a tube tends to spread the socket contacts. Move the tube gently from side to side and then try to lift out. Identify each tube as soon as it is removed so that it can be replaced in its proper socket.

b. Vibrators. Follow the procedures given for vacuum tubes in *a* above.

c. Fuses. Grasp the fuse with the thumb and index finger and pull from fuse clip.

d. Signal Lamp. The signal lamp has a bayonet-type socket. Push the lamp into the socket and turn counterclockwise; then remove the lamp.

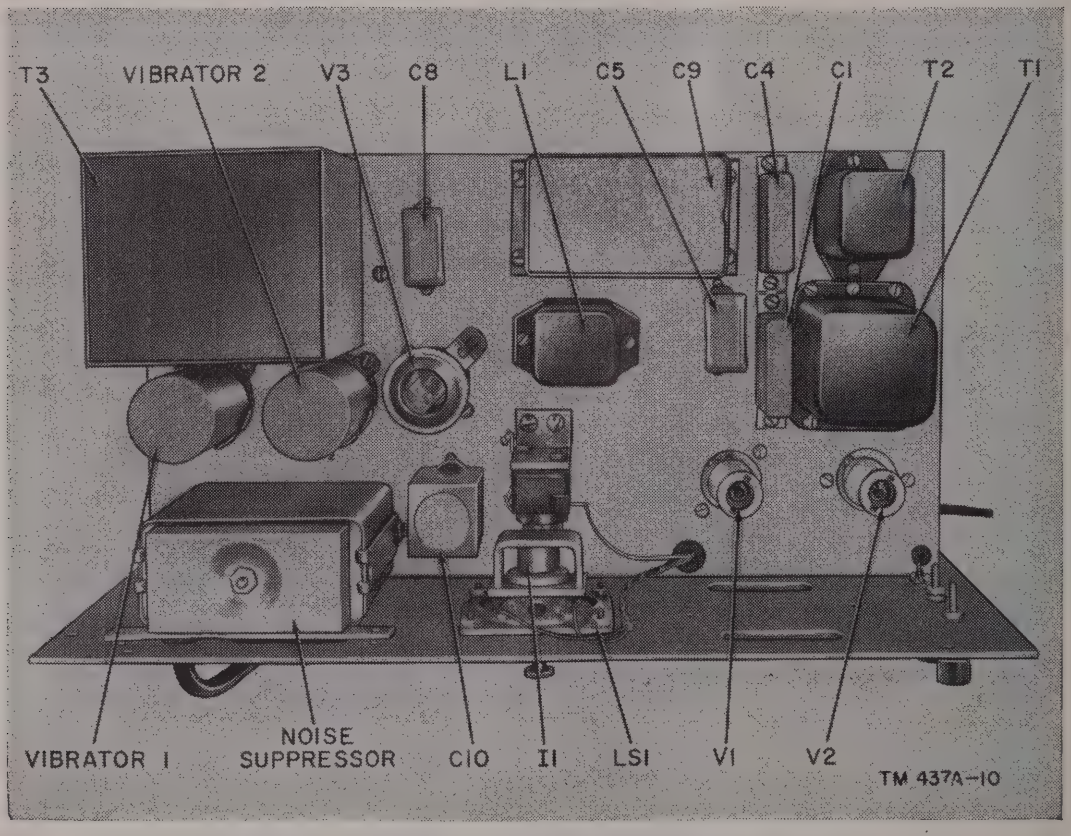


Figure 12. Top internal view of control unit.

44. Inspecting, Cleaning, and Testing Removed Parts

a. Inspecting. Be sure that the labels on the tubes correspond to the tube-socket numbers (fig. 12). Inspect tubes for cracked bases and loose or cracked envelopes. Check vibrators and tubes for broken prongs. Inspect the signal lamp for burned base or broken filament. Check fuses for charring.

b. Cleaning. Clean vacuum tubes and vibrators with a clean cloth moistened with solvent (SD). If necessary, clean the prongs of tubes and vibrators with crocus cloth.

c. Testing.

(1) *Vacuum tubes.* Use Electron Tube Test Set TV–2/U to test vacuum tubes for improper emission, leakage, and short circuits. If a tube tester is not available, check doubtful tubes in a code training set known to be in good operating condition.

(2) *Signal lamp and fuses.* Check the lamp and fuses by substituting spares or by continuity checking with an ohmmeter.

45. Inspecting and Cleaning Front Panel and Chassis Assembly

a. Inspecting. Make a visual inspection of the code training set to determine the general condition of the equipment when it is turned in for repair.

(1) Inspect for burned insulation and resistors. Examine for wax and oil leakage and any discoloration of apparatus and wiring. Inspect the wiring for broken leads, brittle insulation, and corrosion.

(2) Inspect for broken connections at tube sockets, vibrator sockets, and other apparatus. Be sure soldered connections are not defective. There should be no bare wires touching the chassis or other wires.

(3) Be certain all tube and vibrator sockets are tight.

(4) Test the operation of switches and controls. Control and switch shafts should not bind. The contacts of voltage selector switch S1 and POWER OFF–ON switch S2 should close with a slight follow when the switches are operated. Inspect for dirt, corrosion, and other foreign matter which might affect operation adversely. Check for bent or broken switch springs.

(5) Inspect the power plug for bent or broken prongs.

(6) Inspect for lose or missing screws in transformer and suppressor mounts and tube and vibrator sockets.

(7) If there is no indication of damage or fault, connect the equipment for operation, and follow the procedures given in the equipment performance check list (par. 34*c*) to be sure the unit is operating properly.

b. Cleaning.

(1) Clean the exterior of the set with a clean, dry cloth.

(2) Remove dirt from the exterior of the equipment with a cloth moistened with clear water. Allow the equipment to dry before attempting further cleaning.

(3) Remove the front panel and chassis from the carrying case as described in paragraph 26*b*. Use an orange stick to dislodge caked dirt. Remove dirt, dust, sand, lumps of solder, and wire cuttings from the interior of the equipment with a soft bristle brush. If available, dry compressed air may be used at a line pressure not exceeding 60 pounds per square inch to remove dirt, dust, and sand. Be careful, however, or mechanical damage from air blast may result.

(4) Remove oil and grease with a cloth moistened with solvent (SD). Wipe dry with a clean, dry cloth.

(5) Remove rust, corrosion, fungus growth, and similar foreign matter on the structural framework of the case in accordance with instructions in paragraphs 29 and 30.

(6) Clean the contacts of voltage selector switch S1 as follows:

(*a*) Flush the contacts with carbon tetrachloride applied with a clean toothpick or orange stick. Dip the flat end of the toothpick into the fluid to a depth of about one-half of an inch and deposit the liquid on the contacts without rubbing. Hold the contacts slightly apart during this procedure.

(*b*) Dip the flat end of another toothpick into the carbon tetrachloride and deposit the liquid on the contact, also without rubbing, to flush away the dirt loosened by the first application. Be careful to keep the cleaning fluid away from the insulators.

(*c*) When the contacts are thoroughly dry, burnish them so that no foreign matter remains on the contacts. Burnish contacts with a steel blade of the contact burnisher. Clean the contact burnisher before using by wiping the blade with a clean, dry cloth. During the burnishing process, wipe the blade frequently with a cloth moistened with carbon tetrachloride. Rub the burnisher against each contact two or three times. Do not use abrasives other than the burnisher blade.

Section II. TROUBLESHOOTING AT FIELD MAINTENANCE LEVEL

46. Troubleshooting Procedures

The first step in servicing defective equipment is to sectionalize the fault. This is done by tracing the fault to one of the major circuits. The second step is to localize the fault. Localization requires

the repairman to trace through a major circuit to a defective part. Careful observation of performance can aid in sectionalizing and localizing a particular fault. For example, failure of the unit to produce audio signals after successful operation with the blinker lamp would indicate a fault at the audio output circuit. This would sectionalize the trouble. Examination of the circuit would localize the fault to a particular element such as the FREQUENCY-BLINKER control R8, faulty output transformer T2, or faulty loudspeaker LS1.

47. Troubleshooting Data

A knowledge of how the equipment functions is necessary for the techniques of effective troubleshooting. Detailed operation theory of Code Training Set AN/GSC–T1A is covered in chapter 5. The troubleshooting chart (par. 50) provides step-by-step procedures that may be used as a reference. Refer also to the diagrams and charts listed below.

a. Complete schematic diagram (fig. 17).
b. Block diagram (fig. 7).
c. Simplified schematic diagrams (figs. 8, 9, 10, and 11).
d. Voltage and resistance diagram (fig. 13).
e. Equipment performance check list (par. 34*c*).

48. General Precautions

a. Only competent personnel supplied with adequate tools and equipment are authorized to service the equipment.

b. Careless replacement of parts often creates new faults. When removing and replacing defective parts, be careful not to damage leads or adjacent parts by pulling or pushing them out of the way.

c. Test tubes before making repairs. Defective tubes are one of the most common causes of trouble.

d. Make a careful record of the connections to each part removed and of the position of each part in the unit. Avoid using more solder than is necessary to make a secure connection. Solder, carelessly used, may cause short circuits. It is very important to make well-soldered joints since a poorly soldered joint is one of the most difficult faults to trace.

e. When replacing a part, position the new part exactly as the original part was placed. Use leads of the same length as the original leads.

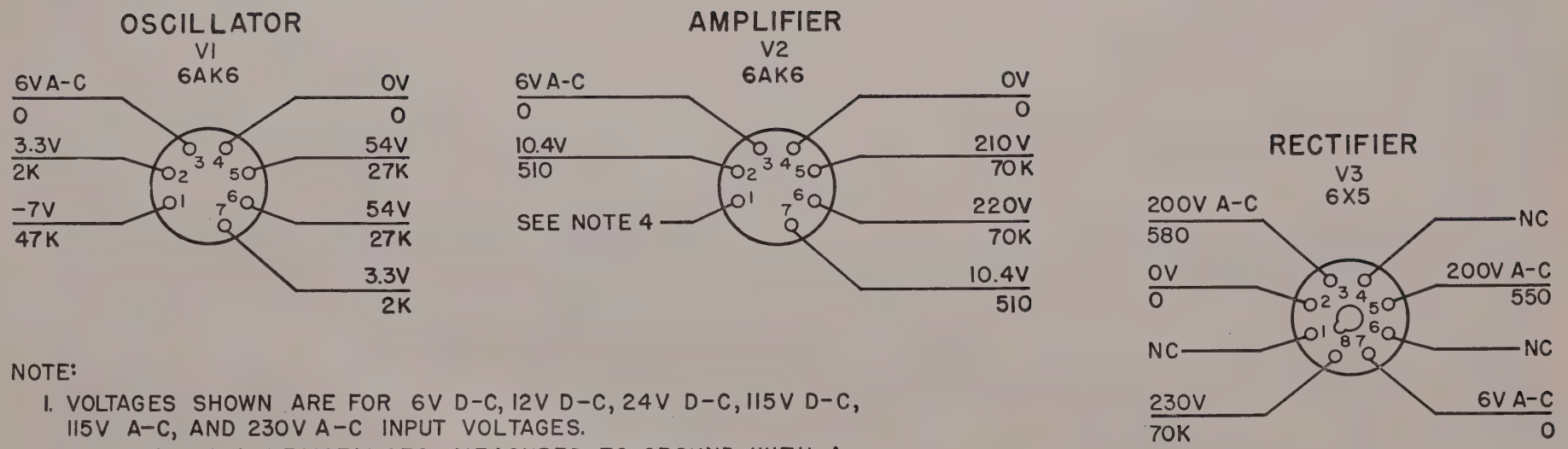
49. Operational Test

Operate the code training set as described in the equipment performance check list (par. 34*c*). The equipment performance test may indicate the general location of trouble. If the code training set still does not function properly, consult the troubleshooting chart given in paragraph 50.

50. Troubleshooting Chart

Symptom	Probable cause	Correction
No plate voltage. Tube filaments do not light.	No input voltage (defective or weak battery)	Replace weak or defective battery. Check input supply voltage.
	Blown fuse	Check fuses.
	Open windings on transformer T3.	
	Defective vibrators.	
	Open noise suppressor	Check and replace if defective.
	Defective POWER OFF-ON switch S2.	
	Defective VOLTAGE SELECTOR switch S1.	
	Open resistor R11 (12-volt d. c. input).	
	Open resistor R11 or R12 (24-volt d. c. input).	
No plate voltage. Filaments light	Defective rectifier tube V3	Replace tube V3.
	C9 shorted	Replace capacitor C9.
	C8 shorted	Replace capacitor C8.
	Open high-voltage winding on transformer T3.	Replace transformer T3.
	Open choke L1	Install new choke L1.
No plate voltage on oscillator tube V1. Filament lights. Plate voltage on amplifier tube V2.	Open resistor R7	Check and replace if defective.
	Shorted capacitor C4A.	
	Open secondary winding on T1.	
No plate voltage on amplifier tube V2. Filaments light.	Open primary winding on transformer T2	Replace output transformer T2.
	C2 shorted	Replace C2.
Fuses blow when power is applied	Voltage selector switch S1 in wrong position.	Check position of switch S1.
	Defective vibrator	Replace vibrator.
	Defective transformer T3	Check and replace if defective.

	Shorted capacitor C8, C9A, C9B, or C6.	
	Defective rectifier tube V3.	
	Shorted capacitor C7 (12- and 24-volt d. c. power input).	
Oscillator does not operate	Defective oscillator tube	Check and replace if defective.
	Defective capacitor C1A, C1B, C3, C4A or C4B.	
	Defective resistor R2, or R4.	
	Defective transformer T1.	
No output from speaker or lamp. Oscillator functioning. Audio voltage at grid of amplifier tube. Plate voltage at plate of tube V2.	Defective amplifier tube	Check and replace if defective.
	Open resistor R5.	
	Defective transformer T2.	
Lamp does not light when key is pressed	Defective lamp I 1	Check and replace if defective.
	Open capacitor C2.	
No output from speaker. Lamp functions properly.	Defective speaker LS1	Check and replace if defective.
	Defective frequency potentiometer R8.	
	Defective secondary on transformer T2.	
Continuous output obtained with key disconnected.	Shorted capacitor C4B	Replace capacitor C4B.
	KEY terminals on front panel shorted	Check KEY terminals for shorts.
Varying potentiometer R8 does not change pitch of output tone. Other functions are normal.	Defective potentiometer R8	Check and replace if defective.
	Defective resistor R9	Check and replace if defective.



NOTE:

1. VOLTAGES SHOWN ARE FOR 6V D-C, 12V D-C, 24V D-C, 115V D-C, 115V A-C, AND 230V A-C INPUT VOLTAGES.
2. VOLTAGES AND RESISTANCES MEASURED TO GROUND WITH A 1,000 OHM-PER-VOLT METER, VOLUME CONTROL AT MINIMUM POSITION FREQUENCY CONTROL AT BLINKER POSITION, AND KEY TERMINALS CONNECTED TOGETHER.
3. NC INDICATES NO CONNECTION.
4. VOLTAGE IS 0 TO 10V, RESISTANCE IS 0 TO 500K, DEPENDING UPON POSITION OF VOLUME CONTROL.
5. ALL VOLTAGES D-C AND ALL RESISTANCES OHMS UNLESS OTHERWISE NOTED.

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Figure 13. Code Training Set AN/GSC-T1A, voltage and resistance diagram.

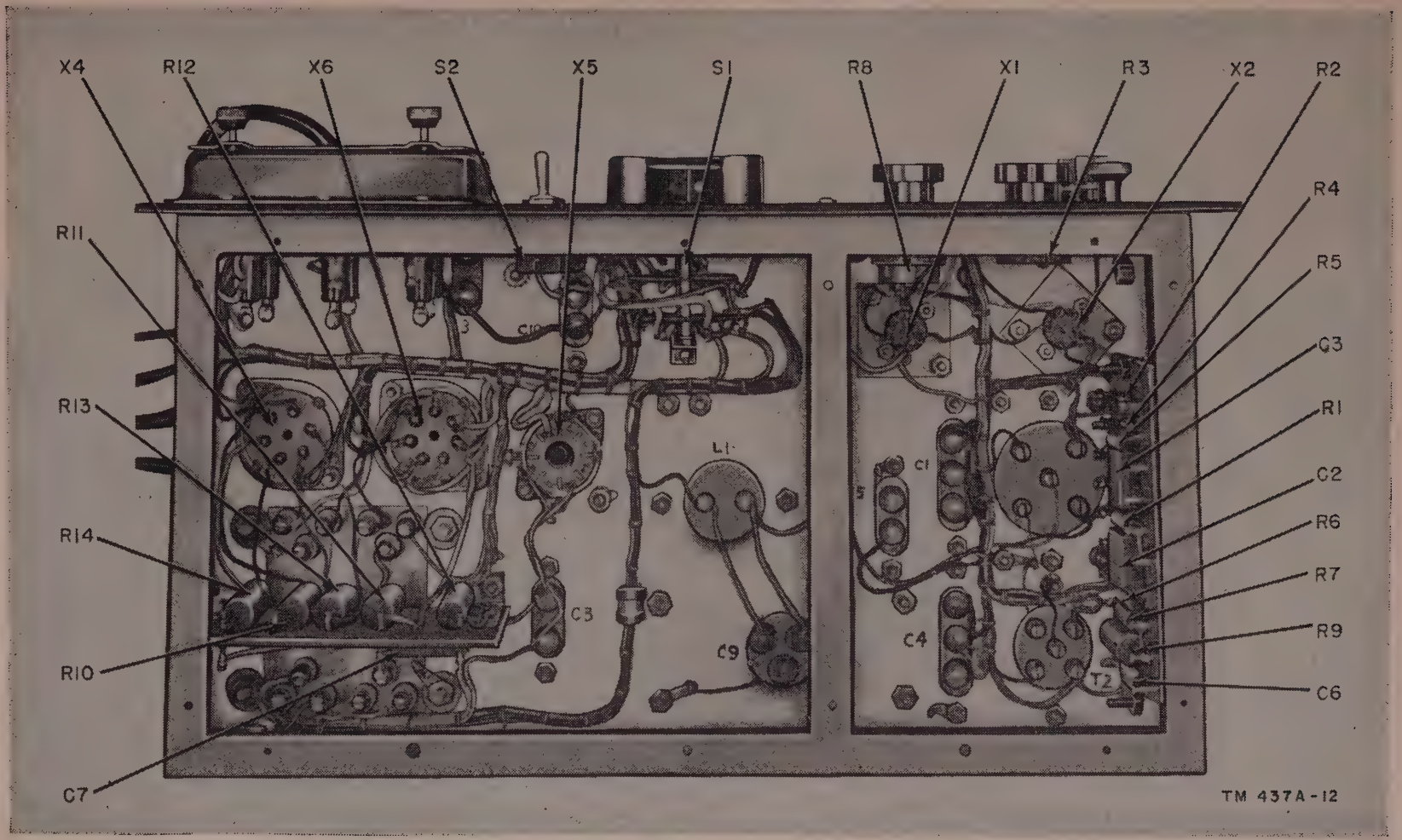


Figure 14. Bottom internal view of control unit.

51. Signal Voltage Tests

If a trouble has been traced to the oscillator stage, make a voltage check between the pins of oscillator tube V1 and ground (fig. 13). Faulty amplifier or rectifier circuits may be checked in a similar manner. A quick way to check the oscillator circuit is to measure the signal voltage at the grid of the amplifier. Set the VOLUME control to the maximum position, and short the KEY terminals, H4, on the front panel. The a. c. voltage between pin 1 and ground should be 10 volts. A quick method for checking the amplifier is to measure the audio output. Set VOLUME control R3 to maximum and the FREQUENCY-BLINKER control to the BLINKER position. The voltage across the terminals of the HEADSET jack should be at least 2.5 volts a. c.

52. Resistor Tests

Since a fault may cause a change in resistance value make resistance measurements to isolate the fault. Resistance values may be found in the schematic diagram (fig. 17), or by checking the color code of the resistor. Turn off all power prior to making resistance checks. Be sure that capacitors have been discharged.

53. Capacitor Tests

Capacitors may be tested by the kick-test method using Test Set TS–26/TSM or with Analyzer ZM–3/U. Be sure to discharge the capacitor before using the ohmmeter.

54. Transformer Tests

The correct a. c. voltages across the secondary windings of power transformer T3 are indicated in figure 17. A. c. voltage between the terminals of output transformer T2 and oscillator transformer T1 should be measured with the VOLUME control set at maximum and the FREQUENCY-BLINKER control set at the half-way position (800 cycles). The a. c. voltages across the terminals are listed in the following table.

Item	Across terminals	Voltage (a. c.)
T1	1 and 2	12
	2 and 3	13
	4 and 5	20
T2	Primary	110
	Secondary	3. 6
T3	1 and 2	100
	2 and 3	100
	11 and 12	6. 3

Section III. REPAIRS

55. Replacement of Parts

Inside parts of the code training set are easily reached for replacement by removing the front panel and chassis assembly from the carrying case. Parts secured to the chassis or front panel may be removed by unsoldering wires from the terminals and then removing the hardware holding the part in place. Parts such as resistors and capacitors are removed by severing the wire connections at the soldered terminals. Check all connections with the wiring diagram of figure 18. Make sure that the color of each wire is the same as that shown in figure 18. Complete all soldering as described in TB SIG 222. Remove loose solder to prevent short circuits. Make sure bare wires or terminals do not touch the chassis. If wiring of different color is used, mark the changes on the wiring diagram Refinishing procedures and preservative application are given in paragraphs 26 through 30.

56. Final Testing

After repairing the code training set, install the equipment and perform the test detailed below. If the code training set fails to function as indicated, further troubleshooting is necessary.

a. Operational Test.

(1) Set the voltage selector switch S1 to 6 volts d. c.
(2) Connect an ammeter in series with a 6-volt d. c. power supply and connect the power supply to the equipment.
(3) Turn the speaker resonance control fully counterclockwise.
(4) Set the FREQUENCY-BLINKER control to the BLINKER position.
(5) Turn the VOLUME control R3 to maximum.
(6) Connect a jumper lead across the KEY terminals H4.
(7) Turn the POWER ON-OFF switch S2 to the ON position.
(8) Blinker lamp should light.
(9) Turn FREQUENCY-BLINKER control to the FREQUENCY positions. An audio signal should be heard at the loudspeaker and should vary in frequency as the control is varied.
(10) Turn VOLUME control R3. Volume of the audio signal must vary as the VOLUME control is varied.
(11) Turn VOLUME control R3 to maximum. The line current indicated on the d. c. ammeter should be between 1.5 and 2.5 amperes.
(12) Repeat this test using power supplies of 12 volts d. c., 24 volts d. c., 115 volts d. c., 115 volts a. c., and 230 volts a. c. The line current for each of these tests should be within the limits stated in the table below.

Power supply	Minimum current (amperes)	Maximum current (amperes)
12 volts d. c	.9	1.4
24 volts d. c	.6	.72
115 volts d. c	.1	.13
115 volts a. c. (60 c. p. s.)	.25	.29
230 volts a. c. (60 c. p. s.)	.14	.16

b. Output Test.

(1) Set the voltage selector switch S1 at 115 volts a. c.
(2) Connect the code training set to a source of 115 volts a. c.
(3) Turn POWER ON-OFF switch S2 to the ON position.
(4) Set the FREQUENCY-BLINKER control R8 to the BLINKER position.
(5) Turn speaker resonance control fully counterclockwise.
(6) Connect an a. c. voltmeter across the terminals of the HEADSET jack.
(7) The meter should indicate at least 2.5 volts a. c.
(8) Turn FREQUENCY-BLINKER control and the VOLUME control to the extreme clockwise position.
(9) Connect the voltmeter across the loudspeaker terminals.
(10) Voltage across speaker terminals should be 1.8 volts ±.2 volt a. c.

c. Frequency Test.

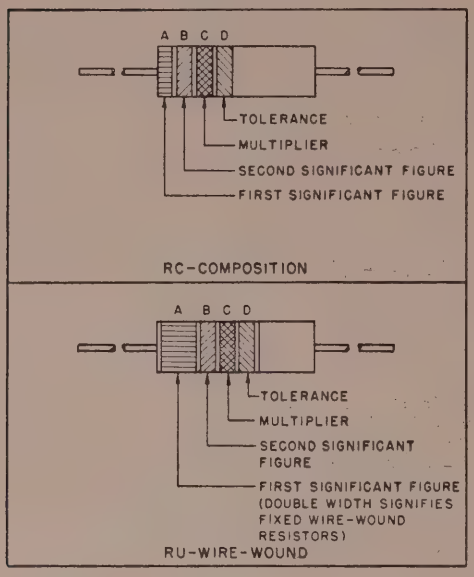
(1) Set voltage selector switch S1 at 115 volts a. c.
(2) Connect code training set to 115 volts a. c. source.
(3) Turn POWER ON-OFF switch S2 to the ON position.
(4) Turn VOLUME control to maximum (fully clockwise).
(5) Set FREQUENCY-BLINKER control to minimum (counterclockwise) FREQUENCY position.
(6) Connect the leads of the loudspeaker LS1 to Frequency Meter FR–67/U.
(7) The audio frequency should read 600 cycles ±20 percent.
(8) Turn the FREQUENCY-BLINKER control to the maximum (clockwise) frequency position.
(9) The audio frequency should read 1,000 cycles ±20 percent.

d. Equipment required for final testing is listed below.

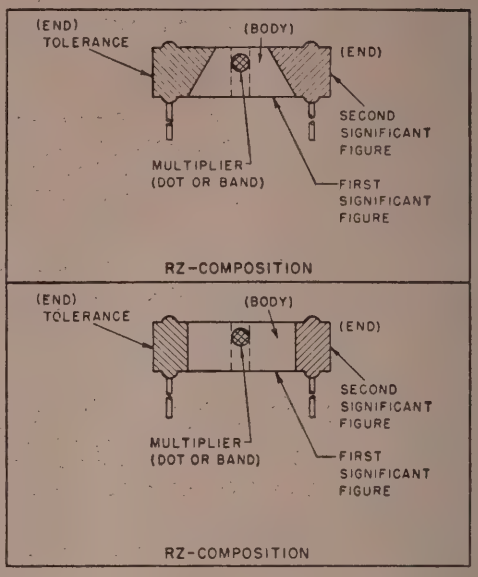
Equipment	Signal Corps stock No.	Use
Multimeter TS–352/U	3F4325–352	Measures voltage and current.
Frequency Meter FR–67/U	3F3313–2	Measures frequency.
Electron Tube Test Set TV–2/U	3F3952–2	Tests tubes.

RESISTOR COLOR CODE MARKING
(MIL-STD RESISTORS)

AXIAL-LEAD RESISTORS
(INSULATED)



RADIAL-LEAD RESISTORS
(UNINSULATED)



RESISTOR COLOR CODE

BAND A OR BODY*		BAND B OR END*		BAND C OR DOT OR BAND*		BAND D OR END*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1	BODY	± 20
BROWN	1	BROWN	1	BROWN	10	SILVER	± 10
RED	2	RED	2	RED	100	GOLD	± 5
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000		
GREEN	5	GREEN	5	GREEN	100,000		
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	GOLD	0.1		
WHITE	9	WHITE	9	SILVER	0.01		

*FOR WIRE-WOUND-TYPE RESISTORS, BAND A SHALL BE DOUBLE-WIDTH WHEN BODY COLOR IS THE SAME AS THE DOT (OR BAND) OR END COLOR, THE COLORS ARE DIFFERENTIATED BY SHADE, GLOSS, OR OTHER MEANS.

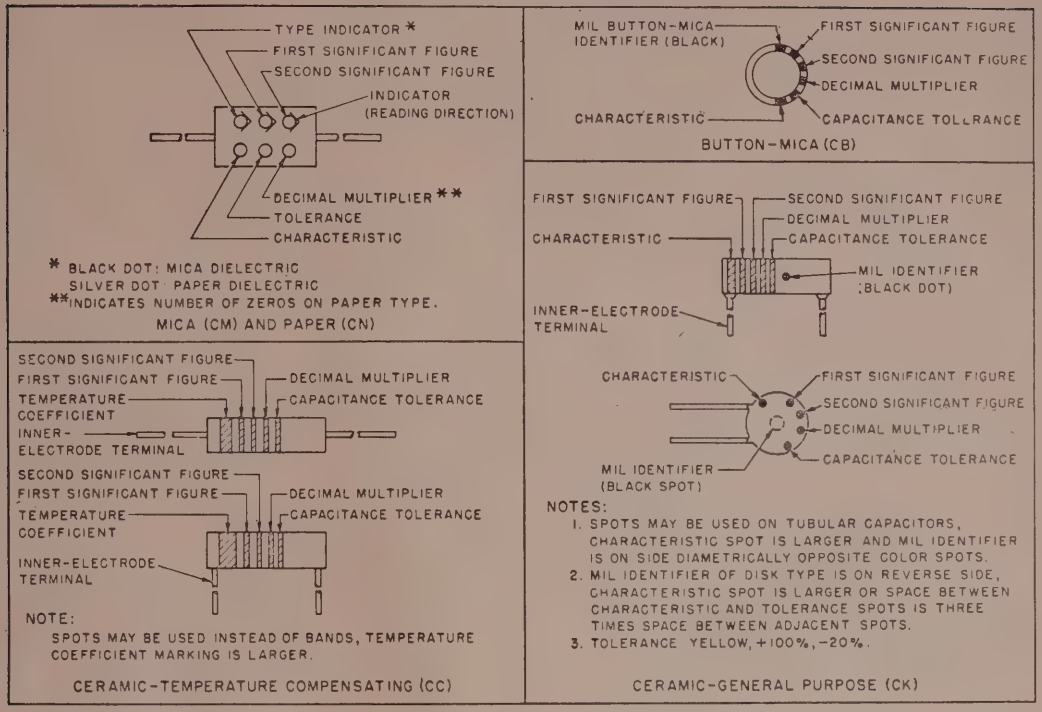
EXAMPLES (BAND MARKING):
10 OHMS ±20 PERCENT: BROWN BAND A; BLACK BAND B; BLACK BAND C; NO BAND D.
4.7 OHMS ±5 PERCENT. YELLOW BAND A, PURPLE BAND B; GOLD BAND C; GOLD BAND D.

EXAMPLES (BODY MARKING):
10 OHMS ±20 PERCENT. BROWN BODY, BLACK END; BLACK DOT OR BAND, BODY COLOR ON TOLERANCE END.
3,000 OHMS ±10 PERCENT. ORANGE BODY, BLACK END, RED DOT OR BAND; SILVER END.

STD-RI

Figure 15. Resistor color and letter codes.

CAPACITOR COLOR CODE MARKING
(MIL-STD CAPACITORS)



CAPACITOR COLOR CODE

COLOR	SIG FIG.	MULTIPLIER		CHARACTERISTIC[1]				TOLERANCE[2]					TEMPERATURE COEFFICIENT (UUF/UF/°C)
		DECIMAL	NUMBER OF ZEROS	CM	CN	CB	CK	CM	CN	CB	CC		
											OVER 10UUF	10UUF OR LESS	CC
BLACK	0	1	NONE		A			20	20	20	20	2	ZERO
BROWN	1	10	1	B	E	B	W				1		-30
RED	2	100	2	C	H		X	2		2	2		-80
ORANGE	3	1,000	3	D	J	D			30				-150
YELLOW	4	10,000	4	E	P								-220
GREEN	5		5	F	R						5	0.5	-330
BLUE	6		6		S								-470
PURPLE (VIOLET)	7		7		T	W							-750
GRAY	8		8			X						0.25	+30
WHITE	9		9								10	1	-330(±500)[3]
GOLD		0.1						5		5			+100
SILVER		0.01						10	10	10			

1. LETTERS ARE IN TYPE DESIGNATIONS GIVEN IN MIL-C SPECIFICATIONS.
2. IN PERCENT, EXCEPT IN UUF FOR CC-TYPE CAPACITORS OF 10 UUF OR LESS.
3. INTENDED FOR USE IN CIRCUITS NOT REQUIRING COMPENSATION.

STD-CI

Figure 16. Capacitor color and letter codes.

CHAPTER 7

SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

57. Removing from Service

a. Set POWER ON-OFF switch S2 to the OFF position.

b. Disconnect the input wires to the training set at the KEY terminals.

c. Disconnect the power cord from the power source.

d. Use the plug from the power cord to rotate the voltage selector switch S1 to the OFF position.

58. Disassembly and Repacking

a. Disassemble the transmitting keys and replace the keys in their proper places in the lid of the code training set.

b. Coil up the power cord and place the cord in the power cord storage compartment, in the lid of the code training set.

c. Close the lid of the code training set; make sure that the locking pin in the lid makes proper contact with the hole in voltage selector switch S1.

d. Repack the equipment for shipment by reversing the procedure given in paragraph 10. Whenever possible, use the original packaging materials which were saved at the time the equipment was unpacked.

59. Methods of Destruction

a. Smash. Smash the control unit, transmitting keys, storage batteries, and all other equipment associated with the code training set; use sledges, axes, handaxes, hammers, crowbars, or other heavy tools.

b. Cut. Cut all cords and wiring connected to the code training set and the transmitting keys; use axes, handaxes, or machetes.

c. Burn. Burn the wooden packing case, corrugated cartons and protective material, technical manual; use gasoline, kerosene, oil, flame throwers, or incendiary grenades.

d. Bend. Bend panels, cabinets, chassis, all switches, power plugs, and tube terminals.

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

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

g. Destroy. Destroy everything.

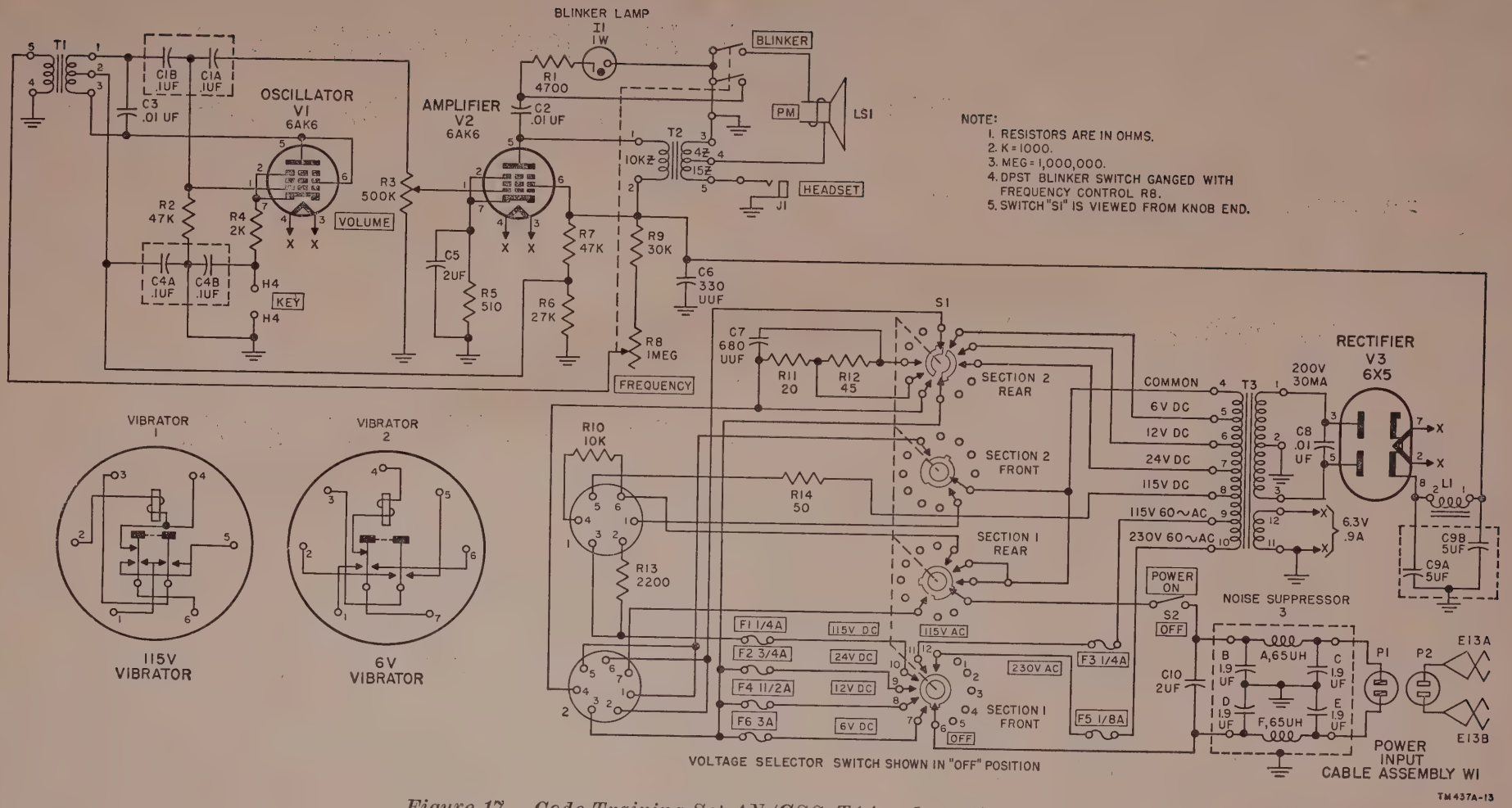


Figure 17. Code Training Set AN/GSC-T1A, schematic diagram.

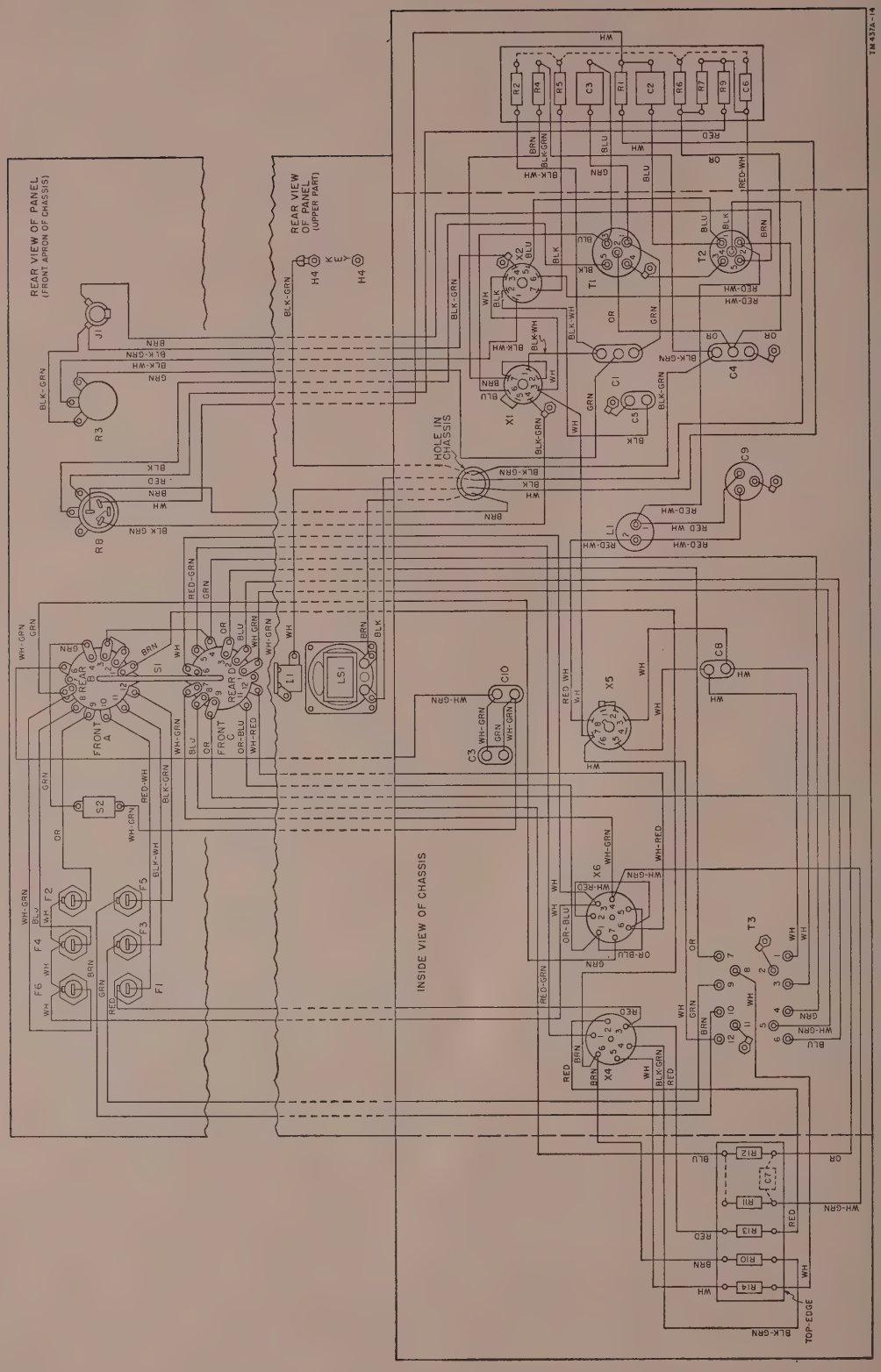


Figure 18. Code Training Set AN/GSC–T1A, wiring diagram.

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[AG 413.44 (25 Aug 54)]

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