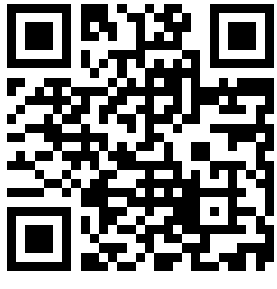

TM 11-2552A

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

SOUND LOCATING SET GR-6-A

DEPARTMENT OF THE ARMY . JUNE 1951

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DEPARTMENT OF THE ARMY *JUNE 1951*

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Acting The Adjutant General

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CONTENTS

WARNING

A potential of

600 VOLTS

is used in the operation of

this equipment.

DEATH ON CONTACT

may result if personnel fail to

observe safety precautions.

Be careful not to contact high-voltage output connections of the dynamotors and of the cathode-ray tube when checking or trouble shooting this equipment. When working inside the equipment after the power has been turned off, always ground every part before touching it.

DANGEROUS VOLTAGES

exist in Recorder BC–1323–A.

First Aid for Electric Shock

RESCUE.

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

SYMPTOMS.

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

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

TREATMENT.

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

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

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

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

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

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

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

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

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

f. The resuscitation procedure is as follows:

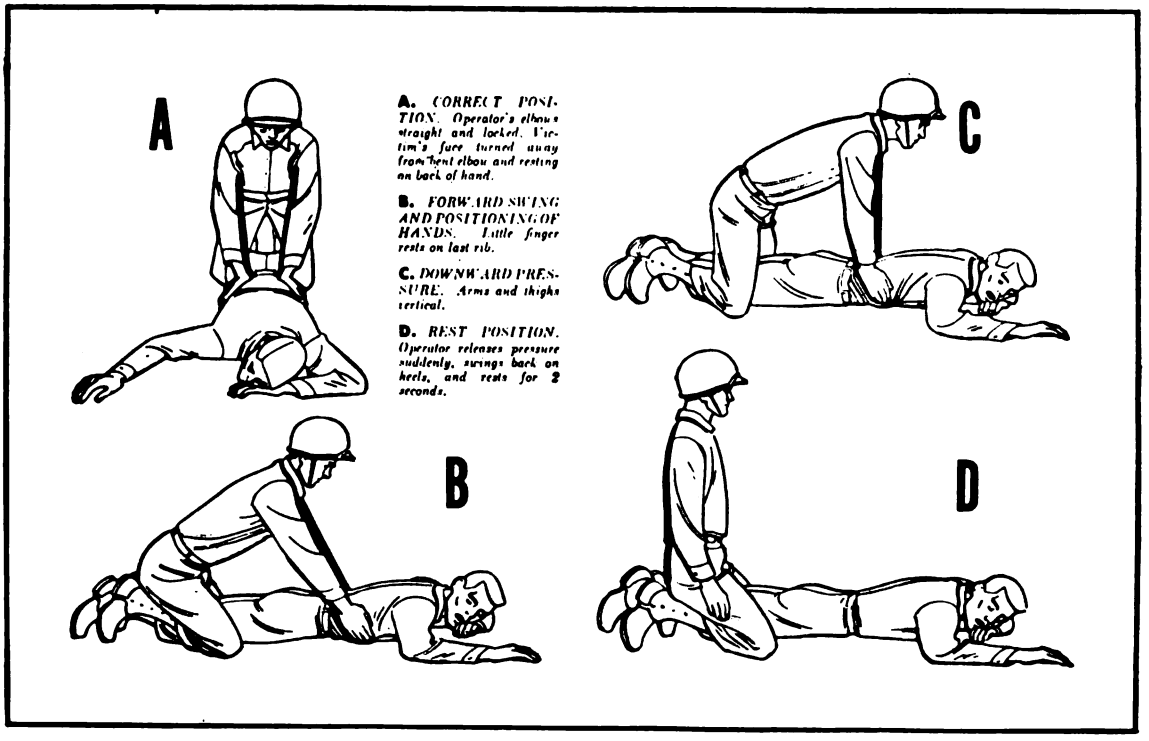
(1) Exert downward pressure, not exceeding 60 pounds, for 1 second.

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

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

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

TL15338-D



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

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

RELIEVING OPERATOR.

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

STIMULANTS.

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

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

CAUTIONS.

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

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

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

TL15338-E

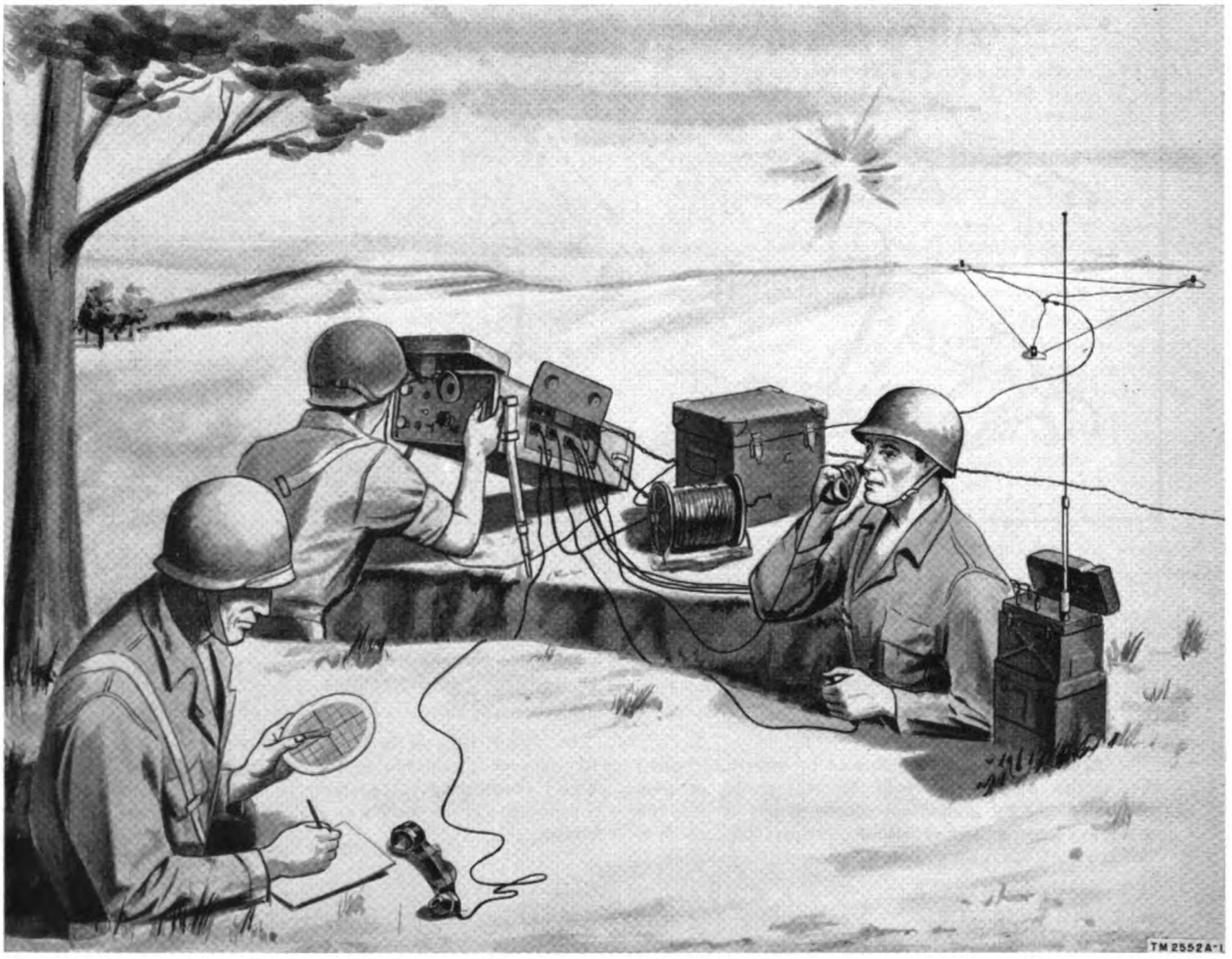


Figure 1. Sound Locating Set GR-6-A in operation.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the information and guidance of the personnel to whom the equipment is issued. Then contain information on the operation, organizational maintenance, and field maintenance of the equipment as well as a discussion of the theory of operation. They apply only to Sound Locating Set GR–6–A.

b. Appendix I contains a list of current references, including supply catalogs, technical manuals, and other available publications applicable to the equipment. Appendix II contains an identification table of parts.

2. Forms and Records

The following forms 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.

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

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

d. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. General

Sound Locating Set GR–6–A is a 6-volt, d-c (direct-current) powered device used to determine the range and azimuth of small arms fire. The sound of a muzzle blast is picked up by an array of three, specially placed microphones whose output is fed to a recorder (fig. 1). The recording is made on steel tape and played back to operating personnel who determine the point of origin of the enemy gunfire. The sound locating set includes appropriate telephone equipment, a radio transmitter and receiver, a gasoline-engine-driven generator for charging the supplied lead-acid-type storage batteries, and other allied equipment and accessories required to operate and maintain the equipment (fig. 2).

4. Technical Characteristics

Input volts	5.6 to 6.3 v dc.
Input power	4.2 amp (amperes); 30 to 33 w.
Number of amplifier channels	3; each using three type 9001 tubes.
Frequency range (amplifier)	60 to 300 cycles, recording and reproducing.
Frequency response	Response of the three channels within ± 2 db (decibels).
Phase matching	Relative differences in electrical phase between any two channels within 0.2 milliseconds.
Operating range	Nominal range 2,000 to 4,000 yards.

Figure 2. Sound Locating Set GR–6–A, major components.

5. Table of Components

Quantity	Equipment	Dimensions (in.)				Weight (lb)
		Length	Height	Width	Diam	
3	Recorder BC–1323–A and Bag BG–182–A	30	8	6		35
3	Bag BG–160–A, each containing the following:	12	9	18		
	4 Microphone T–56	9½			4½	4¾
	4 Microphone Shelter M–413				33	1
	2 legs for recorder.					
	1 Cord CD–1238–A.					
	3 Cord CD–1239.					
	1 Cord CD–1240.					
	1 Cord CD–1444.					
	1 Chain Kit MC–692.					
	1 drill, star.					
	1 Hammer TL–332/U.					
3	Case CS–161, each containing the following:	16	9¼	10⅜		11
	1 Handset TS–10–P.					
	1 Headset HS–30–U complete with Cord CD–874.					
	1 Computor M–414 in Case CS–148.					
	1 Cord CD–1446.					
	3 Marker MC–693.					
	1 Plotting Board M–10 (in Case M–72).					
	1 Compass M–2 in Case.					
	1 Holder M–167–A.					
	1 notebook.					
	6 pencils.					
	1 funnel.					
	4 tubes, type 9001.					
	1 tube, type 6AK6.					
	1 tube, type 2AP1–A.					
	1 rectifier (selenium).					
	3 lamp, incandescent, 6.3 v.					
	5 steel (recording) tape (rolls)					

Quantity	Equipment	Dimensions (in.)				Weight (lb.)
		Length	Height	Width	Diam	
	12 fuses, 6 amp, 250 v.					
	11 fuses, 1/8 amp, 250 v.					
	4 battery caps for BB-221/U.					
	4 battery caps for BB-54.					
2	Reel Equipment CE-11	20 9/16	8	7		3
1	Bag BG-44 (fig. 10) including the following:					
	1 typewriter brush.					
	1 camel's-hair brush.					
	1 soldering iron.					
	1 Pliers TL-304/U.					
	1 pair needle-nosed pliers.					
	1 Pliers TL-103.					
	3 Flashlight TL-122-D.					
	1 screw driver, 4-in. offset.					
	1 screw driver, 6-in. offset.					
	1 screw driver, 8 in.					
	1 Multimeter TS-297/U.					
	1 pair tweezers, 4 in.					
	1 sandpaper, No. 00, 6 strips.					
	1 carbon tetrachloride, 8-oz can.					
	1 tube cement.					
	2 lubricating oil, 4-oz can.					
	1 can soldering paste.					
	1 solder, 1-lb spool.					
	1 insulating tubing, 2 ft long.					
	1 Tape TL-83.					
	1 Tape TL-94.					
	3 Holder M-167-A, clipboard.					
12	Battery Box CH-291	12	6 1/2	5 1/2		4 1/4
6	Battery Box CH-318	12 7/8	11 3/4	9 5/8		18

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

6. Equipment Required but Not Supplied

Quantity	Name	Remarks
1	Power Unit PE-210	450 w, 30 amp at 15 v.
	Battery BA-30	1.5 v.
3	Radio Set SCR-300-A	
36	Battery BB-54	2 v.
12	Battery BB-221/U	6 v.
	Erasers	
3	Rule, 6 in.	

7. Packaging Data

Sound Locating Set GR-6-A is export-packed in seven wooden boxes. The table below lists the contents and dimensions of each box.

Box No.	Item	No. of packages	Dimensions (in.)			Volume (cu ft)
			Length	Width	Height	
1/7	Recorder BC-1323-A	1	36	15	12	3.8
2/7	Recorder BC-1323-A	1	36	15	12	3.8
3/7	Recorder BC-1323-A	1	36	15	12	3.8
4/7	Bag BG-160-A with contents	3	46	40	15	16.0
5/7	Case CS-161 with contents	3	35	20	14	5.6
6/7	Consolidated packages	2	29	24	18	7.3
7/7	12 ea Battery Box CH-291	2	37	31	28	18.5
	and					
	6 ea. Battery Box CH-318					

8. Recorder BC–1323–A
(figs. 3, 4, and 5)

a. GENERAL. Recorder BC–1323–A consists of three microphone amplifiers, a headset amplifier, a bias and erase oscillator, a cathode-ray tube, and a recorder mechanism. Three recorders are supplied with the GR–6–A, two in use and one spare.

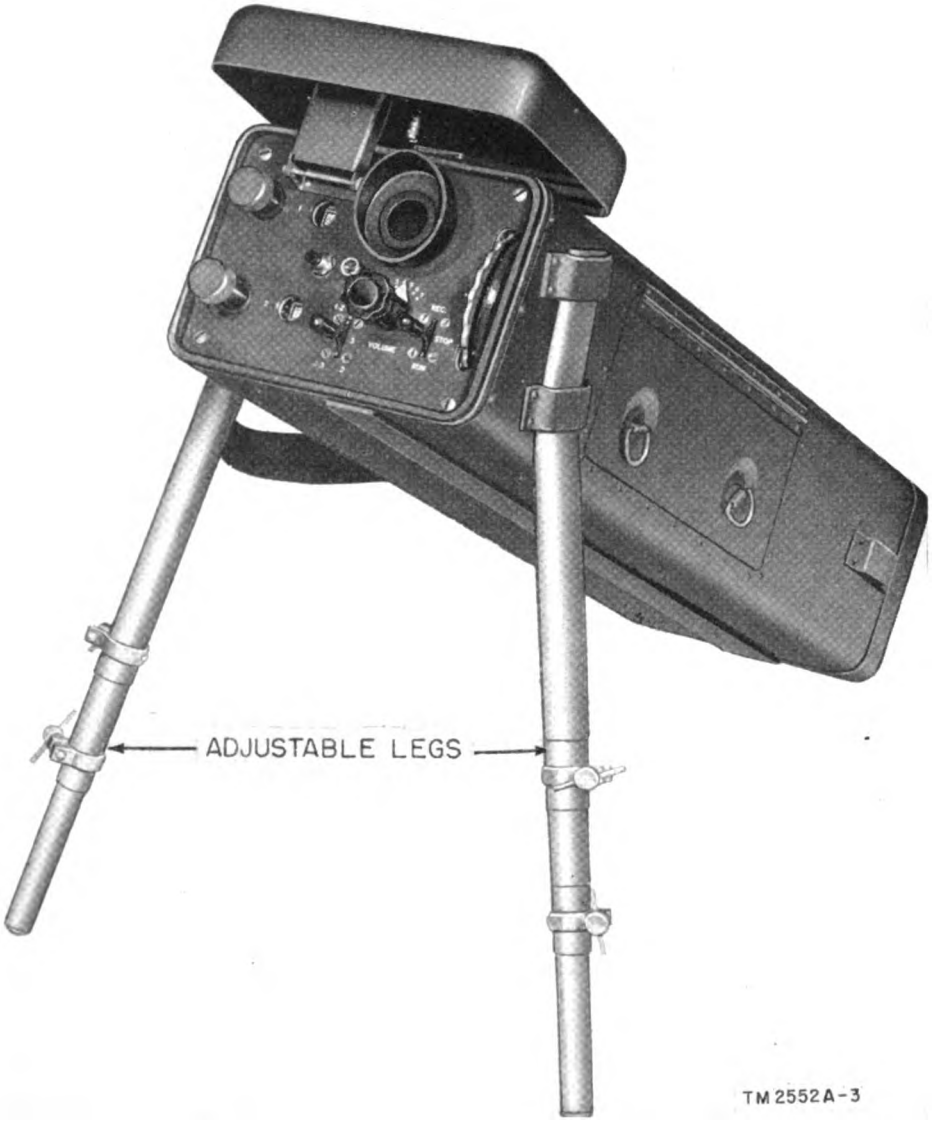


Figure 3. Recorder BC–1323–A, in viewing position.

b. FRONT PANEL. Figure 3 shows the recorder in the operating position. On the front panel (fig. 14), at the extreme right, is a scanning wheel for controlling the tape movement by hand. The following controls are mounted on the front panel: a main control lever (S1), a play-back lever (S2), a volume control with seven steps of attenuation, a viewing tube to permit the operator to see the pattern on the oscilloscope, two counter adjustment knobs and their respective counters, a push-button switch (S3), and an access cover lock.

c. SIDE PANEL (figs. 4 and 15). On the recorder side panel are two female connectors (J1 and J4) marked MICROPHONE and STOP SWITCH; two male connectors (P1 and P2) marked RADIO and 6V; two Binding Posts

TM–175 marked LINE, two terminal posts marked HAND SET, a double-pole, double-throw toggle switch (S4) marked RADIO—SURVEY—OFF; a toggle switch (S7) for power marked ON-OFF; two phone jacks (J2 and J3) marked RADIO HANDSET; a phone jack (J5) marked PHONES; three fuses (F1, F2, and F3) inclosed by a cover marked SERVICE FUSES; and two potentiometer control knobs marked FOCUS and INTENSITY.

10. Bag BG–160–A and Contents

Three Bags BG–160–A (fig. 6) are supplied with each sound locating set. Each bag contains the following components:

a. MICROPHONE T–56. Four magnetic-type microphones are packed in each Bag BG–160–A. Each microphone has a receptacle for connector P103 on Cord CD–1238–A. A stake is provided for ground insertion.

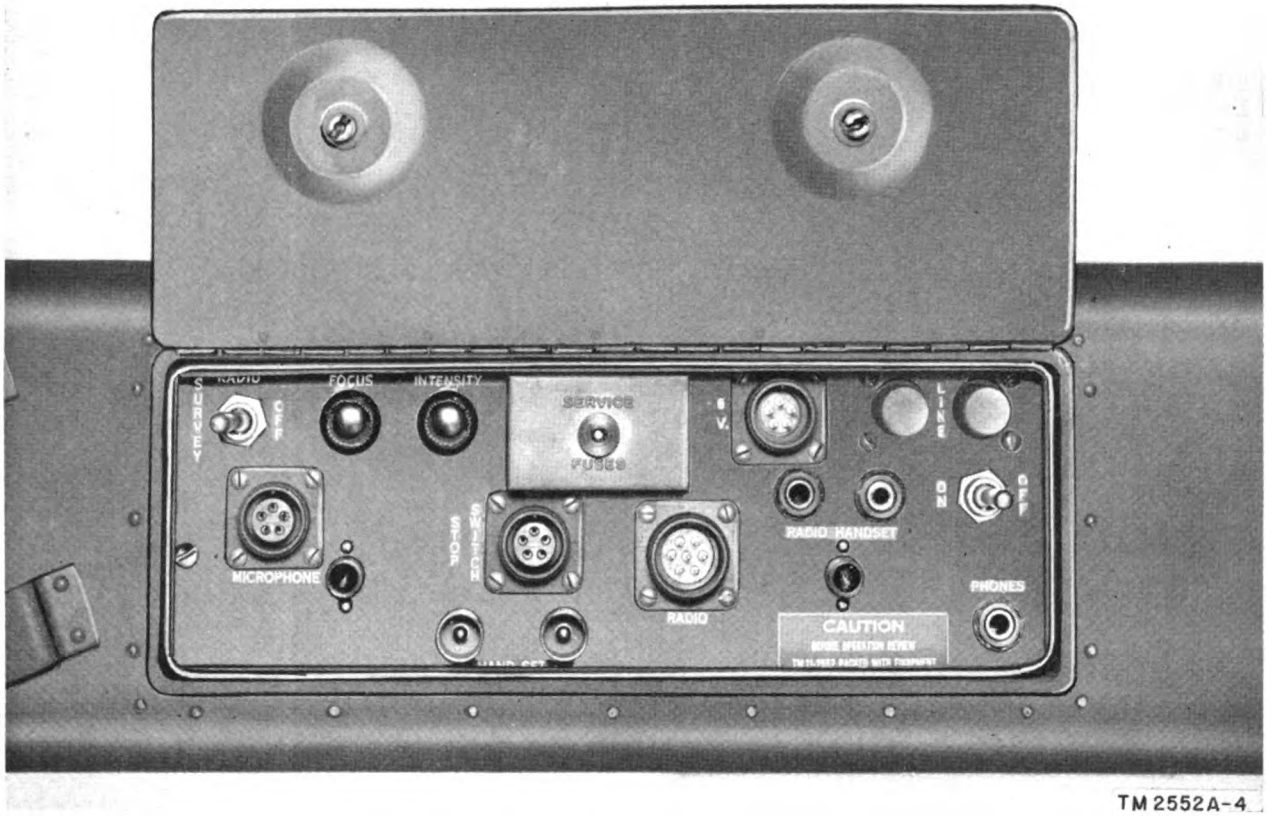


Figure 4. Recorder BC–1323–A, side controls exposed for operation.

d. REAR PANEL. The following parts are mounted on the recorder rear panel (figs. 5 and 16): a relay (O–1), a clip which holds the Allen-head and Bristol wrenches, a tube-pin straightener, and three spare fuses.

9. Bag BG–182–A

Three rubberized fabric Bags BG–182–A (fig. 2) are supplied with each Sound Locating Set GR–6–A. They provide waterproof protection during transportation and storage of Recorders BC–1323–A.

b. MICROPHONE SHELTER M–413. The microphone shelters are wind screens made of two layers of cloth, circular in shape and approximately 33 inches in diameter. A link chain, covered with rubber tubing and sewed between the layers, acts as a weight to hold the shelter over the microphone. A hole in the center of the shelter allows a pin on the microphone to penetrate Marker MC–693.

c. CORD CD–1238–A. Cord CD–1238–A consists of three lengths of single-conductor, shielded cable and one length of three-conductor, shielded cable leading from a special connecting

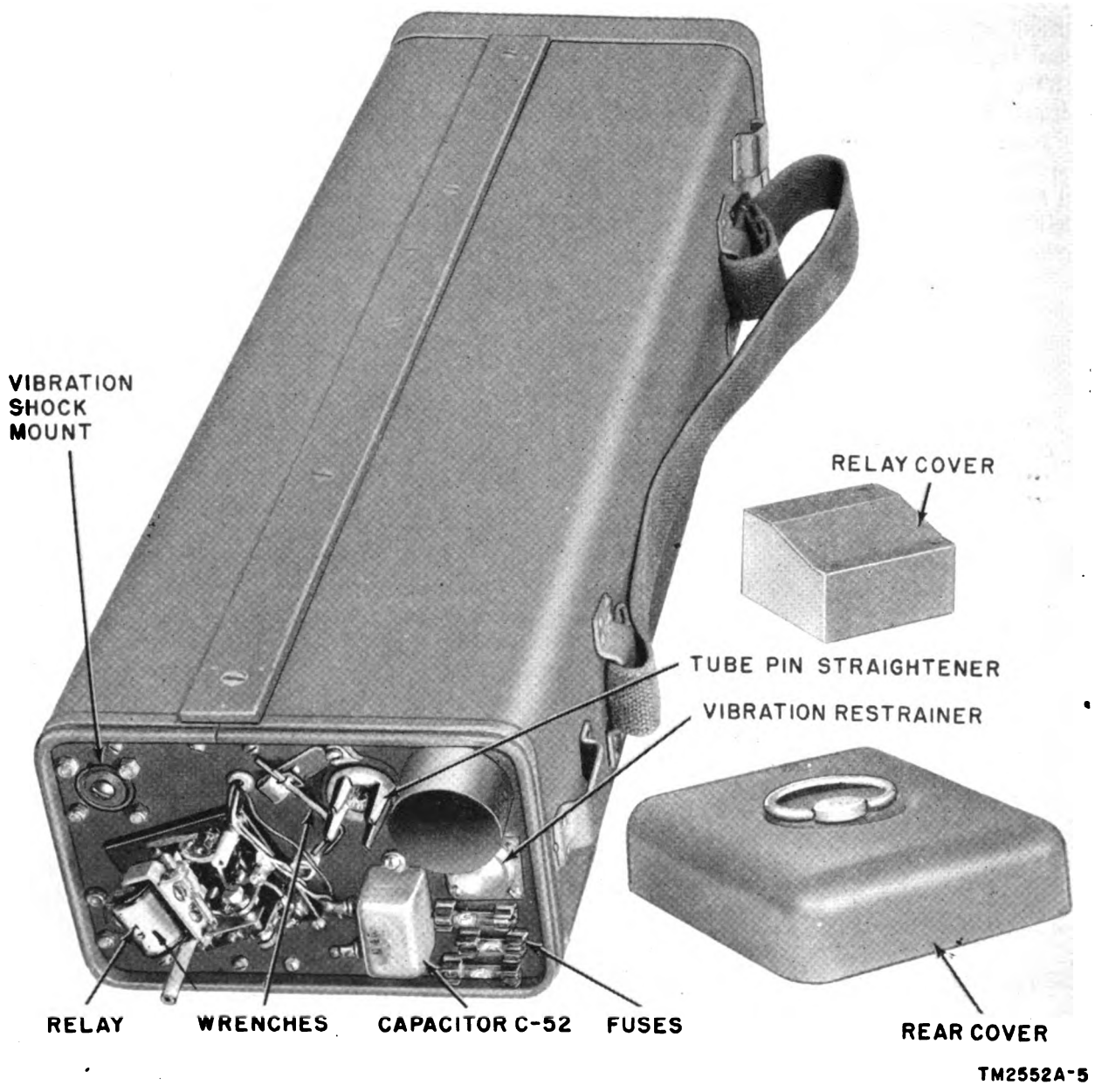


Figure 5. Recorder BC–1323–A, end view showing relay.

box. The single-conductor, shielded cables are 15 feet long and are used to connect to the three microphones forming the array. The three-conductor, shielded cable is 3 feet long and is used to join Cord CD–1238–A to Cord CD–1239 which connects to the recorder. Identification rings are placed near each connector to insure connection to its associated microphone.

d. CORD CD–1239. Each Bag BG–160–A contains three 50-foot Cords CD–1239. One end terminates in a receptacle for connecting to Cord CD–1238–A. The other end terminates in a plug that connects to the recorder or to another Cord CD–1239 as required.

e. CORD CD–1240. Cord CD–1240 is terminated at one end by a push-button switch and at the other end by a connector plug. The plug end connects to the recorder to permit the operator to stop both recorders of a sound locating set at the same time by remote control. If a longer extension is desired, Cord CD–1239 may be inserted between Cord CD–1240 and the recorder.

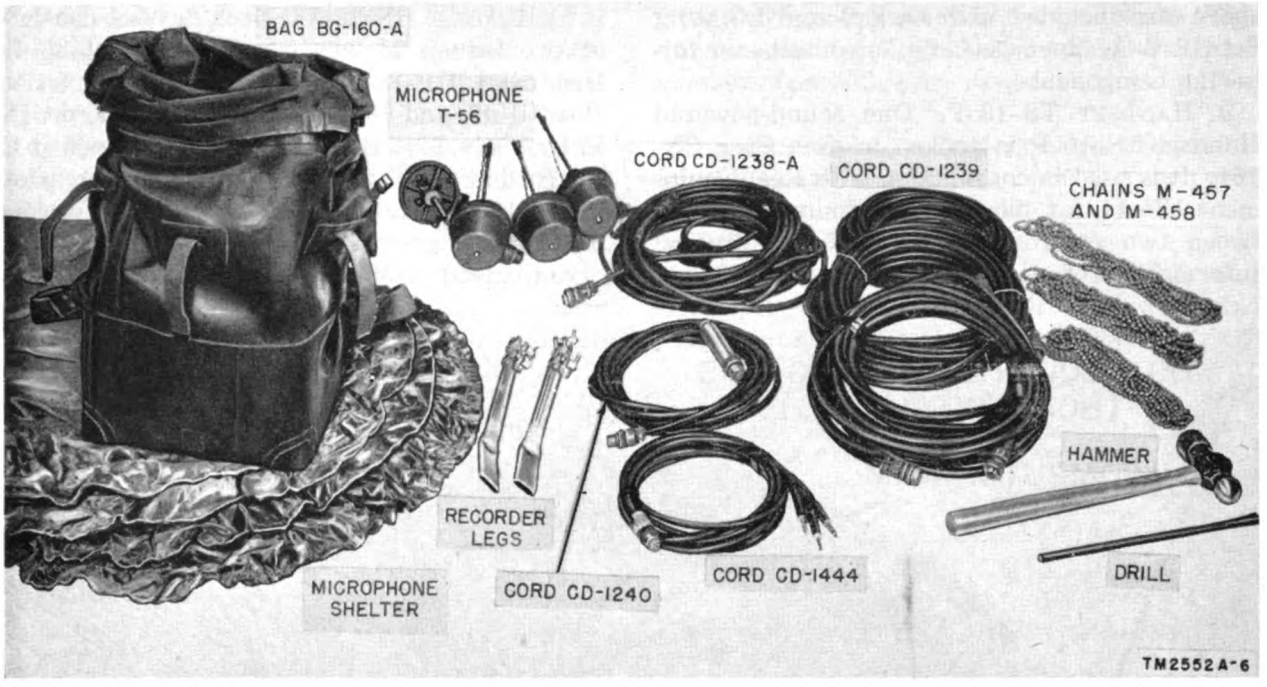


Figure 6. Bag BG–160–A and contents.

f. CHAINS. Three bead-type chains are supplied with Sound Locating Set GR–6–A. Two Chains M–457 are each 15 feet long. The third chain, Chain M–458, is 21 feet 2½ inches long (has the longest eyelets). When the chains are extended fully and properly set up, the fixed microphone array assumes the shape of an isosceles right triangle.

11. Case CS–161 and Contents

Three Cases CS–161, two in use and one

Figure 7. Case CS–161 and contents.

spare, are included with each Sound Locating Set GR–6–A. Each case (fig. 7) contains the following components:

a. HANDSET TS–10–P. One sound-powered Handset TS–10–P is packed in each Case CS–161. It is used in conjunction with Reel Equipment CE–11 for telephone communication between two recorder stations. For additional information refer to TM 11–2250.

b. HEADSET HS–30–U. Each headset consists of two Inserts M–300, two Receivers R–30–U, Headband HB–30, Cord CD–620–U, Junction Box JB–47, and 6½ feet of extension Cord CD–874. A saw-toothed clothing clip is attached to the cord at the Y junction point. The extension cord is terminated by phone Plug PL–55 for connection to the recorder.

c. COMPUTOR M–414 (fig. 8). Computor M–

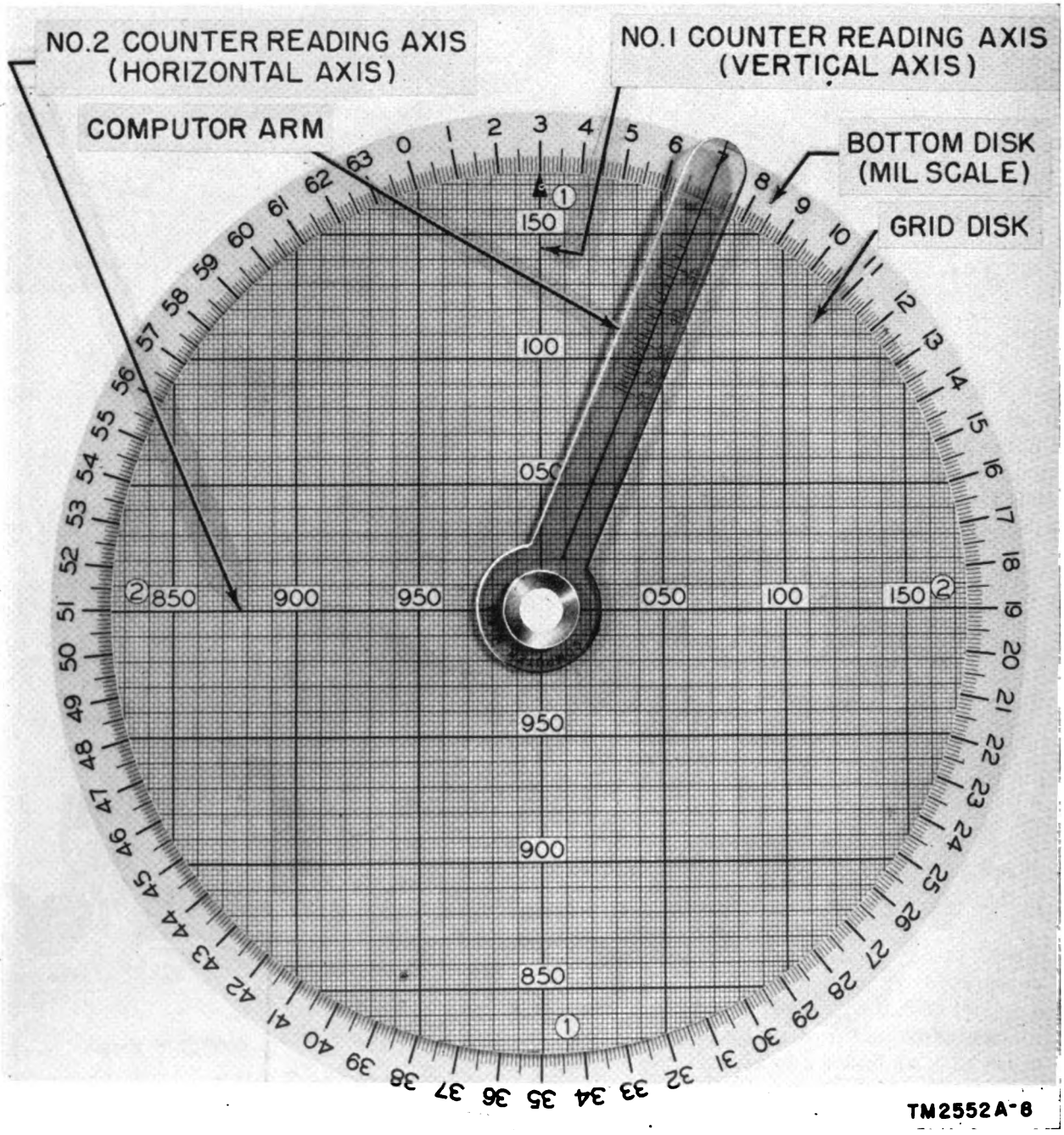


Figure 8. Computor M–414.

414 consists of two concentric plastic disks of different diameters. A scale at the outer edge of the bottom disk is divided into 64 main divisions, each of which represents 100 mils (total is 6,400 mils). The smaller divisions each represent 10 mils. On the grid disk, which can be rotated about the common center, each small division represents two counter numbers. The axis marked 1 is for the No. 1 counter reading, and the axis marked 2 is for the No. 2 counter reading. The arm on the computor may be rotated through any point in the grid scale. This arm has a calibrated scale from which the speed numbers (par. 32*d*) are read for a given setting of axes 1 and 2.

d. CORD CD–1446. Battery Cord CD–1446 is 6 feet long and has connector plugs on each end; one for the battery box and the other for the recorder.

e. MARKER MC–693. Marker MC–693 is a small cube-shaped block with one side coated with luminous material. When placed on the

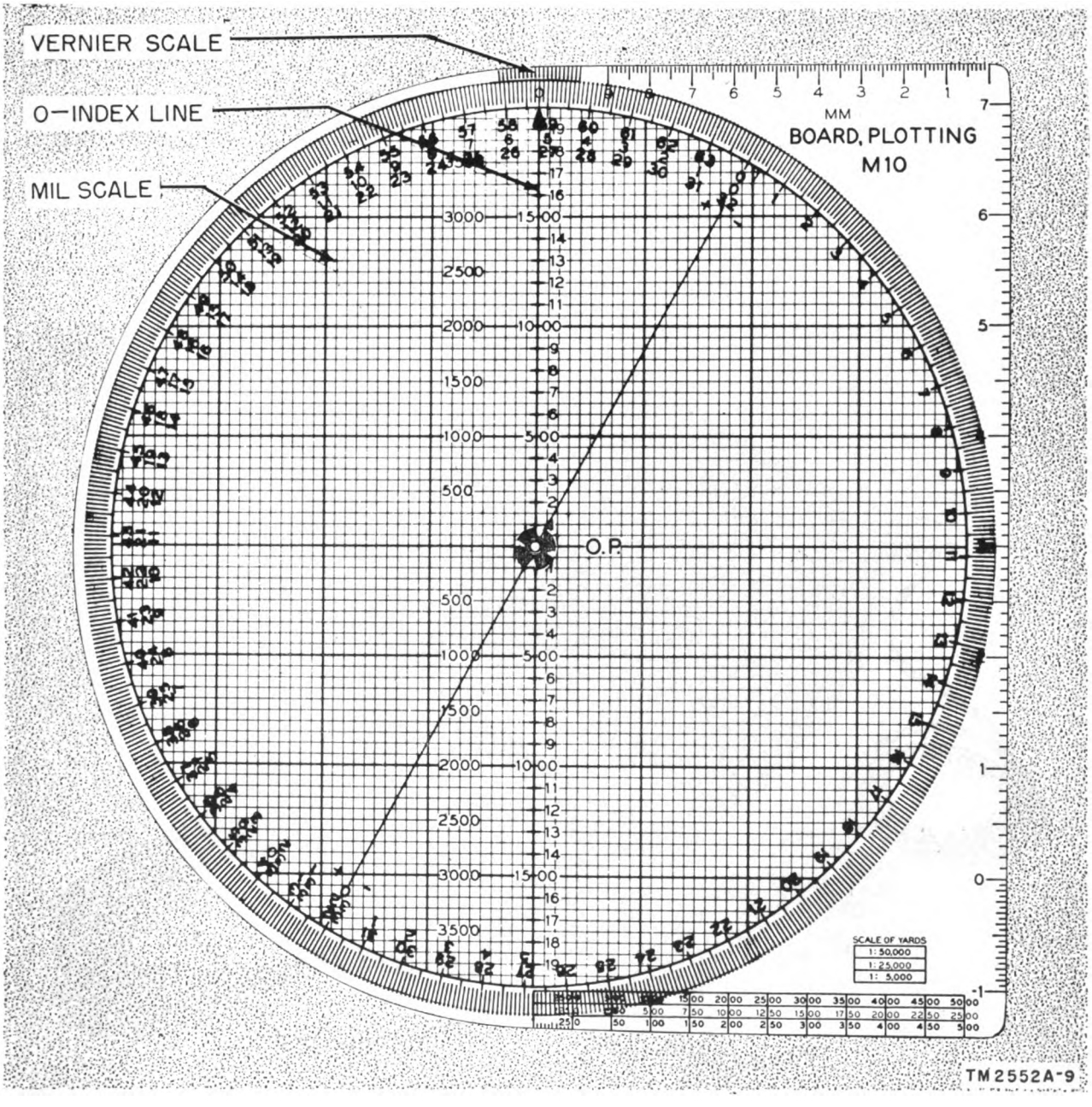


Figure 9. Plotting Board M–10.

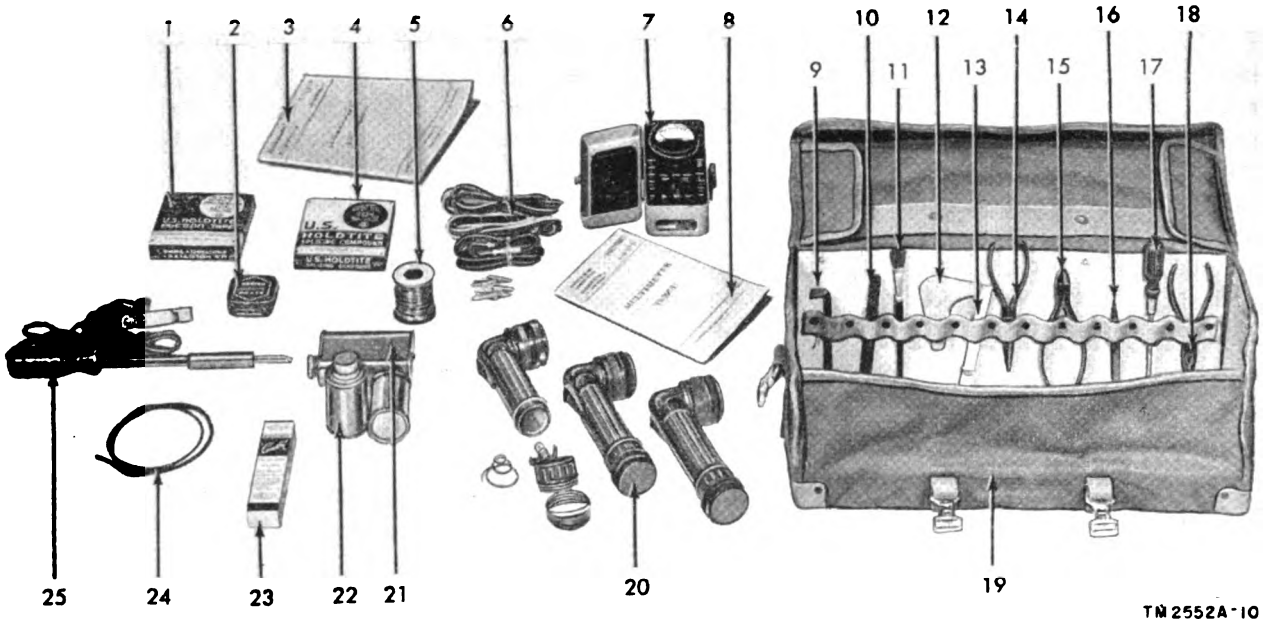


Figure 10. Bag BG-44 and contents.

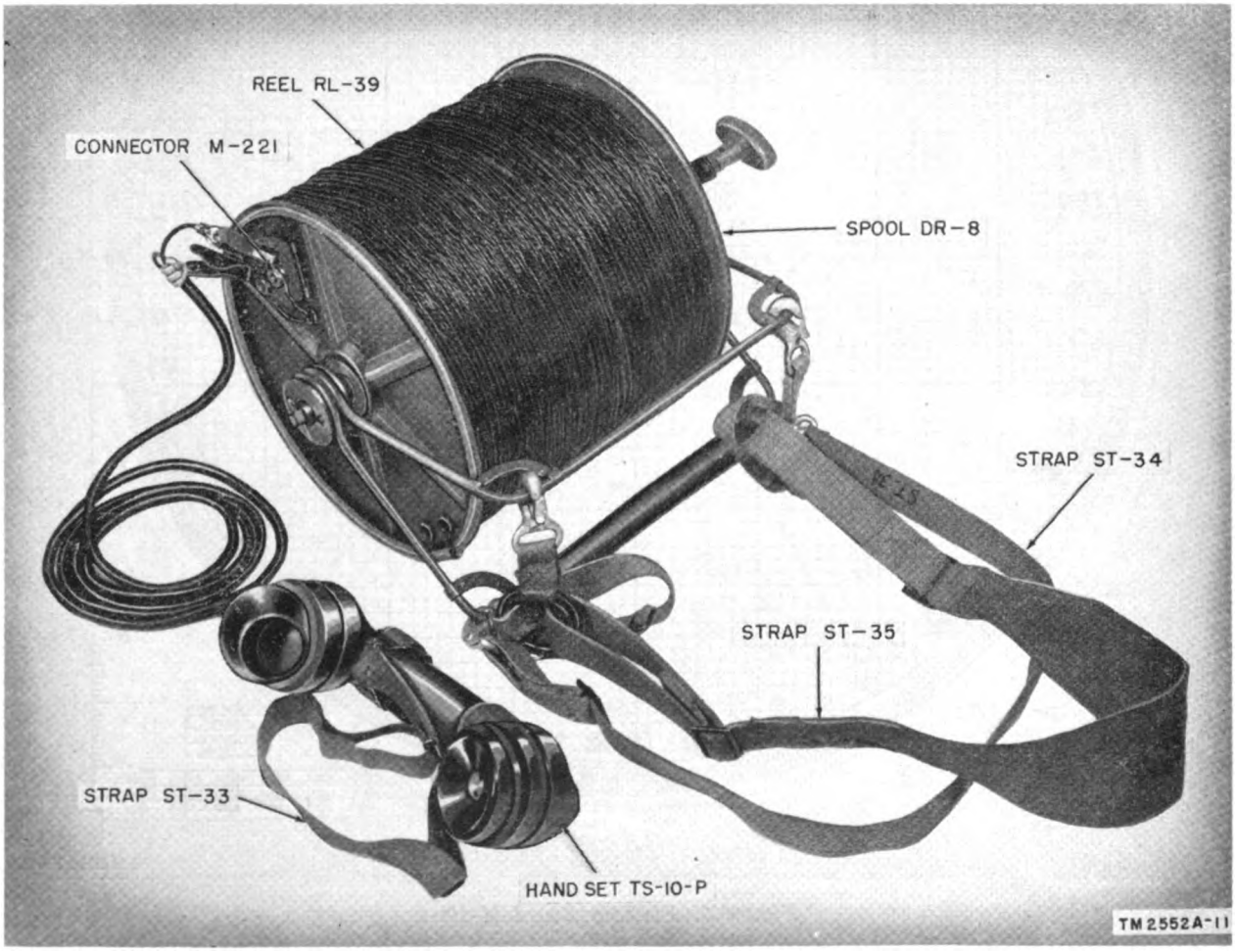


Figure 11. Reel Equipment CE-11.

pin that is provided on the microphone shell, the marker locates the microphone position at night.

f. PLOTTING BOARD M–10 (fig. 9). Plotting Board M–10 consists of an 8½-inch rotatable disk, of transparent plastic material, attached to

11. Brush TL–72.
12. Screw driver, 4-inch offset.
13. Sandpaper (6 strips).
14. Pliers TL–304/U (long-nosed).
15. Pliers TL–103 (side-cutting).
16. Tweezers, 4 inch.
17. Screw driver, 8 inch straight.
18. Pliers (needle-nosed).
19. Bag BG–44.
20. Flashlight TL–122–D.
21. Carbon tetrachloride (8-ounce can).
22. Lubricating oil (4-ounce cans).
23. Cement.
24. Tubing, insulating.
25. Soldering iron.

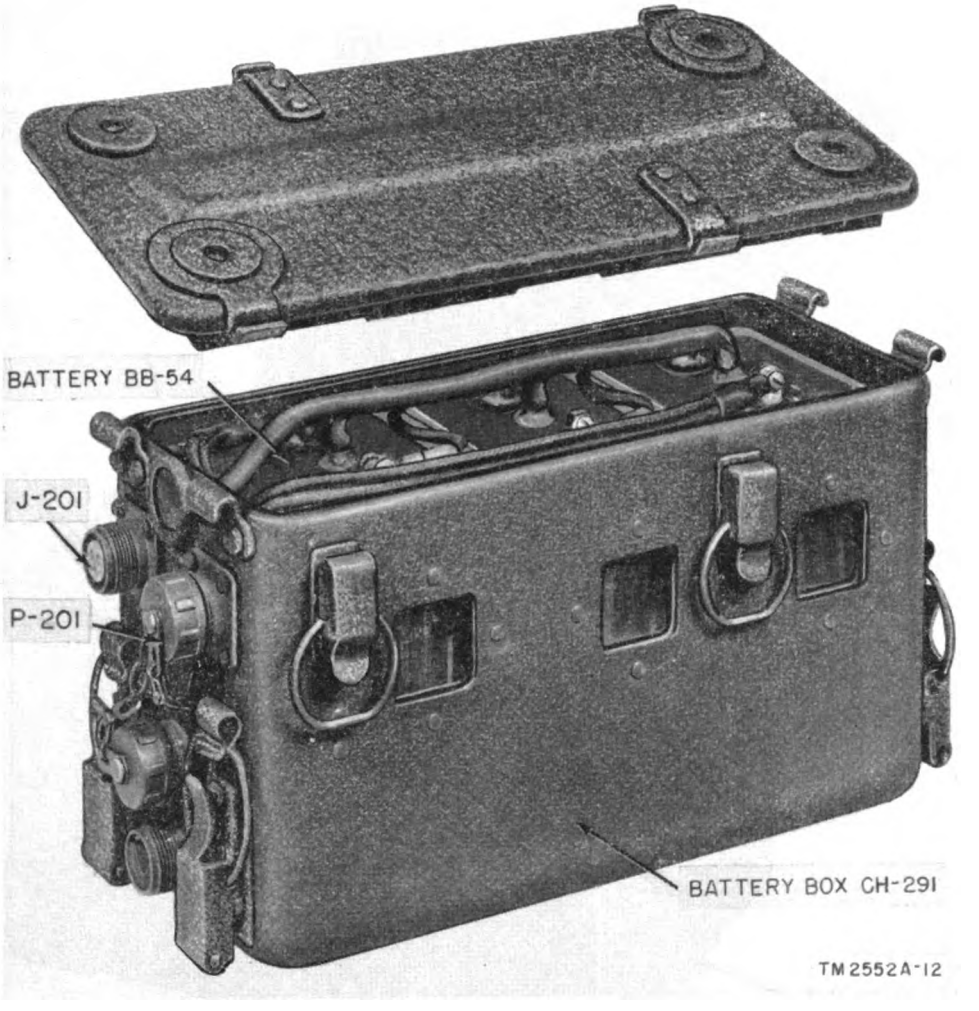


Figure 12. Battery Box CH–291 complete with Batteries BB–54.

a flat base. It is used to plot a base line and also to determine target locations.

12. Bag BG–44

One canvas tool Bag BG–44 (fig. 10) is furnished with each set. Refer to figure 10 for a list of the contents.

1. Tape TL–83 (friction).
2. Soldering paste.
3. TM 11-2552A.
4. Tape TL–94 (splicing).
5. Solder M–31.
6. Multimeter test leads.
7. Multimeter TS–297/U.
8. TM 11–5500.
9. Screw driver, 6-inch offset.
10. Typewriter brush.

13. Multimeter TS–297/U

One Multimeter TS–297/U (fig. 10) is included for the maintenance and repair of each sound locating set. It is used to check voltage, current, and resistance. Refer to TM 11–5500 for complete details.

14. Reel Equipment CE–11

Two Reel Equipment CE–11 (fig. 11) are furnished. One reel is provided as a spare. This

equipment provides wire communication between the two recorders of the sound locating set. The equipment consists of a portable reel with straps containing one-half mile of Wire W–130 and Handset TS–10–P fitted with spring clips. For further details refer to TM 11–2250.

16. Battery Box CH–318 and Battery BB–221/U

Six Battery Boxes CH–318 (fig. 13) are packed with each sound locating set. Battery Box CH–318 contains a 6-volt, lead-acid Battery

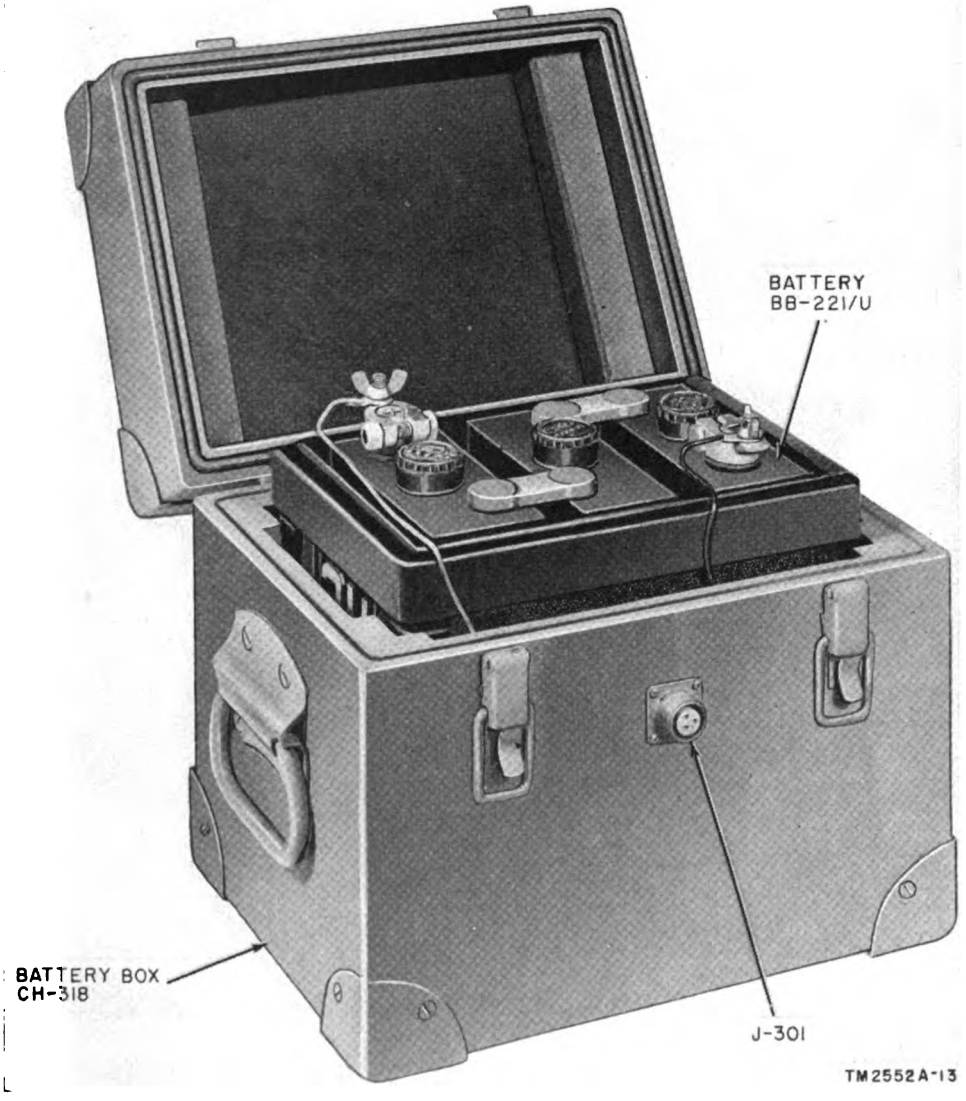


Figure 13. Battery Box CH–318 complete with Battery BB–221/U.

15. Battery Box CH–291 and Battery BB–54

Twelve Battery Boxes CH–291 (fig. 12) are furnished with each set. Each Battery Box CH–291 is a container for three lead-acid Batteries BB–54, connected with two jumpers and a harness to form a 6–volt power supply.

BB–221/U. This power supply is suited especially for arctic operation.

17. Spare Parts

Running spare parts for Sound Locating Set GR–6–A are as follows:

Quantity	Description
1	Recorder BC–1323–A and Bag BG–182.
1	Bag BG–160–A.
2	Legs for recorder.
6	Microphone T–56.
6	Microphone Shelter M–413.
1	Cord CD–1238–A.
3	Cord CD–1239.
1	Cord CD–1240.
1	Cord CD–1444.
1	Chain Kit MC–692.
1	Drill, star.
1	Hammer TL–332/U.
1	Case CS–161.
1	Handset TS–10–P.
1	Headset HS–30–U and Cord CD–874.
1	Computor M–414 in Case CS–148.
1	Cord CD–1446.
3	Marker MC–693.
1	Plotting Board M–10 in Case M–72.
1	Compass M–2.

Quantity	Description
1	Holder M–167–A.
1	Notebook.
6	Pencils.
1	Funnel.
12	Tube, type 9001.
3	Tube, type 6AK6.
3	Tube, type 2AP1A.
3	Rectifier, selenium.
9	Lamp, incandescent.
15	Tape, recording.
36	Fuse, 6-ampere.
33	Fuse, ⅛-ampere.
12	Battery cap for BB–221/U.
12	Battery cap for BB–54.
1	Reel Equipment CE–11.
2 spools	Wire W–130.
1	Flashlight TL–122–D.
1	Lamp, neon, ¼-watt.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

18. General

a. Remove the nails with a nail puller; prying may damage the equipment.

b. Store the inside packaging materials in their respective shipping containers for re-use. Exception is made of the bags of desiccant or dehydrating agent which will be either destroyed or placed aside for reactivation.

c. Follow the steps outlined in paragraph 19 or all boxes 1/1 through 1/7.

19. Unpacking

a. Remove and save the packing slip.

b. Cut the metal straps.

c. Remove the nails with a nail puller and remove the top of the shipping container.

d. Lift out the packaged unit.

e. Slit the waterproof barrier at the seams and remove it from the package.

f. Slit the seal of the outer corrugated carton and remove the moisture-vaporproof carton.

g. Slit the seal of the inner carton and open the flaps.

h. Lift out all the corrugated fiberboard cells and pads.

i. Lift out the contents.

j. Check all packaging for loose parts.

Section II. CONTROLS AND THEIR USE

20. Front Panel Controls (fig. 14)

a. VOLUME CONTROL (S5). The normal position of the VOLUME control knob is at the midpoint or on position 4. This knob controls both the volume of the incoming signal and the volume of the played-back signal. The pattern on the scope should be adjusted to half-scale deflection for the played-back signal. To increase deflection, move the VOLUME control knob to position 5, 6, or 7. To decrease deflection, move the VOLUME control knob to position 3, 2 or 1. If it is necessary to change the position of the knob more than one point either way (increase or decrease), it is advisable to make a new record with the knob either on position 5, 6, or 7 or position 3, 2, or 1 depending on whether the deflection should be increased or decreased.

b. SCANNING WHEEL. The scanning wheel moves the recording tape in either direction so that the recorded signals on the tape can be lined up manually with their respective heads.

c. COUNTER ADJUSTMENT KNOBS. The counters No. 1 and 2 are adjusted by use of the counter adjustment knobs. The counters measure the time required for the sound wave to pass from microphone M1 and microphone M2, respectively, to microphone M3, the reference point. If microphones M1 and M2 are nearer the sound source than microphone M3, the counters will read between 000 and 150. The larger reading is obtained when the respective microphone (M1 or M2) is on the line connecting microphone M3 and the target. The smaller reading means that the respective microphone is on a line at right angles to the line connecting microphone M3 and the target. Intermediate readings

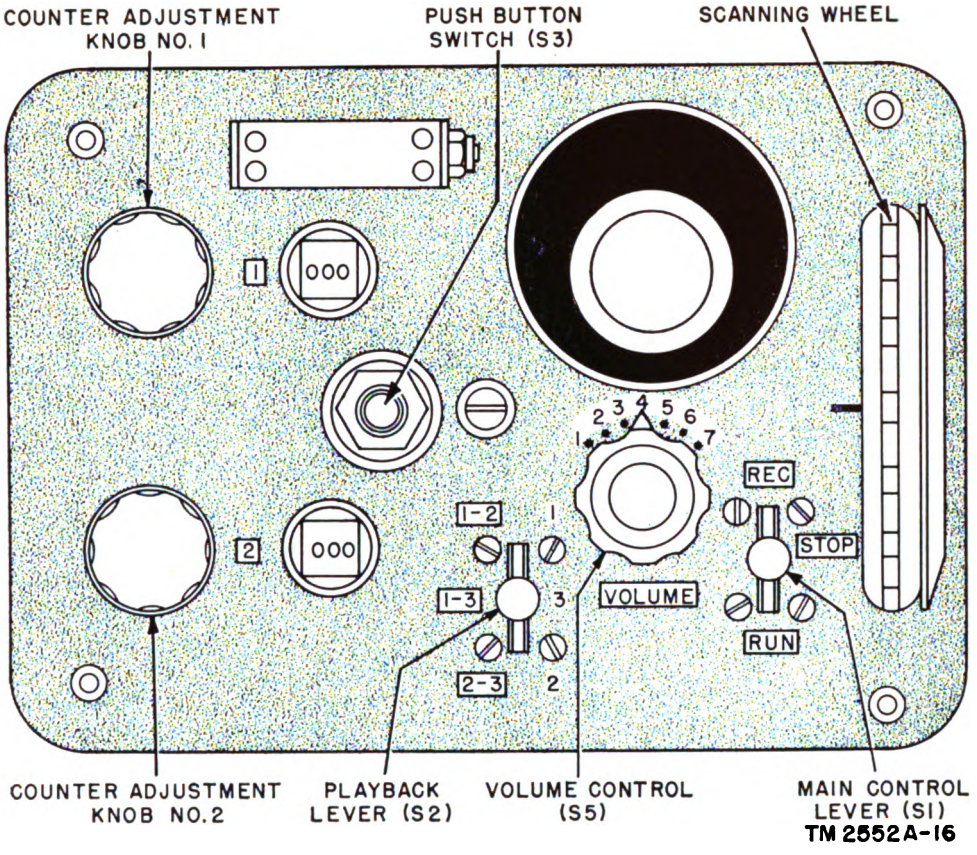


Figure 14. Recorder BC–1323–A, front panel controls.

will be obtained for intermediate positions. If the sound wave reaches microphone M3 earlier than either microphone M1 or M2, the counter will read on the other side of zero, somewhere between 000 and 850.

d. MAIN CONTROL LEVER (S1). The three positions of the main control lever (S1) control the operation of the recorder. In the up or REC position, the main control lever permits simultaneous recording of signals from the three microphones. In the neutral or STOP position, the moving tape is stopped (but still can be moved manually, with the scanning wheel (*b* above)). In the down or RUN position, the tape runs continuously so that the recorded microphone signals can be compared. (Signal comparison can also be made in the STOP position.)

e. PLAY-BACK LEVER (S2). With the main control lever (S1) in the RUN or STOP position, the play-back lever (S2) permits a magnetic recorder or reproducer head to be substituted for a microphone in each of the amplifier channels, thus allowing the recorded signals to be compared by manipulation of the scanning wheel and counter adjustment knobs (*b* and *c* above). The up or 1–2 position feeds the output of the Nos. 1 and 2 recorder-reproducer heads into amplifiers No. 2 and 1, respectively. (Monitoring by use of Headset HS–30–U, while recording, is carried on through amplifier No. 1.) In the neutral or 1–3 position of the play-back lever, the output of the Nos. 1 and 3 recorder-reproducer heads feeds into amplifiers No. 3 and 1, respectively. (Monitoring, while recording, is done through amplifier 3.) In the down or 2–3 position, the output of the Nos. 2 and 3 recorder-reproducer heads is fed into amplifiers No. 3 and 2, respectively. (Monitoring, while recording, is done through amplifier 2.) The position 1–2 may be used as a check on the 2–3 and 1–3 counter settings. If the 2–3 and 1–3 adjustments are correct, then the 1–2 setting will be in similar adjustment.

f. PUSH-BUTTON SWITCH (S3). Push-button switch (S3) is a contact switch; when depressed, it causes the pilot lamps (E1 and E2) to light up the counters.

21. Side Panel Controls
(fig. 15)

a. POWER SWITCH OFF-ON (S7). This switch is used to turn the recorder to the ON or OFF position.

b. FOCUS CONTROL (R68). The FOCUS control is used to adjust the focus or sharpness of the image on the oscilloscope.

c. INTENSITY CONTROL (R66). The INTENSITY control is used to adjust the size and brightness of the image on the oscilloscope.

d. RADIO — SURVEY — OFF SWITCH (S4). Switch S4 is used to connect microphone 3 input to either the wire-line terminals or the radio set. Its operation is complex and reference to its use is explained in paragraphs 32, 33, 34, and 35.

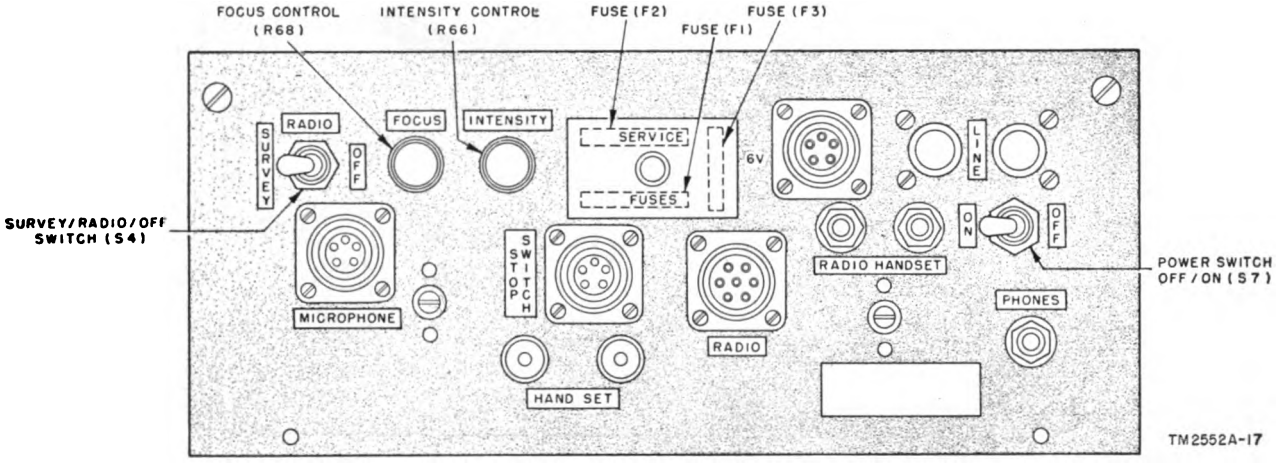


Figure 15. Recorder BC–1323–A, side panel controls.

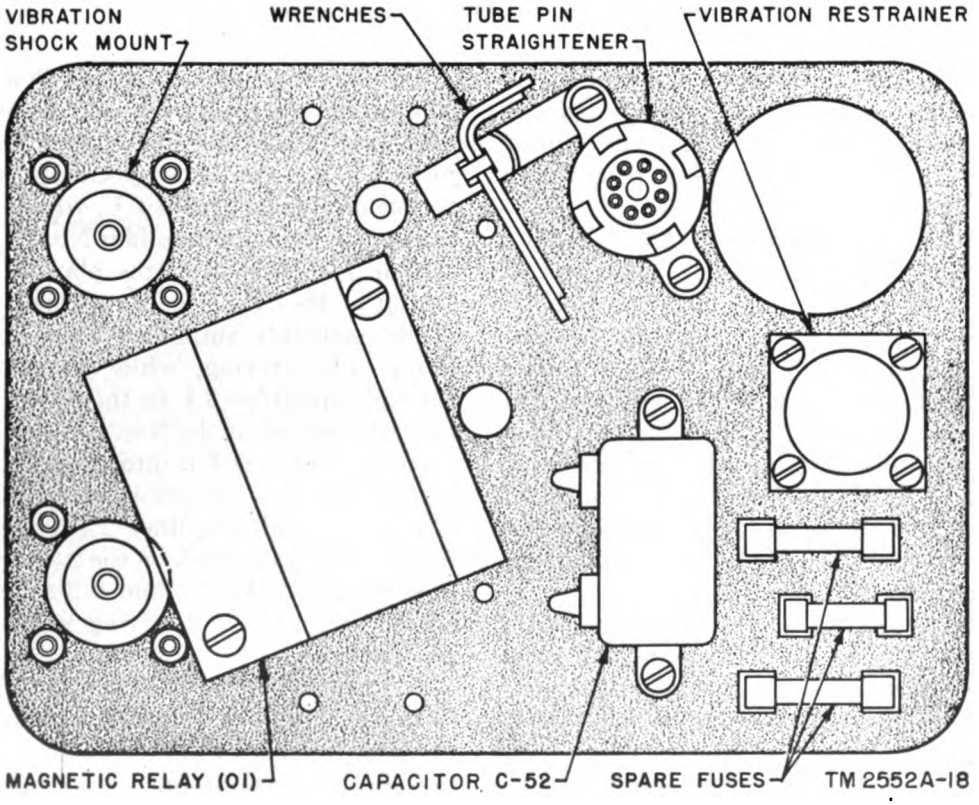


Figure 16. Recorder BC–1323–A, rear cover removed.

e. STOP BUTTON SWITCH (S101). When the stop button switch on Cord CD–1240 of one recorder is depressed, the magnetic relays (O–1) of both recorders are energized. Their contacts complete the magnetic clutch circuit and stop movement of the tape of both recorders of Sound Locating Set GR–6–A.

Section III. OPERATION UNDER USUAL CONDITIONS

22. Setting Up Equipment

For purposes of discussion in this technical manual, the sound locating set to the right, when facing the enemy gun position, is designated as the right array and is also the control operator's station. The unit to the left is known as the left array (fig. 17). The sequence of steps in setting up each azimuth measuring unit follows:

a. Selecting the site for the microphone array (par. 23).

b. Setting up the microphone array (including determination of zero counter settings) (par. 24).

c. Selecting the site for the recorder (par. 25).

d. Interconnecting the equipment (par. 26).

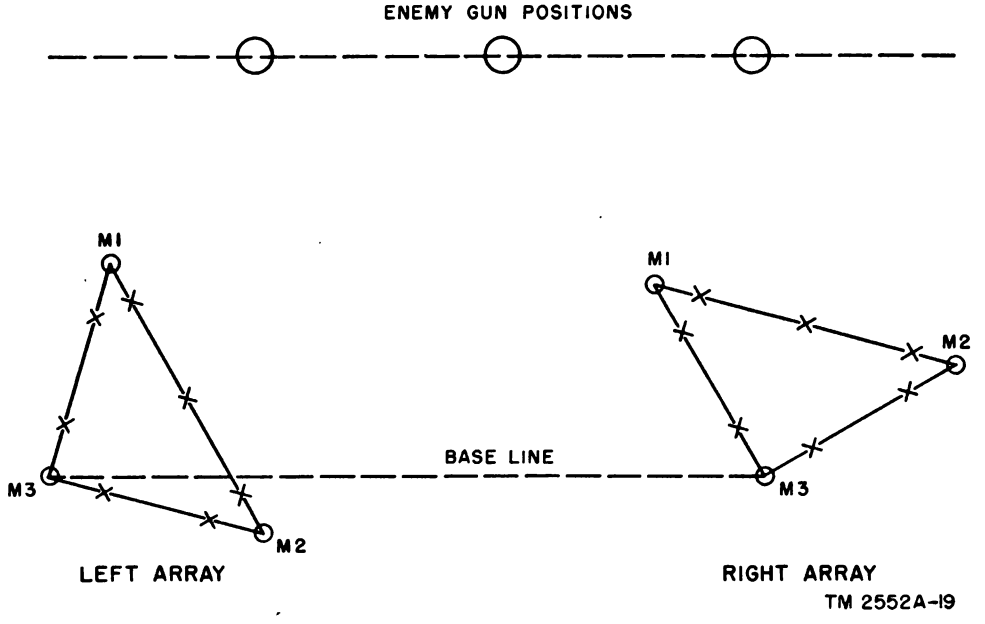


Figure 17. Base line between left and right arrays.

23. Selecting Site for Microphone Array

a. Set up the microphone arrays so that the line connecting the two arrays (called the base line) is parallel to the enemy gun positions (fig. 17). If possible, the arrays should be separated by a distance equal to at least half the estimated distance to the enemy guns. In any case, the arrays should be not more than 700 yards apart. Refer to paragraph 25 for information on selection of site for recorder and radio.

b. Select a site for each microphone array that is high, open, level ground (less than ½-foot rise in 15 feet). Avoid proximity to roads with heavy traffic, because traffic noise will interfere with the successful operation of the set. Avoid deep valleys, densely wooded areas, spots of thick grass or undergrowth, and areas of grouped buildings. In general, the microphones must be situated where the signals can be heard above any interfering noise.

24. Setting Up Microphone Array

Zero counter settings on Recorder BC–1323–

A must be determined before the microphones can be set up as an array (fig. 18). The zero counter settings obtain a correction factor that is used in the computation procedures (par. 32). Proceed as follows:

a. Make the initial adjustment to the tape mechanism as covered in paragraph 26.

b. Insert the connector of Cord CD–1238–A (identified with one ring around the rubber insulation near the connector) into one of the microphones which shall be designated as microphone M1. Repeat the procedure for the other two microphones with the two-ringed cable connector inserted into microphone M2 and the three-ringed cable connector inserted into the microphone designated as M3. These microphone designations must be used later when the microphone array is set up for normal operation.

c. Attach the connector of Cord CD–1239 to the free end of Cord CD–1238–A.

d. Insert the free end of Cord CD–1239 into the receptacle on the recorder marked MICROPHONE.

e. Push the three microphones into the ground at a distance between 10 and 12 feet from the recorder. Each microphone must be equidistant from the recorder and, therefore, should be touching each other after insertion into the ground. Clear the ground of all obstructions immediately surrounding the microphones.

f. Insert the connector of Cord CD–1444 into the recorder receptacle marked 6V and the other end of the cable into the receptacle on Battery Box CH–291.

g. Insert Headset HS–30–U plug into the recorder jack marked PHONES.

h. Place the equipment into operation and follow the operational procedures required to obtain counter readings as explained in paragraph 32.

i. Fire a weapon at a point equidistant from the three microphones or bring heavily gloved hands together to simulate the effect of the muzzle blast of a gun. Do not use the bare hands for this purpose. If no gloves are available, use layers of cloth wrapped around the hands. Repeat this procedure two more times to make three tests.

j. The average of the readings on each counter is the true zero, and each average is taken as follows:

(1) If the readings on a counter are all off on the same side of zero, take the sum of the readings and divide by the number of readings. For example:

(*a*) If the readings on counter No. 1 are 003, 001, and 002, the sum of these (006) divided by the number of tests (3) would give the average true zero for this counter as 002.

(*b*) If the readings on counter No. 1 are 997, 996, and 998, the average would be 997.

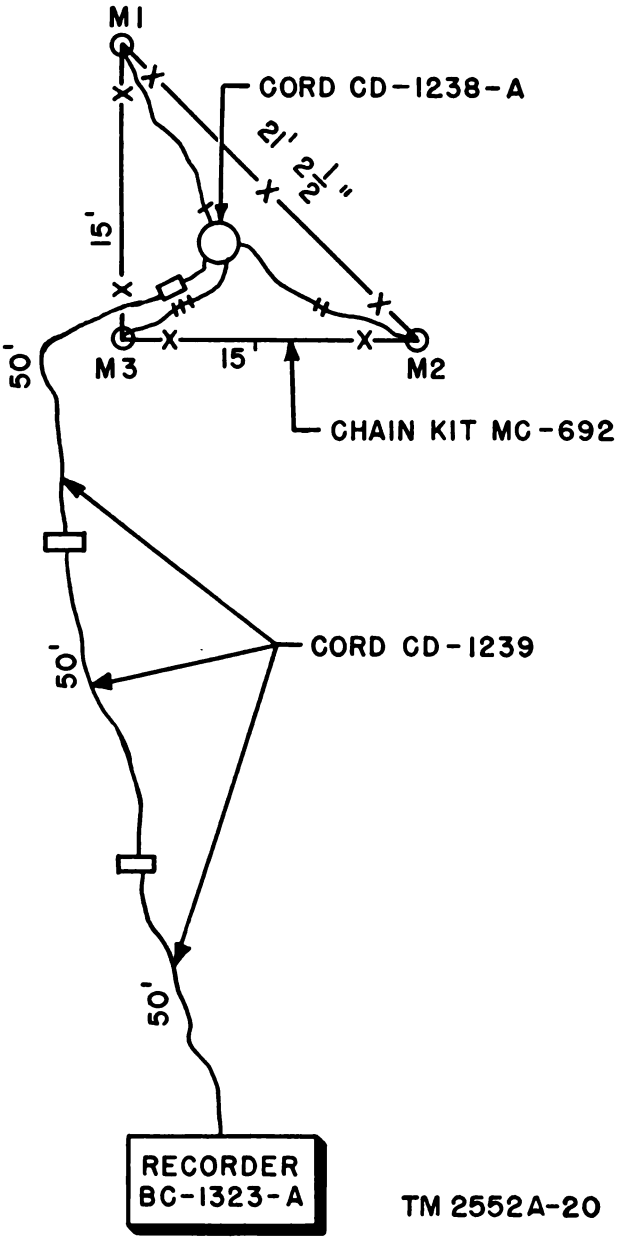


Figure 18. Microphone array interconnections.

(2) If the readings on counter No. 1 are on opposite sides of zero (for example, 997, 996, and 001), find the sum of the variations from zero (000) on each side of the zero, subtract the smaller sum from the larger sum, and then divide by the number of tests. For example:

(*a*) The counter reading 997 is three points from 000 and 996 is four points from 000. The sum of the variations on this side of zero is 7. By subtracting 1, the variation on the other side of zero, the result is 6. Divide 6 by the number of tests (3) to get the average variation of 2.

(*b*) Because the larger sum was on the 900 side of zero, the average will be on that side. The average true zero for this counter, therefore, would be two points away from zero on the 900 side, or 998.

(3) If the average of the readings on each counter is four points or less away from zero, the equipment is in satisfactory adjustment.

k. Apply the counter correction as follows:

(1) If the correction factor for counter No. 1 is 002, subtract two points from counter reading No. 1. For example, the counter reading of 107, as obtained in accordance with procedures outlined in paragraph 32, becomes 105. If the reading is 906, subtracting two points brings it down to 904.

(2) If the correction factor for counter No. 1 is 998, add two points to counter reading No. 1 for the total of 109 (107 plus 2). The 906 reading becomes 908.

Note. A loosely assembled microphone can cause the counter readings to go off by more than four points. If both readings are off from zero by the same amount, check microphone M3. If the average zero is not satisfactory for counter No. 1, check microphone M1. If the average zero is not satisfactory for counter No. 2, check microphone M2. If both the counter readings are unsatisfactory, by different amounts, check all three microphones. Replace a suspected microphone with the spare microphone and repeat the tests. Repair the defective microphone if the test proves it to be necessary.

l. After the correction factor has been obtained, proceed with the setting up of the microphone array as follows:

(1) Shut off the recorder by throwing the power switch to the OFF position.

(2) Pull all three microphones from the ground, leaving the cables connected. At position M1, place the stake of microphone M1 (connected Cord CD–1238–A has one metal ring) through two eyelets of two separate chains (one eyelet must be that of the long chain) and push the stake into the ground (fig. 19). The microphone stake should be pushed into the ground by hand, as far as the stop on the

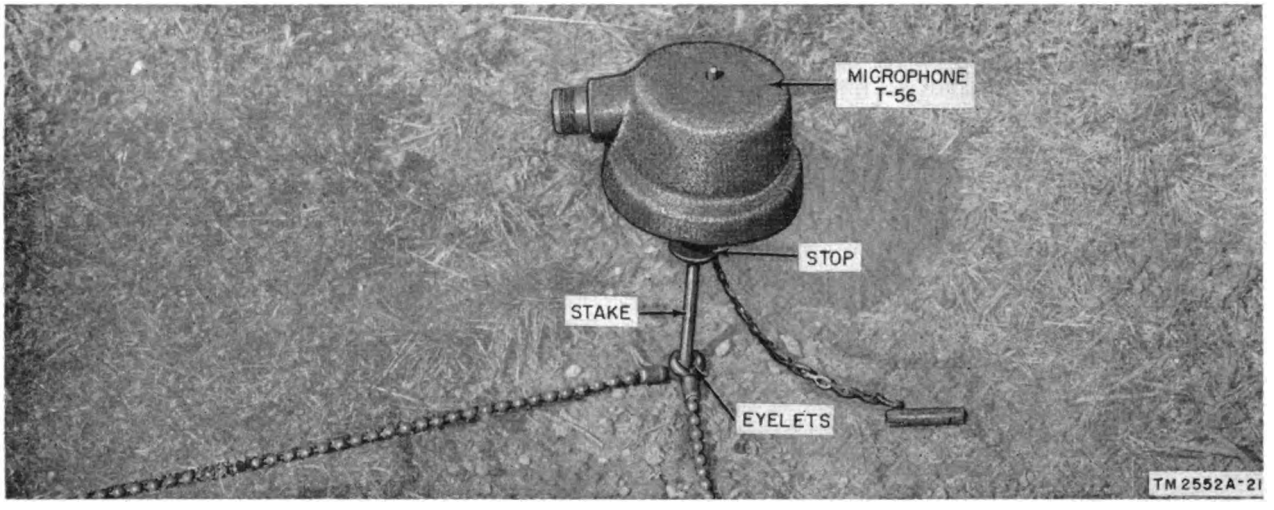


Figure 19. Microphone T–56, stake placed through eyelets.

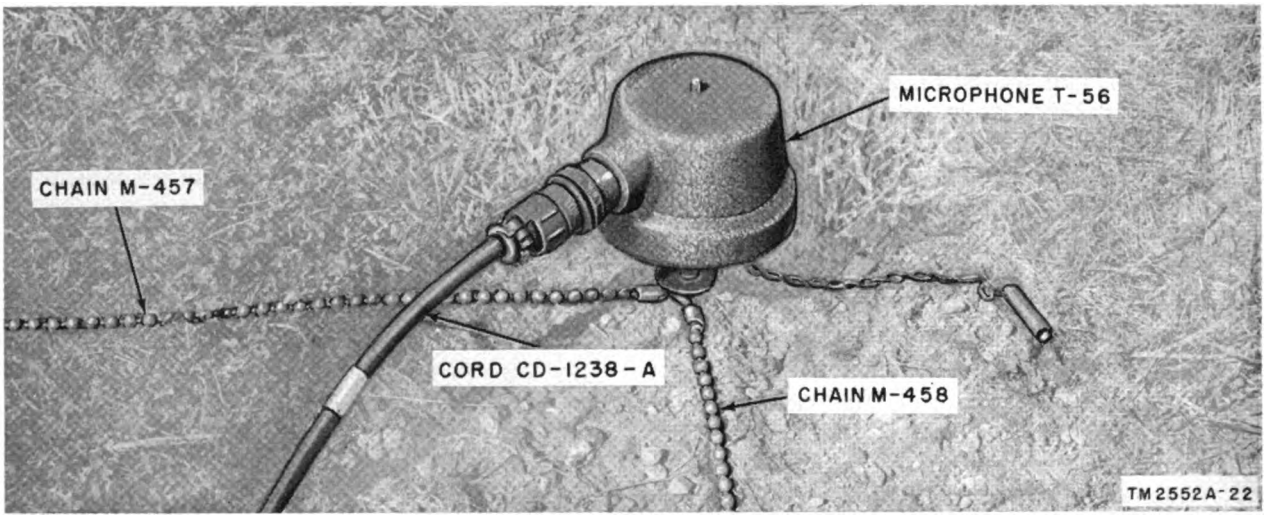


Figure 20. Microphone T-56, Cord CD-1238-A connected to microphone.

stake. At each microphone position, press down or tear away the tall grass underneath and around the microphone. If the ground is hard, use the hammer and drill to make a hole for the stake.

Caution: Do not drive the microphone into the ground with a hammer.

(3) Stretch the long chain to position M2. Place the stake of microphone M2 (connected Cord CD-1238-A has two metal rings) through two eyelets (one eyelet being the other end of the long chain), and set the microphone into position as explained in (2) above.

(4) Stretch the remaining two chains to position M3 and place the stake of microphone M3 (connected Cord CD-1238-A has three metal rings) through two eyelets. Push the microphone into the ground.

Note. All chains must be equally taut

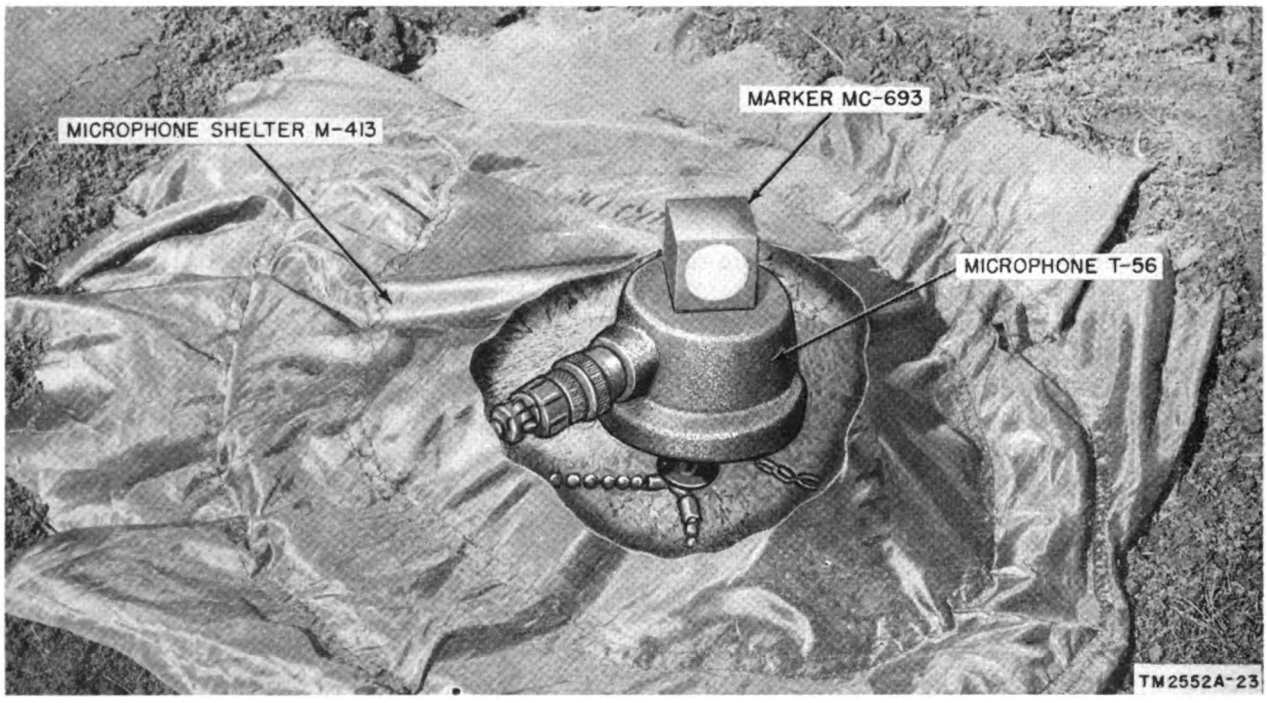


Figure 21. Microphone T-56 and Marker MC-693 placed on top of microphone.

without disturbing the position of the microphone stakes.

(5) Add the required lengths of Cord CD–1239 between the array and the recorder site.

m. Place Microphone Shelter M–413 and Marker MC–693 over each of the microphones as shown in figure 21. The shelter is not necessary if the weather is calm.

n. Set the compass not less than 5 feet directly behind microphone M3 and in line with the M1–M3 side of the array. Sight on the center of microphone M1 and read the magnetic bearing of the M1–M3 side. Read and record this bearing (it will be used as explained in paragraph 32).

25. Selecting Site for Recorder and Radio

Choose a position for the recorder and radio set that will afford adequate cover for the operator and good listening conditions. Avoid locations near power lines, roads, electric motors, or other sources of low-frequency noise-interference.

26. Interconnecting Equipment

a. INITIAL ADJUSTMENTS. After the recorder is unpacked, make the following adjustment under shelter.

(1) *Opening and removing covers.*

(*a*) Turn the front cover latch counterclockwise and pull the cover open.

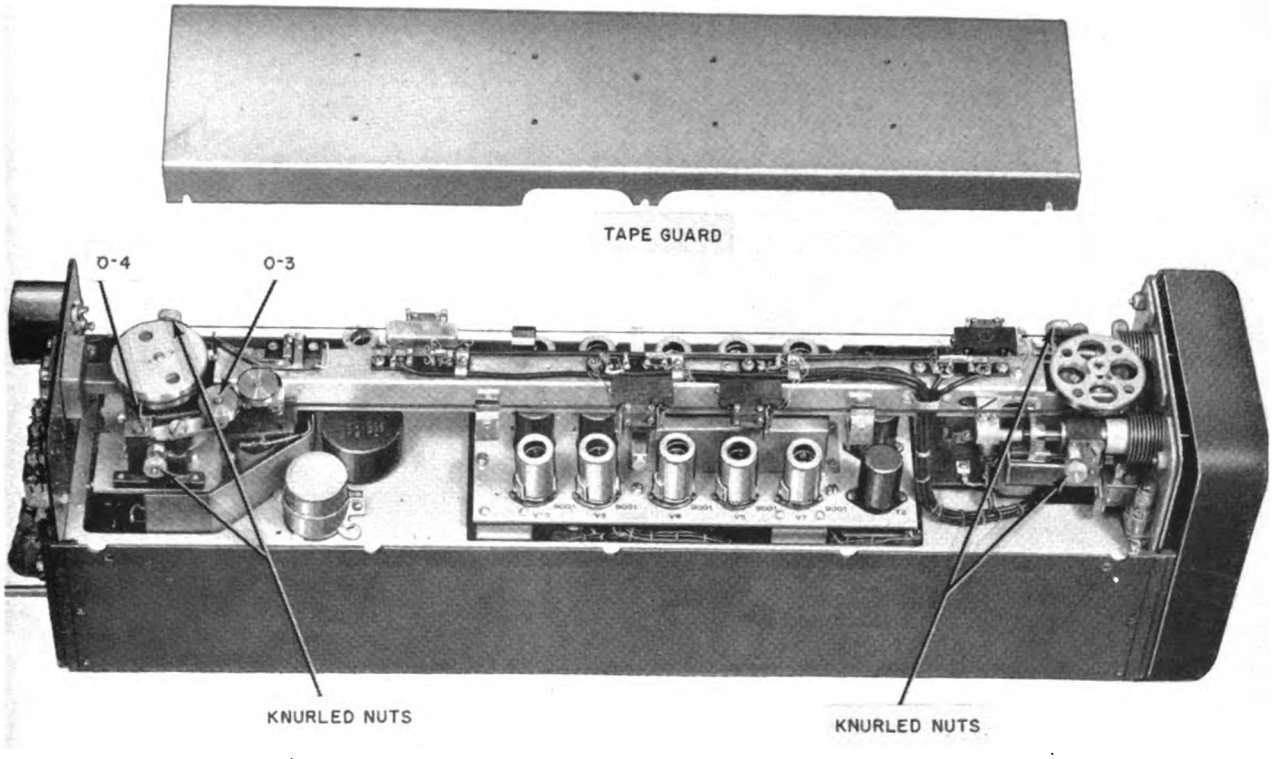
(*b*) Turn the back cover latch counterclockwise and pull off the cover.

(*c*) Loosen the five screws on each side of the recorder until the side cover clamping strips can be pulled away. Place the recorder so that the carrying strap is on top of the equipment. Pull off the cover.

(*d*) Remove the tape guard by loosening the four knurled nuts shown in figure 22.

Caution: Be careful when removing the tape guard. Carelessness will damage the steel tape, pole pieces, and mechanism.

(2) *Adjustment of tape-tension clamp screw.* Loosen, with the aid of a screw



TM 2552A-15

Figure 22. Recorder BC–1323–A, tape locking screw.

driver, the tape-tension clamp screw (O–4, fig. 46), so that the spring attached to the tension pulley (O–3) will maintain constant tension of the pulley against the tape. After this adjustment is made, replace the tape guard and covers.

b. For Wire Line Operation (fig. 23).

(1) Connect Cord CD–1239 (from the microphone array) to the recorder receptacle marked MICROPHONE.

(2) Remove Cord CD–1446 from Case CS–161 and connect one end to the recorder receptacle marked 6V and the other end to the receptacle J201 on Battery Box CH–291.

(3) Connect Cord CD–1240 to the recorder receptacle marked STOP SWITCH.

(4) Plug Headset HS–30–U into the jack marked PHONES.

(5) Attach the running end of Reel Equipment CE–11 to the LINE posts on one recorder and carry the reel to the other recorder. Unreel sufficient wire so that it may be passed through the LINE posts of the second recorder. Do not cut or skin the wire since the TM–175 LINE post pins pierce the insulation and make contact.

(6) Attach the clips of Handset TS–10–P to the HAND SET terminal posts.

c. For Radio Operation (fig. 24).

(1) Perform the steps outlined in *b*(1) through (4) above.

(2) Connect one end of Cord CD–1444 to the receptacle of Recorder BC–1323–A marked RADIO.

(3) Connect the plugs at the other end of Cord CD–1444 to respective jacks on the radio set marked PHONE No. 1, MIC, and RELAY.

(4) Connect radio Handset TS–15–A to the recorder jacks marked RADIO HANDSET.

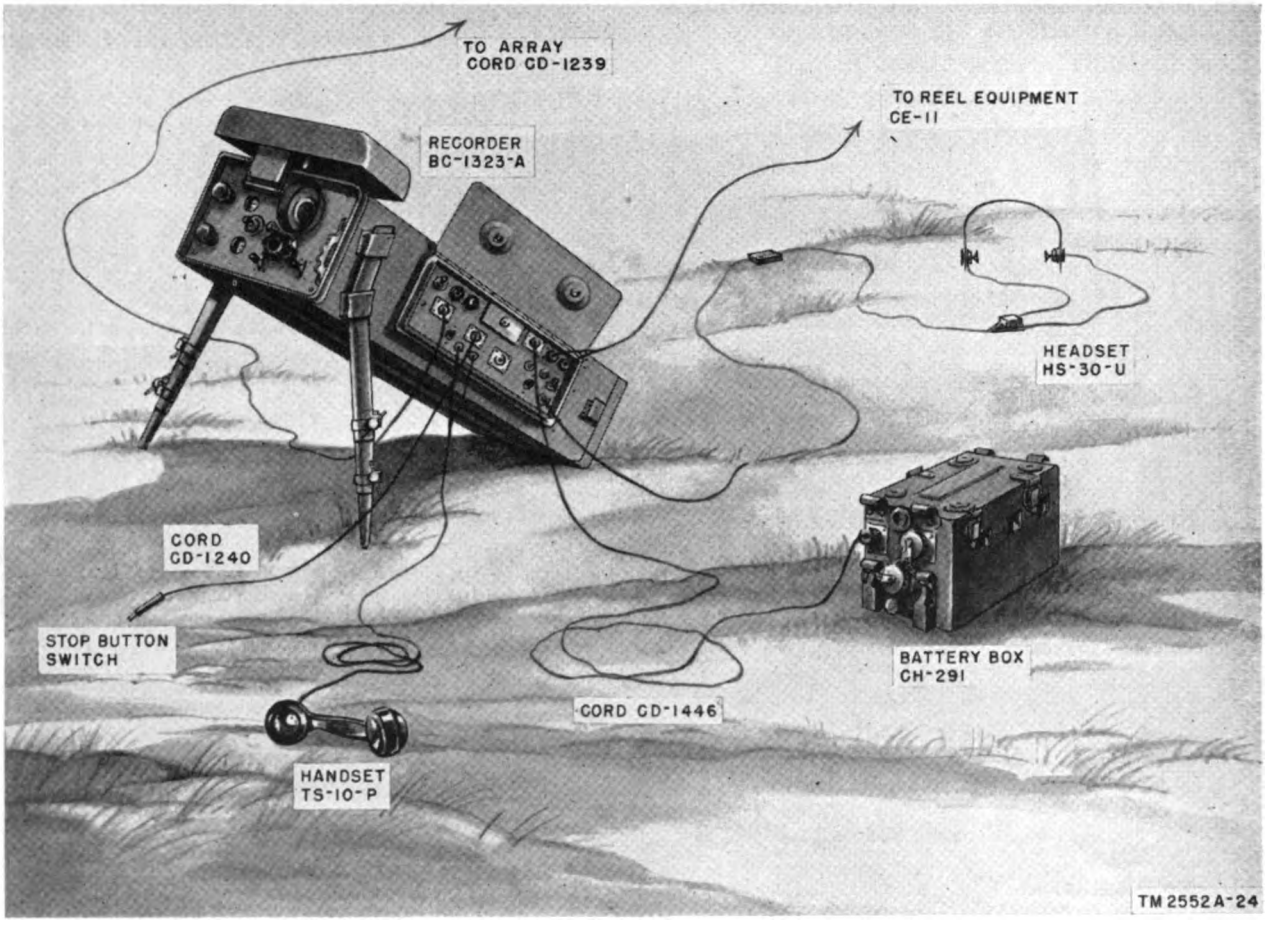


Figure 23. Cording diagram for wire-line operation.

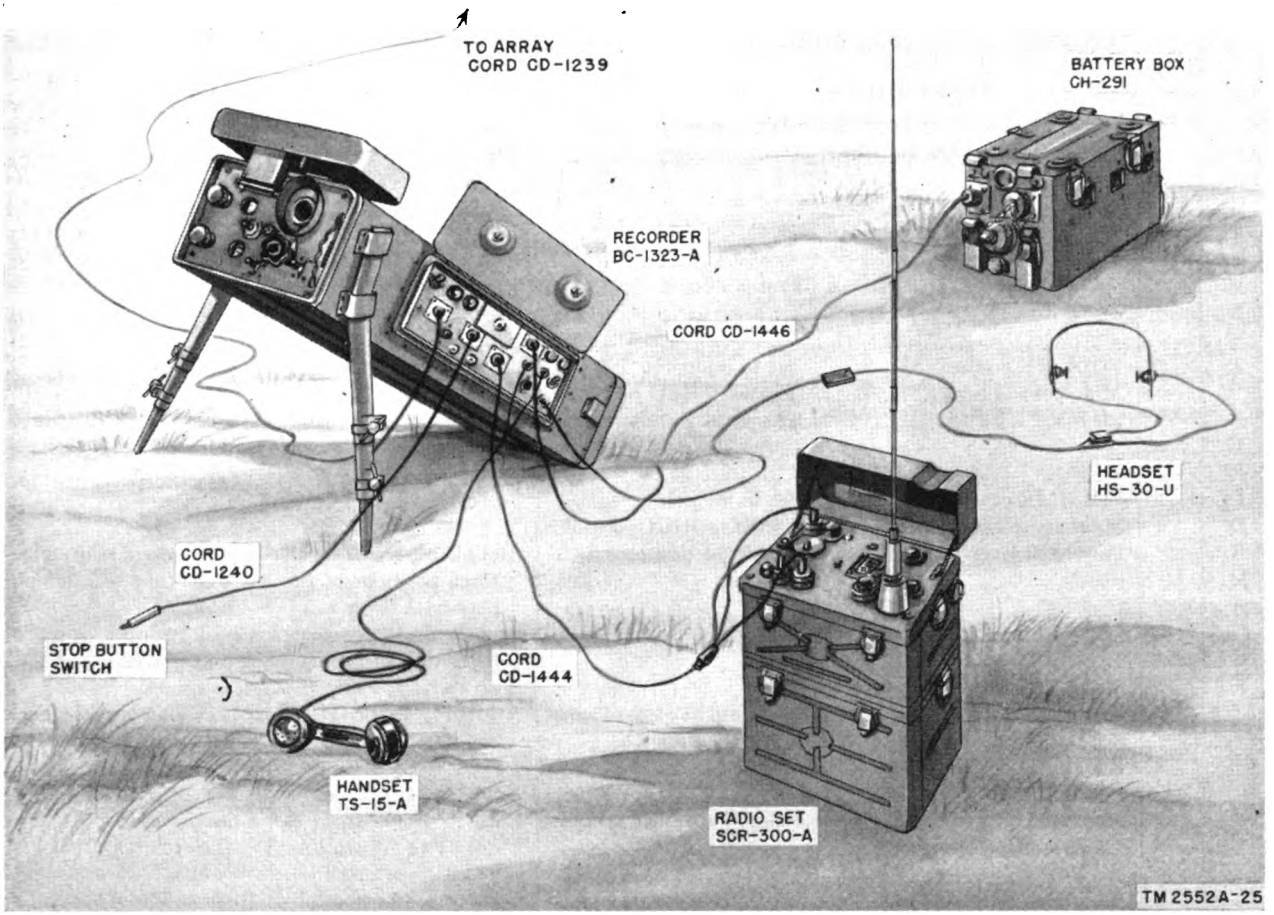


Figure 24. Cording diagram for radio operation.

27. Equipment Performance Checklist

a. PURPOSE. The purpose of the equipment performance checklist is to provide the operator with a means of knowing whether the performance of the equipment is normal or abnormal.

b. HOW AND WHEN TO USE CHECKLIST. The items to be checked are grouped under three headings: START, EQUIPMENT PERFORMANCE, and STOP. Check items 1, 2, and 3 to start the equipment, items 4 through 6 for recorder performance at each array position, items 7 and 8 for wire-line operation, and items 9 and 10 for radio operation.

c. CHECKLIST.

	Item No.	Item	Action or condition	Normal indications	Corrective measures
S	1	Power switch OFF-ON (S7).	Throw to ON position	Dynamotor begins to run with whirring sound.	Check 6-volt power source. Check fuse F2.
T					
A	2	Push-button switch (S3)	Push	Pilot lamps illuminate both counters.	Check pilot lamp or lamps.
R					
T	3	Main control lever (S1)	Throw to STOP position	Small, needle sharp, fluorescent spot on scope.	Adjust FOCUS control (R68). Adjust INTENSITY control (R66).
			Place in RUN and REC positions.	Scanning wheel rotates.	Tape broken or off the drive pulleys.

Checklist—*Continued*

	Item No.	Item	Action or condition	Normal indications	Corrective measures
EQUIPMENT	4	Stop button switch on Cord CD-1240.	Push in	Tape stops if main control lever (S1) is in REC position.	Check Cord CD-1240, switch, and magnetic-clutch solenoid coil (L4). Check relay (O-1).
			Pull out	Tape runs if main control lever (S1) is in REC position.	
PERFORMANCE	5	VOLUME control (S5)	Set to midpoint		
		Main control lever (S1)	Throw to REC position		
		Playback lever (S2)	Throw to positions 1, 3, and 2.	Audible signals from microphone array on Headset HS-30-U.	Check cables. Check microphones.
	6	VOLUME control (S5)	Set to midpoint		
		Main control lever (S1)	Throw to RUN position		
		Play-back lever (S2)	Throw to positions 1, 3, and 2.	Audible pip signal on all three positions of the play-back lever.	Check pip circuit, electron tube E6 or pip head L9.
				Audible recorder signals from the microphone array.	Check recorder or reproducer heads.
	7	Handset TS-10-P	Talk into handset of wire-line equipment.	Audible, intelligible communication.	Check handsets. Check wire line.
	8	RADIO — SURVEY — OFF switch (S4).	Throw to OFF position		
		Stop button switch on Cord CD-1240.	Push in at either array	Both recorders stop recording (scanning wheel stops rotating).	Check switch. Check coil (L4) (clutch).
	9	Radio Set SCR-300-A	Operate Radio Set SCR-300-A without connecting to recorder.	Communications established. Squelch circuit operating.	Refer to TM 11-242.
	10	RADIO — SURVEY — OFF switch.	Throw to RADIO position.		
		Stop button switch on Cord CD-1240.	Push in at either recorder.	Both recorders stop recording.	Check squelch circuit. Refer to TM 11-242.
STOP	11	Power switch OFF-ON	Throw to OFF position	Dynamotor stops running.	

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

28. Unusual Conditions

Sound Locating Set GR-6-A may be operated under conditions of severe dust, moisture, and temperature without damage to the equipment. However, of operation under unusual conditions is to be maintained for long periods, certain precautions must be taken. Refer to paragraphs 29, 30, and 31 for information covering operation under specific unusual conditions.

29. Operation in Arctic Climates

Condensation of atmospheric moisture occurs inside the sound locating set components when the units are exposed alternately to low and high temperatures. Maintain as constant a temperature as possible in the storage of the equipment. Internal battery resistance increases with low temperatures; special battery care with particular attention to higher charging rates is required

when Power Unit PE–210–( ) is used for charging. Refer to TB SIG 66 for additional winter operational information.

30. Operation in Desert Climates

Because of the numerous openings in the recorder housing, precautions against the entry of dust must be taken. A suitable equipment cover may be improvised and placed completely around the recorder after operation. Protect Radio Set SCR–300–A, Power Unit PE–210, Reel Equipment CE–11, and other associated equipment as directed in their respective publications. Consult TB SIG 75 for additional desert operational information.

31. Operation in Tropical Climates

The recorder is a high-voltage device and, although adequately moisture-proofed and fungi-proofed during manufacture, excessive moisture between high voltage and ground may result in the formation of leakage paths and voltage discharges. Damage to the varnish film must be repaired immediately upon discovery. Cover equipment whenever feasible to avoid drenching during tropical downpours. Cover tightly after use to conserve internal heat and reduce the possibility of moisture condensation during the cooler nights.

Section V. COMPUTING AZIMUTH AND RANGE

32. Finding Azimuth Angles

After the steps outlined in paragraphs 22 through 26 have been performed, the azimuth of an approaching sound wave may be determined by transferring the counter readings (obtained from the recorder) to Computor M–414. The procedure at each azimuth measuring unit (recorder) follows:

a. Obtaining Counter Readings.

(1) Throw the power switch (S7) to ON. Allow about 2 minutes for the recorder to become warm enough to operate efficiently.

(2) Throw the main control lever (S1) to REC.

(3) Turn both counters to zero (000).

(4) Place the VOLUME control at position 4.

(5) Throw RADIO — SURVEY — OFF switch (S4) to OFF for wire-line operation or to RADIO for radio operation.

(6) Pull out the stop button at the end of Cord CD–1240 to start the tape of both recorders.

(7) When the muzzle blast of the target weapon is heard, push in the stop button switch on Cord CD–1240; this action stops the tapes on both recording units.

Note. A *ballistic* sound wave is generated by the passage of the missile through the air and always will precede the arrival of the muzzle wave. It will have a characteristic *crack* compared to the *thump* of the muzzle wave. To obtain the correct azimuth or counter readings, the stop button must be pressed on the muzzle wave.

(8) Throw main control lever S1 to RUN. Make certain that the main control lever S1 of the other unit is in the RUN position.

(9) Start the tapes of both recorders by pulling out the stop button switch on Cord CD–1240.

(10) Put on Headset HS–30–U. Fasten the clothing clip at a convenient place on the uniform (lapel).

(11) Throw play-back lever S2 to position 3.

(12) The recordings from the three microphones will be heard in the following sequence: *pip,* 3, 1, 2; *pip,* 3, 1, 2, etc.

(13) Throw main control lever S1 to the STOP position during the microphone M3 recording of the gun report.

(14) Oscillate the scanning wheel with the right thumb; at the same time displace it slowly downward until the *initial* part of the 3 signal is located, as indicated by the sounds in the headset and by the deflection pattern on the scope.

(15) With play-back lever S2 in the 1–3 position, the signals from the micro-

phones at positions M1 and M3 may be compared as follows:

(*a*) Observe the pattern on the oscilloscope.

(*b*) Continue to move the scanning wheel a short distance up and down with the right hand. At the same time, turn counter adjustment knob No. 1 with the left hand until the scope pattern approaches a vertical straight line. To prevent injury to the mechanism, avoid spinning the counter adjustment knobs.

(16) Throw the play-back lever (S2) to the 2–3 position to permit comparison of the signals from microphones M2 and M3.

(17) Observe the scope pattern while moving the scanning wheel up and down with the right hand. At the same time, turn counter adjustment knob No. 2 with the left hand until the scope pattern approaches a vertical straight line.

(18) Read and record the settings on counters No. 1 and 2. Press the push-button switch (S3) to illuminate the readings.

(19) Check the counter readings in the 1–2 position of the play-back lever (par. 20*e*). The pattern observed on the oscilloscope should be a vertical straight line.

Note. Do not spend too much time in obtaining satisfactory counter adjustments on the 1–3 and 2–3 settings. If outside disturbances have been sufficiently great to make these adjustments unusually difficult, it is advisable to make a new record.

b. COMPUTOR M–414 SETTINGS AND READINGS.

(1) Rotate the grid disk of Computor M–414 until the arrow at the No. 1 counter reading axis points to the magnetic bearing of the M1–M3 side of the array (par. 24*i* and fig. 25).

(2) Plot the point on the grid which is the function of the Nos. 1 and 2 counter readings which have been corrected in accordance with procedure outlined in paragraph 24.

(3) Move the computor arm until the red line lies over the point.

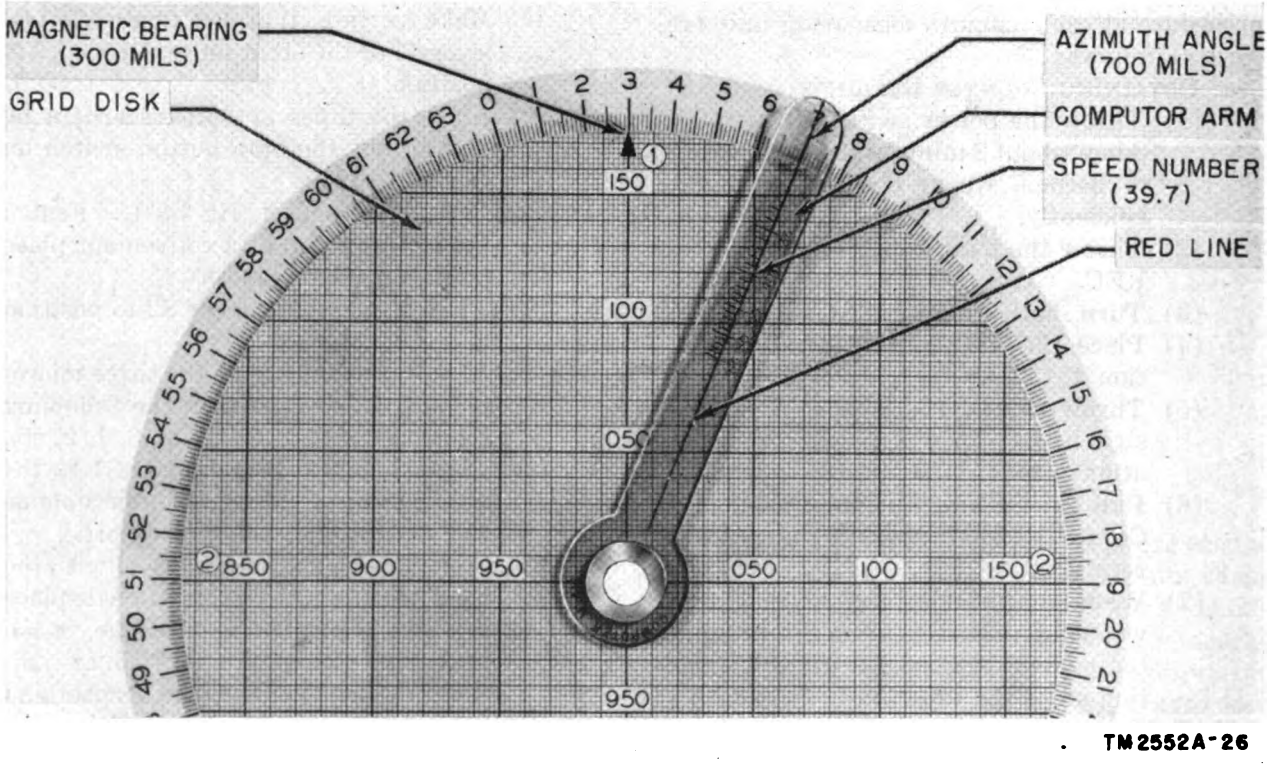


Figure 25. Computor M–414, setting for azimuth angle of 700 mils.

(4) Read the value of the azimuth angle on the bottom disk, under the red line of the computor arm, to the nearest 10 mils.

(5) Read and record the speed number on the red line of the computor arm at the plotted point.

Note. The speed number is a constant based on the velocity of sound and the traverse speed of the tape. Consequently, the speed number will not change unless conditions prevail which affect the velocity of sound or the traverse speed of the tape. (Air temperature affects the velocity of sound; battery voltage affects the speed of the tape.)

(6) For example, suppose the M1–M3 side of the array has a compass bearing of 300 mils, counter No. 1 reads 120 and counter No. 2 reads 50. Figure 25 shows the setting of the computor. The azimuth angle reads 700 mils. The speed number reads 39.7.

(7) In another case, suppose the M1–M3 side of the array has a magnetic bearing of 200 mils, counter No. 1 reads 120 and counter No. 2 reads 950. Figure 26 shows the setting of the computor. The azimuth angle reads 6,200 mils. The speed number reads 39.7

c. AZIMUTH ANGLE ERROR. Because of atmospheric conditions, the measured azimuth angle may be 15 or 20 mils from the true angle. Occasionally, an error of twice this amount may occur. Therefore, if time and conditions permit, obtain readings on more than one blast from a target for higher accuracy. Since the tape records for only 2 seconds, during which time the air conditions change very little, it does not help to measure more than one round on a single record from the same target. However, by the time the readings on one blast have been made, air conditions may have changed enough to warrant making another record. If a subsequent comparison shows that these two angles are close together (within 30 mils), compute their average for the resultant azimuth angle. If the angles are found to be widely different, take another record; select the two angles that are closest together, and take their average. The average is found by adding the two angles and dividing by two. For example, if the two angles

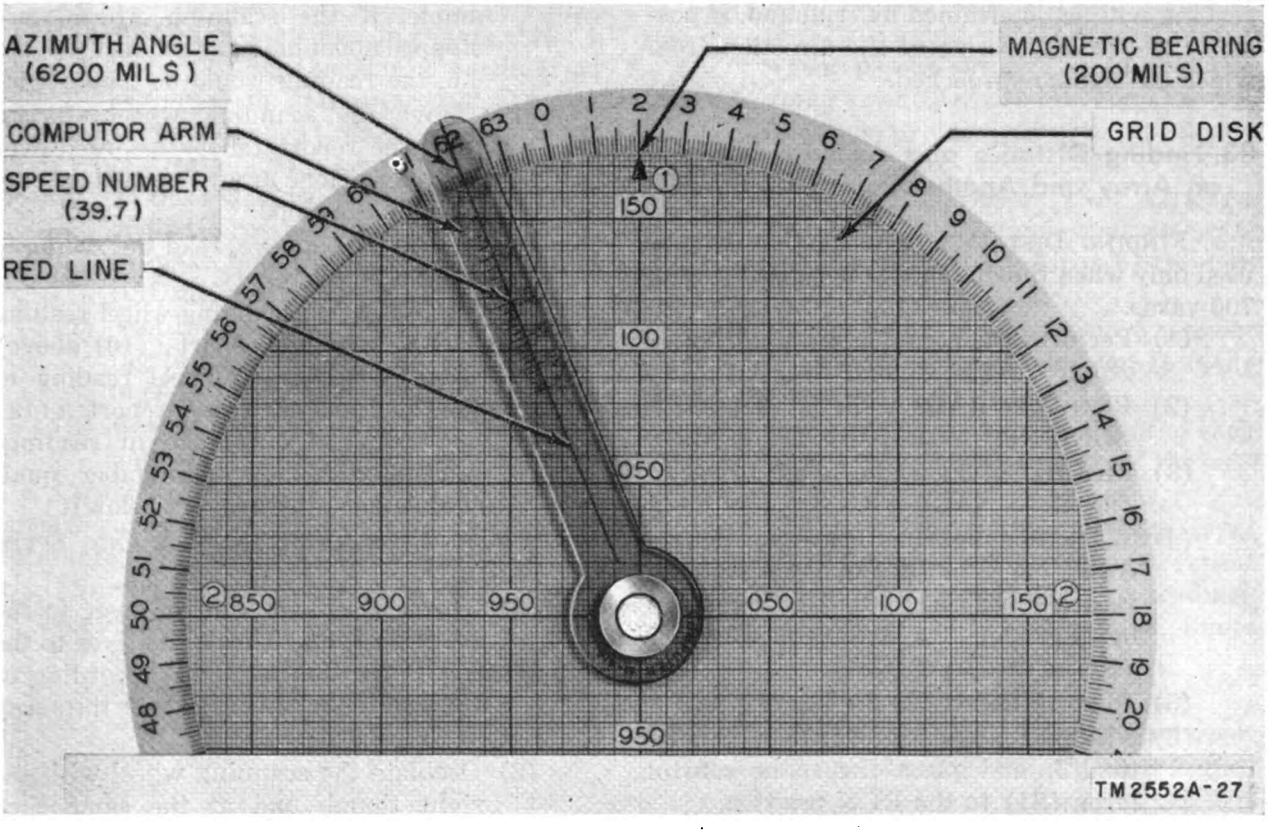


Figure 26. Computor M–414, setting for azimuth angle of 6,200 mils.

were found to be 250 mils and 270 mils, their average would be 260 mils. Compute as follows:

$$\frac{250 + 270}{2} = 260$$

d. USE OF SPEED NUMBER. The speed number is used to compute the distance between an array and a point connected to it by means of a wire line or a radio (pars. 33 and 34). The speed number should be checked from time to time. If it is possible to find the counter reading (straight-line adjustment) with one control, but the scope pattern is so distorted that it is difficult to find the counter reading with the other control, the proper setting for the second control can be approximated by means of the speed number and the first counter reading. For example, suppose that previously measured signals show a speed number of 40. A signal comes in that gives a counter reading of 90 for the 1–3 position but the counter reading for the 2–3 position is difficult to adjust. Then, if the computor arm is moved until the speed number 40 rests on the line through 90 on axis No. 1, it will indicate that the 2–3 counter reading should be either about 92 or 908. The correct counter reading will be determined by trial and, if possible, by a consideration of the direction from which the signal approached.

33. Finding Distance and Azimuth between an Array and Another Point (Using Wire)

a. FINDING DISTANCE. This method can be used only when the distance is not greater than 700 yards.

(1) Perform the steps described in paragraph 32*a*(1) through (4).

(2) Place the RADIO—SURVEY—OFF switch (S4) to the SURVEY position.

(3) Fire a shot near the telephone at P (fig. 27).

(4) When the report is heard by the recorder operator (through the air at the recorder position), stop the recording by throwing the main control lever (S1) to the STOP position.

(5) Put on Headset HS–30–U.

(6) Place the play-back lever (S2) in position 3, and place the main control lever (S1) to the RUN position.

(7) The recordings of the three microphones and the wire line are heard in the following sequence: *pip*, shot, 3, 1, 2; *pip*, shot, 3, 1, 2, etc.

(8) Place the main control lever on STOP during playback of the muzzle blast as recorded over the wire line. Do not let the tape run between the measurements of the portions on the scanning wheel of the wire-line report and microphone report ((9) through (12) below).

(9) Oscillate the scanning wheel with the right thumb; at the same time displace it slowly downward until the sounds in the headset and the deflection pattern on the scope indicate that the *initial* part of the *shot* (recorded over the wire line) is located.

(10) Read the scanning wheel by noting the point on the scale of the wheel opposite the white line on the panel. The space between any two numbers is divided into 10 equal parts. Each of these divisions is read as a tenth (.1). The exact point should be estimated to the nearest five-hundredth (.05). For example, if the scanning wheel were stopped about halfway between 1.5 and 1.6, the reading would be 1.55.

(11) Move the scanning wheel *upward* until the report (shot) recorded over the microphone array is heard and noticed on the scope.

(12) As in (10) above, read the scanning wheel for this report.

(13) Subtract the scanning-wheel reading for the wire-line report ((10) above) from the scanning-wheel reading of the microphone array report ((12) above). The difference in readings multiplied by the speed number equals the distance in yards (*c* below).

b. FINDING AZIMUTH ANGLE AND SPEED NUMBER.

(1) Throw the main control lever to the RUN position. Throw the lever to the STOP position on the 3 recording of the gun report recorded over the array (*a*(7) above).

(2) Oscillate the scanning wheel with the right thumb and at the same time displace it slowly downward until the

initial part of the 3 signal is located, as indicated by the sounds in the headset and by the deflection of the scope.

(3) Since the play-back lever (S2) is in the 1–3 position, it permits the signals from the microphones at positions M1 and M3 to be compared. This comparison is performed as follows:

(*a*) Observe the pattern on the scope and continue to move the scanning wheel a short distance up and down with the right hand.

(*b*) At the same time, turn counter adjustment knob No. 1 with the left hand until the scope pattern approaches a vertical straight line.

(4) Place the play-back lever (S2) in the 2–3 position to permit comparison of the signals from microphones M2 and M3.

(5) Observe the scope pattern and continue to move the scanning wheel up and down with the right hand. At the same time, turn counter adjustment knob No. 2 with the left hand until the scope pattern approaches a vertical straight line.

(6) Record the settings on counters No. 1 and 2. Check the counter readings as explained in paragraph 20*e*. Do not spend too much time attempting to obtain satisfactory counter adjustments on the 1–3 and 2–3 settings. If outside disturbances have been great enough to make these adjustments very difficult, make a new record.

(7) Plot the point on the grid corresponding to the Nos. 1 and 2 counter readings on Computor M–414 (par. 32*b*).

(8) Record the azimuth angle and speed number.

c. COMPUTING DISTANCE. To find the distance in yards, multiply the speed number by the difference in the scanning-wheel readings found in *a*(13) above. Note example below.

(1) Suppose the scanning-wheel readings are 1.55 for the wire-line signal and 9.00 for the microphone signal. Subtracting 1.55 from 9.00 gives 7.45 as the number to be multiplied by the speed number from the computor. If the settings found in paragraph 32*d* were 120 for the No. 1 counter reading and 50 for the No. 2 counter reading, the speed number found by the computor would be 39.7. Multiplying 39.7 by 7.45 gives 295.8 yards. Therefore, the distance between the array (at microphone M3) and the point (P) connected to it is 296 yards.

(2) If the scanning wheel, when turned from the wire-line report to the microphone report, passes the 0 dial marking, add 10 to the reading obtained for the microphone report. (The scale has only 10 divisions. When the wheel is rotated through 10, it starts again at 1. To allow for each 10 divisions passed through, 10 must be added to each successive reading.) Should a second passing of the 0 reading be made, add an additional 10 to this reading. For example, if the scanning-wheel reading for the wire-line signal is 9.5, and the reading of the microphone signal is 3.5, and the wheel passes through 0 only once, then 10 should be added to 3.5, making it 13.5. Subtracting 9.5 from 13.5 leaves 4 as the difference of the two readings. If the scanning wheel passes through 0 twice when going from the wire-line signal to the microphone signal, 20 would be added to the 3.5 before subtraction.

d. RECHECK OF DISTANCE AND AZIMUTH ANGLE. To check the distance and azimuth angle, repeat the steps outlined in *a*(3) through *c* above.

(1) If the distances are within 5 percent of each other, take their average as the distance.

(2) If the angles are within 30 mils of each other, take their average as the azimuth.

(3) If the distances or angles are separated by too great an amount, repeat the procedure until the two readings fall within the above-stated limits ((1) and (2) above).

34. Finding Distance and Azimuth between an Array and Another Point (Using Radio)

Make the following interconnections between

one radio set (Radio Set SCR–300–A) and the recorder:

a. Connect one end of Cord CD–1444 to the RADIO receptacle of the recorder.

b. Insert PHONE and MIC connector plugs at the other end of Cord CD–1444 into PHONE No. 1 and MIC jacks of the radio set. Do not connect the relay connector plug of Cord CD–1444 to the radio set, for it will stop the recorder when transmitting.

c. Insert the radio Handset TS–15–A plug into the recorder jacks marked RADIO HANDSET.

d. The procedure for determining the distance between an array and another point with Radio Set SCR–300–A is similar to that used with the wire-line method (par. 33*a*(1) through (13)). The procedure for finding azimuth is explained in detail in paragraph 32*a*. For instructions on the operation of Radio Set SCR–300–A, refer to TM 11–242.

35. Determining Base Line Distance and Azimuth

a. WIRE-LINE METHOD. There are two methods, when a wire line (Reel Equipment CE–11) is used, for determining the base line distance and azimuth. One method is explained in detail in paragraph 33, in which point P (fig. 27) is actually at the microphone M3 position of the second (R) array. Performing the same steps at the second (R) array and permitting the point (P) to be located at the microphone M3 position of the first (L) array will be a check on the base line distance. (The azimuth, however, will differ by 180° or 3,200 mils. The smaller azimuth angle, in this case, will be at the left (L) array as shown in figure 28.) In the other method, the telephone is not brought out to the array; instead microphone M3 is utilized in place of the telephone. Interconnections are as shown in figure 23. The shot is fired at each microphone M3 position, and the base line distance and azimuth are similarly determined as indicated above.

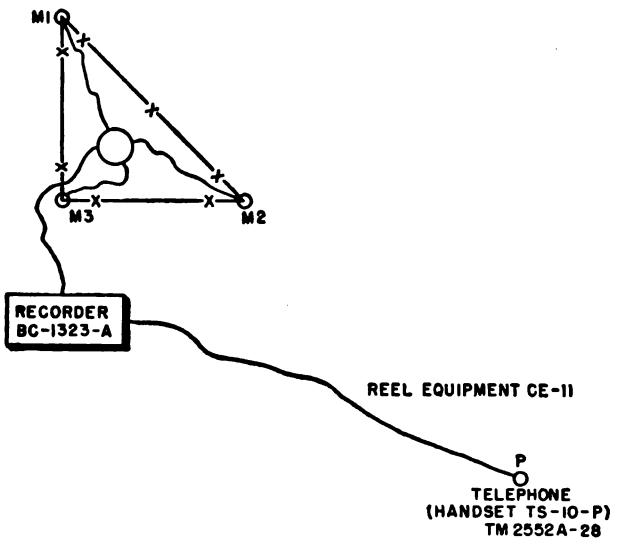


Figure 27. Surveying positions, using wire method.

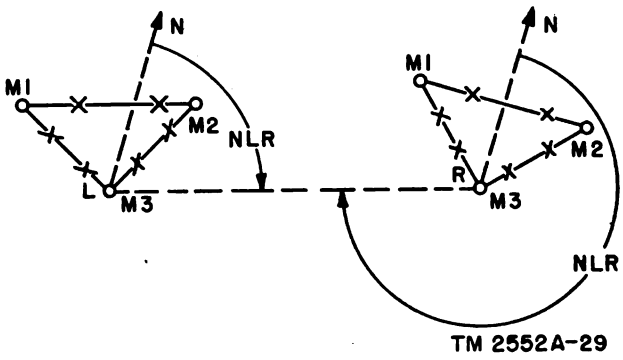


Figure 28. Determining base line between two arrays.

b. RADIO METHOD. The base line distance and azimuth may be determined by means of Radio Set SCR–300–A as outlined in paragraphs 32 and 34, respectively. However, it may be advantageous in some instance to determine the base line distance without transporting the radio set to the array positions. The procedure, in this case, is as follows:

(1) Interconnect the equipment as shown in figure 24, but *omit* connecting the RELAY plugs of Cords CD–1444 to the radio sets and handset plugs (PL–068) to the recorders.

(2) Assume the sidearm will be fired at the M3 position of the left array. Set the left array recorder controls as follows:
   (*a*) Power switch (S7) to the OFF position.
   (*b*) RADIO—SURVEY—OFF switch (S4) to the OFF position.
   (*c*) Stop button switch on Cord CD–1240 pushed in to start the transmitter.

(3) The right array recorder RADIO—SURVEY—OFF switch (S4) is placed to the SURVEY position.

(4) The procedure for determining the base line distance at the right array is

similar to that for wire-line operation (par. 33*a*(4) through (13)).

(5) Then check the base line distance at the right array.

36. Surveying with Plotting Board M–10

After the azimuth of the target blast from each array position (par. 32), the azimuth and distance of the base line, and the azimuth and distance of the counter battery (CB) have been computed, plot these points (fig. 29) on Plotting Board M–10 to locate the target (T). Figure 29 is set up as an example, with *given* values, to illustrate the procedure. Use figure 29 in conjunction with the subparagraphs below.

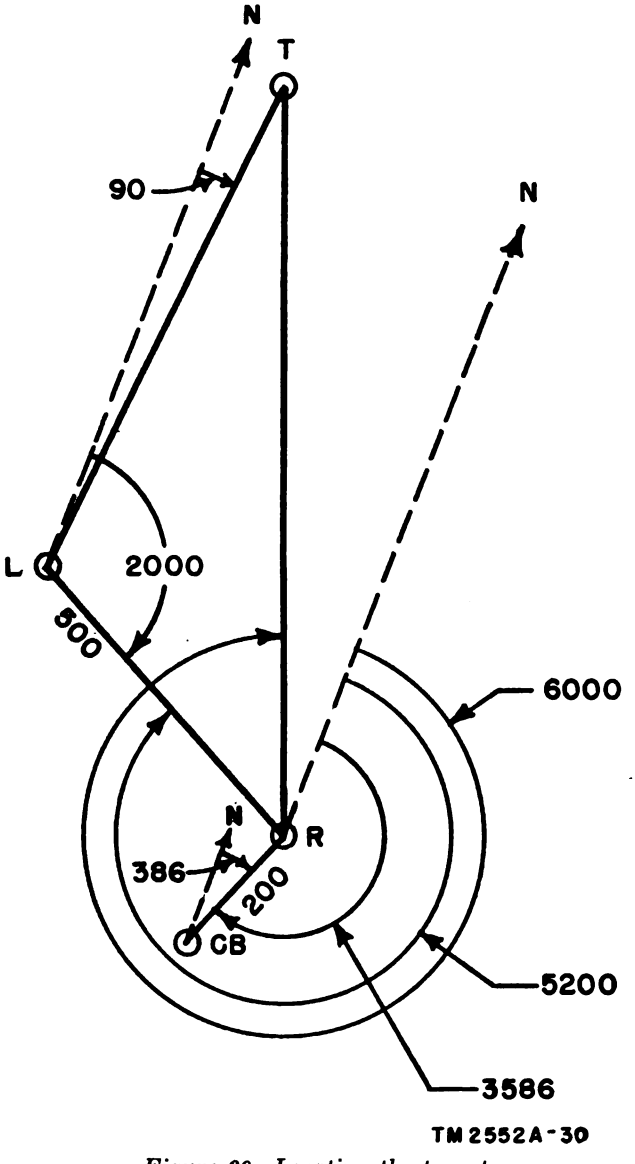


Figure 29. Locating the target.

a. LAYING OFF CB–R AZIMUTH. A vernier scale has been provided at the edge of the base, opposite the index arrow, in order to obtain greater accuracy when laying off azimuths which require interpolation between gradations of the mil scale. The method below ((1) through (3)) illustrates, for example, the steps to be taken to plot the array positions and azimuth angles so that the target range and azimuth (from the counter battery position) can be read off the plotting board.

(1) Set the gradation on the scale which represents 380 mils opposite the 0 (red) line of the vernier scale (A, fig. 30).

(2) Count, on the vernier scale, six lines to the right from the 0 line.

(3) Note the line on the mil scale which lies next to, and outside, the 6-mil line (the line further) on the vernier scale and rotate the top dial until the two lines coincide. The azimuth is now directly opposite the index arrow as shown in B, figure 30.

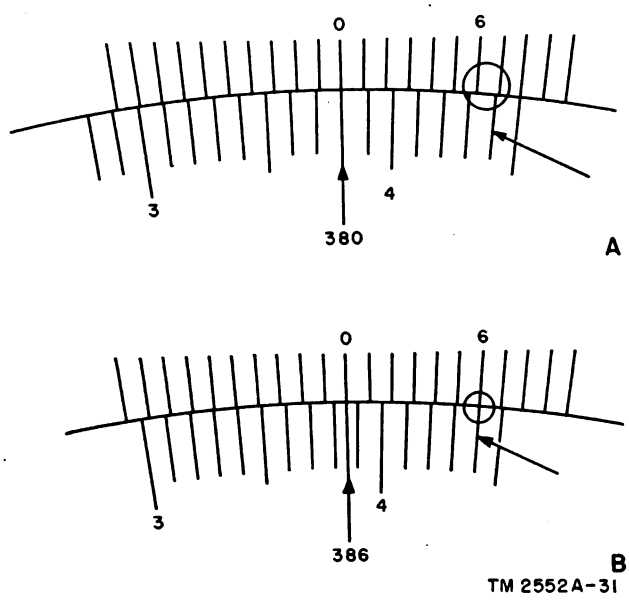


Figure 30. Using the vernier scale on Plotting Board M–10.

b. PLOTTING RIGHT ARRAY POSITION. To plot the right array, position R (after the dial has been set to the azimuth of the CB–R line), simply measure along the index line, using the normal value of the grid squares for ranges less than 2,000 yards, or using double the value of

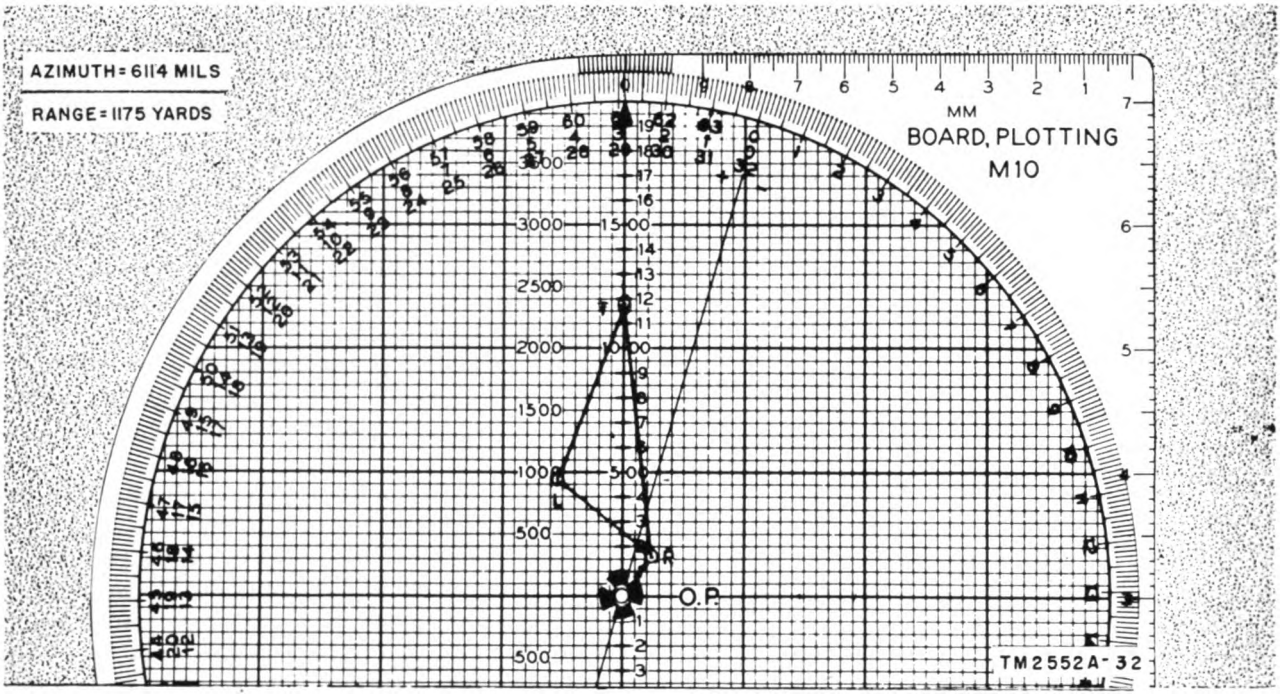


Figure 31. Determining target range and azimuth on Plotting Board M–10.

the grid squares for ranges greater than 2,000 yards. Place a pencil mark directly on the index line at the given distance (200 yards).

c. PLOTTING LEFT ARRAY POSITION. To plot the left array, position L, rotate the dial so that the index line is at the azimuth of the base line R–L (5,200 mils). At point R, draw a straight line parallel to the index line. Plot point L at the given distance (500 yards).

d. PLOTTING AZIMUTH ANGLES FROM ARRAYS TO TARGET. Rotate the dial so that the index line is set at the azimuth of the target from the R array (6,000 mils). From point R, draw a line parallel to the index line. Rotate the dial so that the index line is set at the azimuth of the target from the L array (90 mils). From point L, draw a line parallel to the index line. The intersection of these two lines fixes the target position.

e. READING AZIMUTH AND RANGE OF TARGET. Set the target point over the index line (fig. 31). Read the target azimuth angle from the counter battery position (6,114 mils). Read the target range from the counter battery (1,175 yards).

37. Summary of Computation Procedure (fig. 29)

The following is a summary of a complete computation procedure:

a. Find the azimuth of the target from the right and left arrays (par. 32).

b. Find the azimuth of and the distance from the counter battery position (CB) to the right array (par. 33 or 34).

c. Find the azimuth and distance of the base line (par. 35).

d. Plot the counter battery (CB), the right array (R), the left array (L), and the target (T) positions on Plotting Board M–10 by following the steps as outlined in detail in paragraph 36.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. PREVENTIVE MAINTENANCE SERVICES

38. Definition of Preventive Maintenance

Preventive maintenance is scheduled work performed on equipment during shut-down periods to keep it in such good working order that breakdowns and needless interruptions in service will be kept to a minimum. Preventive maintenance differs from trouble shooting and repair in that it eliminates certain troubles before they occur.

39. Tools and Parts Supplied

Tools for maintenance are supplied with each Sound Locating Set GR–6–A. The spare parts are listed in paragraph 17.

40. Performing Preventive Maintenance

Perform the preventive maintenance operations listed in *a* through *c* below at the intervals indicated, unless otherwise ordered by the local commander. Preventive maintenance for Radio Set SCR–300–A, Power Unit PE–210, and Batteries BB–54 and BB–221/U must be performed as described in TM 11–242, TM 11–947, TB SIG 90, and TM 9–2857, respectively.

a. DAILY.

(1) Check the cords and cables for abrasion and wear. Check connector plugs and receptacles.
(2) Check the counter pilot lamps.
(3) Check the battery level.
(4) Check for battery corrosion and loose connections at terminals.

b. MONTHLY. Disconnect all power before performing the operations below ((1) through (5)). Upon completion, reconnect the power and check for satisfactory operation.

(1) Inspect the filter capacitors for leakage of oil or dielectric, for bulging, and for heating.
(2) Inspect the transformers for excessive heating.
(3) Inspect the fuses and fuseholders for corrosion, cracks, and lack of tension sufficient to insure good contact.
(4) Test the vacuum tubes; replace them if necessary.
(5) Check and remove the accumulation of sludge from the recorder and reproducer pole pieces with Solvent, dry-cleaning (SD), and a clean, lint-free cloth.

c. QUARTERLY. Make a visual inspection of the following parts for the defects listed and correct them if necessary:

(1) Tube sockets and pins for loose contacts, dirt, and corrosion.
(2) Filter capacitor terminals for corrosion.
(3) Resistors for blistering, discoloration, and other evidence of overheating.
(4) Switches for dirt, corrosion, loose contacts, and lack of snap action.
(5) Multiple connectors for dirt, corrosion, and loose contacts.
(6) Wires, cords, and cables for cracked, cut, or frayed insulation.
(7) Terminal boards for cracks, dirt, and loose connections.
(8) Potentiometers for lack of smooth electrical and mechanical operation.
(9) Mountings, machine screws, and nuts for mechanical looseness.
(10) All visible terminals and connections for loose connections and corrosion.
(11) Varnish film (MFP) for breaks. (Retouch with a brush if necessary.)
(12) Finish for scratches and bare spots. (Retouch if necessary.)
(13) Insulators (terminal blocks) for cracks and dirt.

(14) Selenium rectifier for loose connections and dirt.
(15) Relay contacts for pits or build-ups and for improper alinement. (Consult TM 11–4302 for this information.)

Section II. LUBRICATION AND PRESERVATION

41. Lubrication

a. GENERAL. Personnel responsible for lubricating Sound Locating Set GR–6–A must be careful to apply lubricant only to the points indicated. Excess lubricant must always be removed.

b. METHOD OF APPLYING LUBRICANT. Dip a No. 22 gage wire about one-half inch into the oil. Withdraw wire and apply the oiled tip to the point specified. Use a clean, lint-free cloth to remove excess lubricant.

c. METHOD OF CLEANING PARTS WITH SOLVENT (SD). Wipe parts with a dry, lint-free cloth and then with solvent (SD). Pour a small quantity of solvent (SD) onto a clean part of the cloth or brush and apply the cloth or brush to the part. Remove the cleaning residue with a dry part of the cloth. Always clean before applying the lubricant (if cleaning and lubricating are specified).

d. FREQUENCY OF LUBRICATION. Apply lubricant and clean the recorder at least once every month (weekly in tropical areas).

e. RECOMMENDED LUBRICANT AND CLEANER. Sound Locating Set GR–6–A requires the use of the following:

Approved symbol	Standard nomenclature	Stock No.
PL–special	Oil, lubricating, preservative special (4-oz. can).	14–O–2833–944 (Ord.)
SD	Solvent, dry-cleaning	51–S–4385–1 (QMC).

f. LUBRICATING DETAILS. Refer to figure 32 for location of the following parts which require lubrication:

(1) *Hinges.* Apply 2 drops of oil (PL–Special) along each hinge. Remove excess oil with a clean cloth.
(2) *Counter assemblies.* Apply 1 drop of oil (PL–Special) to the pinion shaft at the point indicated.
(3) *Magnetic tape and pole pieces.* Remove the tape (par. 60). Wipe the accumulation of dirt from the tape and the recorder and reproducer pole pieces with solvent (SD) and a clean, lint-

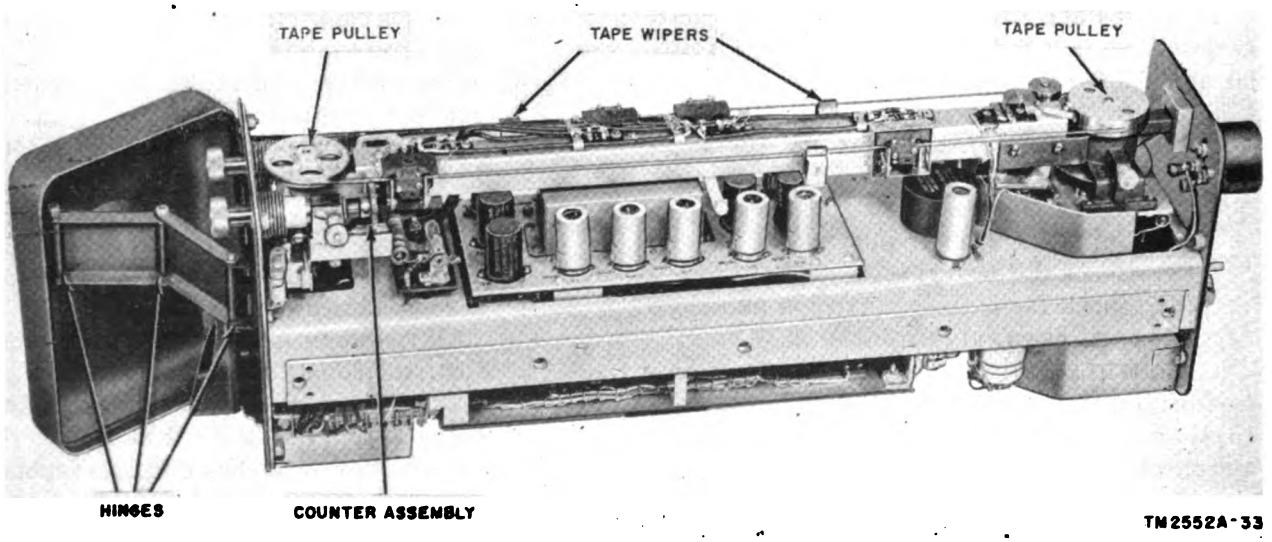


Figure 32. Location of lubricating points.

free cloth. After the pole pieces are thoroughly cleaned, apply oil (PL–Special) to each of the pole pieces and their pivots.

(4) *Scanning wheel.* Apply 2 or 3 drops of oil (PL–Special) in the hole next to the shaft.

(5) *Tape pulleys.* Put 2 or 3 drops of oil (PL–Special) in each of the two holes in the pulley above the dynamotor. Put the same amount of oil in the hole alongside the shaft of the pulley above the counter assemblies.

(6) *Tape wipers.* Apply 1 drop of oil (PL–Special) to each felt wiper pad.

42. Weatherproofing

a. GENERAL. Sound Locating Set GR–6–A, 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 of the materials used in the construction of the equipment.

b. TROPICAL MAINTENANCE. Although the sound locating set is moistureproofed and fungiproofed, additional treatment may be required in the field as a result of damage to the protective varnish film. A special moistureproofing and fungiproofing treatment has been devised, which, if properly applied, provides a reasonable degree of protection. This treatment is fully explained in TB SIG 13 and TB SIG 72.

c. WINTER MAINTENANCE. Special maintenance information, useful under arctic conditions, is contained in TB SIG 66.

d. DESERT MAINTENANCE. Special precautions necessary to prevent equipment failures in areas subject to high temperatures, low humidity, and excessive sand and dust are fully explained in TB SIG 75.

e. LUBRICATION. The specified lubricant oil (PL–Special) (par. 41) will provide adequate lubrication under abnormal operating temperatures such as may prevail in the arctic and desert areas.

CHAPTER 4

FIELD MAINTENANCE INSTRUCTIONS

Section I. GENERAL

43. Field Maintenance Service

a. PURPOSE. The repair instructions in this chapter are intended for use by field maintenance personnel trained and equipped to handle complex repairs requiring special equipment not generally available to organizational maintenance personnel.

b. SCOPE. The scope of repairs that may be performed by units having field maintenance responsibility is limited only by the tools and test equipment available and by the skill of assigned personnel.

44. Recorder Mechanism

a. The recorder mechanism consists of a loop of magnetic steel tape, two pulleys on which the tape runs, three recorder-reproducer heads, three erase heads, a pip signal head, three tape wipers, a tape-tension adjusting mechanism, a dynamotor, a magnetic clutch, and a scanning wheel. When the covers and tape guard are removed, all except the scanning wheel may be seen.

b. The magnetic steel tape is an endless loop .002 inch thick, .050 inch wide, and 48 inches long. It is on this tape that the signals, picked up by the three microphones, are recorded. Figure 46 illustrates the tape stretched between the two pulleys which are mounted on a square tube. Note also the magnetic heads and other components mounted on this square tube.

Section II. THEORY OF OPERATION

45. Overall Theory of Operation

a. RECORDING PROCESS. The three signals from the microphone array are fed through the main control lever, S1, to the primaries of three input transformers T1, T3, and T5. The outputs of the transformers are then fed into three separate amplifier channels as shown in the block diagram (fig. 33). The output signal of each amplifier is routed to its respective output transformer and immediately recorded on the magnetic tape loop by three separate recorder-reproducer heads RH1, RH2, and RH3. Under normal conditions of recording, the tape is automatically erased before recording, since the location of the erase heads immediately precedes the recording heads in the direction of travel of the tape. An additional amplifier V10 is used to make the signals audible in the headset. A fourth head placed in advance of the recorder-reproducer head No. 3 is used to record a pip signal so that identification of the recorded signals can be made easily. An oscillator, V11, is used to supply the necessary erase and bias currents.

b. PLAY-BACK PROCESS. When the main control lever, S1, is placed in the RUN position, the signals that were recorder on the steel tape can be played back and observed on the oscilloscope screen as well as heard on the headset. Each position of the play-back control lever, S2, permits the output from a pair of recorder-reproducer heads to be fed to opposite amplifiers. (The exchange of the amplifiers tends to cancel out any phase and amplitude errors inherent in the amplifier channels.) The reproduced signals after being amplified are fed to two deflection plates of the oscilloscope. The open patterns generally obtained on the scope indicate that the signals, although identical in form, are not

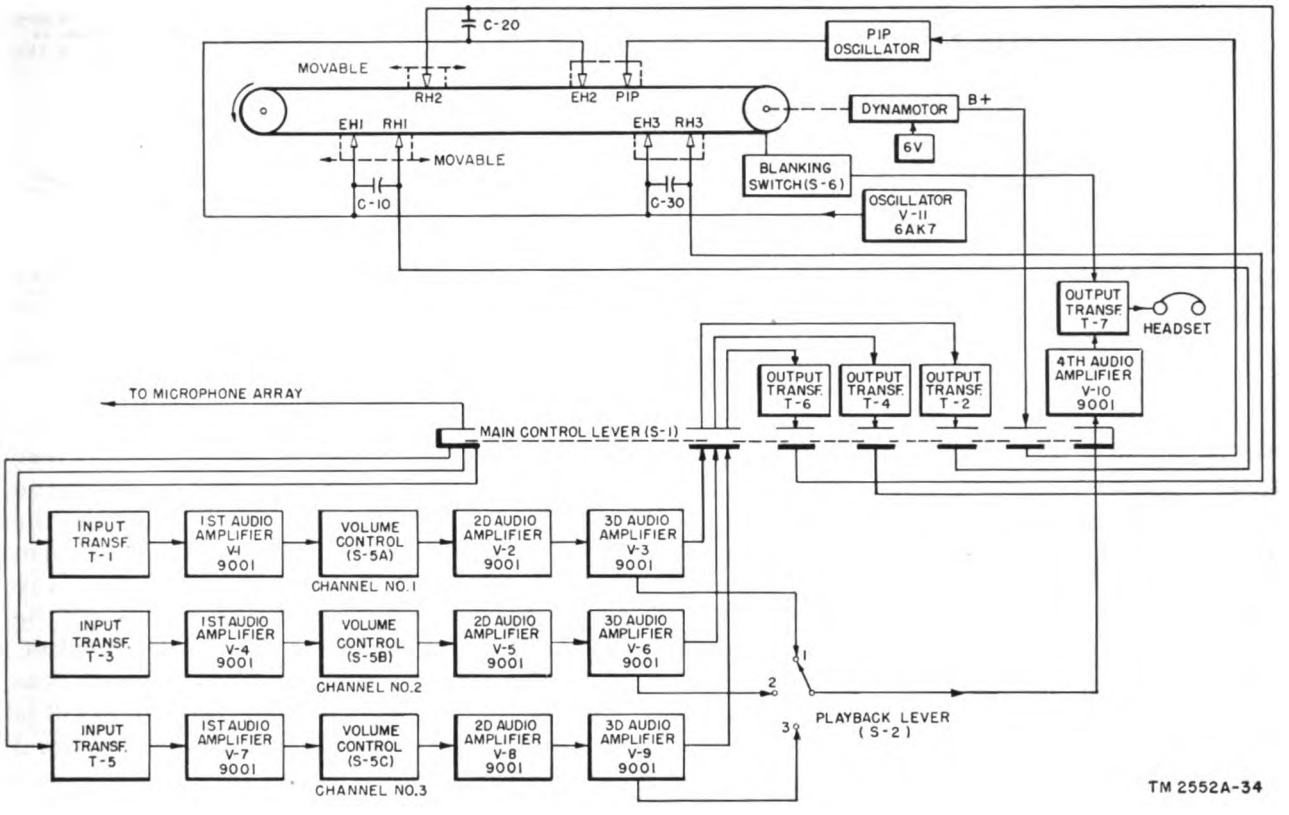


Figure 33. Recording operation, block diagram.

being reproduced simultaneously. However, adjustment of the counters so that a straight-line pattern appears on the scope indicates that two signals are being reproduced simultaneously, despite the fact that they were not recorded simultaneously because of time differences in the arrival of the sound wave at the two corresponding microphones of the array. The counters actually change the position of the movable heads along the tape and represent the time difference in arrival of the sound wave at the microphones.

c. COMPUTING PROCESS. The azimuth angle of the sound blast is determined by means of Computor M–414. Setting up the azimuth of the M1–M3 line as a reference and plotting the counter readings enable the computor to determine the azimuth angle of the sound blast. Duplicating the procedure at the other array position determines another azimuth angle of the same sound blast. The base line and counter battery positions then are drawn on Plotting Board M–10. The azimuth angles of the sound blast from the counter battery position then is easily read off the plotting board.

46. Amplifier Channels

a. The three amplifier channels Nos. 1, 2, and 3 are identical and are matched in gain, frequency response, and phase shift. Consequently, one simplified schematic drawing (fig. 34) is used for functional explanation of its circuits.

b. Channel No. 1 consists of a three-stage, resistance-coupled amplifier using type 9001 pentode tubes (V1, V2, and V3). The gain of the amplifier is varied by an adjustable voltage divider (VOLUME control (S5A)) in the control grid of the second stage (pin No. 1 of tube V2). Seven fixed steps of attenuation, 6 db each, provide a total gain variation of 36 db. Since the maximum energy of muzzle blasts of small arms fire lies in the frequency range from 60 to 300 cycles, the amplifier has been designed so that its response is uniform within these limits in order to reduce, to a minimum, extraneous noises which would make adjustment of the counters difficult. The low-pass filter (R–C (resistance-capacitor) networks, R1–C1 and R16–C6) in the grid circuit of the first and third stages and the plate-load capacitor, C7, in the

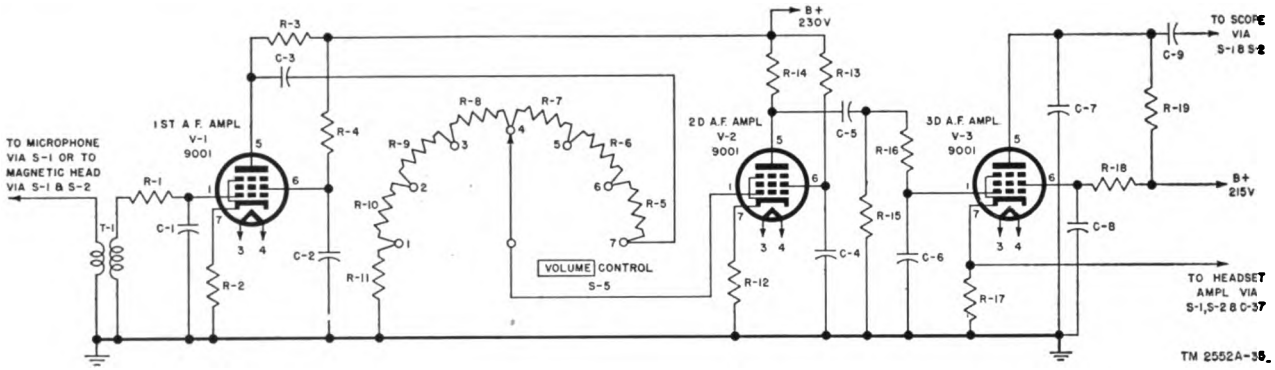


Figure 34. Recorder BC–1323–A, schematic diagram of one amplifier.

output of tube V3, are used to achieve the desired frequency response.

c. When the main control lever (S1) is in the REC position, the signal from microphone M1 is fed to channel No. 1 through input transformer T1. After passing through channel No. 1, the signal is fed to another section of the main control lever and then through V3 plate-load resistor R20 and output transformer T2. The plate-load resistor R20 forms the major part of the load impedance for the output stage and is selected high enough (220K) in relation to the reflected impedance of the output transformer primary (50K) to mask the variation due to the recorder-reproducer head and to maintain the constant output current required for a uniform recorded frequency response. Signals from any microphone can be selected by means of the playback control lever and heard in the headset. To monitor microphone No. 1, the playback control is placed in position 1; microphone No. 3 is monitored in position 3; and microphone No. 2 is monitored in position 2.

d. When the main control lever (S1) is in the

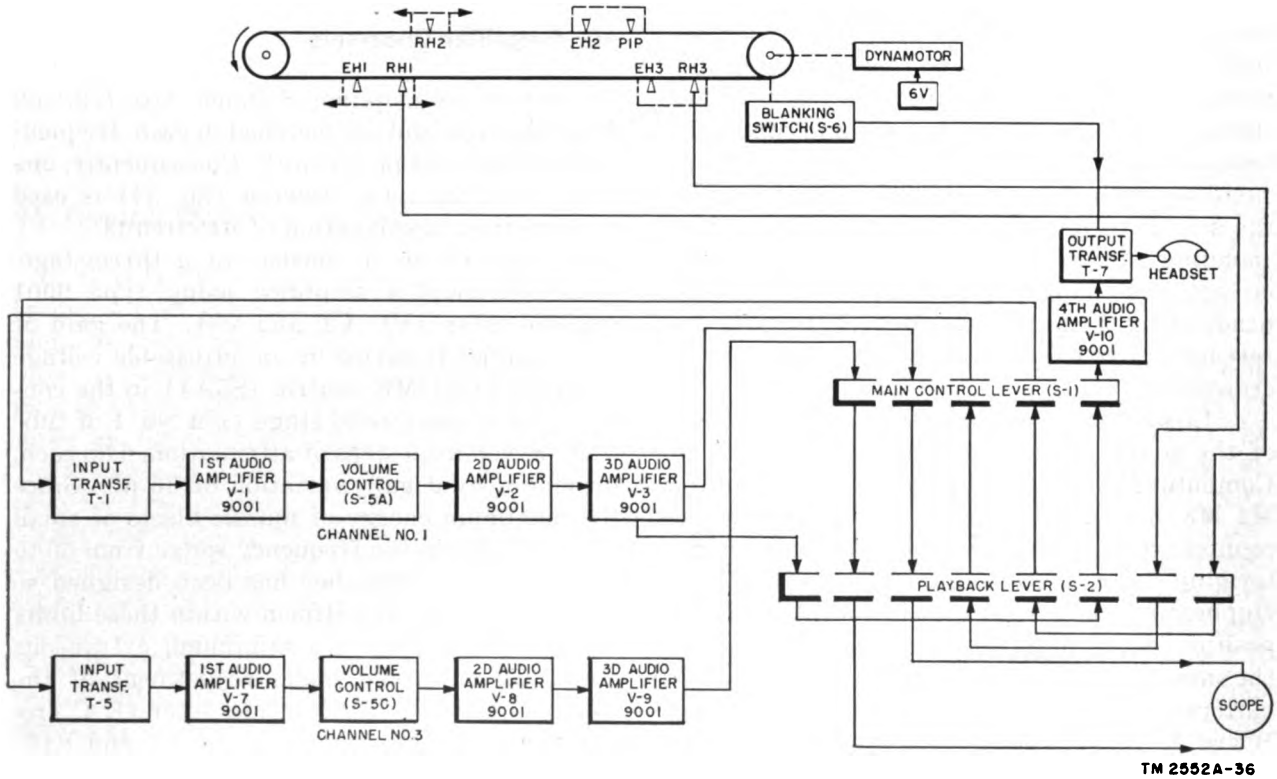


Figure 35. Recorder BC–1323–A, circuits used with playback lever in 1–3 position, block diagram.

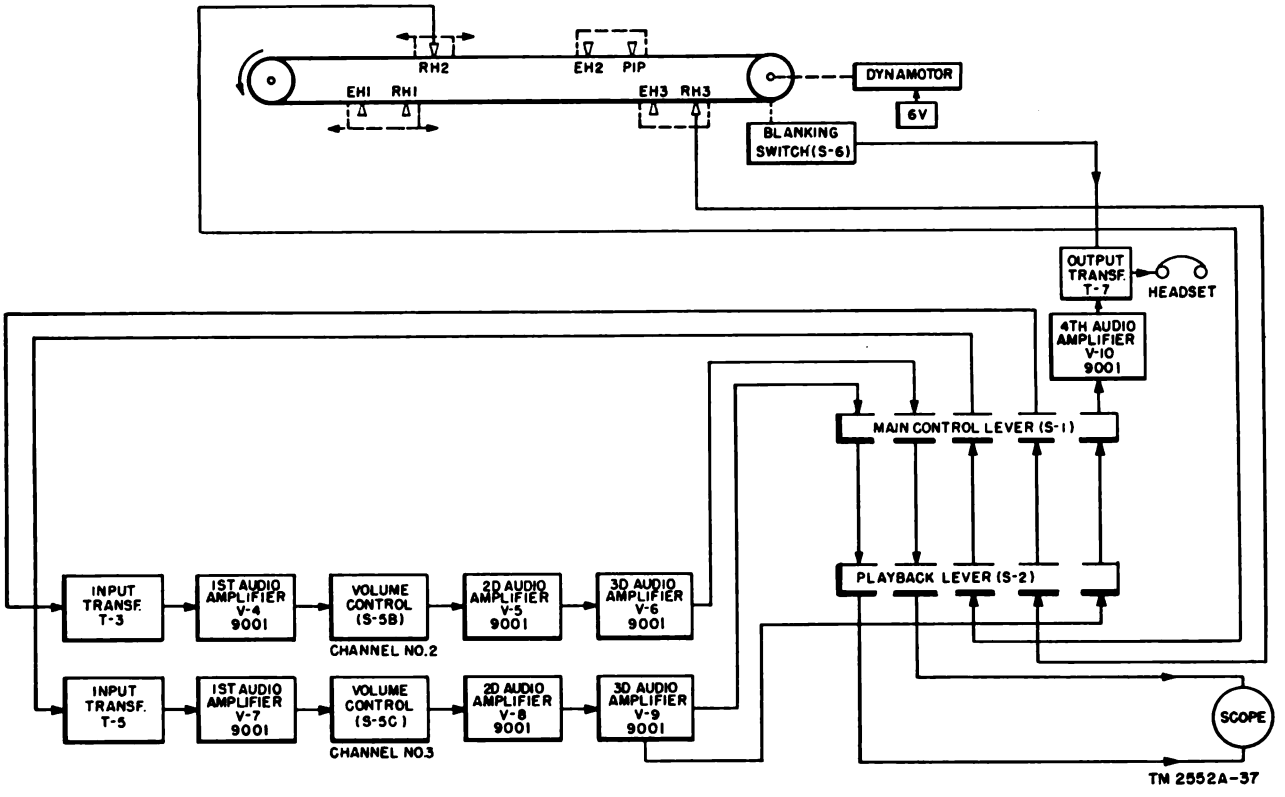


Figure 36. Recorder BC–1323–A, circuits used with playback lever in 2–3 position, block diagram.

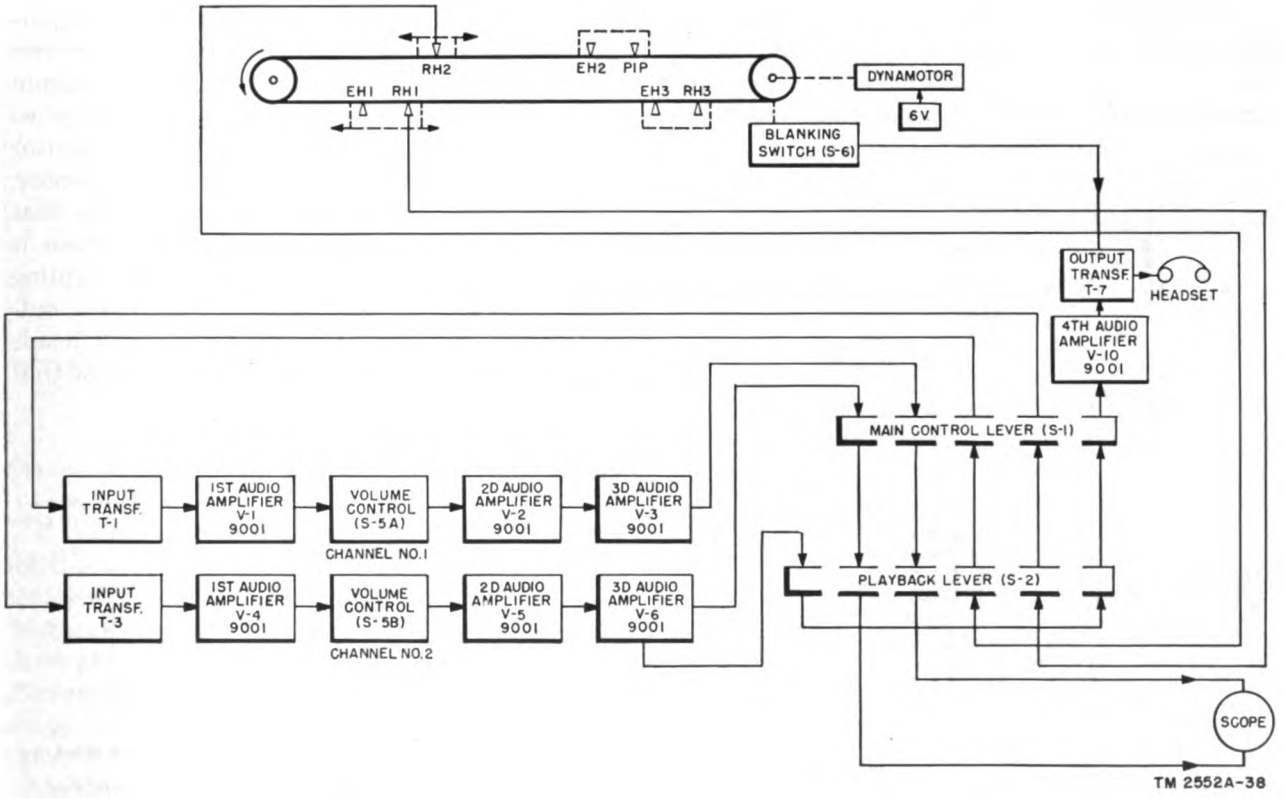


Figure 37. Recorder BC–1323–A, circuits used with playback lever in 1–2 position, block diagram.

STOP or RUN position, the output from a pair of recorder-reproducer heads is fed to opposite amplifiers as shown in the block diagrams (figs. 35, 36, and 37). In the 1–2 position of the play-back lever (S2), the recorded signals are being reproduced in the headset amplifier through reproducer head RH1, in the 1–3 position through reproducer head RH3, and in the 2–3 position through reproducer head RH2.

47. Headset Amplifier and Blanking Switch

a. To monitor the microphones or heads, without disturbing the amplitude and phase response of any channel, an isolation amplifier (fig. 38) is used to feed Headset HS–30–U. By means of the play-back switch the cathode of the third stage of each amplifier is coupled through capacitor C37 to the control grid (pin No. 1) of tube V10. The plate load of the tube consists of capacitor C40, inductance L3, and transformer T7. Capacitor C40 and inductance L3 resonate at approximately 500 cycles giving a uniform overall response (from channel inputs to the headset output) up to 700 cycles. This extended range is necessary to increase the audibility of the signals for monitoring.

b. Capacitor C36 and transformer T7 couple the output of tube V10 to PHONES jack J5. However, the secondary of the transformer is grounded only through the blanking switch, S6.

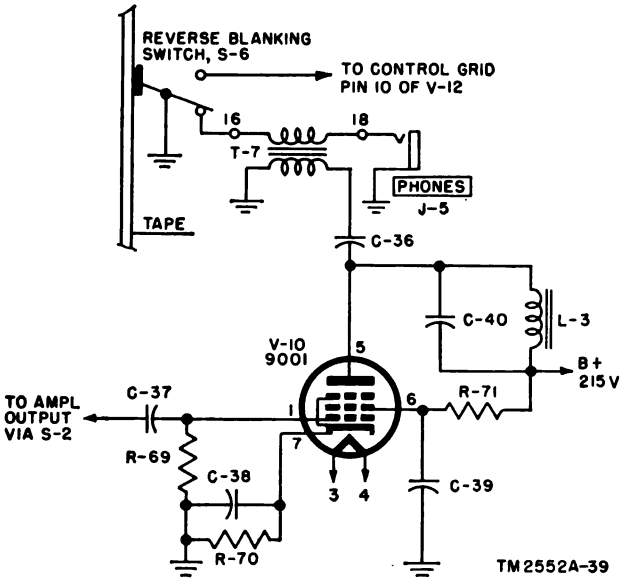


Figure 38. Headset amplifier and blanking switch, simplified schematic diagram.

This switch performs a dual function when making measurements on the recorded signals.

c. In the forward motion of the scanning wheel (direction of tape travel during recording), the blanking switch grounds the secondary, thus completing the headset amplifier circuit. In the backward motion of the scanning wheel, the blanking switch opens the amplifier circuit and transfers the ground to the control grid (pin No. 10) of the cathode-ray tube, V12, thus effectively biasing it to cut-off. Hence, the operator sees and hears the signal as it was originally recorded.

48. Bias and Erase Oscillator

Tube V11, 6AK6, supplies both the bias and the erase current for the recording system as well as high voltage for the cathode-ray tube accelerator anode (pin No. 7). Audio frequency oscillator V11 is connected as a triode (fig. 39); the screen (pin No. 6) and the suppressor grid (pin No. 2) are tied to the plate (pin No. 5). Its resonant frequency, approximately 8,000 cycles, is determined by the tank circuit consisting of tapped inductance L2 and capacitor C42. The absolute frequency is not important and may vary by 1,000 cycles without affecting performance of the equipment, provided the frequency is reasonably constant and the output voltage is stable. Positive feedback is applied to V11 control grid through coupling capacitor C41. Voltage drop across the grid-leak resistor, R72, develops grid bias for the tube. The bias and erase voltage for the recording system is taken from the plate circuit through coupling capacitor C31. A portion of the oscillator output is also fed to the recorder-reproducer heads (through capacitors C10, C20, and C30), so that

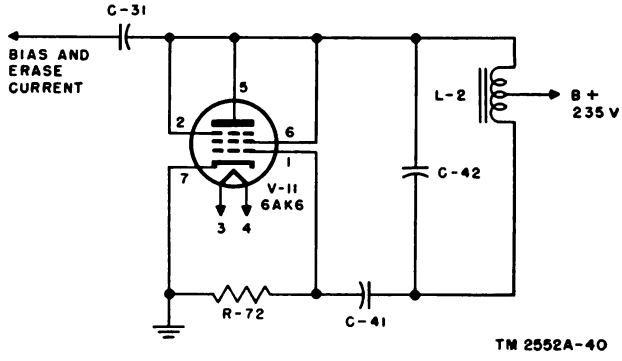


Figure 39. Bias and erase oscillator, simplified schematic diagram.

both the audio signal and the 8,000-cycle biasing voltage are present simultaneously during recording. This high-frequency biasing voltage on the heads results in a better signal-to-noise ratio and less distortion.

49. Pip Signal

a. Identification of the signals would be practically impossible were it not for the tone or pip signal recorded on the steel tape during the recording process. This identifying signal is generated by a 250 cps (cycles per second) relaxation oscillator consisting of resistor R78, capacitor C51, and glow tube E6, as shown in the simplified schematic (fig. 40). The *pip* head (mounted on the same base with the No. 2 erase head) is placed between the recorder-reproducer heads Nos. 2 and 3 and records the continuous identifying tone whenever the main control lever (S1) is in the REC position. On playback, the recorded signals appear in the scope and headset in the following sequence: pip, 3, 1, 2; pip, 3, 1, 2; etc. Since the pip head is mounted slightly in advance of the No. 2 erase head, the erase head clears everything off the tape except the small portion between the heads.

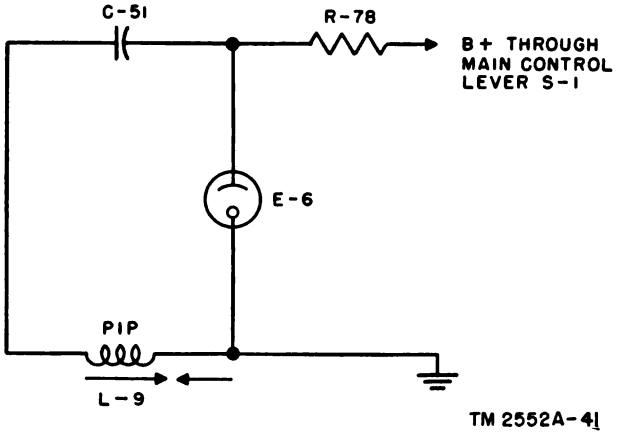


Figure 40. Pip circuit, simplified schematic diagram.

b. When the main control lever, S1, is in the REC position, the glow tube, E6, shunted across series-connected capacitor C51 and pip head inductance L9, is connected to the B+ supply through resistor, R78. Hence, the B+ supply charges the capacitor. When its voltage becomes equal to the starting (ignition) voltage of the tube, the glow discharge takes place and the capacitor discharges through the tube down to a voltage equal to the extinction potential at which the tube goes out and the capacitor begins recharging again. This charge and discharge cycle (250 cps) is repeated continuously as long as the supply voltage is maintained. The current flowing through the pip head records this 250-cps rate as an audible tone.

50. Power Supply and Voltage Doubler

a. All plate and screen voltages for the recorder unit are obtained from the 230-volt, d-c output of the dynamotor, D1. The heater voltages are provided by the 6-volt battery supply. The higher accelerating voltage necessary for the cathode-ray tube is obtained by the addition of a half-wave voltage doubler circuit to the two filter sections of the power supply as shown in figure 41.

b. Operation of the voltage doubler is as follows: assume for the initial half cycle that point A on the oscillator tank circuit is positive with respect to point B. Current then flows through the selenium rectifier, CR1, and charges capacitor C43 to the oscillator peak voltage. During the next half-cycle as point B becomes positive with respect to point A, the charge of capacitor C43 will add its potential to that of point B and current will flow through the selenium rectifier, CR2, thus charging capacitor C47 to twice the oscillator voltage. Since the common input and output terminal, point D, of the voltage doubler circuit is in series with the dynamotor output supply, the total voltage at point C is equal to the sum of the voltages of the dynamotor output and the voltage doubler.

51. Cathode-ray Tube
(fig. 42)

a. The control grid bias and focusing voltage for the cathode-ray tube, V12, type 2AP1-A, is obtained from the voltage divider consisting of two potentiometers, R68 (FOCUS control) and R66 (INTENSITY control), and resistor R67. For operation, the focusing anode (pin No. 4) is approximately 100 volts positive (terminals 28 to 27) with respect to the cathode (pin No. 2); its value is adjusted by means of the FOCUS control, R68. The control grid (pin No. 10) is approximately 10 volts negative (terminals 26 to 27) with respect to the cathode; its value is adjusted by means of the INTENSITY control,

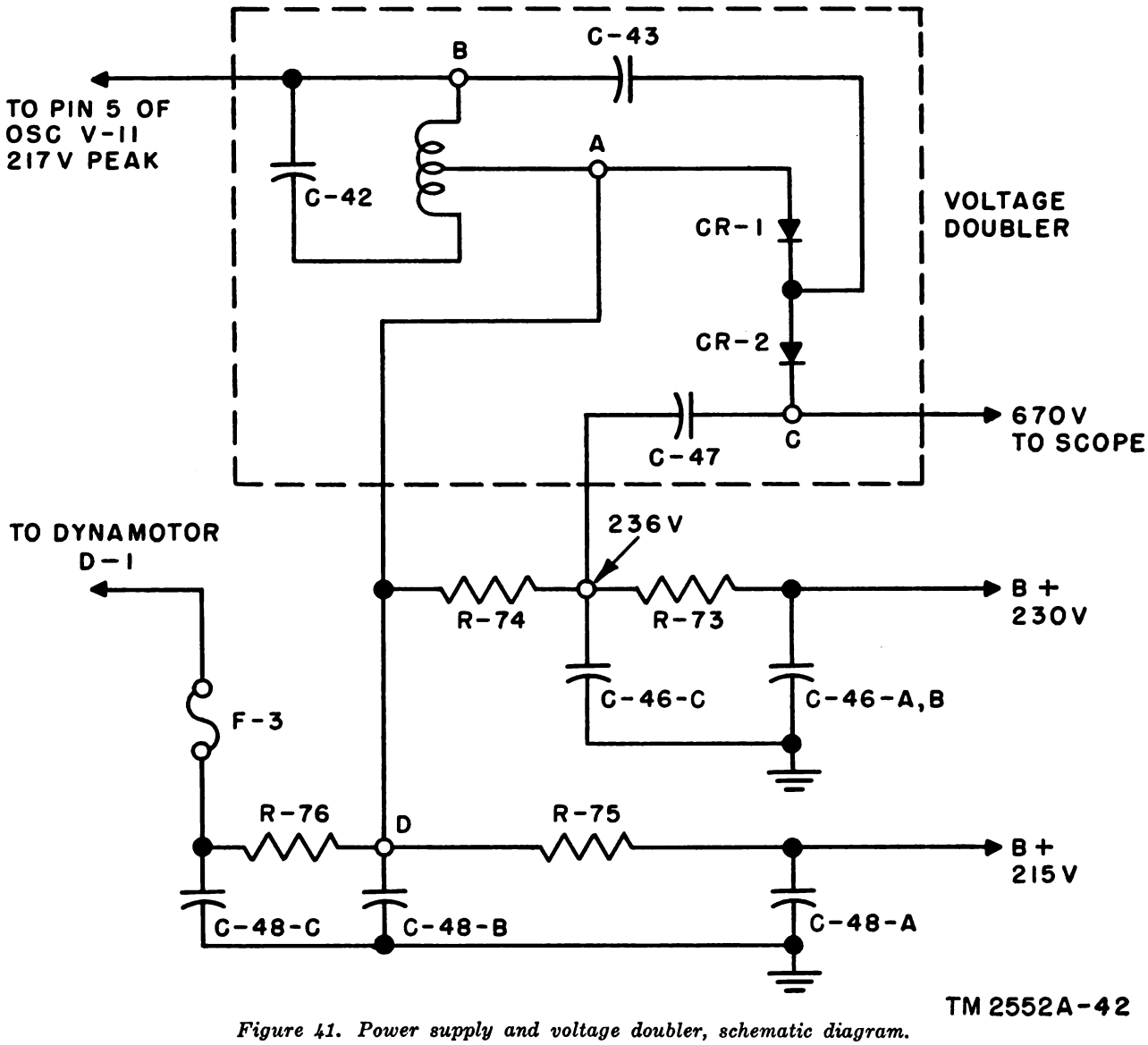


Figure 41. Power supply and voltage doubler, schematic diagram.

R66. When the main control lever (S1) is set on REC, the control grid becomes grounded. The increased grid-to-cathode potential effectively biases the control grid to beam cut-off. A resistor, R65, is used as a current limiting resistor.

b. The output from a pair of amplifiers (selected by the main control lever (S1) and playback lever (S2)) is connected to the deflection plates (pins No. 3 and 9) of the cathode-ray tube through coupling capacitors C32 and C33. Each deflection plate has a low-pass, R–C network (R61–C35, R63–C34) to provide additional high-frequency attenuation to that obtained in the amplifier circuits. The deflection plates are at the same d-c potential as the accelerator anode (pin No. 7) through resistors R62 and R64.

Section III. PREREPAIR PROCEDURES

52. Test Equipment Required

To service Sound Locating Set GR–6–A properly, the test equipments listed below are essential. Most troubles can be traced with the Multimeter TS–297/U which is furnished as a component.

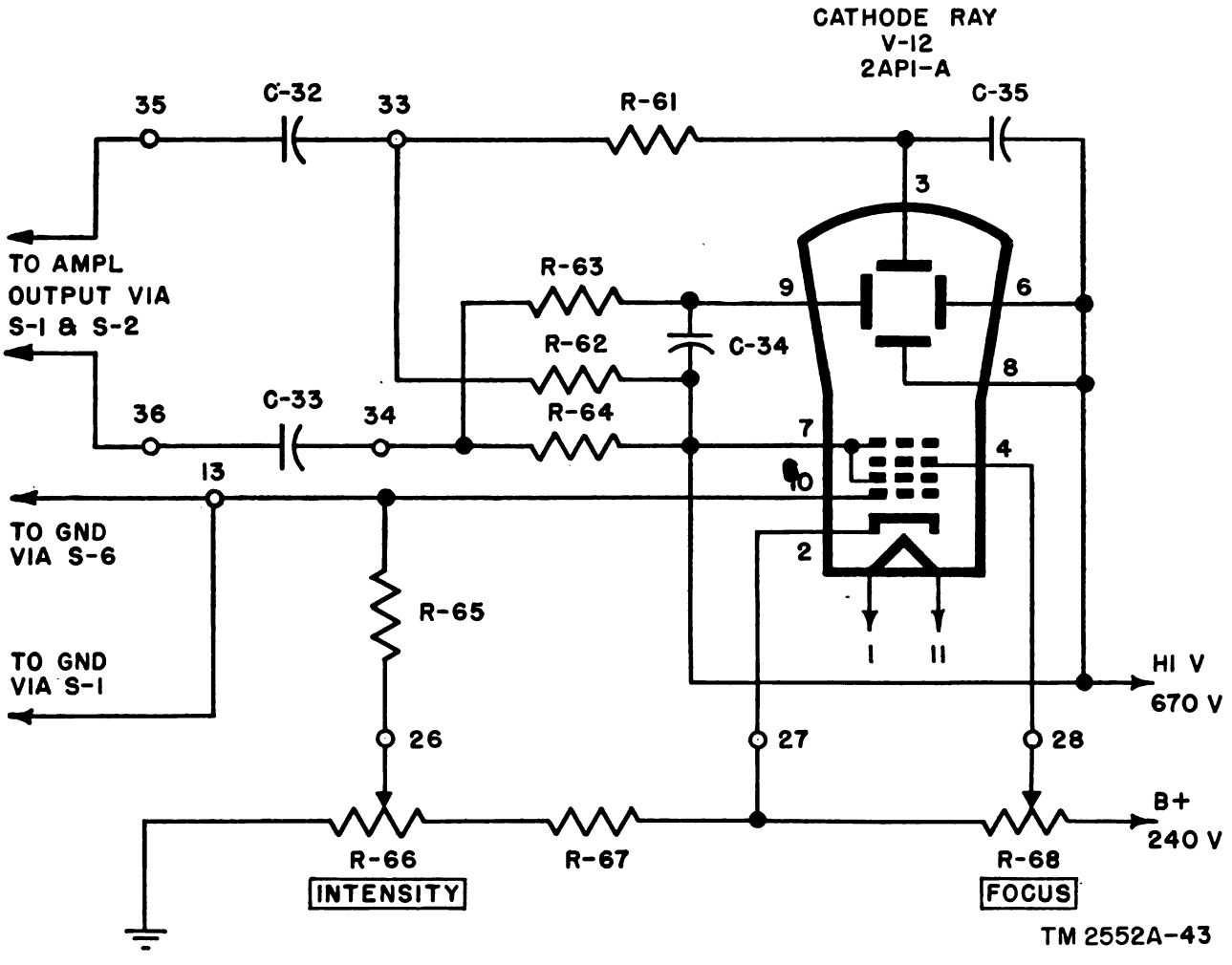


Figure 42. Cathode-ray tube circuit, schematic diagram.

Signal Corps stock No.	Item	Used for	Remarks
3F4325–297	Multimeter TS–297/U	Checking against voltage resistance charts.	Furnished with equipment.
3F3559	Oscillator I–151 or equal	Audio tests	
3F3630–1060	Oscilloscope BC–1060 or equal	Checking tape speed and signal tracing.	
3F4325–505	Electronic Multimeter TS–505/U	Making gain measurements	Vacuum-tube voltmeter should have at least 10-megohm input impedance.

53. Power Requirements

A power source of 110-volt, 60-cycle ac (alternating current) is required for the test equipment listed in paragraph 52. A 6-volt battery supply is required for the sound locating set.

54. Opening and Removing Covers of Recorder BC–1323–A

a. To open the front cover, turn the front cover latch counterclockwise and pull the cover *open.*

b. To remove the back cover, turn the back cover latch counterclockwise and pull the cover *off*.

c. To remove the left side cover, loosen the five screws on each side of the recorder until the side cover clamping strips can be pulled away. Place the recorder so that the carrying strap (left side cover) is up. Pull the cover off.

d. To remove the right cover, place the recorder so that this side is up. Pull the cover off.

e. To expose the tape, heads, etc., remove the tape guard by loosening the four knurled nuts shown in figure 22.

Caution: Be careful when removing the tape guard. Carelessness will damage the steel tape, pole pieces, and mechanism.

Section IV. TROUBLE LOCATION

55. General

Faults should be located by following an orderly and systematic procedure with the purpose of first determining whether the trouble is in an input circuit, an output circuit, the power supply circuit, an oscillator circuit, or an amplifier circuit. After the defect is traced to one of these sections, the fault should be isolated further to components, and tubes should be checked. The signal should be traced from stage to stage to determine where the failure occurred. A trouble-shooting chart (fig. 45) is provided to assist in locating faults. Illustrations showing parts location will assist in identifying the various components when voltage and resistance measurements are made. Consult schematic diagrams (figs. 38 and through 42). Block diagrams (figs. 35 through 37) and over-all schematic diagrams (figs. 54 through 62) are also provided.

56. Specific Faults and Remedies

a. MAGNETIC TAPE CONTROL. A relay, O–1, is used to operate the clutch solenoid, L4, in response to 6 volts applied to a telephone (wire) line by means of the stop button switch at a remote point. However, if the relay coil becomes open-circuited or if the contacts fail, remote control of the tape drive becomes impossible. In such a case, the recorder (with the defective coil) should be wired to include a jumper from terminal board, E12 (lug 2), to stop switch, J4 (pin D), and should be used in the control position so that the control operator will be able to

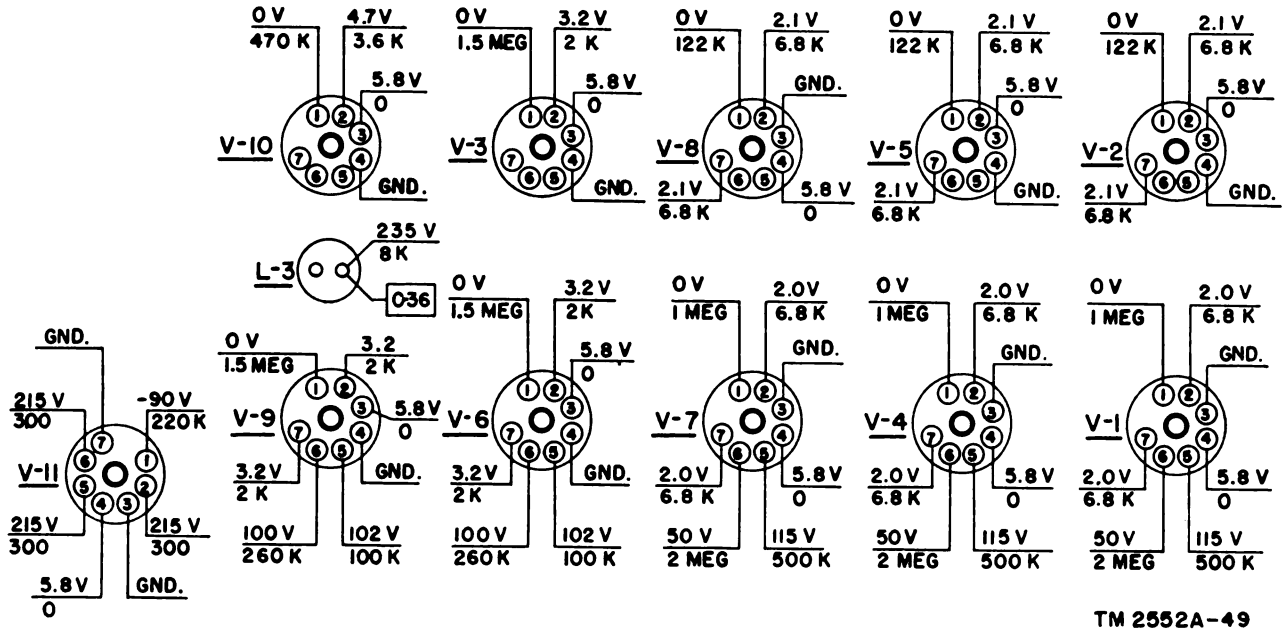


Figure 43. Tube socket voltage and resistance measurements.

stop the recorder at the remote position with the good relay.

Caution: This jumper should be used only in an emergency. The defective coil should be replaced as soon as possible.

b. MICROPHONES AND AMPLIFIERS. Set the main control lever, S1, in the REC position. Note whether a large difference in volume level is noted in the headset as the play-back lever is switched to channels Nos. 1, 2, and 3. An interchange of microphones will show whether differences of response exist between microphones or between amplifier channels. For example, if comparatively low volume response is noted in channel No. 3 and again in channel No. 1 after interchanging microphones M3 and M1, the microphone originally at M3 is defective and should be replaced. On the other hand, if the response in channel No. 3 remains low after interchanging the microphones, channel No. 3 is defective (figs. 43 and 44). Replace the type 9001 tubes. Microphones may be opened and checked (fig. 51).

57. Audio Stage Gain Chart

Note. The audio gain measurements listed are made under the following conditions: All voltages are measured to ground with a vacuum-tube voltmeter having at least a 10-megohn input impedance. Oscillator tube V11 is removed from the socket. Maximum signal fed to the microphone connector, J-1 (pins B, C, and D), is .006 volt at 100 cps. The main control lever, S1, is in the REC position. Signal to heads (at terminals 5, 6, and 8 of E11) = .065 volt.

Stage	Input		Output		Voltage gain
	Pin or terminal	Volts	Pin or terminal	Volts	
T1, T3, T5	3	0.006	6	0.18	30
V1, V4, V7	1	.145	5	3.90	27
V2, V5, V8	1	.060	5	1.56	26
V3, V6, V9	1	1.380	5	25.00	18
V3, V6, V9	2 and 7	1.000			
V10	1	.980	5	18.00	18.2
T7*	5	1.300	1	.07	

* Headset HS-30-U is connected to PHONES receptacle J5.

58. Voltage and Resistance Measurements

The voltage and resistance measurements of Recorder BC-1323-A are shown in figures 43 and 44. Measurements at the cathode-ray tube socket and the terminal boards are listed in tabular form below. Measurement conditions are as follows:

a. Voltage and resistance measurements are taken to ground with a 20,000-ohm-per-volt meter.

b. Battery voltage is 5.8 volts at battery connector P2.

c. Measurements are taken with all tubes (except V12) in sockets, VOLUME control set on 4, R66 (INTENSITY) on full, R68 (FOCUS) on full, play-back lever on 1–3 position, and main control lever on REC, unless otherwise noted.

d. Resistance measurements (fig. 43) are taken with power source removed.

e. All voltages in the following table are dc unless otherwise noted:

Ref. symbol	Terminal	S1 on REC (volts)	S1 on STOP (volts)	Resistance (ohms)
E11	1			0
	2	5.8		20
	3	5.8		20
	4	5.8	5.8	3
	5	9.2 ac		30
	6	15. ac		30
	7			0
	8	9.0 ac		30
	9	85.0 ac		∞
E9	10	215.0	220.0	2.6 K
	11			0
	12	225.0	230.0	50 K
	13		21.0	120 K
	14			∞
	15			∞
	16			0
	17	85.0 ac	150.0 ac	∞
	18			28
	19	5.8	5.8	3
	20			0
E7	21	N.C.*		
	22			∞
	23	5.8	5.8	9
	24			1.2 K
	25			0
	26	40.0	50.0	0
	27	50.0	60.0	24 K
	28	180.0	187.0	32 K
	29	240.0	245.0	200
	30	240.0	245.0	200
	31	5.8	5.8	1
	32			2
E8	33	445.0	620.0	∞
	34	445.0	620.0	∞
	35			∞
	36			∞

Ref. Symbol	Terminal	S1 on REC (volts)	S1 on STOP (volts)	Resistance (ohms)
X12	1	5.8	5.8	3
	2	50.0	60.0	24 K
	3	430.0	600.0	∞
	4	180.0	187.0	30.6 K
	5			
	6	480.0	670.0	∞
	7	480.0	670.0	∞
	8	480.0	670.0	∞
	9	430.0	600.0	∞
	10		45.0	100 K
	11			0

* N. C.—No connection.

59. Trouble-shooting Chart

The trouble-shooting chart shown in figure 45 lists the corrective measures to be taken by the trouble-shooter for the symptoms given. The chart is sectionalized into four units: 6-volt battery, dynamotor, record, and playback. Use the chart as follows:

a. Starting with the battery, note that the words LOW VOLTAGE appear to the left of the rectangle labelled 6-VOLT BATTERY. In this case, LOW VOLTAGE is the symptom; follow the arrowheads to the left of the symptom; the arrow heads terminate at another rectangle which contains the checks to be made in order to find the causes of the low voltage. The corrective measures in this case are indicated by the checks.

b. Following the arrowhead down the chart, note two more rectangles containing the words DYNAMOTOR and TUBE FILAMENTS. By continuing in the direction of the arrowheads, the symptoms and checks will be located on the chart.

c. The same method is used for the balance of the chart; namely, RECORD and PLAYBACK.

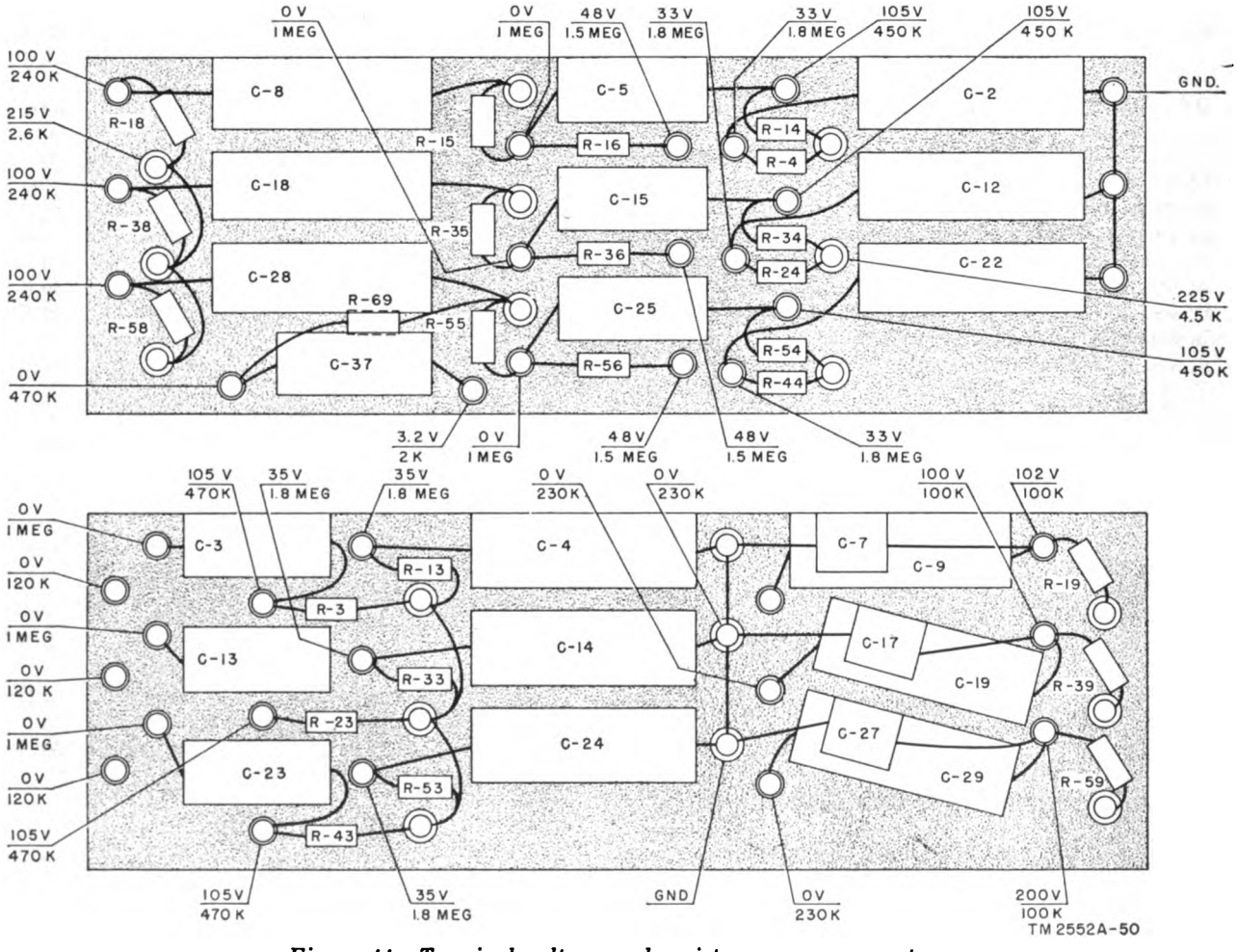


Figure 44. Terminal voltage and resistance measurements.

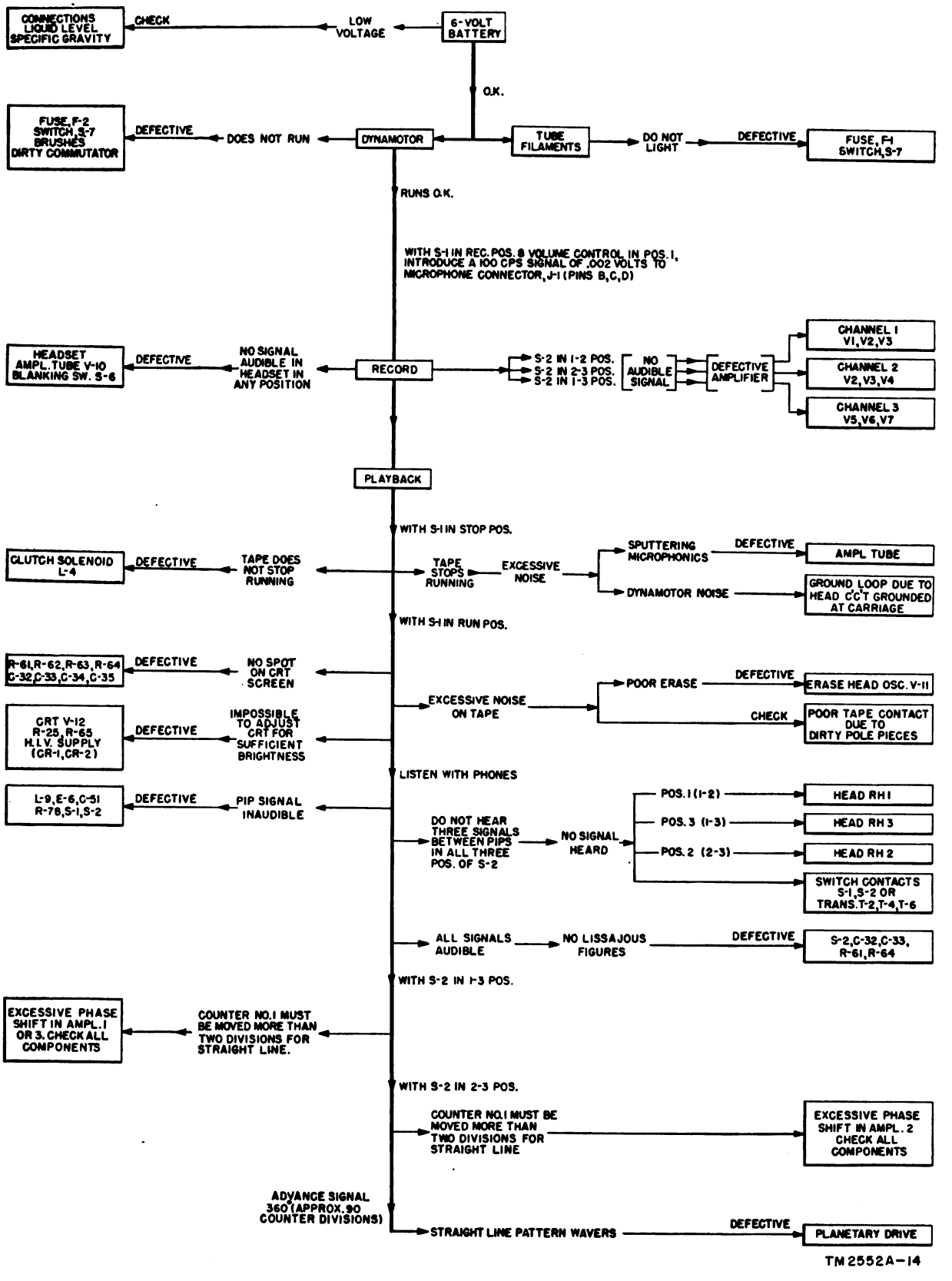


Figure 45. Trouble-shooting chart.

60. Removing and Replacing Magnetic Tape (fig. 46).

a. GENERAL. The magnetic tape must be removed whenever the recorder is being cleaned and oiled. If a tape is broken accidentally, install a new one. Be careful when handling the tape because it may be kinked or broken easily.

b. REMOVING TAPE.

(1) Hold tension pulley, O–3, at one end of the tension arm and loosen the tape-tension clamp screw, O–4, at the other end of the arm.

(2) Swing the tension arm away from the tape wipers to separate the pads and lift the tape from between them.

(5) Loosen the holding screws (fig. 47) and pull out the top sapphire guides just enough to clear the tape.

(6) Lift the tape from between the pole pieces by opening the jaw of each pole piece, one at a time, and by slipping the tape out.

Caution: Do not permit the pole pieces to spring back against the tape as a kink in the tape might result.

(7) Slide the tape off the pulleys and lift it out.

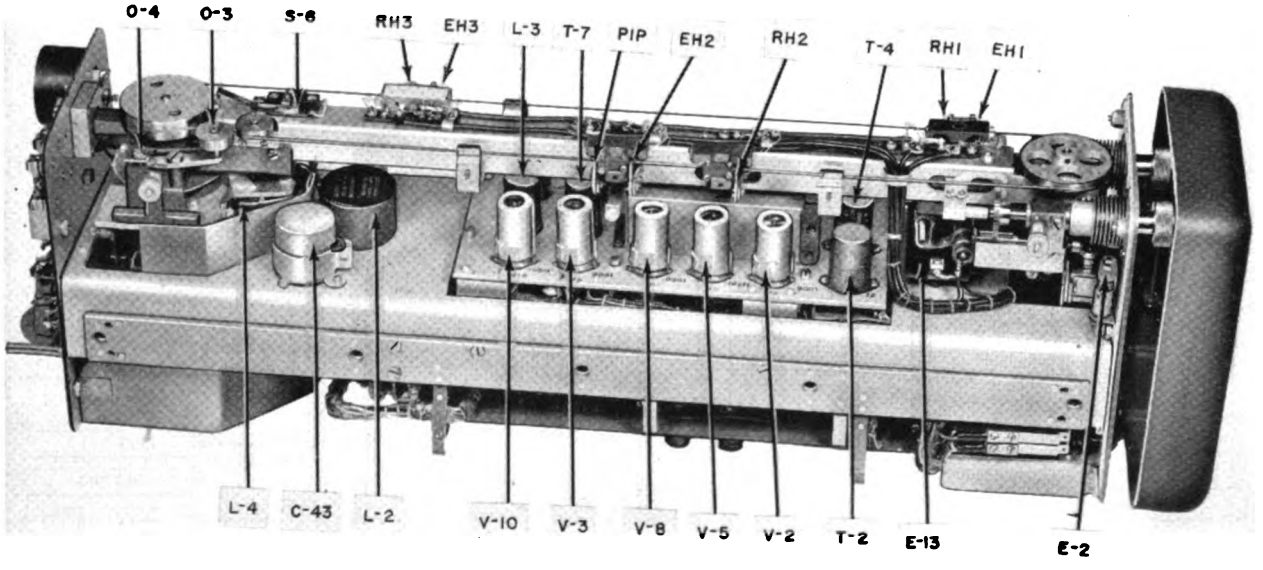


Figure 46. Recorder BC–1323–A, left side cover and tape guard removed.

tape and tighten the clamp screw so that the arm can be held in that position.

Caution: Do not release the tension pulley until the clamp screw has been tightened. Should the pulley be released while the clamp screw is loose, the spring may snap the pulley against the tape and break it.

(3) Remove the shield inclosing signal heads RH3 and EH3.

(4) Pull down the arms on the side of the

c. REPLACING TAPE.

(1) To replace the tape, follow the steps outlined in *b*(1), (2), (3), (4), and (5) above.

(2) Pull down the arms on the side of the tape wipers to separate the pads.

(3) Place the tape over the pulleys. Note the weld in the tape. It should face the outside as shown in figure 47. If the movable pole piece is not closer to the weld than the fixed pole piece in the direction of tape travel, serious dam-

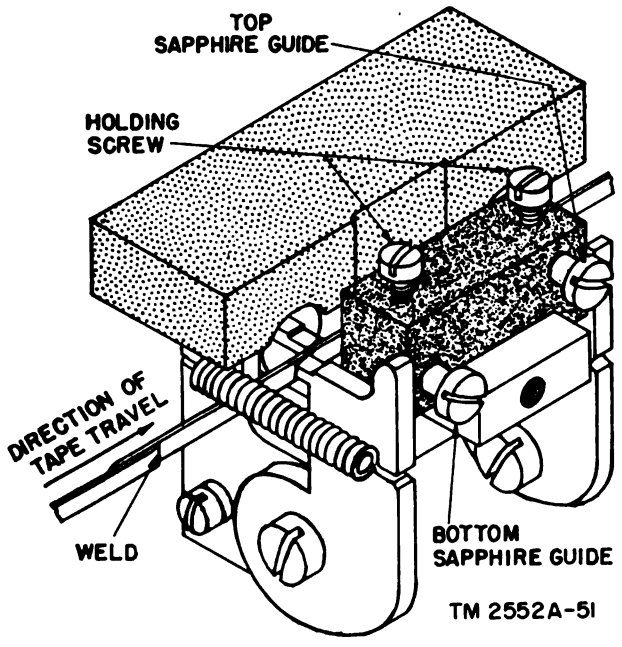


Figure 47. Recorder-reproducer head, details.

age to the tape and pole pieces may result.

(4) Insert the tape between the pole pieces by opening the jaw of each pole piece one at a time. Ease the pole piece back against the tape very carefully.

(5) Push the top sapphire guide into place. Adjust sapphire positions by rotating the sapphire guides so that the tape rides evenly between the top and bottom sapphires. Tighten the holding screws.

Caution: Sapphire guides must hold tape firmly in position without causing the tape to twist. A loose tape will cause phase errors during playback.

(6) Adjust the tape wipers and replace the magnetic head shield.

(7) Repeat the step described in (1) above.

(8) Let the tension pulley come up slowly against the tape as far as it will go and then release it. Do not release the tension pulley until it is firmly against the tape.

(9) Rotate the scanning wheel a short distance downward so that the tape revolves in a clockwise direction. This will even up the tension on the tape.

(10) Tighten the tape-tension clamp screw.

61. Replacing Dynamotor or Brushes (fig. 48)

There are four dynamotor brushes, two on each end of the armature. Replace the brushes or the dynamotor as follows:

a. Remove the shield (by removing three

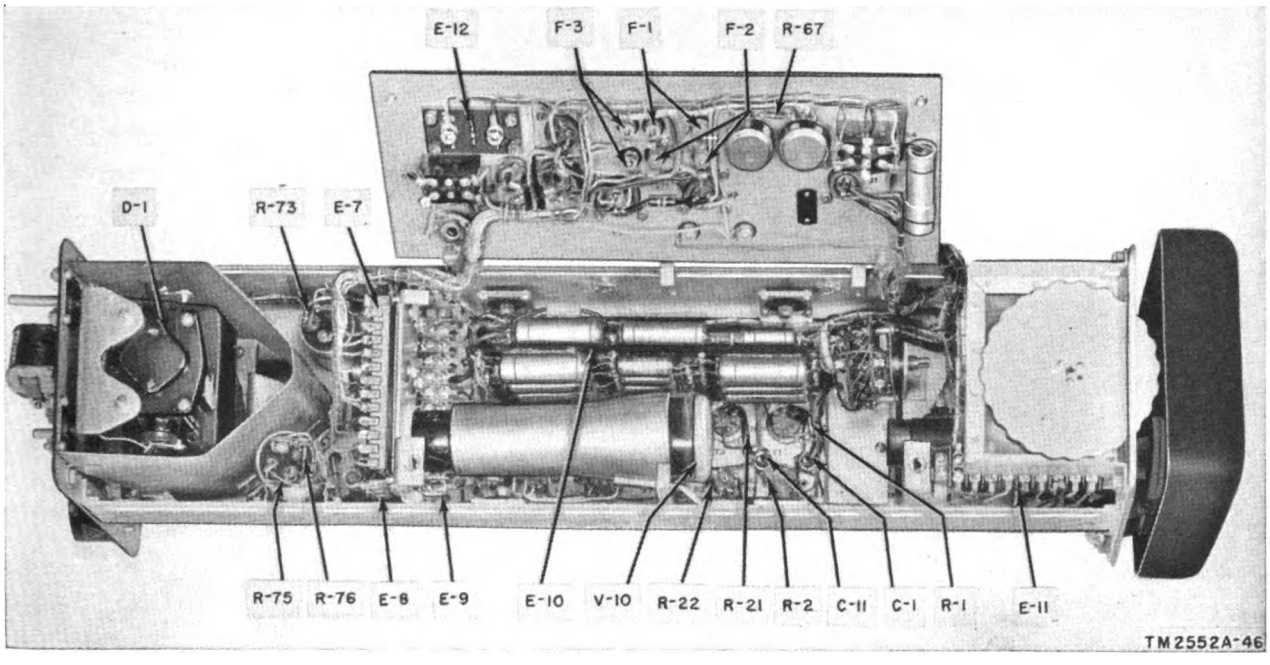


Figure 48. Recorder BC–1323–A, right side cover removed and side panel parts exposed.

screws holding it to the chassis and two screws on rear panel).

b. Unsolder the three wires on the magnetic clutch coil, L4.

c. Remove the two screws holding the dynamotor to the shock mounts.

d. With the side panel up, remove the four screws holding the dynamotor mounting plate to the planetary drive.

e. Carefully lift the dynamotor out so that the wires do not tear away from the soldered joints. To replace the dynamotor, carefully remove the attached components and reinstall them on the new dynamotor.

f. To remove a brush, take out the screw (at the bottom of the brush holder) that fastens the brush holder to the dynamotor.

g. Unsolder the brush lead wire from the lug on the outside of the brush holder.

h. Note the position and type of brush and remove it from the brush holder.

i. Put a new brush of the same type in the same position as the old brush. Solder the lead wire to the lug.

j. Replace the brush holder and tighten in place by means of the screw which was removed in the step described in *f* above.

CHAPTER 5

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

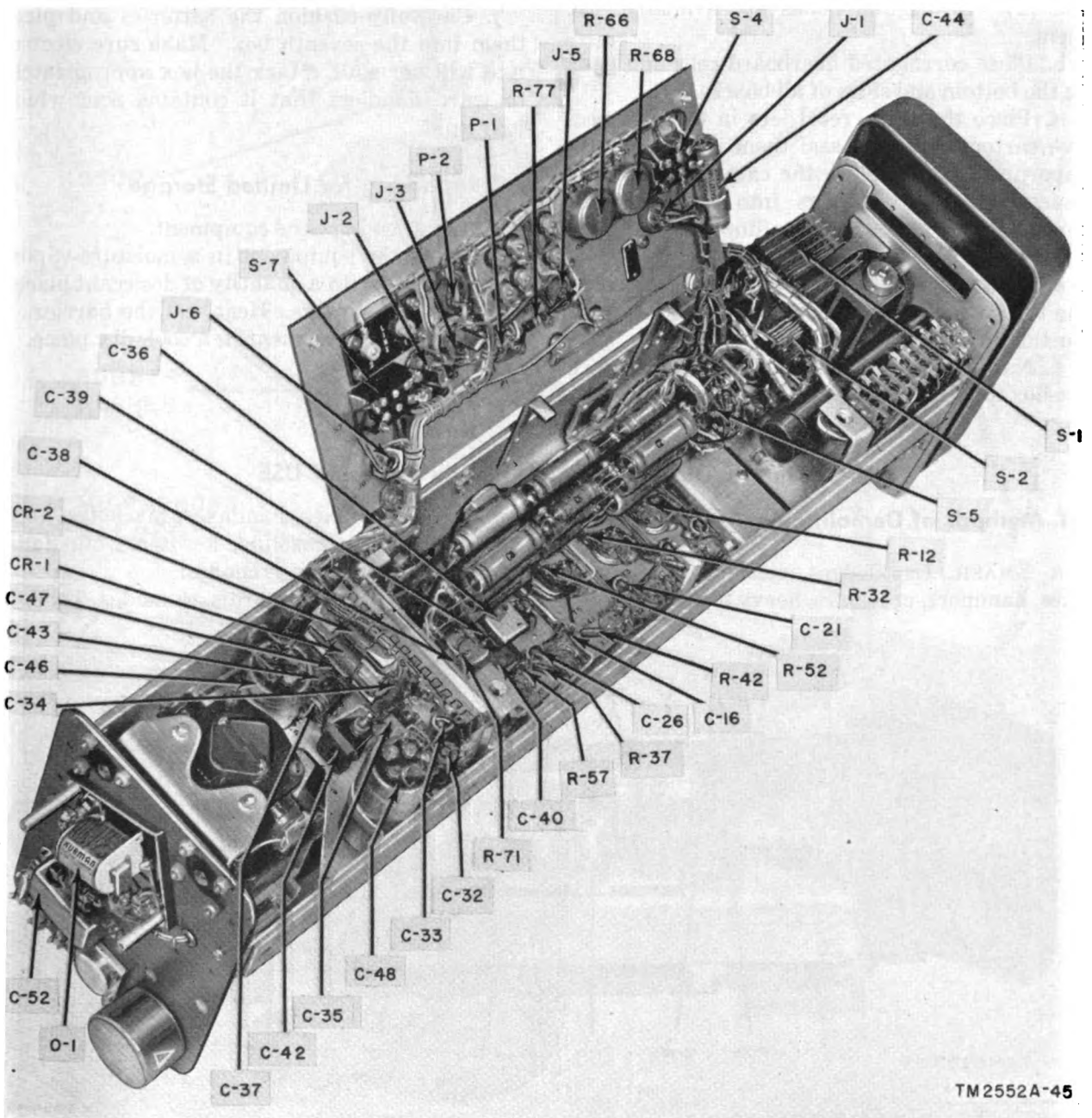


Figure 49. Recorder BC–1323–A, right side cover removed showing parts.

Section I. SHIPMENT AND LIMITED STORAGE

62. Packing Equipment for Shipment

a. See that all components and accessories are at hand by consulting the packing slip or the list of parts in paragraph 5.

b. Prepare seven wooden boxes to house all the equipment of a complete Sound Locating Set GR–6–A. Size of boxes shall be the same as those used to ship the equipment (export packed). If original boxes are available, use them.

c. Place corrugated fiberboard cells and pads on the bottom and sides of all boxes.

d. Place the three recorders in their respective cartons and heat-seal them into moisture-vaporproof bags. Place the cartons with their moisture-vaporproof bags into a waterproof container and place the three similarly wrapped recorders in their respective boxes.

e. Heat-seal the waterproof bag and cover the top with corrugated pads and cells. Do this for the three recorders.

f. Nail wooden box covers in place and mark the box to identify contents.

g. Place Bag BG–160–A and contents into the fourth box after making sure the proper cushioning and waterproofing steps have been taken. Cover box and identify contents with appropriate marking.

h. Place Case CS–161 and contents into another box after proper packing procedure.

i. Place the balance of the equipment into the sixth box (except batteries).

j. Carefully cushion the batteries and place them into the seventh box. Make sure electrolyte will not spill. Mark the box appropriately to warn handlers that it contains acid which may spill.

63. Repacking for Limited Storage

a. Clean and dry the equipment.

b. Place the equipment in a moisture-vaporproof barrier with a quantity of desiccant placed around the recorders. Heat-seal the barrier.

c. Place the equipment in a cool, dry place.

Section II. DEMOLITION TO PREVENT ENEMY USE

64. Methods of Demolition

a. SMASH. Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

b. CUT. Use axes, handaxes, machetes.

c. BURN. Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

d. EXPLODE. Use firearms, grenades, TNT.

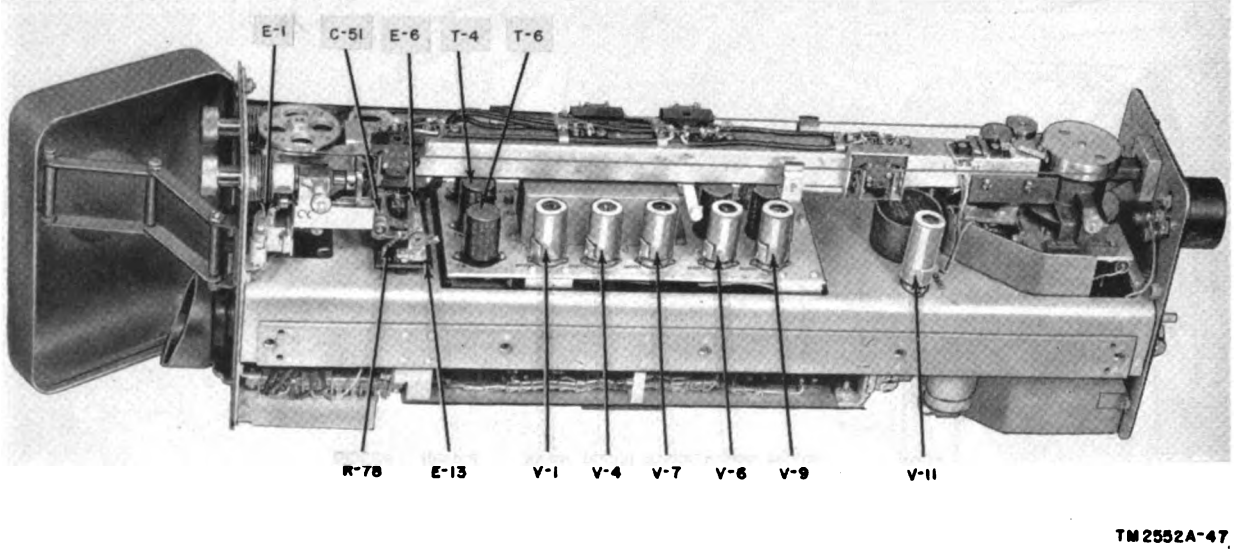


Figure 50. Recorder BC–1323–A, tape guard and end cover removed.

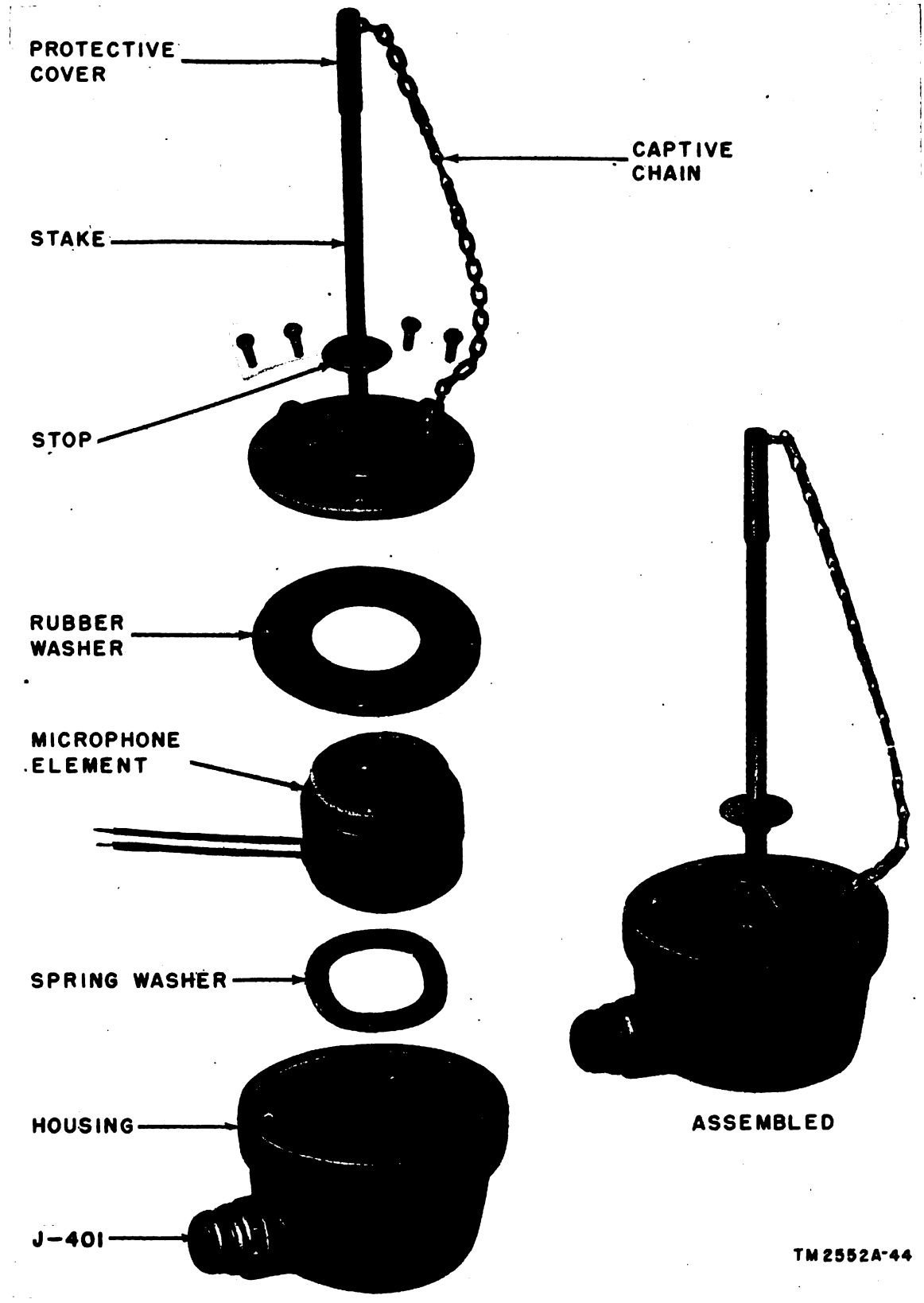


Figure 51. Microphone T-56, exploded view.

e. DISPOSE. Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

f. Other.

Note. Use anything immediately available for destruction of this equipment.

65. Destruction of Components

When ordered by the commander, destroy all equipment to prevent its being used or salvaged by the enemy.

a. Smash the recorder, power unit, radio set, all headsets and handsets, and batteries.

b. Cut all wires, cables, and computors.

c. Burn all technical manuals, circuit diagrams, etc.

d. Bury or scatter all remaining parts of the equipment.

e. Destroy everything.

APPENDIX I

REFERENCES

Note. For availability of items listed, check SR 310-20-3 and SR 310-20-4.

1. Technical, Administrative, and Supply Publications

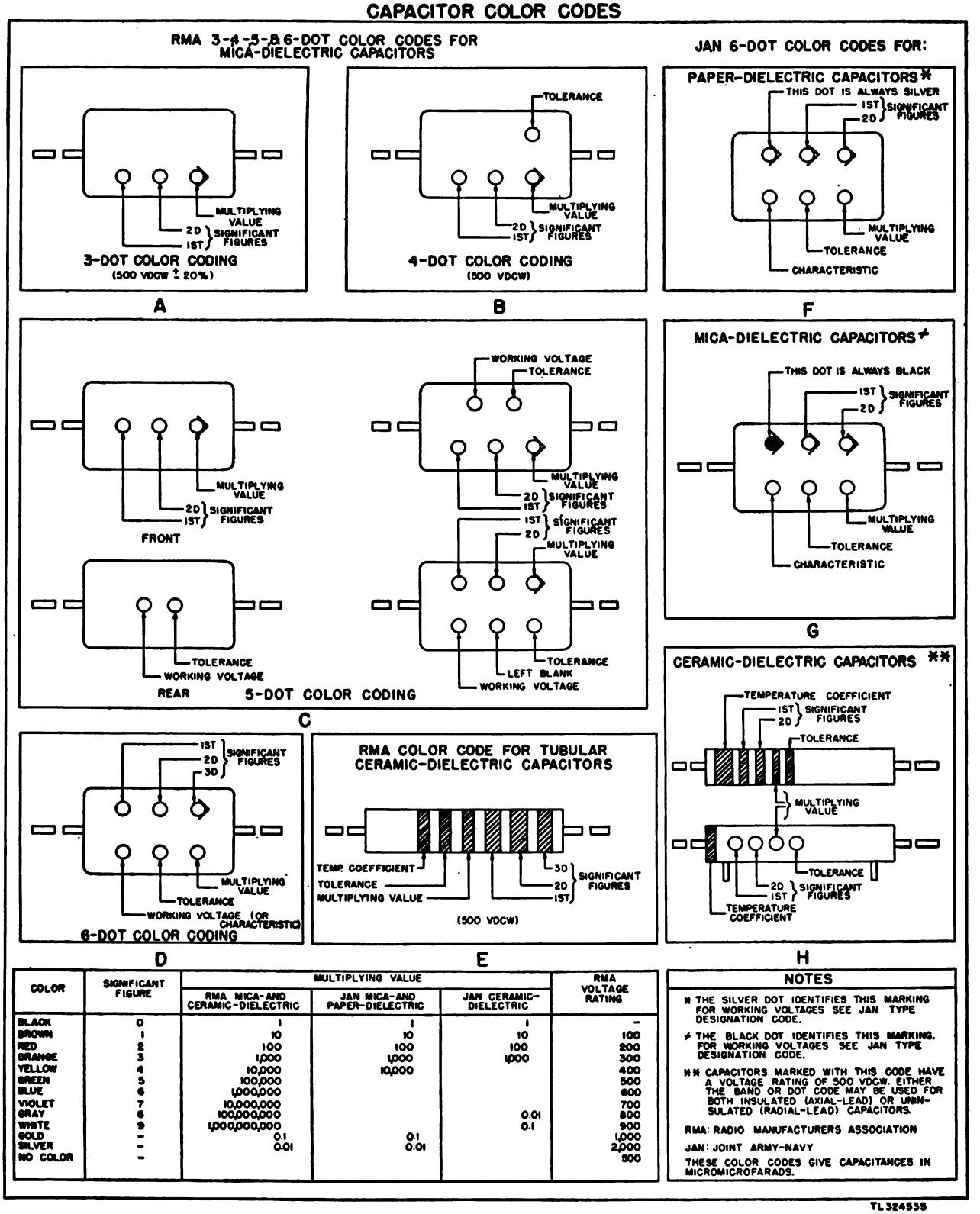
SB 11-47	Preparation and Submission of Requisitions for Signal Corps Supplies.
SR 310-20-3	Index of Training Publications (Field Manuals, Training Circulars, Firing Tables and Charts, Army Training Programs, Mobilization Training Programs, Graphic Training Aids, Joint Army-Navy-Air Force Publications and Combined Communications Board Publications).
SR 310-20-4	Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, Modification Work Orders, Tables of Organization and Equipment, Reduction Tables, Tables of Allowances, Tables of Organization, and Tables of Equipment.
SR 700-45-5	Unsatisfactory Equipment Report (Reports Control Symbol CSGLD-247).
SR 745-45-5	Report of Damaged or Improper Shipment (Reports Control Symbols CSGLD-66).
TM 1-455	Electrical Fundamentals.
TM 9-2820	Shop Mathematics.
TM 9-2857	Storage Batteries Lead-Acid Type.
TM 11-453	Shop Work.
TM 11-455	Radio Fundamentals.
TM 11-2250	Reel Equipment CE-11
TM 11-242	Radio Set SCR-300-A
TM 11-4302	Tactical Switchboards and Long Lines Equipment—Repair Instructions, Apparatus Requirements.
AR 750-5	Maintenance Responsibilities and Shop Operation.
SB 11-76	Signal Corps Kit and Materials for Moisture- and Fungi-Resistant Treatment.
TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 66	Winter Maintenance of Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 123	Preventive Maintenance Practices for Ground Signal Equipment.

2. Packaging and Packing Instructions

a. JOINT ARMY-NAVY PACKAGING SPECIFICATIONS.

JAN-D-169	Desiccants (Activated).
JAN-P-100	Packaging and packing for overseas shipment—General specification.
JAN-P-106A	Packaging and packing for overseas shipment—Boxes, wood, nailed.
JAN-P-116	Packaging and packing for overseas shipment—Preservation, methods of.
JAN-P-125	Packaging and packing for overseas shipment—Barrier-materials, water proof, flexible.
JAN-P-131	Packaging and packing for overseas shipment—Barrier-material, moisture-vaporproof, flexible.

CAPACITOR COLOR CODES



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

NOTES

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

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

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

RMA: RADIO MANUFACTURERS ASSOCIATION

JAN: JOINT ARMY-NAVY

THESE COLOR CODES GIVE CAPACITANCES IN MICROMICROFARADS.

Figure 52. Capacitor color codes.

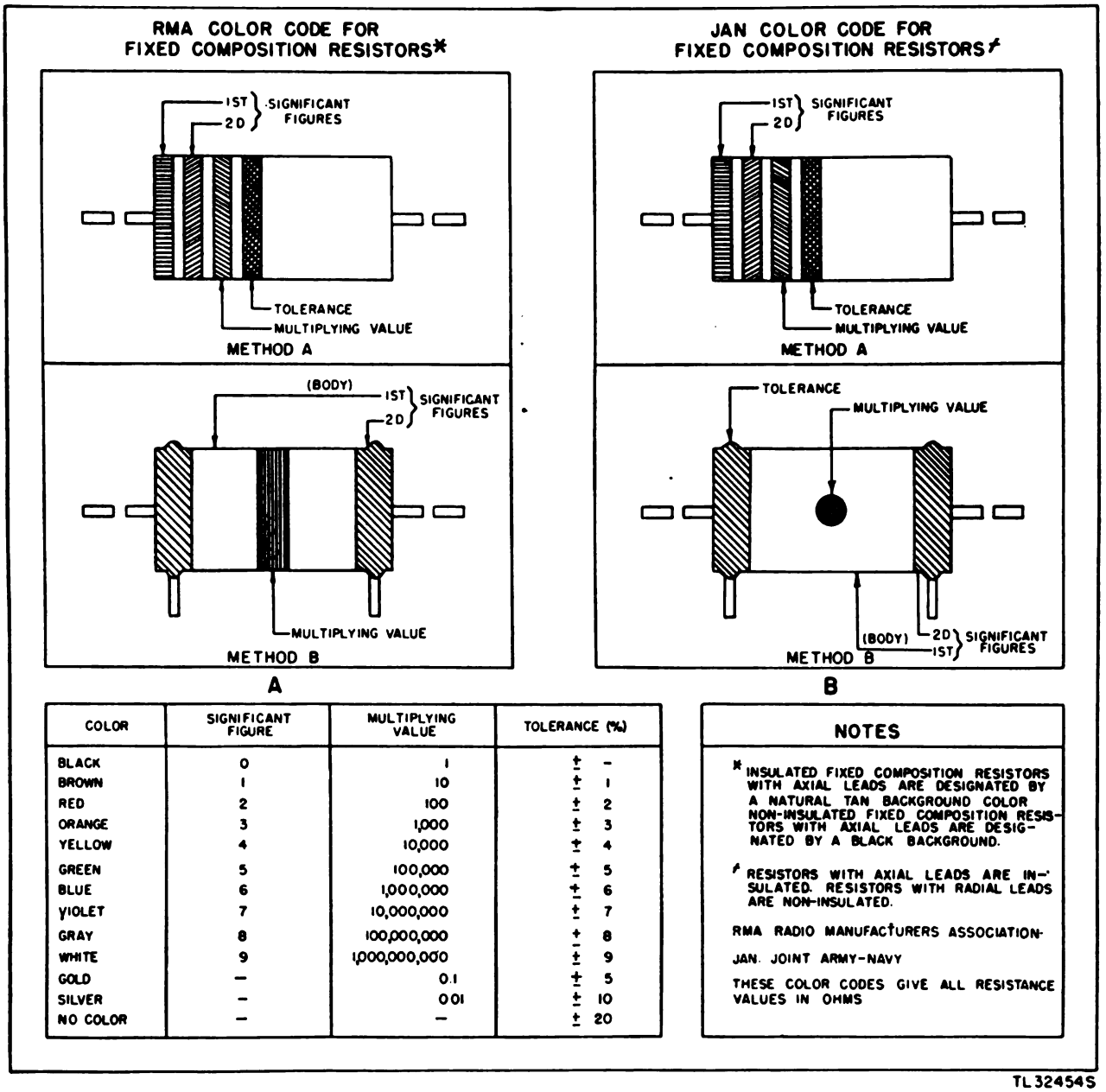
b. U. S. ARMY SPECIFICATIONS.

100–2E	Marking Shipments by Contractors (and Signal Corps Supplement thereto).
100–14A	Army-Navy General Specification for Packaging and Packing for Overseas Shipment.

c. SIGNAL CORPS INSTRUCTIONS.

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

RESISTOR COLOR CODES



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

NOTES

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

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

RMA RADIO MANUFACTURERS ASSOCIATION

JAN. JOINT ARMY-NAVY

THESE COLOR CODES GIVE ALL RESISTANCE VALUES IN OHMS

TL 32454S

Figure 53. Resistor color codes.

APPENDIX II

IDENTIFICATION TABLE OF PARTS

Note. The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite a T/O & E, T/A, SIG 7 & 8, SIG 7–8–10, SIG 10, list of allowances of expendable material, or other authorized supply basis. The Department of the Army Supply Catalogs applicable to the equipment covered in this manual are SIG 7 GR–6 and SIG 8 GR–6. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1.

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	MISCELLANEOUS ITEMS GROUP		
	BAG BG–44: tool; cotton duck; olive drab; water repellent.	Tool container	6Q2044
	BAG BG–160–A: general purpose; blk rubberized nylon; watertight.	Microphone and cable container	2Z551–160A
	BAG BG–182–A: carrying; blk rubberized nylon; watertight.	Carrying case for Recorder BC–1323–A.	2Z551–182A
	BATTERY, Box CH–291: aluminum; 3 compartments.	Container for Battery BB–54	3B380–291
	BATTERY BB–221/U, storage: portable; 3 cells; 6 v; 120 amp-hr.	Furnishes 6 volts	3B275–221
	BATTERY BB–54–A, storage: 2 v	Furnishes 2 volts	3B54
	BOARD, plotting: portable; plastic (Plotting Board M–10).	Computing device	6Z1006–7
	BOX: CH–318: plywood, olive-drab finish; single compartment.	Holds Battery BB–221/U	3B901–318
	CAP, battery: p/o Battery BB–221/U; hard rubber	Cover for battery cell	3B695–1
	CAP, battery: p/o Battery BB–54–A; bakelite	Cover for battery cell	3B695
	CASE CS–148: cotton duck; circular	Holds Computor M–414	4G330–148
	CASE CS–161: aluminum; olive-drab finish; 6 compartments.	Holds running spare parts and other components of Sound Locating Set GR–6A.	6F461
	CHAIN M–457: bead type #13; brass; 15 ft. lg	Fixes microphone array position	6Z1806A–3
	CHAIN M–458: bead type #13; brass; 21 ft. 2½ in. lg.	Fixes microphone array position	6Z1806A–4
	CLAMP: Cable Clamp M–284; aluminum; fits cable w/½ in. max dia.	Secures cable connector	2Z1587–284
	CLIPBOARD: Holder M–167–A	Holds data sheets	6M567
	COMPASS, magnetic: moving needle (Ordnance Compass M–2).	Determines bearing	6Z2203–4
	COMPUTOR M–414, azimuth: phenolic, circular	Determines range and azimuth	4G370–414
P102	CONNECTOR, plug: 5 round male contacts; type AN3106–14S–5P.		22K7115.4
J103	CONNECTOR, plug: 7 round female contacts; type AN3106–16S–1S.	Connects to radio receptacle P1	2Z8677.14
P101	CONNECTOR, plug: 3 round male contacts; type AN3106–14S–7P.	Battery cable connector	2Z7113.35
J102	CONNECTOR, receptacle: 5 round female contacts; type AN3101–14S–5S.		2Z3066–17
J201, J301	CONNECTOR, receptacle: 3 round female contacts; type AN3102–14S–7S.	J201—Battery box receptacle; receives P101. J301—Receptacle on Battery Box CH–318.	2Z3064–8

Identification Table of Parts—*Continued*

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
P201	CONNECTOR, receptacle: 3 round male contacts; type AN3102-14S-7P.	Part of CH-291; connects to battery charger.	2Z3023-5
	MARKER MC-693: luminous; phenolic	Marks microphone position	2Z6502-693
	MICROPHONE T-56: 225-ohm impedance; c/o housing, sound-powered microphone unit, cover assembly, plug, cap, spring washer, and rubber gasket.	Converts sound energy into electrical energy.	2B1656
	CORD AND CABLE GROUP		
	CABLE ASSEMBLY, power: Cord CD-1446, Cordage CO-132; 6 ft lg.	Connects battery box to recorder	3E199-446
	CABLE ASSEMBLY, power: electrical; Cord CD-1240, Cordage CO-132; 15 ft lg.	Connects stop switch to recorder	3E1999-240
	CABLE ASSEMBLY, special purpose: Cord CD-1239, Cordage CO-132; 50 ft lg.	Connects recorder to microphone array.	3E1999-239
	CABLE ASSEMBLY, special purpose: electrical; Cord CD-1444; 5 ft 2 in. lg.	Connects radio set to recorder	3E1999-444
J101	CONNECTOR, plug: 5 round female contacts; type AN3106-14S-5S.	Connects to 6-volt battery receptacle P2.	2Z7226-P200
P103, P104, P105, P106, P107	CONNECTOR, plug: 5 round male contacts; type AN3106-14S-5P.	P103—Connects to microphone receptacle J1. P104, P105, P106—Connect to microphones No. 1, 2, and 3, respectively. P107—Connects to J4.	2ZK7115.4
	CORD, headset: Cord CD-874; 6½ ft lg	Connects headset to recorder	3E1874
	CORD, microphone: Cord CD-1238-A; 3 ft of Cordage CO-132 and three 15 ft lengths of #18 AWG cond.	Connects microphone to Cord CD-1239.	3E1999-238A
	GROMMET: rubber		6Z4853-8
	INSULATION, flexible sleeve: blk; plastic extrusion		3G2425-1
	LEAD, electrical: 4½ ft lg		3E7998-4.6
P109, P110	PLUG, telephone: tubular; blk bakelite; 3 cond, 1 shank.	To connect handset	2Z7168
P108, P111, P112	PLUG, telephone: tubular; blk bakelite; 2 cond, 1 shank; JAN type PJ-055-B.	To connect phones, relay, and microphone.	2Z7228A-55B
	SLEEVE, cord: neoprene; p/o Cord CD-874		2Z8552-19
S101	SWITCH, push-pull	Starts and stops recorder tape movement.	3Z9815-12
	MISCELLANEOUS TOOLS AND SUPPLIES GROUP		
	ABRASIVE, sheet: sandpaper, #00 flint; 6 sheets per unit.		6Z7500-00.1
	BRUSH TL-72, painting: camel's hair		6Z1372
	CARBON TETRACHLORIDE: technical grade		6G184.1
	CEMENT, liquid: general purpose		6G202.11
	DRILL, star: carbon steel; straight shank; ½-in. dia		6Q35208-12
	FLUX, soldering: acid paste		6N4102
	FUNNEL: blk plastic		6Z4028-4
	HAMMER, hand: ball peen; #4, 2 lb		6Q49732
	NOTEBOOK: cross section; quadrille, 10 divisions to the in.		6M676-1
	OIL, lubricating: low temp; for light mechanical parts.		6G1398.7
	PENCIL: blk #2 lead		
	PLIERS TL-304/U: long-nosed w/cutters		6R4512X
	PLIERS: needle-nosed		6R4602A
	SCREW DRIVER: offset; 2 blades ea ¾ in. lg, perpendicular to shank.		6R1833-3

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
S101	SCREW DRIVER: offset; 4 in. blade		6R18334–3
	SCREW DRIVER: TL–458/U straight; 5½ in. blade.		6R15811
	MICROPHONE T–56 GROUP		
J401	CONNECTOR, receptacle: 5 contacts	Provides connection with Cord CD–1238.	2Z3066–17
	GASKET: rubber	Provides seat for microphone cover.	2Z4868.733
	MICROPHONE: sound-powered, element	Converts sound into electrical energy.	2B1717–5
	SHELTER: microphone (Microphone Shelter M–413).	Shelters microphone from extraneous noises.	2B2165–413
	WASHER, spring	Provides tension against microphone element.	6L73628–1N
	RECORDER BC–1323–A GROUP		
	ABSORBER, shock	Absorbs vibration and shock	2Z142–5
	BLOCK, bearing: aluminum	Supports scanning wheel	6C9E–2
	BLOCK, bearing: aluminum	Supports driving head	6C9E–1
E7	BOARD, terminal: 12 lugs	Provides terminals for wires	2Z9412.107
E8	BOARD, terminal: 4 lugs	Same as E7	2Z9464.2
E9	BOARD, terminal: 11 terminals	Same as E7	2Z9411.15
E10	BOARD, terminal: 38 turret lug terminals and 9 lugs	Provides terminals for resistors and capacitors.	3Z770–38.9
E11	BOARD, terminal: 9 terminals	General purpose	2ZK9409.6
E12	BOARD, terminal: 2 TM–175 terminals	Line terminal panel	3Z770–2.76
E13	BOARD, terminal: 2 turret lug terminals	Mounts pip circuit components	3Z770–3.43
E14, E16, E17	BOARD, terminal: 4 lug terminals	Magnetic head terminal strip	3Z770–8.65
E15	BOARD, terminal: 2 lug terminals	Magnetic head terminal strip	2Z9402.236
E18, E19	BOARD, terminal: 2 terminals	Capacitor terminal plate	3Z770–2.67
	BRUSH: carbon and copper; input	Provides contact to commutator on dynamotor.	3H525C–5
	BRUSH: carbon; output	Same as above	3H525–34
C46A, C46B, C46C, C48A, C48B, C48C	CAPACITOR: electrolytic; 3 section; 600 vdcw; 15–15–15 μf.	Filter	3DB15–64
C3, C5, C13, C15, C23, C25, C31, C32, C33, C37, C43	CAPACITOR: paper; 600 vdcw; 10,000 μμf	C3, C5, C13, C15, C23, C25—Plate coupling. C31, C32, C33, C37—Coupling. C43—Voltage doubler.	3DA10–388
C49, C50	CAPACITOR: paper; 400 vdcw; 20,000 μμf	Bypass high frequency	3DA20–156
C2, C4, C8, C12, C14, C18, C19, C22	CAPACITOR: paper; 600 vdcw; 100,000 μμf	C2, C4, C8, C12, C14, C18, C22—Bypass screen and B plus. C9, C19—Output coupling.	3DA100–730
C24, C28, C29, C38, C44, C47	CAPACITOR: paper; 600 vdcw; 100,000 μμf	C–24, C–28—Bypass screen and B plus. C29—Output coupling. C38—Cathode bypass. C44—Blocking. C47—High voltage bypass.	3DA100–730
C45A, C45B	CAPACITOR: paper; 2 section; 600 vdcw; 250,000 μμf	Blocking	3DA250–415
C52	CAPACITOR: paper; 100 vdcw; 1μf	Coupling	3DBI–195
C6, C16, C26	CAPACITOR: mica; 400 vdcw; 500 μμf	Grid bypass	3D9500–236
C40	CAPACITOR: mica; 500 vdcw; 560 μμf	Plate load	3K2556121
C1, C11, C21	CAPACITOR: mica; 400 vdcw; 1000 μμf	Grid bypass	3DA1–290
C7, C17, C27, C34, C35	CAPACITOR: mica; 500 vdcw; 1000 μμf	C7, C17, C27—Plate bypass. C34, C35—Coupling.	3K3010222
C10, C20, C30, C41	CAPACITOR: mica; 500 vdcw; 2000 μμf	C10, C20, C30—Coupling. C41—Feedback.	3K3020222

Identification Table of Parts—*Continued*

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
C42	CAPACITOR: mica; 500 vdcw; 3000 μμf	Oscillator tuning	3K3030222
C36, C39	CAPACITOR: mica; 500 vdcw; 5600 μμf	C36—Coupling C39—Screen bypass.	3K3556221
C51	CAPACITOR, fixed: paper; 600 vdcw; 20,000 μμf	Coupling	3DDA20–208
O–2	CLUTCH, magnetic	Starts and stops tape motion	6C13C–4
L5, L6, L7, L8, L9, L10, L11	COIL, reproducer head	L5—Generates pick-up voltage. L6, L8, L11—Apply erasing voltage to tape. L7, L10—Generate recorder reproducer voltage. L9—Applies pip signal voltage to tape.	6C171–1
L4	COIL, solenoid	Core for clutch O–2	3C1999–31A
P1	CONNECTOR: receptacle; 7 contact	Provides radio connection	2Z3027–18
P2	CONNECTOR: receptacle; 5 contact	Provides battery connection	2Z8799–180
J1, J4	CONNECTOR: receptacle; 5 contact; female	J1—Provides microphone connection. J4—Provides stop-switch connection.	2ZK7409–20
I–3	COUNTER, mechanical	Indicates position of tape	6Z3417–43
I–4	COUNTER, mechanical	Same as I–3	6Z3417–44
I–2	DIAL: scanning wheel	Moves tape manually	2Z3723–202
D1	DYNAMOTOR: 250 v. DC output, 30 ma.	Supplies B voltage	3H1506–10
	FELT	Cushions switch leaf	6Z3812–4
	FELT: recording tape	Cleans recording tape	6Z3812–5
F3	FUSE, cartridge: ⅛ amp, 250v	Protects against overload	3Z2585.1
F1, F2	FUSE, cartridge: 6 amp, 250 v	Same as F3	3Z2606.3
	GASKET: rubber; rectangular-shaped	Seals cover and door	6Z4182–2
	GEAR: bevel type; 18 teeth	Operates mechanical counter	2Z4878–1147
	GEAR: spur type; 54 teeth	Same as above	2Z4878–1146
	GEAR: Spur type; 14 teeth	Same as above	2Z4878–1148
	GUARD: tape, aluminum	Protects recording tape	6C25F
	GUIDE, tape	Alines tape	6C25J–4
	HEAD, micrometer	Varies position of magnetic head	6C26A–2
E5	FUSEHOLDER: 10 amp; retainer type	Holds fuse cartridge	3Z3282–29
E3, E4	FUSEHOLDER: 10 amp; retainer type	Same as E5	3Z3282–29.2
J5	JACK, telephone: 2 cond	Connects radio headset to equipment.	2Z5534
J3	JACK, telephone: 2 cond	Connects radio handset to equipment.	2Z5598–31
J2	JACK, telephone: type JK–33–C	Same as J3	2Z5533C
	KNOB: blk plastic	Used to rotate dials	2Z5822–435
	KNOB: blk phenolic; round	Same as above	2Z5842–12
E6	LAMP, glow: 105 to 125 v., 1/25 w	Generates pip signal	
E1, E2	LAMP, incandescent (Lamp LM–52): 6 to 8 v	Illuminate panel	2Z5952
J6, J7	LAMPHOLDER	Support lamp E1	2Z5956.27
J8	LAMPHOLDER	Supports lamp E6	2Z5956.28
	LEG: telescopic tubes; aluminum	Supports Recorder BC–1323–A	6C33–3
	MOUNT, vibration: oval mounting	Absorbs vibration	2Z8405–85
	MOUNT, vibration: square mounting	Same as above	2Z8402–10
	NUT, thumb: aluminum; #6–32 NC–2	Provides leverage for turning screw	6L2506–32–4
E21, E23, E25, E27, E29, E31, E33	POLE PIECE: permalloy	E21, E25, E29, E31—Movable recorder head pole piece. E23, E27, E33—Movable erase head pole piece.	6C180
E20, E21, E24, E26, E28, E30, E32	POLE PIECE: recorder head; permalloy	E20, E24, E28, E30—Stationary recorder head pole piece. E22, E26, E32—Stationary erase head pole piece.	6C180–1

Identification Table of Parts—*Continued*

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
E35, E36	POST, binding: TM-175	Provide terminals for wire (line terminal posts).	3Z275
O-3	PULLEY: tape tension	Permits tape tension adjustment	6C255-11
	PULLEY ASSEMBLY: driven tape	Driven tape pulley	6C255-13
	PULLEY ASSEMBLY: driving	Driving tape pulley	6C255-12
L1, L2	REACTOR: audio; 0.1 hy	L1—Filter. L2—High voltage step-up.	3C573-37
L3	REACTOR: audio; 200 hy/50 hy	Part of band-pass circuit	3C573-36
CR1, CR2	RECTIFIER, metallic: selenium	Convert ac to dc	3H4860-128
	REDUCER, speed	Reduces D1 speed for tape motion	6C274A
O-1	RELAY, armature: SPST	Operates clutch O-2	2Z7585-197
R76	RESISTOR, fixed: 100 ohms, ½ w	Voltage dropping	3RC20BF101J
R17, R37, R57	RESISTOR, fixed: 2,000 ohms, ½ w	Cathode bias	3RC20BF202J
R73, R74, R75	RESISTOR, fixed: 2400 ohms, ½ w	Voltage dropping	3RC20BF242
R70	RESISTOR, fixed: 3600 ohms, ½ w	Cathode bias	3RC20BF363J
R67	RESISTOR, fixed: 5600 ohms, ½ w	Voltage dropping	3RC20BF562J
R2, R12, R22, R32, R42, R52	RESISTOR, fixed: 6800 ohms, ½ w	Cathode bias	3RC20BF682J
R77	RESISTOR, fixed: 10,000 ohms, 1 w	Voltage dropping	3RC303F103K
R10, R11, R30, R31, R50, R51	RESISTOR, fixed: 15,000 ohms, ½ w	Attenuator section	3RC20BF153J
R9, R29, R49	RESISTOR, fixed: 30,000 ohms, ½ w	Attenuator section	3RC20BF303J
R8, R28, R48	RESISTOR, fixed: 62,000 ohms, ½ w	Attenuator section	3RC20BF623J
R19, R39, R59, R65	RESISTOR, fixed: 100,000 ohms, ½ w	R19, R39, R59—Plate load. R65—Isolation resistor.	3RC20BF104J
R7, R27, R47, R72	RESISTOR, fixed: 120,000 ohms, ½ w	R7, R27, R47—Attenuator section. R72—Grid leak.	3RC30BF124J
R20, R40, R60	RESISTOR, fixed: 220,000 ohms, ½ w	Current limiting	3RC20BF224J
R6, R26, R46	RESISTOR, fixed: 240,000 ohms, ½ w	Attenuator section	3RC20BF244J
R18, R38, R58, R71	RESISTOR, fixed: 270,000 ohms, ½ w	Screen dropping	3RC2013F274J
R3, R5, R14, R23, R25, R34, R43, R45, R54	RESISTOR, fixed: 470,000 ohms, ½ w	R3, R14, R23, R34, R43, R54—Plate loading. R5, R25, R45—Attenuator section.	3RC20BF474J
R16, R36, R56, R69	RESISTOR, fixed: 470,000 ohms, ½ w	R16, R36, R56—Low-pass filter. R69—Grid leak.	3RC20BF474J
R1, R15, R21, R35, R41, R55, R61, R62, R63, R64	RESISTOR, fixed: 1 megohm, ½ w	R1, R21, R41—Low-pass filter. R15, R35, R55—Grid leak. R61—Vertical deflection plate low-pass filter. R62—Vertical deflection plate loading. R63—Horizontal deflection plate low-pass filter. R64—Horizontal deflection plate load.	3RC20BF105J
R4, R13, R24, R33, R44, R53, R78	RESISTOR, fixed: 1.8 megohm, ½ w	R4, R13, R24, R33, R44, R53—Screen dropping. R78—Controls pip frequency.	3RC20BF185J
R66	RESISTOR, variable: 25,000 ohms, 2 w	Intensity control	3RV42503
R68	RESISTOR, variable: 100,000 ohms, 2 w	Focus control	3RV51004
	SCREW, adjustment: slot drive; brass, nickel pl; #3-56 thread.	Holds fixed and movable magnetic poles at pivot points.	6L4713-2N
	SCREW, machine: slot drive; stainless steel; #4-40 thread.		6L20904-10.3F
	SHAFT: aluminum, anodized; ¼ in. dia x 5 5/16 in. lg.	Extends attenuator shaft	2Z8204-172
	SHIELD, light: synthetic neoprene	Shields eye from light	6C2790-1

Identification Table of Parts—*Continued*

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
E34	SHIELD, reproducer head: zinc pl and iridited	Shields reproducer head	
	SHIELD, tube: brass, nickel pl; cylindrical; bayonet mounting; JAN type TSFOT102.	Shields tube 6AK6	2Z8320-13
	SHIELDS, tube: cylindrical, w/½ in. dia hole in top; bayonet mounting; JAN type TSFOT101.	Shields tube 9001	2Z8304.57
X1, X2, X3, X4, X5, X6, X7, X8, X9, X10, X11	SOCKET, tube: 7 contacts, miniature; JAN type TSE7T101.	Support tube	2Z8677.94
X12	SOCKET, tube: 11 contacts	Supports cathode-ray tube	2Z8681.19
	SPRING: helical compression type; stainless steel wire; 5 turns.	Provides compression in tube shield.	2Z8877.339
	SPRING: helical tension type; stainless steel wire	Provides tension against tape	2Z8877.338
	STRAP, carrying: olive-drab cotton webbing	Carrying strap for Recorder BC-1323-A.	2Z9052-104
S6	SWITCH ASSEMBLY: c/o bracket and leaf assembly, block assembly, and insulating spacer.	Reverse blanking switch	3Z9824-104
S1	SWITCH, lever: 2 position locking; metal body	Main control lever	3Z9580-30.25
S2	SWITCH, lever: 2 position locking; metal body	Play-back switch	3Z9580-30.24
S3	SWITCH, push: SPST; silver contacts	Pilot lamp switch	3Z9824-2.1
S5A, S5B, S5C	SWITCH, rotary: 6 pole; 7 positions; 3-section	Volume control	3Z9825-62.519
S4	SWITCH, toggle: DPDT; JAN type ST52P	RADIO SURVEY OFF switch	3Z9863-52P
S7	SWITCH, toggle: DPST; JAN type ST52K	Power switch	3Z9863-52K
	TAPE, blank recording: .050 in. ±.002 in. wd x .002 in. ±.0002 in. thk.	Recording and play-back medium.	6C303-2
T1, T2, T3, T4, T5, T6, T7	TRANSFORMER, AF: input type; primary 125/200/500 ohms impedance; secondary 50,000 ohms impedance; hermetically sealed.	Transfer electrical energy by mutual conduction.	2Z9631.391
V12	TUBE, electron: electrostatic deflection; type 2AP1-A.	Cathode-ray tube	2J2AP1A
V1, V2, V3, V4, V5, V6, V7, V8, V9, V10	TUBE, electron: pentode; type 9001	Amplifier tube	2J9001
V11	TUBE, electron: pentode; miniature type; 6AK5	Oscillator tube	2J6AK5
	WASHER, flat: round; 5/32 in. ID, 9/32 in. OD		6L54002-13
	WIPER, tape: brass, cad pl		6C578
	WRENCH: L shaped; steel, cad pl; special for #6 set screw.	Knob set screw wrench	6R55230

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