16-30 GNQ 7-S

DEPARTMENT OF THE ARMY
DEPARTMENT OF THE AIR FORCE

TM 11-2511
AFM 100-65

REPRODUCER
AN/GNQ-6
AND
RECORDER REPRODUCER
AN/GNQ-7, AN/GNQ-7A
AND AN/GNQ-8

B-6

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
AUGUST 1948

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DEPARTMENT OF THE AIR FORCE MANUAL

REPRODUCER AN/GNQ-6 AND RECORDER REPRODUCER AN/GNQ-7, AN/GNQ-7A, AND AN/GNQ-8

C1, TM 11-2511

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
WASHINGTON 25, D. C., *19 August 1949*

TM 11-2511—AFM 100-65, 9 August 1948, is changed as follows:

78. Special Tools (fig. 27)

The following special * * * of these tools.

Signal Corps stock No.	*Name*
6Q45232	Adjusting template (**earlier model**)
	Adjusting template (later model)

* * * * *

In figure 27, change the designation "adjusting template" to read: Adjusting Template **(Earlier Model).**

80. Use of Earlier Model Adjusting Template

Note (added). Refer to paragraph 80.1 for information on use of later model adjusting template.

* * * * *

80.1 (added). Use of Later Model Adjusting Template (fig. 27.1)

a. ADJUSTMENT OF RECORDER HEAD OUTSIDE STOP (AN/GNQ-8 AND -7-(*)).

(1) Place the template center spindle hole over the square center spindle (H, fig. 28) of the turntable and lay the template on the turntable. Push the template toward the spindle.

(2) With the LISTEN-TALK switch in the TALK position, place the diamond stylus of the recorder head in the template groove marked R.

(3) Adjust the outside stop screw (figs. 28 and 31) so that the screw is firmly against the lifting stud (14, fig. 19).

(4) Lock the outside stop screw in this position with the locknut.

b. ADJUSTMENT OF CLICKER SPRING (AN/GNQ-8 AND -7-(*)).

(1) Place the diamond stylus in the groove marked C.

(2) Loosen the clicker gear setscrew and slide the gear on its shaft so that the spring (figs. 29 and 31) is engaged on the edge of the face of the gear.

(3) Tighten the clicker gear setscrew.

(4) Operate equipment to determine loudness of clicks. Bend the clicker spring, if necessary, to insure positive spring clicks

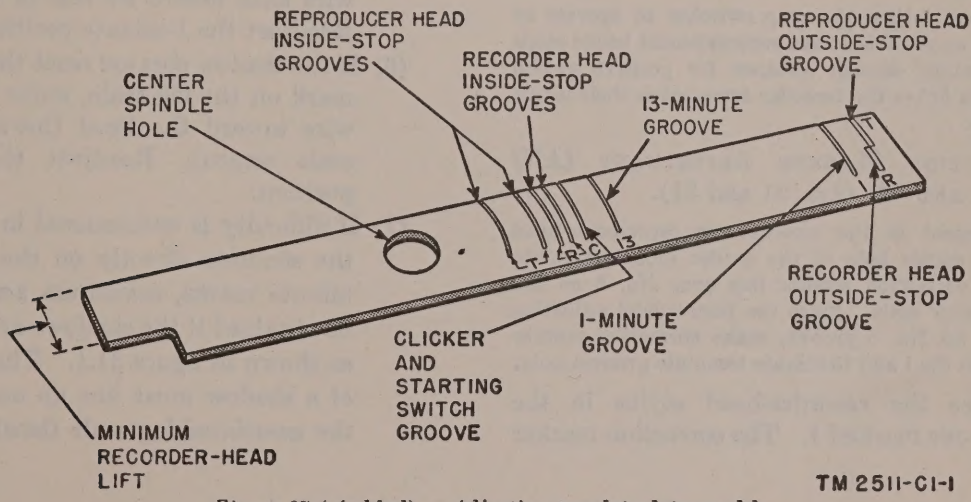


Figure 27.1 (added). *Adjusting template, later model.*

as the gear rotates. The recorder head log scale should read between 14¼ and 14¾ when the clicker starts to operate.

c. Adjustment of Recorder Head Inside Stop (AN/GNQ–8 and –7–(*)).

(1) Place the recorder-head stylus anywhere between the two grooves marked R. The lifting stud (fig. 19) must not emerge from underneath the clamping shoe (figs. 19 and 28).

(2) Adjust by bending the stem (13, fig. 19).

(3) Continue to bend the stem until the lifting stud is at the edge of the clamping shoe.

d. Adjustment of Switch Adjusting Screws (figs. 28, 29, 30, and 31).

(1) Place the recorder-head stylus in the groove marked C.

(2) Adjust the starting switches S–107 and S–109 by carefully rotating the associated adjustment screws until a click is heard from each switch. This click indicates a *make* or that the circuit is closed. Physical contact between the switch adjusting screw and the switch leaf does not mean the circuit is closed.

(3) Rotate the two screws to adjust the stopping switches S–104 and S–105 so that these switches open their respective circuits 30 to 60 seconds after the starting switches close their respective circuits. This adjustment provides the proper overlap recording between the two turntables (A and B). The adjusting template is not required for the stop switch adjustments.

Note. Adjust the stop switches to operate as close as possible to the recorder-head inside stops but allow enough distance for positive switch action *before* the recorder arms reach their inside stops.

e. Correction Marker Adjustment (AN/GNQ–8, –7, and –6) (figs. 21 and 31).

Note. Placement of the recorder- or reproducer-head stylus in the center hole of the earlier model template positions the correction marker line over No. 6 on the correction marker scale. Since the later model adjusting template has no No. 6 groove, make correction marker adjustments on the 1 and 13 minute template grooves only.

(1) Place the recorder-head stylus in the groove marked 1. The correction marker indicator should appear over the 1 mark on the correction marker. If the correction marker indicator does not appear directly over the 1 mark, the correction marker log scale must be separated from the support bracket and moved. Cement the log scale in place.

(2) Place the reproducer-head stylus (AN/GNQ–6 only) in the groove marked 1. If necessary shift the correction marker log scale, and cement the scale in place. (See (1) above.)

f. Calibration of Log Scales (AN/GNQ–7A only).

(1) Position the log-scale lamps I–102 and I–103 so that they are vertical.

(2) Throw the switch marked TUBES ON-OFF to ON position. The log-scale lamp should illuminate the log scale.

(3) With the adjusting template in position, place the recorder-head or reproducer-head stylus in the groove marked 1. The shadow thrown by the shadow wire atop the recorder or reproducer heads should coincide with the 1-minute mark on the illuminated translucent log scale. If necessary, adjust the shadow wire to throw the shadow directly on the log scale mark 1.

(4) Place the stylus in the groove marked 13. The shadow should coincide with the 13-minute log scale mark. If necessary, adjust the shadow wire.

(5) If the shadow *goes beyond* the 13-minute mark on the log scale, move the shadow wire back *toward the rear* of the cabinet. Readjust the 1-minute position.

(6) If the shadow *does not reach* the 13-minute mark on the log scale, move the shadow wire toward the front (toward the log-scale screen). Readjust the 1-minute position.

(7) If difficulty is encountered in positioning the shadows directly on the 1- and 13-minute marks, maximum accuracy may be obtained if the shadows are positioned as shown in figure 31.1. The center line of a shadow must line up on the side of the associated log scale (lens) mark.

g. Reproducer-head Outside and Inside Stops (figs. 22 and 31).

(1) *Outside stop.* Place the reproducer-head stylus in the groove marked T. Bend the outside stop as required.

(2) *Inside stop.* Place the reproducer-head stylus in any position between the two grooves marked T. Bend the inside stop as required.

h. Recorder-head Height.

(1) Place the narrow end of the adjusting template (½-inch width) in a vertical position between the bottom of the recorder head and the turntable shell. Minimum distance between the bottom of the recorder head and the turntable shell is one-half inch.

(2) Adjust clearance as required (par. 73*b*).

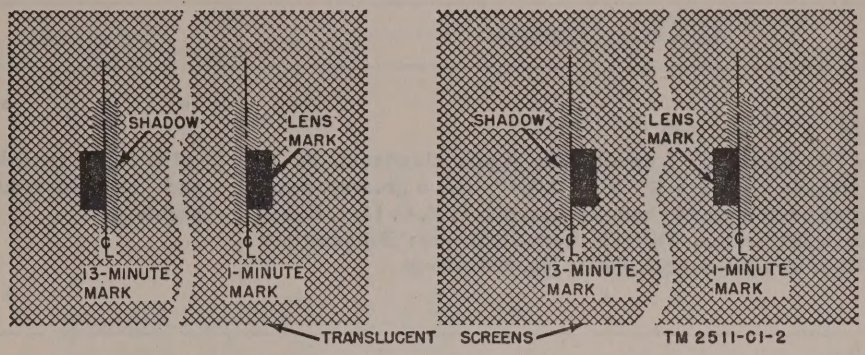


Figure 31.1 (added). *Shadow error tolerance limits.*

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DEPARTMENT OF THE AIR FORCE MANUAL

REPRODUCER AN/GNQ-6 AND RECORDER REPRODUCER AN/GNQ-7, AN/GNQ-7A, AND AN/GNQ-8

C1, TM 11-2511

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
WASHINGTON 25, D. C., *19 August 1949*

TM 11-2511—AFM 100-65, 9 August 1948, is changed as follows:

78. Special Tools (fig. 27)

The following special * * * of these tools.

Signal Corps stock No.	*Name*
6Q45232	Adjusting template (**earlier model**)
	Adjusting template (later model)

* * * * *

In figure 27, change the designation "adjusting template" to read: Adjusting Template **(Earlier Model).**

80. Use of Earlier Model Adjusting Template

Note (added). Refer to paragraph 80.1 for information on use of later model adjusting template.

* * * * *

80.1 (added). Use of Later Model Adjusting Template (fig. 27.1)

a. ADJUSTMENT OF RECORDER HEAD OUTSIDE STOP (AN/GNQ-8 AND -7-(*)).

(1) Place the template center spindle hole over the square center spindle (H, fig. 28) of the turntable and lay the template on the turntable. Push the template toward the spindle.

(2) With the LISTEN-TALK switch in the TALK position, place the diamond stylus of the recorder head in the template groove marked R.

(3) Adjust the outside stop screw (figs. 28 and 31) so that the screw is firmly against the lifting stud (14, fig. 19).

(4) Lock the outside stop screw in this position with the locknut.

b. ADJUSTMENT OF CLICKER SPRING (AN/GNQ-8 AND -7-(*)).

(1) Place the diamond stylus in the groove marked C.

(2) Loosen the clicker gear setscrew and slide the gear on its shaft so that the spring (figs. 29 and 31) is engaged on the edge of the face of the gear.

(3) Tighten the clicker gear setscrew.

(4) Operate equipment to determine loudness of clicks. Bend the clicker spring, if necessary, to insure positive spring clicks

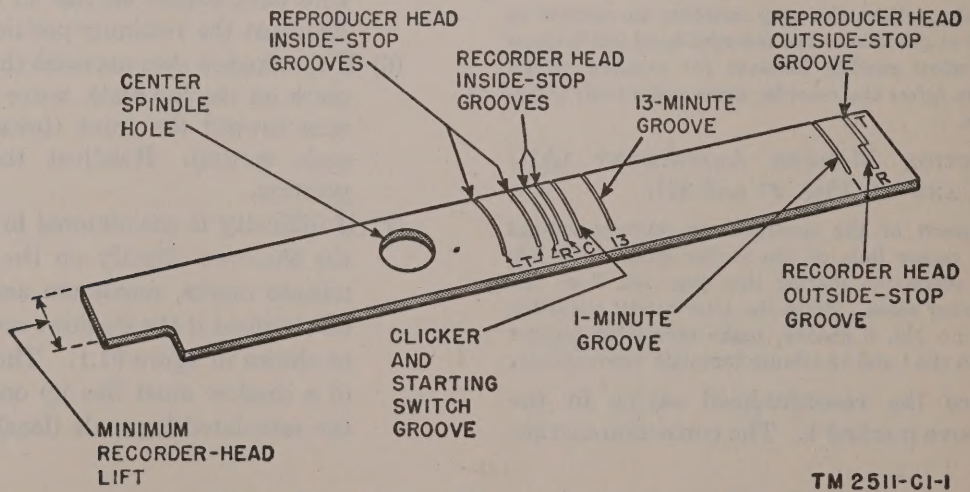


Figure 27.1 (added). *Adjusting template, later model.*

TM 11-2511—AFM 100-65

This manual supersedes TM 11-2511, 6 April, 1944; TM 11-2512, 6 April 1944; and TB 11-2511-2, March 1945.

REPRODUCER
AN/GNQ-6
AND
RECORDER REPRODUCER
AN/GNQ-7, AN/GNQ-7A
AND AN/GNQ-8

United States Government Printing Office
Washington: 1948

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
Washington 25, D. C., 9 August 1948

TM 11–2511—AFM 100–65, Reproducer AN/GNQ–6 and Recorder-Reproducers AN/GNQ–7, AN/GNQ–7A, and AN/GNQ–8, is published for the information and guidance of all concerned.

[AG 300.7 (21 May 48)]

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

OMAR N. BRADLEY
Chief of Staff, United States Army

OFFICIAL:
EDWARD F. WITSELL
Major General
The Adjutant General

HOYT S. VANDENBERG
Chief of Staff, United States Air Force

OFFICIAL:
L. L. JUDGE
Colonel, USAF
Air Adjutant General

DISTRIBUTION:

Army:

Tech Sv (2); Arm & Sv Bd (1); AAF Bd (ea Sv Test Sec) (1); AFF (5); OS Maj. Comd (5); Base Comd (3); MDW (5); A (ZI) (20), (Overseas) (5); CHQ (2); FC (2); USMA (2); Sch 11 (10); Gen Dep 11 (10); Dep 11 (5) except Baltimore & Sacramento (20); Tng Ctr (2); PE (10); Lab 11 (2); 4th & 5th Ech Maint Shops 11 (2); T/O & E 11–47 (2); 11/107 (2); 11–127 (2); 11–587 (2); 11–592 (2); 11–597 (2); SPECIAL DISTRIBUTION.

Air Force:

USAF (5); USAF Maj Comd (5); USAF Sub Comd (3); Services (MATS) (2); Class III Instls (2); USAF Technical School (Communications) (10); Watson Laboratories, Electronic Laboratories (2).

For explanation of distribution formula see TM 38–405.

CONTENTS

		Paragraphs	Page
PART ONE.	**INTRODUCTION.**		
Section I.	Description	1–8	1
II.	Installation	9–12	15
PART TWO.	**OPERATING INSTRUCTIONS.**		
Section III.	Controls and their use	13–15	20
IV.	Operation	16–25	21
V.	Equipment performance check list	26–28	23
PART THREE.	**MAINTENANCE INSTRUCTIONS.**		
Section VI.	Preventive maintenance techniques	29–30	28
VII.	Itemized preventive maintenance	31–45	29
VIII.	Lubrication	46–50	32
IX.	Weatherproofing	51–54	33
PART FOUR.	**AUXILIARY EQUIPMENT. (Not used.)**		
PART FIVE.	**REPAIR INSTRUCTIONS.**		
Section X.	Theory of equipment	55–59	36
XI.	Trouble shooting	60–64	40
XII.	Repairs	65–79	51
XIII.	Adjustments	80–86	70
APPENDIX I.	**REFERENCES.**		79
APPENDIX II.	**IDENTIFICATION TABLE OF REPLACEABLE PARTS.**		80

DESTRUCTION NOTICE

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

WHEN —When ordered by your commander.

HOW —1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

2. Cut—Use axes, handaxes, machetes.

3. Burn—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

4. Explosives—Use firearms, grenades, TNT.

5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT —1. Smash—Carrying case, amplifier, motor, carriage assembly, tubes.

2. Cut—All wires, speaker cone, films, cables.

3. Burn—All smashed and cut material.

4. Bury or scatter—All of the above material after burning.

DESTROY EVERYTHING



Figure 1. Reproducer AN/GNQ–6 in use.

PART ONE INTRODUCTION

Section I. DESCRIPTION

1. General

a. Reproducer AN/GNQ–6 (figs. 1 and 2) is a portable sound-reproducing equipment for transcribing from a disk record. The equipment reproduces through a headset and is provided with a step-back and brake mechanism permitting control of the record while transcribing.

b. Recorder-Reproducers AN/GNQ–7, AN/GNQ–7A, and AN/GNQ–8 (fig. 2) are portable sound-recording and sound-reproducing equipments designed for making 15-minute disk recordings of dictations, conferences, telephone conversations and the like, and playing back the recordings at will. Each of these equipments reproduces through a loudspeaker and is provided with a logging system for determining recorded positions on the record.

(1) Recorder-Reproducers AN/GNQ–7 and AN/GNQ–7A are very similar. Each has two turntables which can be used to record on two disks simultaneously, or to record on one and automatically continue the recording on the other (with about a 60-second overlap period on each disk) and so on indefinitely by alternately placing new disks on the turntables. Reproducing is done on only one of the two turntables. *Hereafter in this manual the nomenclature AN/GNQ–7–(*) will refer to both models, and the specific nomenclature AN/GNQ–7 or AN/GNQ–7A will be used only where the models differ.*

(2) Recorder-Reproducer AN/GNQ–8 has only one turntable, on which both the recording and reproducing functions are accomplished.

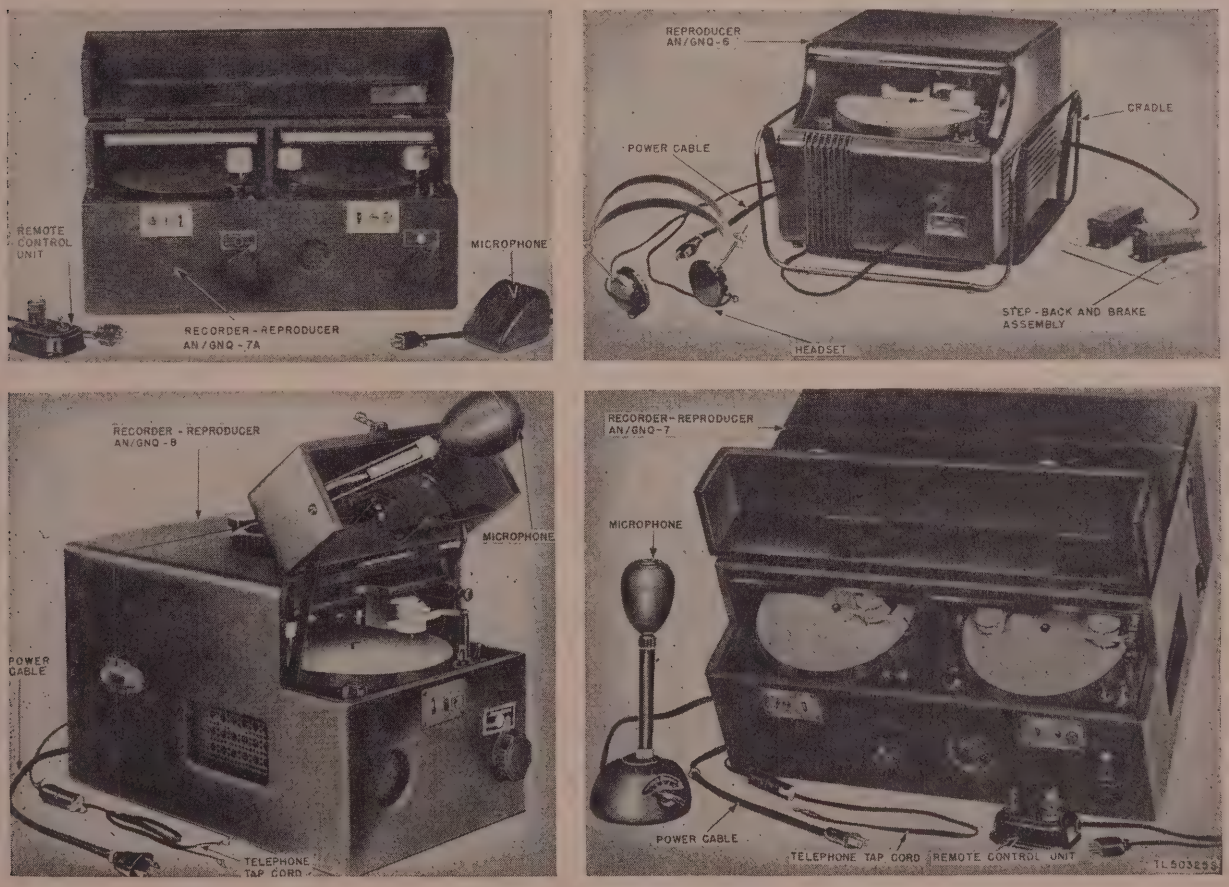


Figure 2. Reproducer AN/GNQ–6, and Recorder-Reproducers AN/GNQ–7, 7A, and 8.

2. Technical Characteristics

a. Characteristics Common to all Models.

Characteristic	Reproducer AN/GNQ–6 Recorder-Reproducer AN/GNQ–7, AN/GNQ–7A, AN/GNQ–8
Power source	115 volts, 60 cycles
Power output	3 watts
Overall gain	110 decibels
Frequency range (flat within 6 decibels).	200–3,000 cycles-per-second
Tube complement:	
Voltage amplifier	1—JAN 12SC7
Phase inverter	1—JAN 12SC7
Push-pull output	2—JAN 35L6
Rectifier	1—JAN 35Z5 (or 35Z4)
Reproducer head (magnetic type).	50 ohms

b. Characteristics Differing among Models.

Characteristic	Reproducer AN/GNQ–6	Recorder-Reproducer AN/GNQ–7	Recorder-Reproducer AN/GNQ–7A	Recorder-Reproducer AN/GNQ–8
Power input	50 watts	75 watts	75 watts	50 watts
Microphone (dynamic type)	None	50-ohm	10-ohm	50-ohm
Recorder head (magnetic type)	None	17 ohms	4 ohms	17 ohms
Turntable motor (induction)	Shaded-pole start	Shaded-pole start	Capacitor start	Shaded-pole start
Headset	500 ohms	None	None	None
Loudspeaker (dynamic)	None	4-ohm	6-ohm	4-ohm

3. Table of Components

The following lists are for general information only. See appropriate publications for information pertaining to the requisitioning of spare parts.

a. Reproducer AN/GNQ–6.

Quan.	Component	Height (in.)	Depth (in.)	Length (in.)	Weight unpacked (lb.)
1	Reproducer, complete with tubes and including:	12½	8½	10¼	17
	1 a-c power cable, packed inside front on top of turntable.			120	
1	Step-back and brake-foot switch assembly.	2½	5¼	8¼	1½
1	Cabinet cradle	6¼	11¾	11¾	2
2	Headset	2	6¼	6¼	½
1	Set of running spare parts consisting of:				
	1 Fuse FU-50, 3 amp.				
	1 Lamp, incandescent, 2.9 volts.				
	1 Tube, JAN-12SC7.				
	1 Tube, JAN-35L6GT.				
	1 Tube, JAN-35Z5GT.				

b. Recorder-Reproducer AN/GNQ–7.

Quan.	Component	Height (in.)	Depth (in.)	Length (in.)	Weight unpacked (lb.)
1	Recorder-reproducer, complete with tubes and including:	10⅛	16⅛	19	46
	1 a-v-c unit mounted on rear of recorder-reporducer.				
	1 a-c power cable packed inside rear door.			120	
	1 remote control unit packed inside rear door.	1	2⅝	3½	
1	Telephone tap cord			18	
1	Microphone, with cord.	10¼	6¾	6¾ (cord, 120)	3
1	Set of running spare parts consisting of:				
	1 Fuse FU-50, 3 amp.				

b. Recorder-Reproducer AN/GNQ–7.—*Continued*

Quan.	Component	Height (in.)	Depth (in.)	Length (in.)	Weight unpacked (lb.)
	1 lamp, glow, 115-125 volts. 1 lamp, incandescent, 2.9 volts. 1 lamp, incandescent, 3.2 volts. 1 tube, JAN–12SC7. 1 tube, JAN–35L6GT. 1 tube, JAN–35Z5GT.				

Note. The blank recording disks (stock No. 6C15–4) designed for use with this equipment are not component parts, but must be requisitioned separately through normal supply channels.

c. Recorder-Reproducer AN/GNQ–7A.

Quan.	Component	Height (in.)	Depth (in.)	Length (in.)	Weight unpacked (lb.)
1	Recorder-reproducer, complete with tubes and including: 1a-v-c unit mounted on rear of recorder-reproducer. 1 a-c power cable packed inside rear door. 1 remote control unit packed inside rear door.	10⅛ 1	16⅛ 2⅝	19 120 3½	46
1	Telephone tap cord.....			18	
1	Microphone, with cord..	4	2½	4 (cord, 144)	
1	Set of running spare parts consisting of: 1 Fuse FU–50, 3 amp. 1 lamp, glow, 115-125 volts. 1 lamp, incandescent, 2.9 volts. 1 lamp, incandescent, 3.2 volts. 2 lamps, incandescent, 115 volts. 1 tube, JAN–12SC7. 1 tube, JAN–35L6GT. 1 tube, JAN–35Z5GT.				

Note. The blank recording disks (stock No. 6C15–4) designed for use with this equipment are not component parts, but must be requisitioned separately through normal supply channels.

d. Recorder-Reproducer AN/GNQ–8.

Quan.	Component	Height (in.)	Depth (in.)	Length (in.)	Weight unpacked (lb.)
1	Recorder-reproducer, complete with tubes and including: 1a-v-c unit mounted on rear of recorder-reproducer. 1 a-c power cable packed inside rear door.	10	10¼	16¾ 120	29½
1	Set of running spare parts consisting of: 1 Fuse FU–50, 3 amp. 1 lamp, incandescent, 2.9 volts. 1 tube, JAN–12SC7. 1 tube, JAN–35L6MT. 1 tube, JAN–35Z5GT.				

Note. The blank recording disks (stock No. 6C15–4) designed for use with this equipment are not component parts, but must be requisitioned separately through normal supply channels.

4. Packaging Data

a. Reproducer AN/GNQ–6 (fig. 13). For export shipment, seven cartons inclosing the various items of this equipment are packed tightly by pads and cells of corrugated fiberboard within a wooden box which has a waterproof inside liner. Each carton consists of two corrugated cardboard containers, one fitted inside the other with a moisture-vaporproof barrier between them. A quantity of silica gel is used as the desiccant. The dimensions and weights follow:

Quan.	Container	Height (in.)	Depth (in.)	Length (in.)	Weight (lb.)
1	Wooden box, containing following cartons:	19	19	29	91
1	Carton, containing reproducer and power cable.	14⅞	9⅝	11⅞	21
2	Cartons, each containing one headset.	4	7¼	7¼	2
1	Carton, containing step-back and brake assembly.	4⅜	6¼	9¼	3½
1	Carton, containing cradle for cabinet.	8⅛	12¾	12¾	6
1	Carton, containing tubes	11⅝	4⅝	4⅜	2⅛
1	Carton, containing spare parts.	4⅜	6¼	9¼	2

b. Recorder-Reproducer AN/GNQ–7 (fig. 12). For export shipment, four cartons inclosing the various items of this equipment are packed tightly by pads and cells of corrugated fiberboard within a wooden box which has a waterproof inside liner. Each carton consists of two corrugated cardboard containers, one fitted inside the other with a moisture-vaporproof barrier between them. A quantity of silica gel is used as the desiccant. The dimensions and weights follow:

Quan.	Container	Height (in.)	Depth (in.)	Length (in.)	Weight (lb.)
1	Wooden box, containing following cartons:	17	24	31	130
1	Carton, containing recorder-reproducer, a-v-c unit, a-c power cable, and remote control unit.	12⅛	17⅝	20⅛	56
1	Carton, containing microphone.	12⅛	7¾	7¾	5¾
1	Carton, containing tubes	11⅝	4⅝	4⅜	2⅛
1	Carton, containing spare parts.	4¾	6¼	9¼	3⅛

c. Recorder-Reproducer AN/GNQ–7A. The various items of this equipment are packed in four containers which have the following dimensions:

Quan.	Container	Height (in.)	Depth (in.)	Length (in.)
1	Carton, containing recorder-reproducer, a-v-c unit, and power cord.	16½	10½	19¾
1	Box, containing remote control unit.	5¼	2⅝	9
1	Box, containing microphone.	6¾	2¾	6¾
1	Box, containing station components.	5¼	2⅝	9

d. Recorder-Reproducer AN/GNQ–8 (fig. 11). For export shipment, three cartons inclosing the various items of this equipment are packed tightly by pads and cells of corrugated fiberboard within a wooden box which has a waterproof inside liner. Each carton consists of two corrugated cardboard containers, one fitted inside the other with a moisture-vaporproof barrier between them. A quantity of silica gel is used as the desiccant. The dimensions and weights follows:

Quan.	Container	Height (in.)	Depth (in.)	Length (in.)	Weight (lb.)
1	Wooden box, containing following cartons:	16	16	28	89
1	Carton, containing recorder-reproducer, a-v-c unit, and a-c power cable.	11⅞	11¼	17¾	35½
1	Carton, containing tubes	11⅝	4⅝	4⅜	2⅛
1	Carton, containing spare parts.	4⅜	6¼	9¼	3¼

5. Reproducer AN/GNQ–6 (figs 3 and4)

Reproducer AN/GNQ–6 consists principally of a wooden desk-model cabinet, turntable unit and turntable motor, reproducer head, amplifier, step-back and brake assembly, headset, and cradle.

a. Cabinet. The turntable compartment at the top of the cabinet is open at the front to permit access to the turntable, reproducer head, switches, and controls. Pilot lamp I–102 is located to the right of switch S–101. Ventilating grills in the ends of the cabinet vent heat from the amplifier compartment.

b. Controls and Connectors. (1) A listening device jack, J–101, is located on the front of the cabinet (right-hand side) below the turntable compartment. (On earlier models, J–101 is located at the rear, and a tone control knob is located in its place on the front panel; in later models the tone control is inside the equipment and is preset at the factory.) Volume control knob E–101 is located in the left-hand front corner of the turntable compartment. TUBE ON-OFF switch S–101 is located in the right-hand front corner of the turntable compartment.

(2) The following connectors are panel-mounted at the rear of the reproducing equipment: three-prong female connector J–105 for the step-back and brake assembly cable, six-prong male connector P–102 to accommodate the a-c power cable, and two-prong female connector J–102 to accommodate an external loudspeaker.

c. Turntable and Turntable Meter. (1) The reproducer uses a single turntable which is driven by a small motor. The bakelite turntable shell which rotates at 33 r.p.m., is held in place by a single screw. A supporting ring under the shell provides proper damping effect.

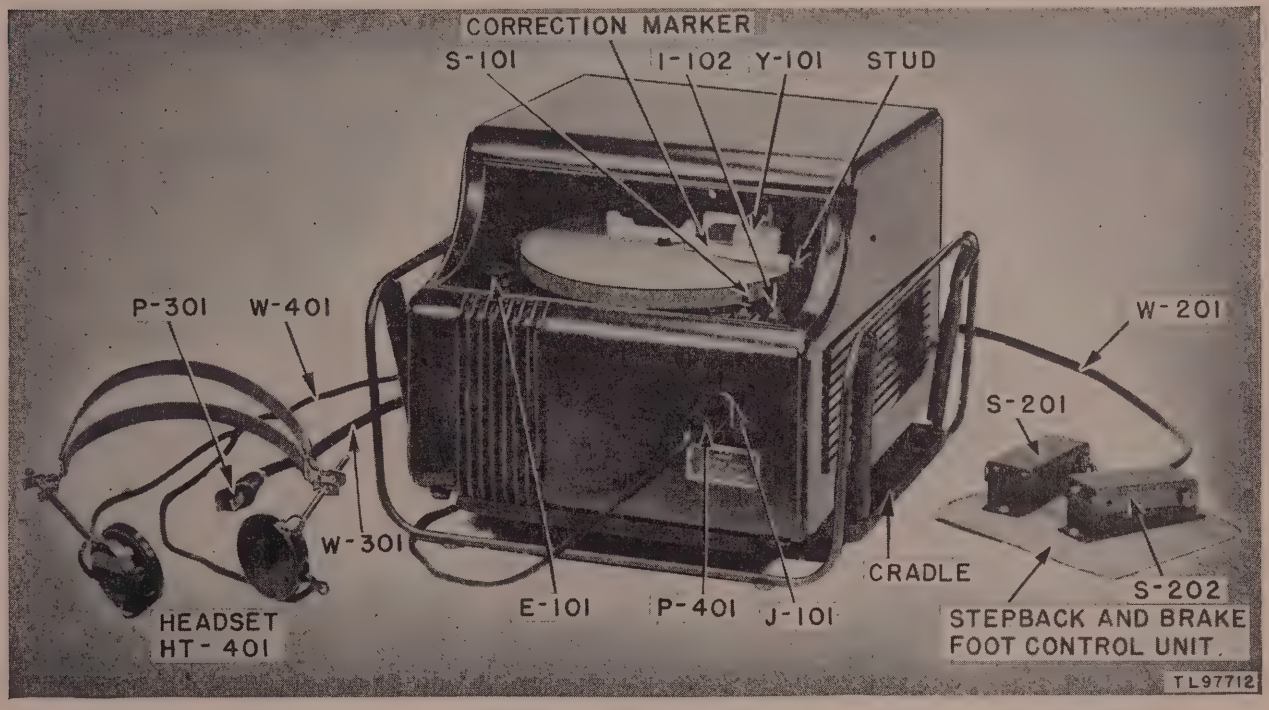
(2) The motor is a back-geared, shaded-pole, a-c induction motor mounted beneath the turntable. Three loopsprings (E, fig. 16), whose action is

limited by brackets F, support the motor and permit the motor to float in order to minimize vibration. A flexible coupling (fig. 16) consisting of several pieces of fabric and metal disks, riveted together at the center and outside edges, transmits motive power from the turntable motor to the turntable shell.

d. Step-back and Brake Assemblies (figs. 36 and 38). The step-back and brake assembly is a foot-controlled device which permits an operator to stop the turntable or to operate the step-back mechanism without moving his hands from a typewriter while transcribing a recording. The foot control unit (fig. 4) consists of two pedal-controlled footswitches S–201 and S–202 (both secured by screws to a wooden base), and cable W–201 which is provided at its free end with a three-prong male connector P–201. The brake footswitch, S–202 is a normally closed microswitch; when pressure is applied to the pedal, the brake circuit opens and releases the brake from the turntable shell. The step-back footswitch, S–201, is a normally open microswitch; when pressure is applied to the pedal, the step-back mechanism operates.

e. Amplifier. The five-tube amplifier uses two JAN–35L6 in push-pull in the output stage. One Tube JAN–12SC7 is used as a voltage amplifier in the first and second amplifier stages and one Tube JAN–12SC7 is used in the driver and inverter stages. Tube JAN–35Z5 (or 35Z4) is used as the rectifier. The amplifier is mounted below, and to the rear of the turntable. The amplifier output is wired to phone jack J–101 which receives the headset plug.

f. Reproducer Head. (1) The reproducer head is mounted on the right side of the turntable and is a front part of the reproducer arm assembly which is mounted in a bracket located at the right rear of the turntable chassis. The magnetic element contains a one-piece alnico fixed magnet and a 50-ohm movable coil to which is attached a permanent sapphire stylus. The movable coil is connected to the amplifier input through a twisted



E–101	Reproducer volume control knob.	P–301	A-c power cable connector.	W–201	Foot control unit cable.
I–102	Pilot lamp.	P–401	Headset plug.	W–301	A-c power cable.
J–101	Phone jack (listening device).	S–101	TUBE ON-OFF switch.	W–401	Headset cord.
		S–201	Brake switch.	Y–101	Reproducer arm assembly.
		S–202	Step-back switch.		

Figure 3. Reproducer AN/GNQ–6, front view.

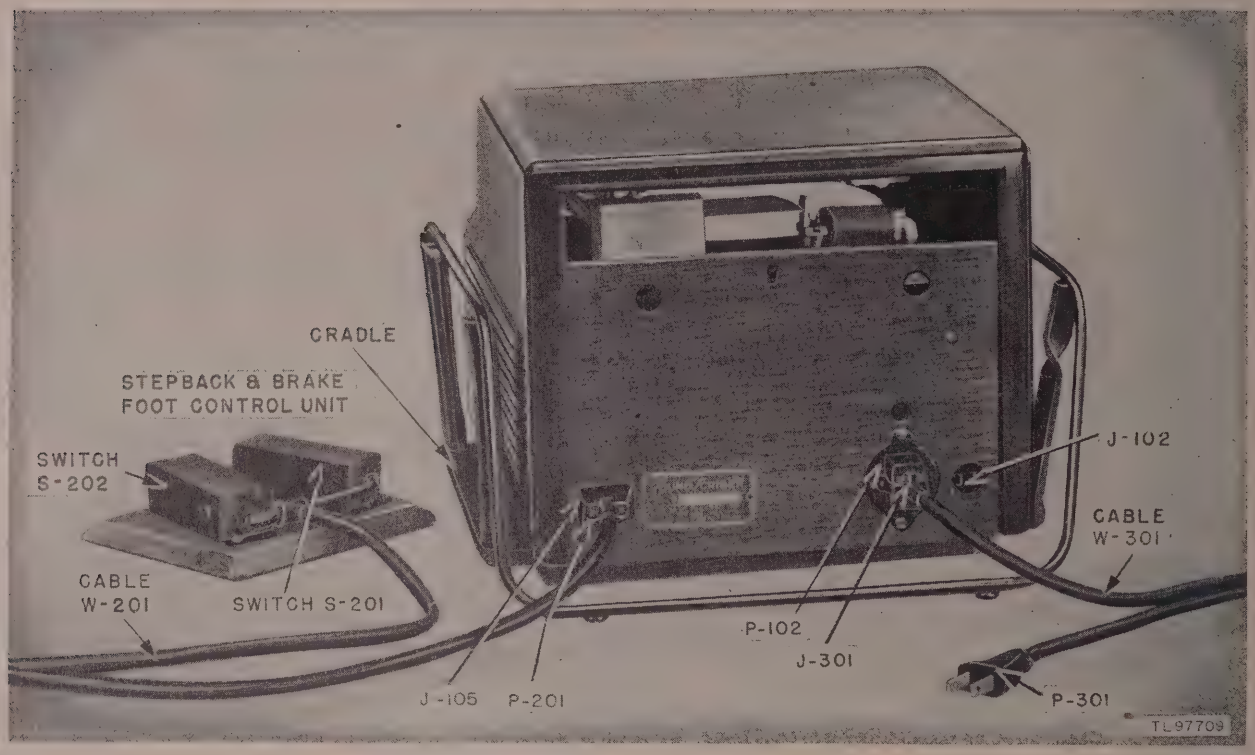
pair of wires connected to connector P–101 which seats into a three-prong receptacle, J–103. A correction marker serves to locate the reproducer head stylus position on the disk.

(2) A neutralizing mechanism insures stability of operation. The neutralizing mechanism consists of a bracket and spring connected between the movable arm and the fixed D-shaped stanchion.

(3) The arm is suspended in a bearing and pivots within the mounting bracket so that it is movable horizontally but rigid vertically. A counterbalance weight is mounted on the rear of the arm to minimize the effects of tilting upon tracking by the arm. This weight counterbalances the arm in a horizontal direction *only*. It has no effect upon stylus pressure since the head is connected to the arm by the flexible hinge.

g. Headset (fig. 3). The headset is a lightweight, permanent-magnet, diaphragm type with two adjustable receiver units mounted on a flexible headband. The headband consists of two flat spring steel bands curved to fit the head. The receiver units mounting brackets are fixed to each end of the headband.

h. Cradle (fig. 2). The cradle consists of a steel frame with two web cross straps on which the reproducer cabinet is suspended. The cradle rests on felt-padded feet which are screwed to the bottom of the cradle frame. The cradle minimizes the effects of mechanical vibration.



J–102 Amplifier output connector.
J–105 Step-back and brake input connector.
J–301 Power cable input connector (receptacle).
P–102 Power cable input connector (plug).
P–201 Step-back and brake input connector (plug).
P–301 A-c power cable connector.

Figure 4. Reproducer AN/GNQ–6, rear view.

6. Recorder-Reproducer AN/GNQ–7

(figs. 2, 5, and 6)

Recorder-Reproducer AN/GNQ–7 consists of a cabinet, an a-v-c unit, and two turntable and motor units—one with both recorder and reproducer heads and the other with a recorder head only. Also included are an amplifier, a built-in permanent magnet speaker, microphone, remote control unit, a-c power cable, and a telephone tap cord.

a. Cabinet. The cabinet is constructed of plywood, is covered with fabrikoid, and is furnished with a carrying handle. It has two compartments with one turntable and motor housed in each compartment. The rear cover of the cabinet is removable; the front cover is hinged and secured by a

lock. Ventilating grills provide outlets for internal heat.

b. Controls, A-v-c Unit, and Connectors. (1) The recording volume control knob, E–102, is located at the top back of the cabinet. The loudspeaker and the LISTEN-TALK knob, E–103, are located on the front of the cabinet, below the front cover. The LISTEN-TALK nameplate partly covers the volume flasher lamp I–101 behind a translucent screen. The reproducer volume control knob, E–101, is located in the left-hand front corner of the cabinet (front cover open), and the MIC-TEL lever of switch S–201 is provided in the top right-hand corner. At the right of the turntable are two switches: the TUBE ON-OFF switch, S–101 (the switch nearer the turntable), and the TURNTABLE START-STOP switch, S–103. Two push-button switches are located to the right of the left-hand turntable: a momentary, normally-open switch, S–106, for actuating relay K–107, and a similar switch, S–108, for actuating relay K–102. LISTEN-TALK control E–104 for the left-hand turntable unit is located to the left of the loudspeaker on front of the cabinet. The MIC-TEL switch S–201 is located above the a-v-c unit which is mounted on the back of the recorder-reproducer.

(2) The a-v-c unit and associated cables and connectors are located behind the right-hand turntable.

(3) Below the a-v-c unit, on the right-hand side of the rear panel, are located listening device jack J–101, six-prong power-input connector J–401, and two-prong receptacle J–102, (output receptacle to the a-v-c input). The amplifier-input receptacle (J–107) from the a-v-c unit is located beneath the a-v-c unit on the left-hand side of the near panel. The a-v-c unit is provided with a microphone cable, W–202 (with a four-prong receptacle J–201), a short two-conductor cable, W–203 (cable from a-v-c unit to amplifier output), cable W–201 (cable from a-v-c to amplifier input), and cable, W–204, to telephone input. An eight-prong, recessed-type, panel-mounted, male connector P–107 accommodates cable W–102 for interconnection between the two units. A four-prong recessed-type panel-mounted connector P–106 accommodates cable W–101 for interconnection between the two turntable units. A three-prong female connector, J–108, located below the a-v-c unit accommodates the male connector at the end of remote control cable W–501.

c. Turntables and Turntable Motors. Each of the two turntables and turntable motors used in the AN/GNQ–7 is identical with the turntable and motor described in paragraph 5*c*. In addition, there is a geared shaft extending from the motor to a rear gear box which drives the recorder arm.

Note. For identification purposes, hereafter in this manual the left-hand turntable is designated turntable A, and the right-hand turntable is designated turntable B.

d. Amplifier and Loudspeaker. (1) The amplifier used in the AN/GNQ–7 is similar to the one described in paragraph 5*e*, with the following exceptions:

(*a*) Amplifier output is wired to a built-in speaker ((2) below) as well as to jack J–101.

(*b*) An a-v-c circuit is added to accommodate the various input circuits for recording purposes.

(*c*) A recording volume control is added to control signal intensity of sound being recorded.

(*d*) A volume flasher is added to visually indicate intensity of signal being recorded.

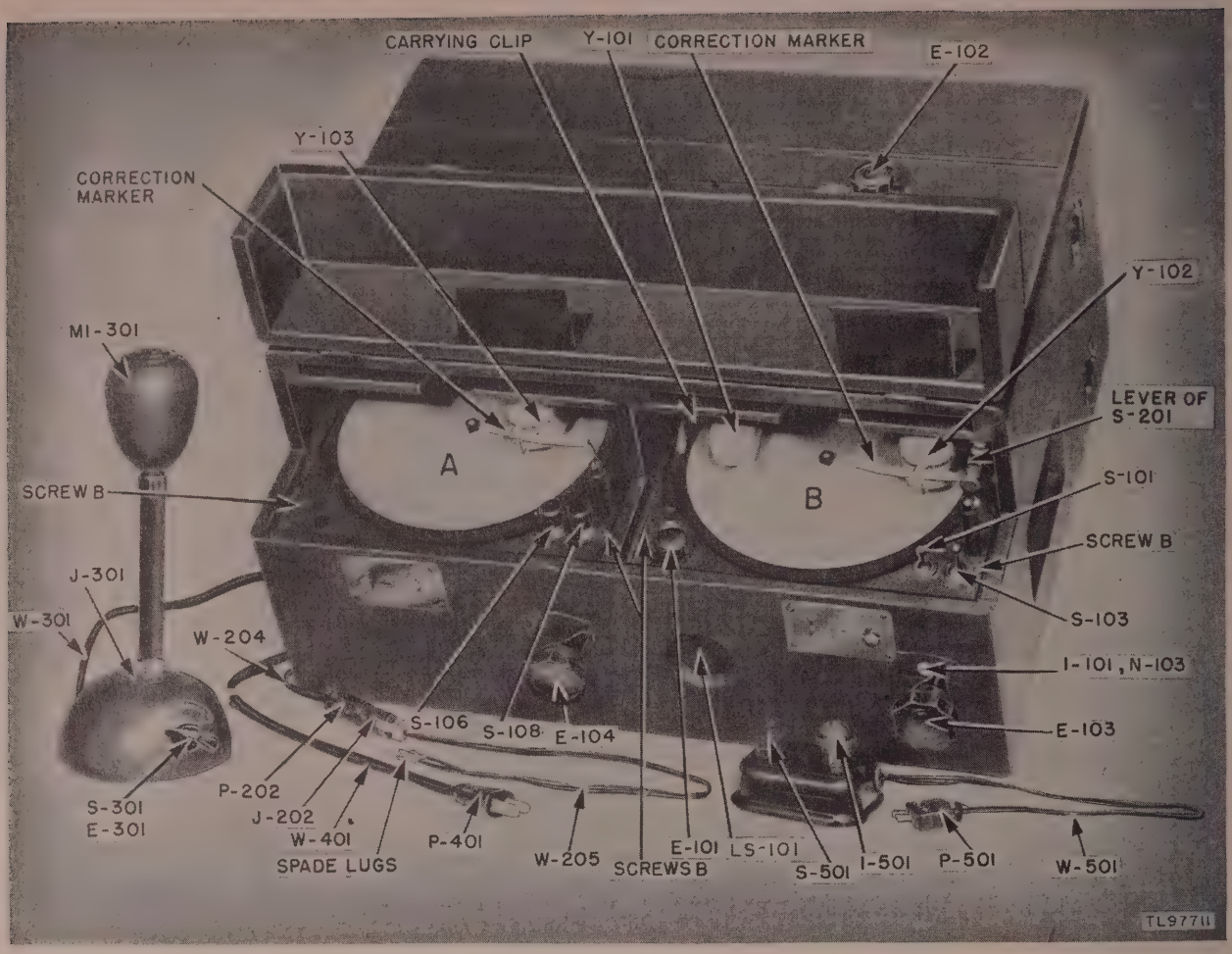
(2) The loudspeaker is a 3-inch permanent magnet unit mounted behind the left-hand panel underneath turntable A.

e. Microphone. The microphone, MI–301, is a low-impedance, dynamic type (moving coil in magnetic field). The microphone head is mounted on a short desk-type stand with a die-case base incorporating six-position selector switch S–301. A 10-foot 3-wire shielded microphone cord, W–301, extends from the base of the microphone. The free end of the cord is provided with a four-prong male connector, P–301, which engages the female connector, J–201, at the end of cable W–202 (from a-v-c unit). The microphone base also contains female connector J–301 into which a second microphone may be connected in parallel.

f. Remove Control Unit. The remote control unit consists of a small plastic case on which are mounted toggle switch S–501 and indicator lamp I–501. One end of cable W–501 is attached to the remote control unit, and the other end is provided with three-prong male connector P–501.

g. Power Cable. The a-c power cable, W–401, is packed inside the rear door of the cabinet. It consists of a 10-foot length of two-wire cable, a six-prong female connector, J–401, at one end of the cable, and a two-prong male connector, P–401, at the other end.

h. Telephone Tap Cord. The telephone tap cord is provided at one end with two spade lugs and at the other end with a two-prong female connector, J–202.

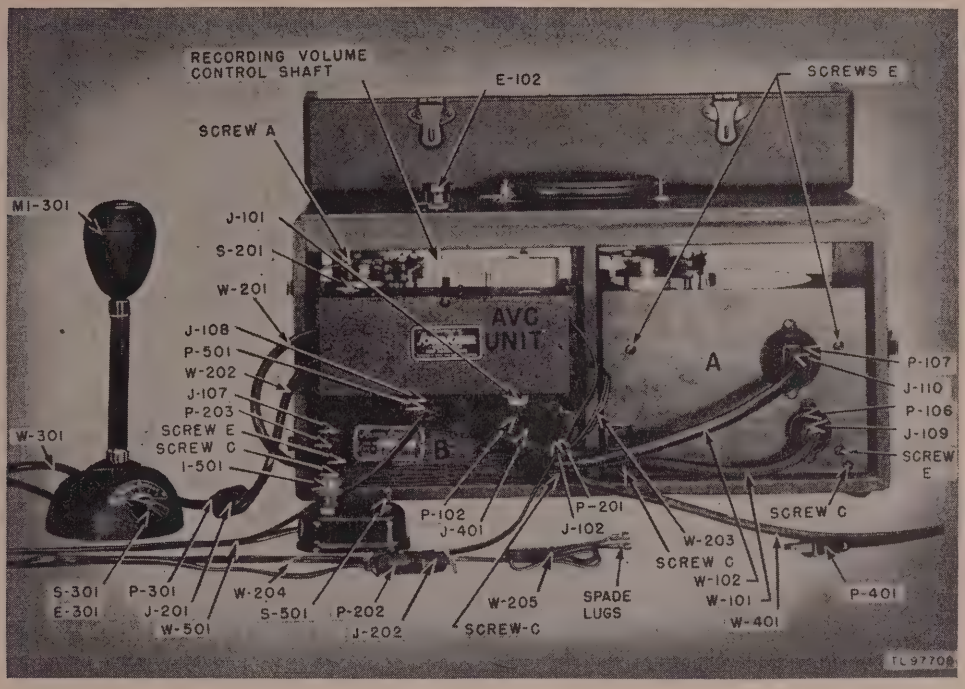


E–101	Reproducer volume control knob.	S–101	TUBE ON-OFF switch.
E–102	Recorder volume control knob.	S–103	TURNTABLE START-STOP switch.
E–103	LISTEN-TALK knob, turntable B.	S–106	Selector switch, turntable A.
E–104	LISTEN-TALK knob, turntable A.	S–108	Selector switch, turntable B.
E–301	Microphone selector knob.	S–201	MIC-TEL switch.
I–101	Volume flasher lamp.	S–301	Microphone selector switch.
I–501	Remote control on-off guide.	S–501	Remote control ON-OFF switch.
J–202	Telephone tap cord connector.	W–204	A-v-c cable.
J–301	Microphone connector.	W–205	Telephone tap cord.
LS–101	Loudspeaker.	W–301	Microphone cable.
MI–301	Microphone.	W–401	A-c power cable.
N–103	LISTEN-TALK nameplate.	W–501	Remote control unit cable.
P–202	A-v-c input cable connector.	Y–101	Reproducer head.
P–401	A-c power cable connector.	Y–102	Recorder head, turntable B.
P–501	Remote control unit connector.	Y–103	Recorder head, turntable A.

Figure 5. Recorder-Reproducer AN/GNQ–7, front view.

i. Recorder Head. (1) Each of the two recorder heads used in the AN/GNQ–7 is a low-impedance unit provided with a permanent diamond-tipped stylus attached to the moving coil. A metal hinge spring located behind the recorder head supports the recorder head and when the stylus rests upon a disk, the stylus pressure upon the disk is equal to the weight of the recorder head. The correction marker is a fixed cellulose scale mounted in front of the recorder head. It indicates the position of the recorder-head stylus on the disk.

(2) The recorder arm is held on its shaft above the feed collar (7, fig.19) by two locking nuts (4). A clamping shoe (11) is provided and it lifts the recorder head by pressing down on the lifting stud (14). The cone (29) underneath the clamping shoe is serrated. A clicker spring with associated gear is located to the left of the recorder head and to the rear of the turntable. An outside stop pro-



E–102 Recorder volume control knob.
E–301 Microphone selector knob.
I–501 Remote control on-off guide.
J–101 Listening device jack.
J–102 Output jack for a-v-c unit.
J–107 Input connector from a-v-c unit.
J–108 Remote control connector to amplifier.
J–109 Interconnection between units A and B.
J–110 Interconnection between units A and B.
J–201 Microphone input connector.
J–202 Telephone tap cord connector.
J–401 Power cable connector.
MI–301 Microphone.
P–102 Power input connector.
P–106 Interconnection between units A and B.
P–107 Interconnection between units A and B.
P–201 Output connector to a-v-c unit.
P–202 A-v-c input cable connector.
P–203 A-v-c output connector.
P–301 Microphone input connector to a-v-c unit.
P–401 A-c power cable connector.
P–501 Remote control unit connector.
S–201 MIC-TEL switch.
S–301 Microphone selector switch.
S–501 Remote control ON-OFF switch.
W–101 Interconnecting cable between units A and B.
W–102 Interconnecting cable between units A and B.
W–201 A-v-c cable to amplifier input.
W–202 Cable from a-v-c to microphone input.
W–203 A-v-c cable to amplifier output.
W–204 A-v-c cable.
W–205 Telephone tap cord.
W–301 Microphone cable.
W–401 A-c power cable.
W–501 Remote control unit cable.

Figure 6. Recorder-Reproducer AN/GNQ–7, rear view.

vides a fixed starting point at the outside of a disk; an inside stop prevents the recorder arm from feeding too far towards the center of the disk.

(3) In turntable B, the recorder arm actuates switches S–104 and S–107 both of which are located at the inside limit of lateral travel of the recorder head. In turntable A, switches S–105 and S–109, similarly located, are actuated by the recorder arm.

(4) Each recorder-head assembly consists of a recorder head, a recorder arm, feed mechanism, and a locking mechanism. In addition, a clicker spring and limiter bar are used. The clicker spring is adjusted to engage the teeth of the exposed gear on the horizontal shaft of the mechanical drive system and makes a clicking sound during the last one-half minute of recording time.

(5) The recorder-head coil is connected to the amplifier through a pair of twisted wires and three-prong male connector P–103 (for recorder head Y–102) and connector P–104 (for recorder head Y–103) (figs. 20 and 30).

(6) The recorder arm is moved across the disk by action of the gear in the rear gear box which is engaged through a shaft to the front gear box on the turntable motor. The recorder-head stylus embosses 200 grooves per inch of disk surface.

j. Reproducer Head. The hinged reproducer head is part of the reproducer arm assembly which is located on the left side of turntable B (fig. 31). The entire head assembly is identical to the one described in paragraph 5*f*.

7. Recorder-Reproducer AN/GNQ–7A

(figs. 2, 7, and 8)

Recorder-Reproducer AN/GNQ–7A consists of a cabinet, an a-v-c unit, and two turntable and motor units, one with both recorder and reproducer heads and the other with a recorder head only. Also included are an amplifier, built-in permanent magnet speaker, microphone, remote control unit, a-c power cable, and a telephone tap cord.

a. Cabinet. The cabinet used with the AN/GNQ–7A is similar to the one described in paragraph 6*a*.

b. Controls, A-v-c Unit, and Connectors. (1) The locations and functions of the controls of the AN/GNQ–7A are approximately the same as described in paragraph 6*b*(1), except that the locations of the reproducer and recorder volume control knobs are reversed, that is, E–101 is located at the top back of the cabinet, and E–102 is located in the left front corner of the right-hand turntable compartment.

(2) The a-v-c unit and associated cables and connectors are located on the rear of turntable B. The cables and connectors are located approximately the same and have the same functions as described in paragraph 6*b*(3).

c. Turntables and Turntable Motors. Each of the two turntable units used in the AN/GNQ–7A is identical with the one described in paragraphs 5*c* and 6*c*, but the motor is capacitor-start instead of shaded-pole start.

d. Amplifier and Loudspeaker. (1) The amplifier used in the AN/GNQ–7A is essentially the same as the one described in paragraph 5*e* with the additions given in paragraph 6*d*(1).

(2) The loudspeaker is identical to and located the same as the one described in paragraph 6*d*(2).

e. Microphone. The microphone used with the AN/GNQ–7A is housed in a small wooden cabinet designed to rest upon a flat surface. It is a low-impedance, dynamic type (moving coil in magnetic field), and is connected to the amplifier through a *shielded* 12-foot cable, W–301. A four-prong Jones plug type connector, P–301, a four-terminal socket type connector, J–201, and cable W–202 comprise the balance of parts on the microphone.

f. Remote Control Unit. The remote control unit used with the AN/GNQ–7A is identical with the one described in paragraph 6*f*.

g. Power Cable. The power cable used with the AN/GNQ–7A is identical with the one described in paragraph 6*g*.

h. Telephone Tap Cord. The telephone tap cord is identical with the one described in paragraph 6*h*.

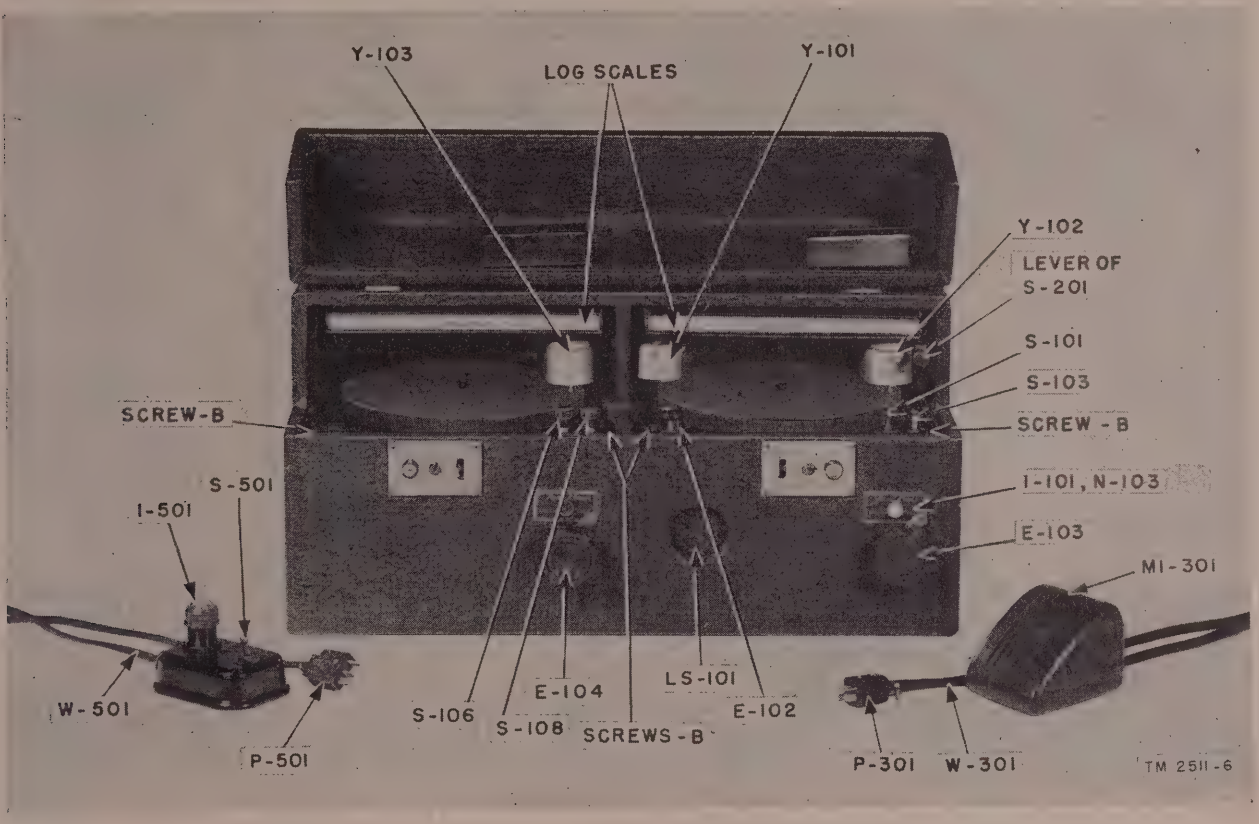
i. Recorder Head. (1) Each of the two recorder heads used in the AN/GNQ–7A is a low-impedance unit provided with a permanent diamond-tipped stylus. The head is attached to a recorder arm by a flexible steel hinge. Each recorder arm actuates switches as described in paragraph 6*i*(3).

(2) The feed mechanism for each recorder arm consists of a feed collar, two clutch springs, two flat washers, two tension nuts, and a locknut (fig. 19). The recorder arm moves across the disk upon rotation of the rear gear, and the recorder head stylus embosses 220 grooves per inch of disk surface. Clutch springs provide positive feed of

the recorder arm without backlash which might cause overlapping grooves. The lower clutch spring provides a heavy friction load on the gear in the rear gearbox, thus effectively eliminating backlash between this gear and its worm drive pinion.

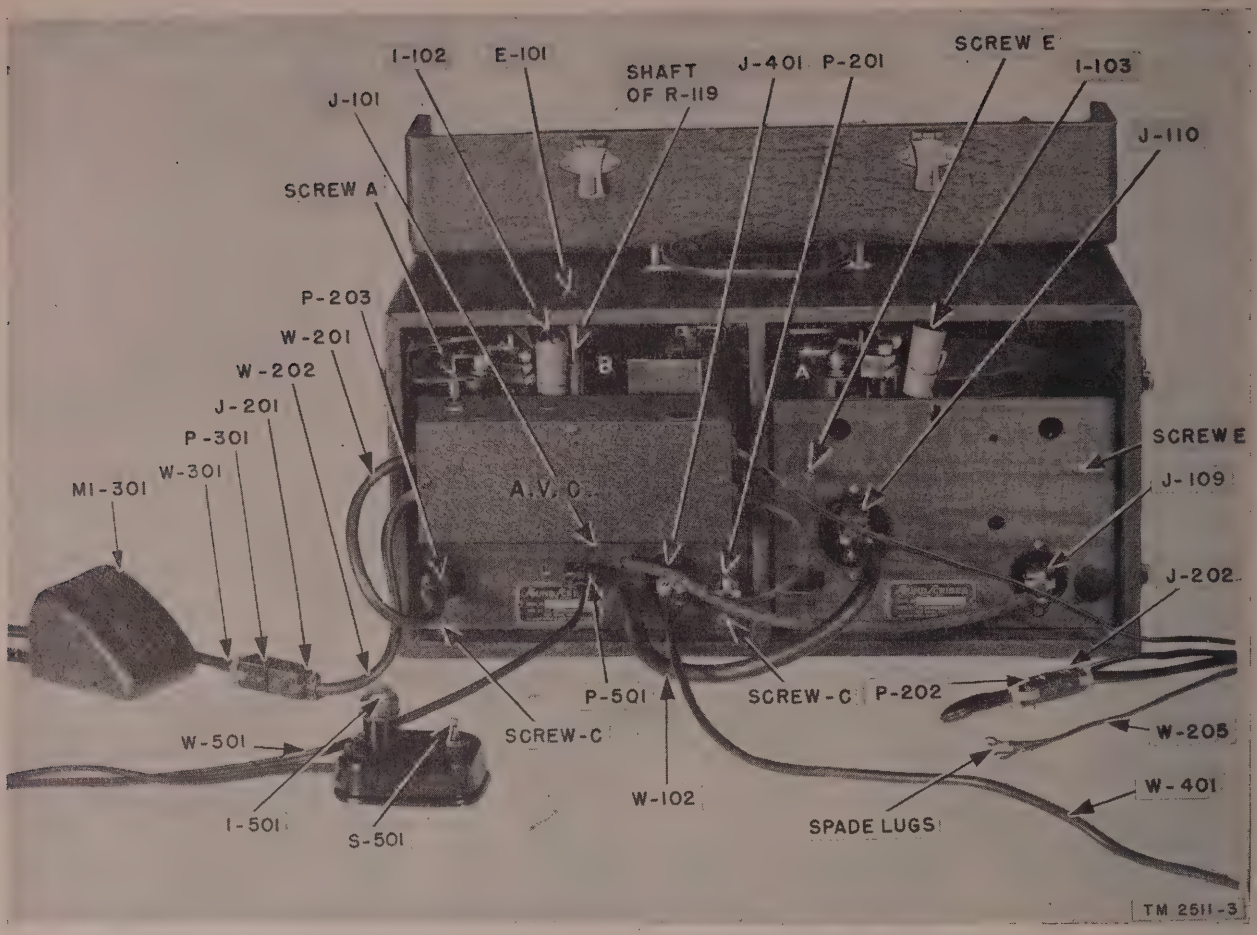
(3) The logging system used on the AN/GNQ–7A is a shadow-wire assembly I–105 and I–106 (figs. 20 and 28) mounted on each recorder arm. The log scale (fig. 7) is an elongated translucent polystyrene screen backed by a scale graduated in minutes. The log scales are mounted on the top fronts of the two turntable units so that the shadows of wires I–105 and I–106 are projected on their respective scales. The position of the recorder head stylus on the disk is indicated by the position of this shadow line. Lamps I–102 and I–103 furnish illumination and are located at the rear of turntables B and A respectively.

(4) The locking mechanism (fig. 20) consists of a T-collar (O–105) on the lifting post and a friction plate (O–112) mounted on the recorder arm. The purpose of the locking mechanism is to provide sufficient friction to prevent the recorder arm from moving across the disk during *reproduction* while permitting manual movement of the arm across (not on) the disk without harm to the friction surface.



E–102 Recorder volume control knob.
E–103 LISTEN-TALK knob, turntable B.
E–104 LISTEN-TALK knob, turntable A.
I–101 Volume flasher lamp.
I–501 Remote control on-off guide.
LS–101 Loudspeaker.
MI–301 Microphone.
N–103 LISTEN-TALK nameplate.
P–301 Microphone input connector to a-v-c unit.
P–501 Remote control unit connector.
S–101 TUBE ON-OFF switch.
S–103 TURNTABLE START-STOP switch.
S–106 Selector switch, turntable A.
S–108 Selector switch, turntable B.
S–201 MIC-TEL switch.
S–501 Remote control ON-OFF switch.
W–301 Microphone cable.
W–501 Remote control unit cable.
Y–101 Reproducer head.
Y–102 Recorder head, turntable B.
Y–103 Recorder head, turntable A.

Figure 7. Recorder-Reproducer AN/GNQ–7A, front view.



E–101	Reproducer volume control knob.
I–102	Lamp for log scale illumination, turntable B.
I–103	Lamp for log scale illumination, turntable A.
I–501	Remote control on-off guide.
J–101	Listening device jack.
J–109	Interconnection between units A and B.
J–110	Interconnection between units A and B.
J–201	Output jack for a-v-c unit.
J–202	Telephone tap cord connector.
J–401	Power cable connector.
MI–301	Microphone.
P–201	Output connector to a-v-c unit.
P–202	A-v-c input cable connector.
P–203	A-v-c output connector.
P–301	Microphone input connector to a-v-c unit.
P–501	Remote control unit connector.
S–501	Remote control ON-OFF switch.
W–102	Interconnecting cable between units A. and B.
W–201	A-v-c cable to amplifier input.
W–202	Cable from a-v-c to microphone input.
W–205	Telephone tap cord.
W–301	Microphone cable.
W–401	A-c power cable.
W–501	Remote control unit cable.

Figure 8. Recorder-Reproducer AN/GNQ–7A, rear view.

(5) A limiter bar and clicker spring are used which are similar to those described in paragraph 6*i*(4).

j. Reproducer Arm Assembly. The reproducer head and arm assembly used in the AN/GNQ–7A is similar to the one described in paragraph 5*f*, except that the shield (fig. 22) over the head is longer and a shadow line logging assembly (*i*(3) above) is used. A special grease is used in the reproducer head to prevent oscillation of the head during operation.

8. Recorder-Reproducer AN/GNQ–8

(figs. 2, 9, and 10)

Recorder-Reproducer AN/GNQ–8 consists of a cabinet, a-v-c unit, turntable unit with turntable motor, amplifier, built-in speaker, microphone, cords, and recorder and reproducer heads.

a. Cabinet. The cabinet used in the AN/GNQ–8 is similar to the one described in paragraph 6*a*, except that it is smaller, having only one compartment.

b. Controls, A-v-c Unit, and Connectors. The

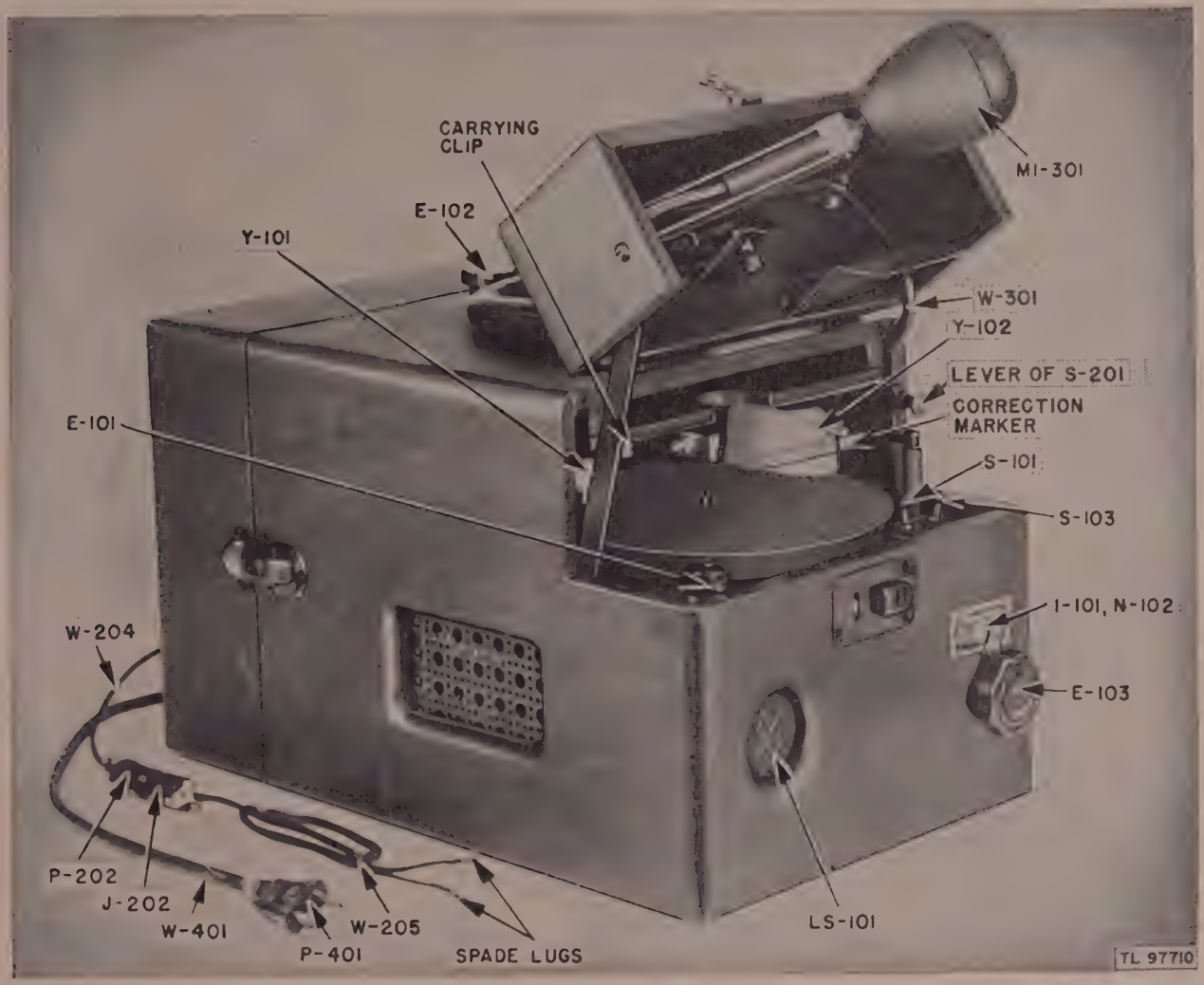
controls, a-v-c unit, and connectors used in the AN/GNQ–8 are similar to those described in paragraph 6*b*, except that the AN/GNQ–8 does not include a second turntable unit and consequently does not use interconnecting cables W–101 and W–102 nor connectors P–106 and P–107.

c. Turntable and Turntable Motor. The turntable and turntable motor used in the AN/GNQ–8 is similar to the one described in paragraph 5*c*. In addition, there is a geared shaft extending from the motor to a rear gear box which drives the recorder arm.

d. Amplifier and Loudspeaker. (1) The amplifier used in the AN/GNQ–8 is similar to the one described in paragraph 5*e* with the additions given in paragraph 6*d*(1).

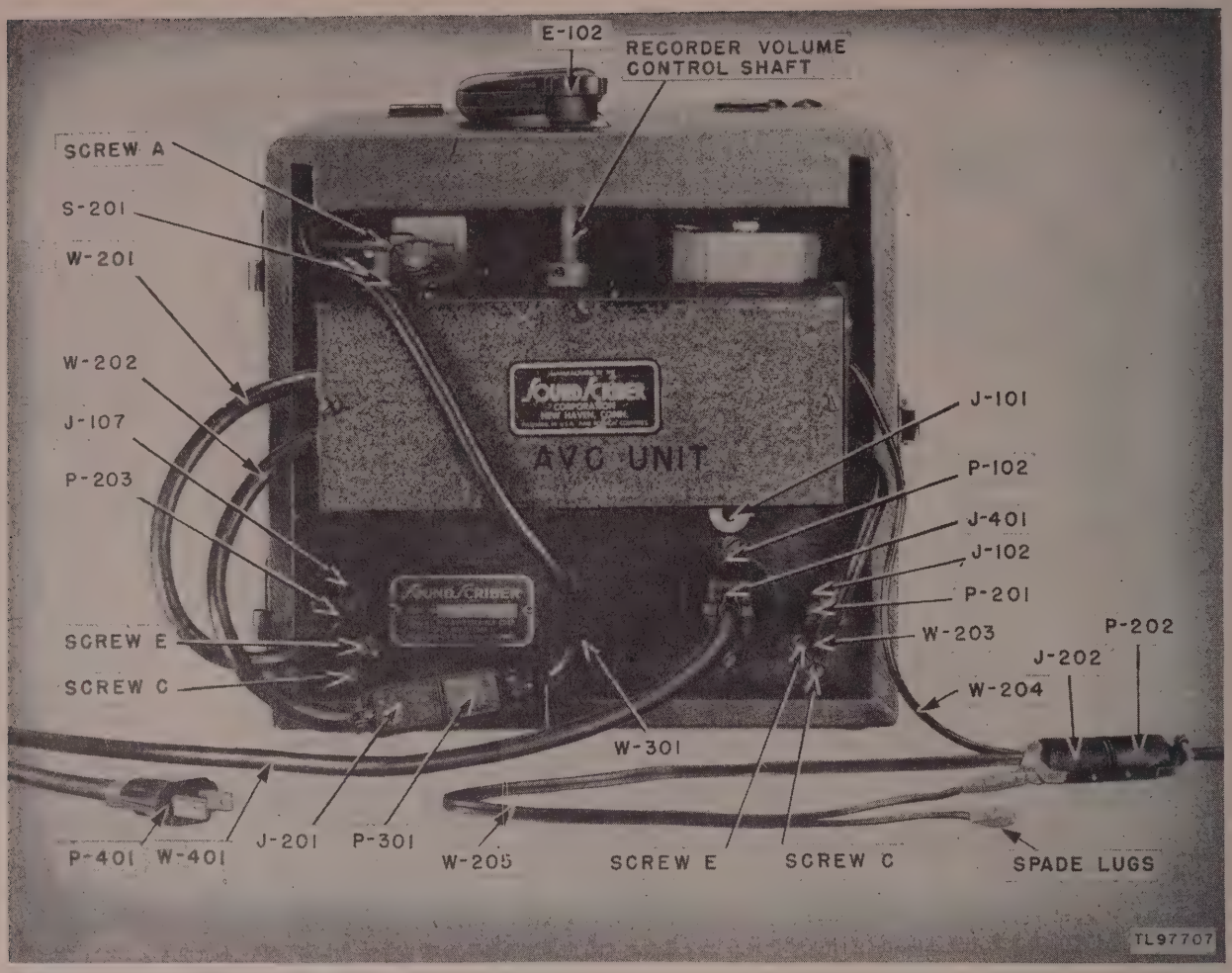
(2) The loudspeaker is identical to and located the same as the one described in paragraph 6*d*(2).

e. Microphone. The microphone used in the AN/GNQ–8 is mounted inside the front cover of



E–101	Reproducer volume control knob.	I–101	Volume flasher lamp.	P–202	A-v-c input connector.	S–201	MIC-TEL switch.
E–102	Recorder-volume control knob.	J–202	A-v-c input socket.	P–401	Power connector.	W–202	Microphone cable.
E–103	LISTEN-TALK knob.	LS–101	Loudspeaker.	S–101	TUBE ON-OFF switch.	W–204	A-v-c cable.
		MI–301	Microphone.	S–103	TURNTABLE START-STOP switch.	W–205	Telephone or radio cable.
		N–102	LISTEN-TALK nameplate.			W–401	A-c power cable.
						Y–101	Reproducer head.
						Y–102	Recorder head.

Figure 9. Recorder-Reproducer AN/GNQ–8, front view.



E–102 Recorder volume control knob.
J–101 Listening device jack.
J–102 Output jack for a-v-c unit.
J–107 Input connector from a-v-c unit.
J–201 Microphone input connector.
J–202 A-v-c input socket.
J–401 Power cable connector.
P–102 Power input connector.
P–201 Output connector to a-v-c unit.
P–202 A-v-c input connector.
P–203 A-v-c output connector.
P–301 Microphone input connector to a-v-c unit.
P–401 Power connector.
S–201 MIC-TEL switch.
W–201 A-v-c cable to amplifier input.
W–202 Microphone cable.
W–203 A-v-c cable to amplifier output.
W–204 A-v-c input cable.
W–205 Telephone or radio cable.
W–301 Microphone cable.
W–401 A-c power cable.

Figure 10. Recorder-Reproducer AN/GNQ–8, rear view.

the cabinet. It is a low-impedence, dynamic type (moving coil in magnetic field), and is connected to the a-v-c unit by means of a shielded three-wire cable W–301, connector P–301, connector J–201, and cable W–202. The microphone mounting bracket is designed to permit the microphone to be swung outwardly for operation and also to prevent shock damage during transportation.

f. Power Cable. The power cable used with the AN/GNQ–8 is identical with the one described in paragraph 6*g*.

g. Recorder Head. The recorder head used in the AN/GNQ–8 is identical with the one described in paragraph 6*i*, except that it is *not* equipped to actuate switches as described in paragraph 6*i*(3).

h. Reproducer Head. The reproducer head used in the AN/GNQ–8 is similar to the one described in paragraph 5*f*.

Section II. INSTALLATION

9. Siting

The ideal site for the equipment is a room where there are no extremes of temperature and humidity, and where extraneous noise is at a minimum. The equipment may be used in mobile units provided the proper power supply (par. 2) is available. *Recording* can be accomplished while the unit is in transit if the equipment is not subjected to severe shock. Best *reproducing* results are obtained only when the equipment is stationary. Both recording and reproducing can be done at a maximum tilt of 30°.

10. Uncrating, Unpacking, and Checking

a. To uncrate and unpack Recorder-Reproducer AN/GNQ–8 or AN/GNQ–7, or Reproducer AN/GNQ–6, follow the steps shown in figure 11, 12, or 13, respectively. Follow similar steps in uncrating and unpacking Recorder-Reproducer AN/GNQ–7A, which, however, may not have moisture vaporproof barriers since it is not export packed.

b. Be careful not to drop the equipment when removing it from the cartons or to jar it once it is unpacked.

c. Be extremely careful when removing the head packing in step 13 of figures 11 and 12 and in step 11 of figure 13. Place fingers on top of packing, press down slightly, and pull packing out. *Do not place fingers under the packing and lift it up against the recorder and reproducer head styluses.*

d. Check the equipment to see that all components and running spares are present and in good condition. Check against the table of components (par. 3) or against packing slips included with the shipment.

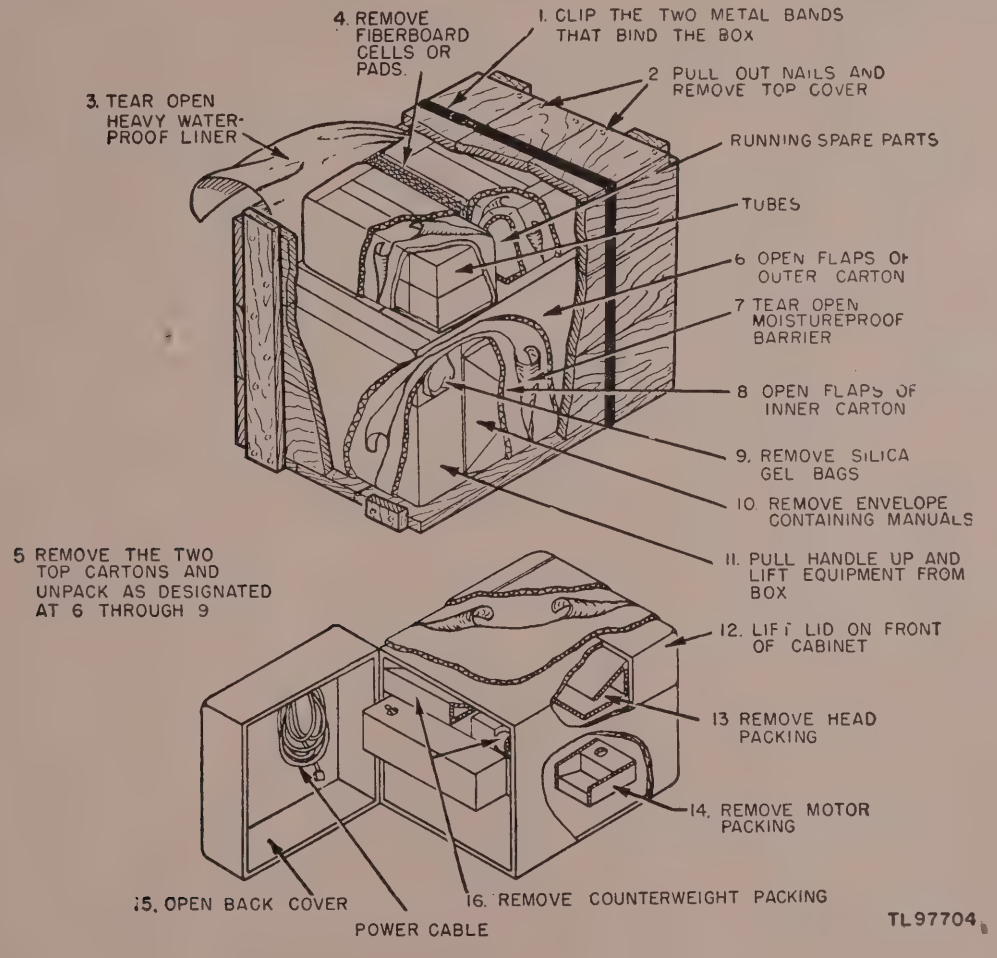


Figure 11. Cutaway view of export package (Recorder-Reproducer AN/GNQ–8).

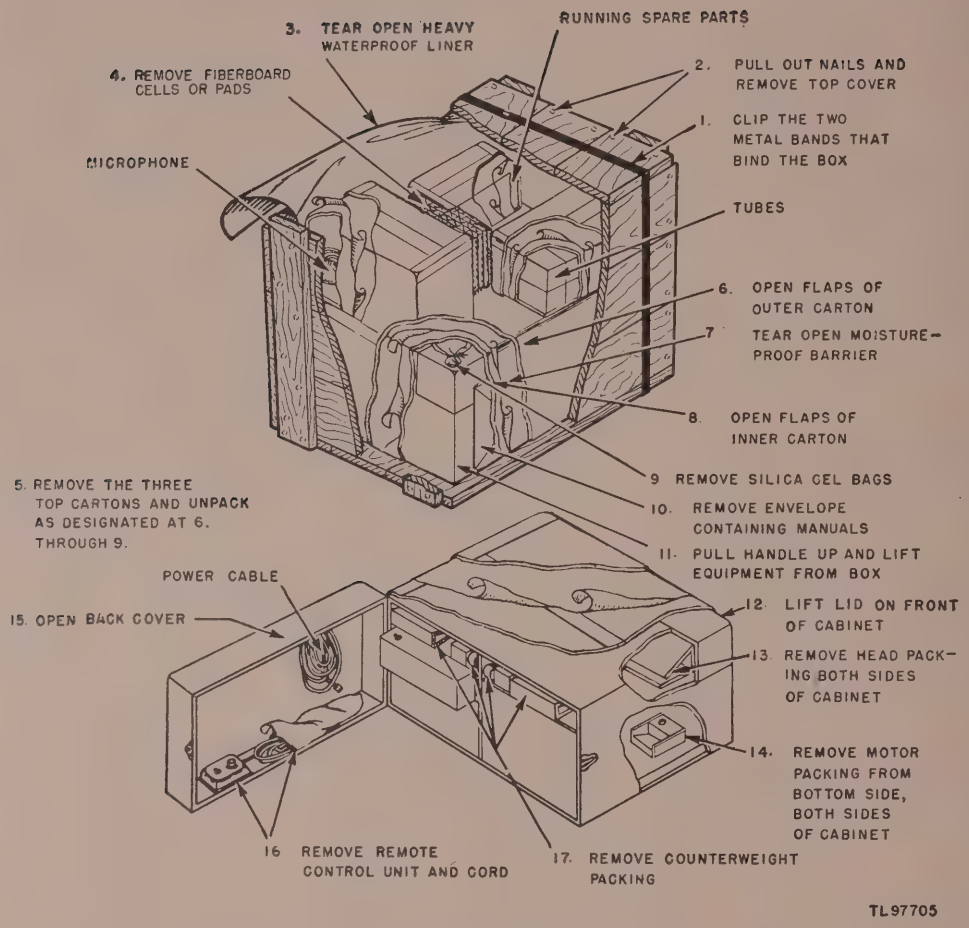


Figure 12. Cutaway view of export package (Recorder-Reproducer AN/GNQ-7).

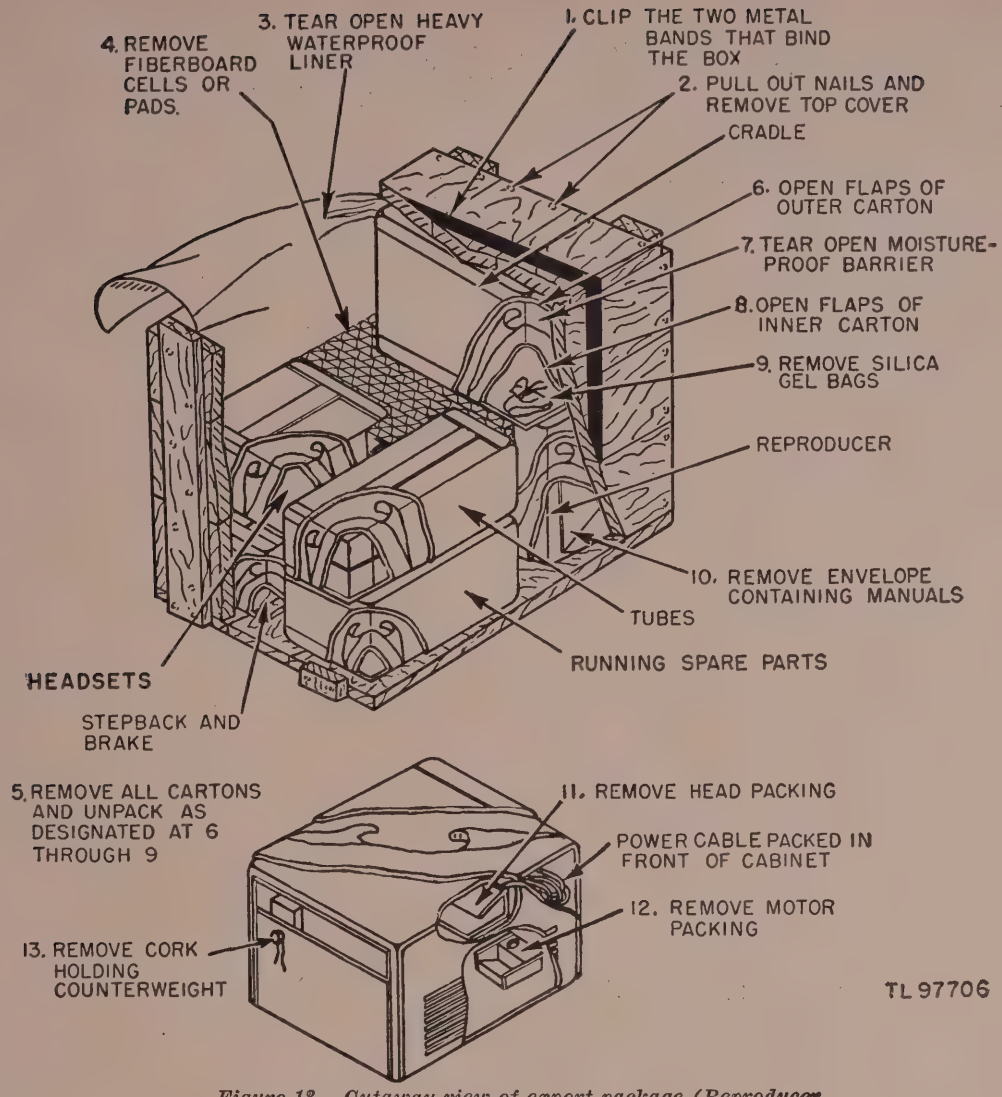


Figure 13. Cutaway view of export package (Reproducer AN/GNQ-6).

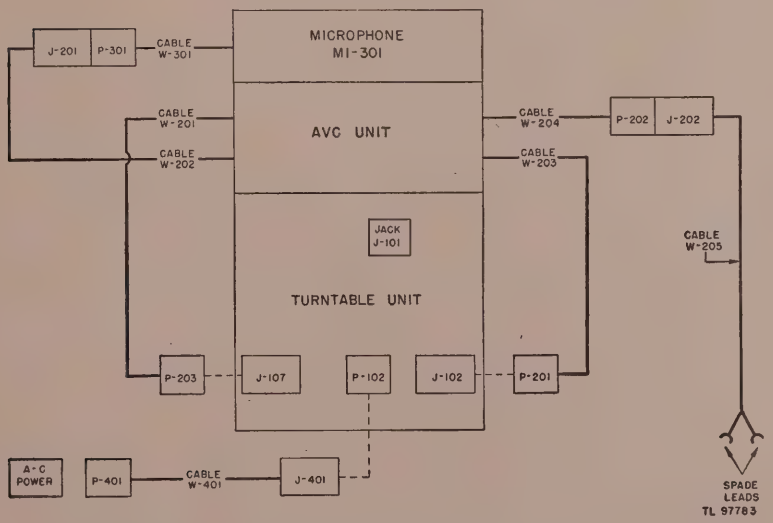


Figure 14. Connection diagram for Recorder-Reproducer AN/GNQ-8.

11. Connections and Interconnections

a. Recorder-Reproducer AN/GNQ–8 (fig. 14). (1) Connect female connector J–401 of a-c power cable W–401 to six-prong male connector P–102 located beneath the listening device jack J–101.

(2) Connect four-prong male connector P–301 at the end of microphone cable W–301 to female connector J–201 at the end of cable W–202 which is connected to the a-v-c unit.

(3) Connect two-prong male connector P–201 on the end of the short two-conductor cable, W–203, which is connected to the a-v-c unit, to female connector J–102 (located beneath the a-v-c unit).

b. Recorder-Reproducer AN/GNQ–7–(*) (fig. 15). (1) Connect female connector J–110 at the end of cable W–102 to eight-prong male connector P–107 (located on the rear panel of turntable unit A).

(2) Connect female connector J–109 at the end of cable W–101 to four-prong connector P–106 (located on rear panel of turntable unit A).

(3) Throw the remote control switch S–501 to OFF. Then connect three-prong male connector P–501 at the end of remote control cable W–501 to female connector J–108 below the a-v-c unit.

(4) Make the same connections described in *a*(1) through (6) above.

c. Reproducer AN/GNQ–6 (figs. 3 and 4).

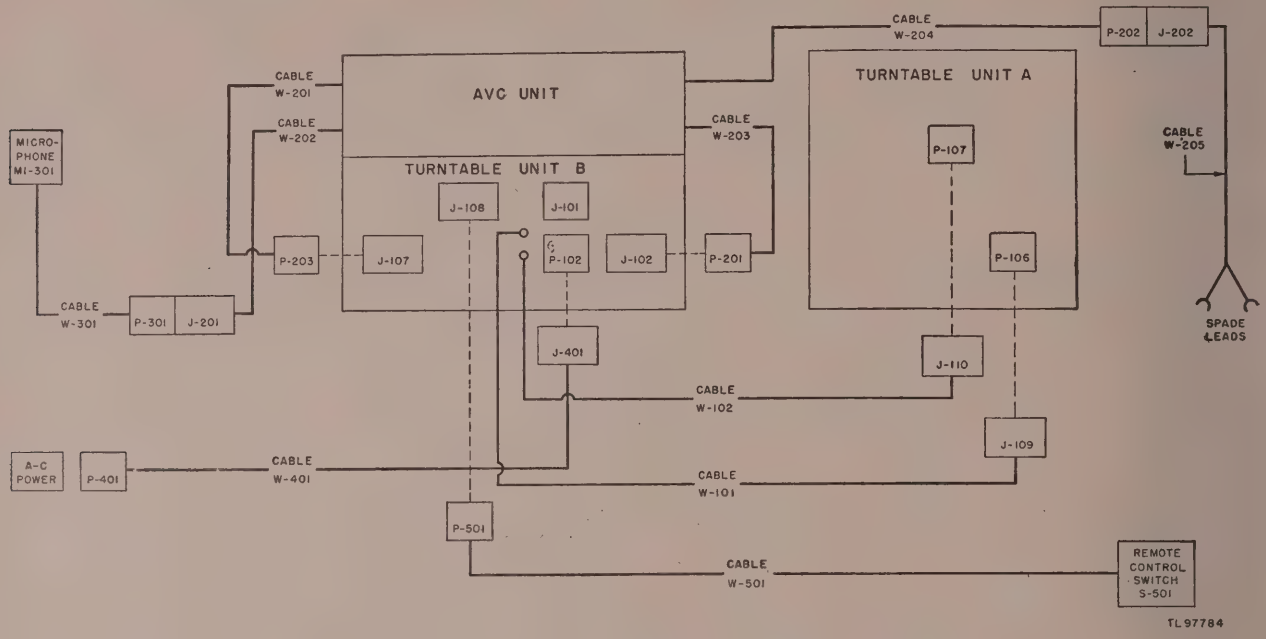


Figure 15. Connection diagram for Recorder-Reproducer AN/GNQ–7–(*).

(4) Connect four-prong male connector P–203 on the end cable W–201, which is connected to the a-v-c unit, to female connector J–107 (located beneath the a-v-c unit).

(5) Connect two-prong male connector P–401 at the end of the a-c power cable to a 115-volt, 60-cycle, a-c power source.

(6) For recording telephone conversations, connect one of the spade lugs at the end of telephone tap cable W–205 to one of the telephone lines and connect the other lug to the other telephone line. For recording radio programs connect the W–205 leads to the voice-coil terminals of the radio loudspeaker.

(1) Place the reproducer in the cradle.

(2) Connect female connector J–301 of a-c power cable W–301 to six-prong connector P–102 on the rear panel of the reproducer.

(3) Connect three-prong male connector P–201 at the end of the step-back and brake-assembly cable to female connector J–105, located at the back of the reproducer.

(4) Connect two-prong phone connector P–401 to phone jack J–101 on the front of the reproducer.

(5) Connect the two-prong male connector, P–301, at the end of the a-c power cable to a 115-volt, 60-cycle, a-c power source.

12. Repacking

a. Remove all external connections, such as to the power source, and to a telephone or radio. Stow cables in the cabinet.

b. Check to see that the reproducer head is secure in its rest, and on the AN/GNQ–7–(*) or AN/GNQ–8 check to see that the TALK-LISTEN knobs are in LISTEN position.

c. Close and fasten covers and doors, and on the AN/GNQ–6, replace the fabrikoid cover.

d. If the equipment is to be transported a long distance, repack it as nearly as possible the same way it was originally packed (par. 10).

Note. For information on destroying the equipment to prevent enemy use, refer to the destruction notice at the front of the manual.

Section III. CONTROLS AND THEIR USE

13. Controls on Recorder-Reproducers AN/GNQ–7, AN/GNQ–7A, and AN/GNQ–8 (figs. 5, 7, and 9)

a. Recording volume control knob E–102 controls the volume of the sound being recorded. Clockwise rotation of the knob increases the volume; counterclockwise rotation decreases it.

b. Volume flasher lamp I–101 indicates the recording volume. Excessively bright or dim flashes of light indicate too loud or too soft sounds, respectively.

c. Reproducer volume control knob E–101 adjusts the listening volume from the loudspeaker. Turning the knob clockwise increases the volume; turning the knob counterclockwise decreases the volume.

d. LISTEN-TALK knob E–103 lowers and raises recorder head Y–102 and changes the amplifier circuits from listening to recording.

e. TUBES ON-OFF switch S–101 (the switch nearest the turntable) is a master switch that removes all power from the equipment when it is in the OFF position.

f. TURNTABLE START-STOP switch S–103 (located to the right of the tube switch) allows the turntable to be started or stopped during interruption of operations. This is used as a standby switch.

g. MIC-TEL switch S–201 provides for recording with either microphone or telephone.

h. The correction marker, located in front of each recorder head, indicates (by numerals in the AN/GNQ–7 and AN/GNQ–8; by minutes in the AN/GNQ–7A) the location of recorded material on the disk. (Correction marker notations are to be entered on a log sheet or on the disk filing envelope to expedite a later search for desired recorded material.)

Note. See the following paragraph for additional controls on the AN/GNQ–7 and AN/GNQ–7A.

14. Additional Controls on Recorder-Reproducers AN/GNQ–7 and AN/GNQ–7A (figs. 5 and 7)

a. Push-button switches S–106 and S–108 located on the right-hand front corner of turntable unit A permit the manual selection of the desired turntable.

b. Remote control ON-OFF switch S–501 is used in conjunction with, and performs the same function as, TURNTABLE START-STOP switch, S–103 (par. 13*f*). Switch S–501 provides a standby switch at a remote point.

c. On the AN/GNQ–7 only, the six-position selector switch, S–301, mounted on the base of the conference microphone, is used as follows:

(1) It permits the operator to select the proper microphone sensitivity for the acoustical conditions under which recording is made.

(2) It provides means for connecting a microphone (plugged into connector J–301) in parallel with the microphone containing the switch.

(3) It provides for use in noisy locations to exclude outside noises (positions 1 and 2). In these positions, the lips must not be more than 3 inches from the microphone.

(4) Position 3 permits the dictator to speak in a moderate tone of voice at a greater distance from the microphone. In both the CONF and EXT positions the microphone is at its highest sensitivity.

(5) In positions 1, 2, and 3, the second microphone plugged into connector J–301 is disconnected from the input of the recorder amplifier.

(6) In CONF position, both microphones are connected in parallel to the input of the recorder.

(7) In EXT position, the microphone plugged into connector J–301 is connected to the input of the recorder amplifier; and the microphone containing the switch is disconnected from the input of the recorder.

15. Controls on Reproducer AN/GNQ–6 (fig. 3)

a. Volume control knob E–101 adjusts the listening volume of the headset. Turning the knob

clockwise increases the volume; turning it counterclockwise decreases the volume.

b. TUBES ON-OFF switch S–101 is a master switch that disconnects the power from the equipment when it is in the OFF position.

c. The foot switches, S–202 and S–201, control the step-back and brake, respectively. Switch S–202 operates the mechanism that backspaces the reproducer head. Switch S–201 controls the brake that prevents the turntable shell from rotating. The turntable shell rotates only when switch S–201 is depressed.

d. The correction marker located on the front of the reproducer head is used to indicate the location of recorded material on the disk. The location of recorded material may be listed on a log sheet or on the disk filing envelope.

Section IV. OPERATION

16. Preoperation Procedure for Recording (figs. 5, 7, and 9)

a. Turn the LISTEN-TALK knob (E–103 or E–104, or both) of the turntable to be used, to the TALK position. (The recorder head cannot be moved laterally when this knob is in the LISTEN position.)

b. Lift the recorder head by its lifting stud and move it to the outside edge of the turntable.

c. While holding the recorder head off the turntable with the right hand, place a disk on the turntable with the left hand, and then lower the recorder head. If a partially used disk is placed on the turntable, move the recorder head to the beginning of the unused portion of the disk.

d. Turn TUBES ON-OFF switch S–101 to ON. Allow approximately a 40-second tube warm-up period to elapse from the time switch S–101 is turned on before starting to record.

17. Microphone Recording (figs. 5, 7, and 9)

a. Perform the steps described in paragraph 16.

b. Place the MIC-TEL switch, S–201, in the MIC position.

c. Start recording by placing the TURNTABLE START-STOP switch, S–103, in the START position, and on the AN/GNQ–7 or AN/GNQ–7A only, press selector switch button A or B depending upon which turntable is used.

Note. Continuous and simultaneous recording procedures on the AN/GNQ–7 and AN/GNQ–7A are covered in paragraphs 23 and 24.

d. During recording, watch the volume flasher, I–101, for indication of the recording volume. The flasher lights with each spoken word. If the sound being recorded is too loud or if the microphone is too close to the source of the sound, the light flashes excessively bright. An opposite condition causes a dim flash of light. The volume is controlled by adjusting volume control knob E–102 (located on top of the cabinet of the AN/GNQ–7 or AN/GNQ–8; located to the left and front of turntable B of the AN/GNQ–7A). In addition, knob E–301 at the base of the microphone of the AN/GNQ–7 may be used to adjust for proper brilliancy of the volume flasher lamp.

(1) If the recording level is too low, reproduced signals may be too low to override disk surface noise. This surface noise is of the same volume regardless of the loudness of recorded signals. Since a weak recording requires a higher reproducing volume setting, surface noise will be high compared to the recorded sound.

(2) Experience will enable the operator to determine when the volume flasher is at its proper brilliance and the recording volume is at its proper level.

18. Telephone Recording (figs. 5, 7, and 9)

a. Perform the steps described in paragraph 16.

b. Place the MIC-TEL switch, S–201, in the TEL position.

c. Start recording by placing the TURNTABLE START-STOP switch, S–103, in the START position, and on the AN/GNQ–7 or AN/GNQ–7A only, press selector switch button A or B, depending upon which turntable is used.

Note. Continuous and simultaneous recording procedures on the AN/GNQ–7 and AN/GNQ–7A are covered in paragraphs 23 and 24.

d. To attain the proper recording volume, make a test call on the telephone connected to the recorder-reproducer unit (par. 11*a*(6)). Turn the volume control knob, E–102, until the pointer faces the back of the machine, and carefully adjust the knob until each spoken word lights the volume flasher distinctly (par. 17*d*).

19. Radio Recording (figs. 5, 7, and 9)

a. Perform the steps described in paragraph 16.

b. Place the MIC-TEL switch, S–201, in the TEL position.

c. Start recording by placing the TURNTABLE switch, S–103, in the START position, and on the AN/GNQ–7 and AN/GNQ–7A only, press selector switch A or B, depending upon which turntable is used.

Note. Continuous and simultaneous recording procedures on the AN/GNQ–7 and AN/GNQ–7A are covered in paragraphs 23 and 24.

d. Turn the volume control knob, E–102, until the pointer faces the back of the machine. Carefully adjust the radio receiver volume control knob to light the volume flasher distinctly (par. 17*d*).

e. Sometimes, during radio recording, the automatic volume control provided by the a-v-c unit is not desirable. To eliminate the a-v-c action, remove connector P–201 from receptacle J–102. *Do not short the contacts of connector P–201 after it is removed from its receptacle.*

20. Reproducing Operation for Recorder-Reproducer AN/GNQ–8 (fig. 9)

a. Turn LISTEN-TALK knob E–103 to LISTEN to raise the recorder head from the turntable.

b. Throw TUBES switch S–101 to ON.

c. Place the disk on the turntable, and throw TURNTABLE START-STOP switch S–103 to START.

d. Carefully place the reproducer head, Y–101, in position on the rotating disk. Adjust the reproducer volume by volume control knob E–101.

e. When reproduction is completed, throw TUBE switch S–101 to OFF. Throw the TURNTABLE switch, S–103, to STOP. Place the reproducer head in the reproducer rest.

21. Reproducing Operation for Recorder-Reproducer AN/GNQ–7–(*) (figs. 5 and 7)

a. Throw TUBES switch S–101 to OFF.

b. Turn LISTEN-TALK knobs E–103 and E–104 to LISTEN to raise both recorder heads from the turntables.

c. Place the disk on turntable B.

d. Throw TUBES switch S–101 to ON. Allow 40 seconds for tube filaments to warm up.

e. Press selector switch button B.

f. Throw switch S–103 to START, or remote control switch S–501 to ON.

g. Place reproducer head Y–101 in position on the revolving disk. Adjust the volume by turning volume control knob E–101.

h. When reproduction is completed, throw switch S–101 to OFF. Also throw TURNTABLE switch S–103 to STOP, or the remote control switch S–501 to OFF. Place the reproducer head in the reproducer rest.

22. Reproducing Operation for Reproducer AN/GNQ–6 (fig. 3)

a. Throw switch S–101 to ON.

Note. Allow approximately a 40-second tube warm-up period to elapse from the time switch S–101 is thrown to ON before starting up reproduce. The turntable will rotate until rectifier tube V-105 is warm enough to operate, at which time the brake becomes actuated and the turntable stops. Thereafter the brake footswitch S–202 must be depressed to operate the turntable.

b. Place the disk on the turntable.

c. Place reproducer head Y–101 in position on the disk.

d. Depress the brake footswitch, S–202, and adjust the reproducer volume by turning volume control Knob E–101.

e. To repeat a portion of the reproduction, depress the step-back footswitch S–201. Each tap on this pedal will step back the reproducer head a number of grooves, determined by the step-back adjustment (par. 85).

f. When reproduction is completed, throw switch S–101 to OFF. Place the reproducer head in the reproducer rest.

23. Continuous Recording Operation on Recorder-Reproducer AN/GNQ–7–(*) (figs. 5 and 7)

With a disk in place on each turntable (par. 16) and switch S–201 in the proper position for the type of recording (par. 17*b*, 18*b*, *or* 19*b*), proceed as follows:

a. Press selector switch button S–106 on the panel of turntable A.

b. Start recording by throwing switch S–103 to the START position, or remote control switch S–501 to the ON position. Thereafter, 60 seconds before recording on the disk on turntable A is

completed, recording on turntable B will automatically start. Turntable A, at the end of the 60-second overlap period, will stop, and recording will continue on turntable B, thus providing continuous recording for a 30-minute period.

c. To continue recording for more than 30 minutes, proceed as follows:

(1) When turntable A stops, move recorder head Y–103 to the outside edge of the turntable.

(2) Turn the disk over (or place a new disk on the turntable) while holding the recorder head off the turntable by means of the recorder-head lifting stud.

(3) Place the recorder head in position on the disk. Turntable A will automatically start recording as soon as the disk on turntable B is completed.

(4) If further continuous recording is required, perform steps (1), (2), and (3) above for turntable B when it stops, and so on alternately for each turntable.

d. To transfer recording from one turntable to the other during continuous recording and *before a disk is completed, proceed as follows*:

(1) Press selector button S–106 or S–108 to start the other turntable.

(2) Raise the recorder head from the recorded disk and move the recorder head to the inside stop near the center of the turntable to stop the turntable.

e. When recording is completed or stand-by is desired, throw TURNTABLE switch S–103 to STOP, or remote control switch S–501 to OFF.

24. Simultaneous Recording Operation on Recorder-Reproducer AN/GNQ–7–(*) (figs. 5 and 7)

With a disk in place on each turntable (par. 16) and switch S–201 in the proper position for the type of recording (par. 17*b*, 18*b*, or 19*b*), proceed as follows:

a. Press both selector switch buttons S–106 and S–108.

b. Throw TURNTABLE switch S–103 to START, or remote control switch S–501 to ON. Both turntables will start.

c. Either turntable can be stopped during simultaneous recording while the other continues to record. Raise the recorder head from the turntable that is to be stopped and move it to the inside stop near the center of the turntable.

d. When recording is completed, throw TURNTABLE switch S–103 to STOP, or remote control switch S–501 to OFF.

25. Logging

a. Correction markers in front of the recorder and reproducer heads (figs. 3, 5, and 9) indicate the location of recorded material on disks.

b. Indicate on the scale of a log sheet or a log filer envelope the location of recorded material. The disks may be filed in indexed filer envelopes.

c. To make another recording on a partially used disk, move the recorder head just beyond the inside edge of the previous recording. The beginning of the unrecorded area can be determined easily if a log is kept.

Section V. EQUIPMENT PERFORMANCE CHECK LIST

26. Purpose and Use of Check List

The equipment performance check lists in paragraphs 27 and 28 will help the operator determine whether the recorder-reproducer unit or the reproducer unit, respectively, is functioning properly. The columns used in these lists are explained below.

a. Action or Condition. For some items the information given in this column consists of the setting of various switches and controls used with the item to be checked. For other items, it represents an action that must be taken in order to produce normal indication.

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

c. Corrective Measures. The corrective measures listed are those that the operator can make without turning in the equipment for repairs. Reference to part five paragraphs indicates that the correction of the trouble cannot be effected during operation and that servicing by an experienced repairman is required. If the equipment is completely inoperative or if recommended corrective measures do not yield results, trouble shooting is necessary.

d. Preparatory Items. All items which are designated as preparatory should be checked every time the equipment is put into operation.

e. Start and Operation Items. These items represent starting and general operating conditions of the equipment. The operator must become familiar with the characteristics of the equipment during normal operation; he must use that knowledge as a basis for recognizing changes in audible and visual indications when the set is not operating properly.

f. Stop Items. Check the stop items whenever the equipment is taken out of operation. Abnormal indications at this time are probably caused by trouble in the equipment and should be corrected before the next period of operation.

27. Check List for Recorder-Reproducers AN/GNQ–8 and AN/GNQ–7–(*)

a. Recording Procedure.

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	1	Cable and cords	Make all connections as described in paragraph 11.	All connectors secure in place.	Push connectors into receptacles.
	2	LISTEN-TALK knob.	Turn to TALK position.	Recorder head lowered to turntable.	Tighten knob set-screws.
	3	Disk.	Hold recorder head off turntable and place disk on turntable		
	4	Microphone.	*a. AN/GNQ–8.* Swing microphone from pivot. *b. AN/GNQ–7.* Set microphone switch (par. 14*c*).	*a.* Microphone extends from front cover of cabinet.	
	5	MIC–TEL switch S–201.	Place in MIC position for microphone recording, or in TEL position for telephone or radio recording.		
START	6	TUBES ON-OFF switch S-101.	Turn to ON position.	Power is supplied to the equipment; tube filaments light up.	Check cable connections; check tubes
OPERATION	7	Selector switch button S–106. (For continuous recording operation of Recorder-Reproducer AN/GNQ–7–(*)).	Press.	Refer to paragraph 23.	
	8	Selector switch buttons S–106 and S–108. (For simultaneous recording operation on Recorder-Reproducer AN/GNQ–7–(*)).	Press both buttons.	Refer to paragraph 24.	

	Item No.	Item	Action or condition	Normal indications	Corrective measures
	9	TURNTABLE START-STOP switch S–103 (or remote control switch S–501 with Recorder-Reproducer AN/GNQ–7–(*)).	Throw to START position (or to ON).	Turntable rotates (lamp I–501 on remote control unit does not indicate).	Recheck items 1 through 6.
	10	Volume control knob E–102; also volume control knob E–301 at base of microphone used with Recorder-Reproducer AN/GNQ–7 (par. 14*c*).	Adjust for proper volume.	Volume flasher light I–101 flashes to proper (medium) brilliancy.	Refer to paragraph 17*l*.
STOP	11	TURNTABLE switch S–103 (or remote control switch S–501 when used).	Throw to STOP (or to OFF).	Turntable does not rotate. (lamp I–501 on remote control unit indicates).	

b. Reproducing Procedure, Recorder-Reproducer AN/GNQ–8.

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	1	Cables and cords.	Make all connections as described in paragraph 11.	All connections secure in place.	Push connectors into receptacles.
	2	LISTEN-TALK knob E–103.	Turn to LISTEN.	Recorder head is lifted from turntable table.	Tighten knob set-screw.
	3	Disk.	Place on turntable.		
START	4	TUBES ON-OFF switch S–101.	Throw to ON position.	Tube filaments light up.	Check connector P–401.
	5	TURNTABLE START-STOP switch S–103.	Throw to START position.	Turntable rotates.	
OPERATION	6	Reproducer head Y–101.	Place needle in groove of rotating disk.	Recording can be heard in loudspeaker, and reproducer head should not drift laterally across disk. Recorder head should not move.	Adjust bracket as explained in paragraph 83.
	7	Volume control knob E–101.	Turn clockwise to increase volume; turn counterclockwise to decrease volume.	Listening volume in loudspeaker adjusted.	Replace volume control.

	Item No.	Item	Action or condition	Normal indications	Corrective measures
STOP	8	TURNTABLE switch S–103.	Throw to STOP position.	Turntable stops rotating.	Replace switch S–103.
	9	TUBES switch S–101.	Throw to OFF position.	Power to equipment is removed.	Check and replace switch S–101.
	10	Reproducer head.	Place in the reproducer rest.		

c. Reproducing Procedure, Recorder-Reproducer AN/GNQ–7–(*).

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	1	Cables and cords.	Make all connections as described in paragraph 11.	All connectors secure in place.	Tighten connectors.
	2	LISTEN-TALK knobs E–103 and E–104.	Turn knobs to LISTEN position.	Both recorder heads are raised above turntables.	
	3	Disk.	Place on turntable B.		
START	4	TUBES switch S–101.	Throw to ON.	Tube filaments warm up	Check cable connections; check tubes.
	5	Selector switch button S–108.	Press.		
	6	TURNTABLE switch S–103 (or remote control switch S–501).	Throw to START (or to ON).	Turntable rotates.	Check power cable to wall receptacle.
OPERATION	7	Reproducer head Y–101.	Place needle in desired groove of rotating disk.		
	8	Volume control knob E–101.	Turn clockwise to increase volume; turn counter-clockwise to decrease volume.	Play-back volume in loud-speaker adjusted.	
STOP	9	TUBES switch S–101.	Throw to OFF.	Power off.	Check and replace defective switch.
	10	Switch S–103 (or remote control switch S–501).	Throw to STOP (or to OFF).	Turntable stops rotating.	Check and replace defective switch.
	11	Reproducer head Y–101.	Place in reproducer rest.		

28. Check List for Reproducer AN/GNQ–6

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	1	Cradle	Place reproducer cabinet in cradel.	Cabinet rests securely in cradle.	
	2	Cables and connectors.	Make all connections as described in paragraph 11.	All connections secure in place.	Secure loose connectors.
	3	Headset.	Put on headset.	Headset fits comfortably on head.	Adjust receiver brackets as necessary.
	4	Disk.	Place on the turntable.		
START	5	TUBES switch S–101.	Throw to ON.	Turntable rotates until tubes are warm (40 seconds) and then stops.	Check brake footswitch S–202. Check connector P–201.
OPERATION	6	Reproducer head Y–101	Place needle in the desired groove of disk.		
	7	Brake footswitch S–202.	Depress.	Turntable rotates; lamp I–101 indicates.	Recheck items 2 and 4 Refer to paragraph 64.
	8	Volume control knob E–101.	Adjust knob for proper listening volume.	Recording heard in headset.	Refer to paragraph 64.
	9	Step-back footswitch S–201.	Depress.	Reproducer head stepped-back proper number of grooves.	Refer to paragraph 64.
STOP	10	TUBES switch S–101.	Throw to OFF.	Turntable stops rotating; lamp I–101 does not indicate.	Refer to paragraph 64.
	11	Reproducer head Y–101.	Place in reproducer rest.		

Section VI. PREVENTIVE MAINTENANCE TECHNIQUES

29. Introduction

a. MEANING. Preventive maintenance (PM) means making systematic checks and adjustments at regular intervals to keep equipment operating at top efficiency. It is different from trouble shooting and repair. The purpose of preventive maintenance is to *prevent* break-downs and, therefore, the need for repair. On the other hand, the purpose of trouble shooting and repair is to locate and *correct* existing defects.

b. IMPORTANCE. The proper recording and reproducing of important information depends upon the equipment being in satisfactory condition when it is needed. It is vitally important, therefore, that operators and repairmen maintain their recorder-reproducer units in excellent working order. See TB SIG 123, Preventive Maintenance Practices for Ground Signal Equipment.

Note. The operations in sections VI and VII are performed by organizational maintenance personnel. Some operations in sections VIII and IX are performed by field or base maintenance personnel.

30. Description of Techniques

a. GENERAL. (1) Many of the parts used in recorder-reproducers require systematic PM. Hit-or-miss methods are detrimental to the equipment. This section of the manual covers specific instructions and serves as a guide for maintenance personnel. The standard lettering system for the six basic maintenance operations is as follows:

F—Feel
I—Inspect
T—Tighten
C—Clean
A—Adjust
L—Lubricate

(2) The Feel and Inspect operations usually indicate the need for maintenance. Dust filters into the equipment no matter how much care is taken to prevent it. Extreme changes in weather (such as heavy rain followed by blistering heat) or excessive dampness tend to cause corrosion of exposed parts and surfaces. Without frequent inspections and the necessary tightening, cleaning, and lubricating operations, the equipment will not be dependable and may break down when it is most needed.

b. FEEL. The Feel operation is used most often to check rotating machinery, such as the turntable motors and motor bearings, and to determine whether electrical connections, bushings, etc., are overheated. Feeling may indicate the need for lubrication or the existence of similar types of defects requiring correction. The maintenance man must become familiar with the normal operating temperatures of the equipment in order to recognize signs of overheating.

Note. It is important that the Feel operation be performed as soon as practicable after shut-down and always before any other maintenance is done.

c. INSPECT. Inspection is the most important operation in the PM program. A careless observer will overlook the evidences of minor trouble. Although these defects may not at the moment interfere with the performance of the equipment, valuable time and effort will be saved if they are corrected *before* they lead to major break-downs. Make every effort to become thoroughly familiar with the indications of normal functioning in order to be able to recognize the signs of defective equipment. Look carefully at all parts of the equipment, noticing their color, placement, and state of cleanliness. Inspect for the following conditions:

(1) Overheating, as indicated by discoloration, blistering, or bulging of the parts or surface of the container; leakage of insulating compounds; and oxidation of metal contact surfaces.

(2) Improper placement, by seeing whether all leads and cabling are in their original positions.

(3) Lack of cleanliness, by carefully examining all places in the units where dust might accumulate, especially between connecting terminals. Parts, connections, and joints must be kept free of dust, excessive moisture, corrosion, and other foreign matter. In tropical and high-humidity locations, look for fungus growth and mildew on parts and wiring.

(4) Looseness, by testing any connection or mounting which appears to be loose.

d. TIGHTEN, CLEAN, AND ADJUST. These operations are self-explanatory. Specific procedures to be followed in performing them are given wherever necessary throughout part three.

Caution: Tighten screws, bolts, and nuts carefully. Fittings tightened beyond the pressure for which they were designed will be damaged or broken. After a loose connection is tightened, it may be necessary to apply moistureproofing and fungiproofing varnish with a small brush. See section IX for details.

e. LUBRICATE. Lubrication refers to the application of grease or oil to the bearings of motors or other rotating parts. It may also mean the application of a light oil to door hinges and sliding surfaces on the equipment.

Section VII. ITEMIZED PREVENTIVE MAINTENANCE

31. Introduction

For ease and efficiency of performance, PM on Recorder-Reproducers AN/GNQ–8 and AN/GNQ–7–(*) and Reproducer AN/GNQ–6 is broken down into units of work called items, which are to be performed at specified times and intervals. The general techniques and application of the FICTAL operations on individual parts were discussed in section VI and are not repeated in this section. All maintenance work is to be done with the power removed from the equipment except when otherwise indicated. After PM has been performed, the equipment should be checked for satisfactory performance (pars. 27 and 28).

32. Common Materials Needed

The following tools and materials are needed in performing PM:

Tool Equipment TE–21/G (Electrical Instrument Repairman).
Clean cloth.
Solvent, Dry Cleaning (SD).
No. 0000 sandpaper.

Note. Gasoline will not be used as a cleaning fluid for any purpose. Solvent (SD) is available as a cleaning fluid through established supply channels.

33. Item 1, Carrying Case or Cabinet

a. INSPECT (I). (1) Inspect the surface of the case for dirt and the fabrikoid covering for tears.

(2) Check control knobs, hinges, and locks for dirt, corrosion, and for mechanical condition. Inspect all exterior mounting screws for looseness.

b. TIGHTEN (T). Tighten loose screws. Check and tighten loose setscrews in the control knobs. Knobs must not turn on their shafts.

c. CLEAN (C). Remove dust and loose dirt from the case with a clean, dry cloth. Remove accumulations of caked dirt, grease, or fungus with solvent (SD). If hinges, locks, or other metal parts on the exterior of the case are rusted or corroded, loosen the corrosion with fine sandpaper; then clean thoroughly with solvent (SD).

d. LUBRICATE (L). Lubricate hinges and locks according to instructions in paragraph 48.

34. Item 2, Cables and Connectors

a. INSPECT (I). Inspect all cables for cracks and frayed insulation. Closely examine all areas near plugs and sockets, where cables are likely to be bent in handling. Inspect connectors, receptacles, and jacks for dirt or corrosion, mechanical faults, and condition of electrical contacts.

b. TIGHTEN (T). Tighten only screws that are loose in connector assemblies.

c. CLEAN (C). Clean cables with a clean, dry cloth. Remove dirt, rust, or fungus growth from connectors, receptacles, and jacks with solvent (SD). First loosen accumulations of rust or corrosion on metal contact surfaces of connectors, receptacles, or jacks with a fine file or sandpaper; then clean with solvent (SD).

d. REMARKS. To gain access to the rear panels of the turntable units of Recorder-Reproducers AN/GNQ–7–(*) and AN/GNQ–8 (figs. 5, 7, and 9), open the latch near the back of the case, swing the door open, and lift the door off the hinge.

35. Item 3, Reproducer Head

a. INSPECT (I). (1) Check the mechanical action of the reproducer head. Lift slightly and move the head back and forth laterally between the outside and inside stops. The motion should be free.

(2) Examine the rubber hinge (steel hinge on

AN/GNQ–7A) for cracks, breaks, or stiffness. Inspect the springs for corrosion and breakage. Examine the leads for poor insulation, cracks, and evidence of dry rot and fungus growth.

(3) Note the shield on the reproducer head assembly of the AN/GNQ–7A. The shield should not bind against the sides of the reproducer head case. Be sure the shield does not press down upon the reproducer head when the head is at the inside and outside of the disk. Lift the shield and thus make certain that the lifting screw (H–111) lifts the head off the disk when the shield is raised (fig. 22).

b. TIGHTEN (T). Tighten the two screws holding the reproducer arm to the turntable chassis and tighten the screws that hold the springs.

c. CLEAN (C). Clean dirty or corroded parts with solvent (SD).

d. ADJUST (A). Adjust screw H–111 if necessary (par. 74*e*).

e. LUBRICATE (L). Lubricate the bottom pivot according to instructions in paragraph 47.

36. Item 4, Recorder Head

a. INSPECT (I). (1) With the LISTEN-TALK switch in the TALK position, move the recorder head back and forth laterally to check mechanical action. Some pressure will be required to do this, but the motion of the head should be smooth.

(2) Examine the spring hinges for cracks and corrosion. Inspect the leads for poor insulation, cracks, and evidence of dry rot and fungus growth. Look for rust and corrosion on metal parts.

(3) Examine the recorder stylus to be sure that the diamond tip has not been removed and also that paint from the stylus shank is not so close to the tip of the diamond as to cause interference with the making of a proper groove during the recording process.

b. CLEAN (C). Clean dirty or corroded parts with solvent (SD).

37. Item 5, Turntable Shell

a. INSPECT (I). Inspect the bakelite turntable shell for damage. When replacing the bakelite turntable shell, do not tighten the screw that holds the shell to the turntable. This screw is used only to keep the shell in place. Tightening this screw removes the damping effect of the supporting ring located under the shell.

b. CLEAN (C). Keep the turntable shell clean at all times. Pieces of dirt or sand may cause the recorder and reproducer heads to bounce during operation and seriously interfere with the proper functioning of the machine.

38. Item 6, Turntable Chassis

a. FEEL (F). With the motor running and the LISTEN-TALK switch in the TALK position, feel the turntable chassis for vibration. Slight vibration is normal.

b. INSPECT (I) Inspect the chassis for dirt, rust, corrosion, and loose screws.

c. TIGHTEN (T). Tighten loose assembly screws.

d. CLEAN (C). Clean the turntable chassis with a clean, dry cloth. Remove caked dirt or grease with solvent (SD).

39. Item 7, Microphone

a. INSPECT (I) Inspect the exterior of the microphone for dust, dirt, and corrosion. Check to see that the microphone for Recorder-Reproducer AN/GNQ–7 is firmly mounted on its stand (the AN/GNQ–7A microphone has no stand). Inspect the mounting of the microphone in the front cover of Recorder-Reproducer AN/GNQ–8 for looseness. The hinged mounting, which is adjustable for the convenience of the speaker, should be snug enough to prevent the microphone head from moving of its own accord.

b. TIGHTEN (T). Tighten loose mountings.

c. CLEAN (C). Clean the exterior of the microphone.

40. Item 8, Headset

a. INSPECT (I). Inspect the headset (on Reproducer AN/GNQ–6) for dirt, rust, and corrosion on the metal parts, and also for broken leads and cracked earpieces.

b. CLEAN (C). Clean earpieces with a clean, dry cloth. Remove rust or corrosion from the metal parts with solvent (SD).

41. Item 9, Step-back and Brake Foot Conrol Switches

a. INSPECT (I). Inspect the foot control unit assembly (on Reproducer AN/GNQ–6) for dirt and corrosion and for tightness of mounting screws.

b. TIGHTEN (T). Tighten loose screws or wiring connections.

c. CLEAN (C). Remove dirt or corrosion with a cloth moistened with solvent (SD).

d. LUBRICATE (L). Lubricate pivot points described in paragraph 49.

42. Item 10, Remote Control Unit

a. INSPECT (I). Inspect the remote control unit on Recorder-Reproducer AN/GNQ–7 for dirt.

b. CLEAN (C). Remove dirt from the unit with a clean cloth moistened with solvent (SD).

43. Item 11, Motor and Gearbox

a. FEEL (F). Feel the motor housing and bearings for overheating. Experience is necessary to determine if these parts are excessively hot.

b. INSPECT (I). Inspect the motor housing for dirt, grease, and corrosion. Inspect the mounting springs, mounting brackets, mounting studs, and cotter pins for mechanical condition, dirt, grease, and corrosion. Make sure that the motor hangs freely from the springs and that it is free to move up and down a short distance without the mounting springs or studs hitting against the mounting brackets. Examine the motor couplings to see that the motor does not rub against the front gearbox. Examine the motor leads for poor insulation, cracks, and evidence of dry rot or fungus growth.

c. CLEAN (C). Clean dirty or corroded parts with solvent (SD).

d. LUBRICATE (L). Lubricate according to the instructions in paragraph 70.

44. Item 12, Amplifier and A-v-c Unit

a. INSPECT (I). Refer to paragraphs 66 and 67 for procedures to follow in removing units from cabinets of Recorder-Reproducers AN/GNQ–8 and AN/GNQ–7–(*) and from the cabinet of Reproducer AN/GNQ–6.

(1) *Vacuum tubes.* Inspect glass tubes for accumulation of dirt and looseness of the envelope on the tube base. Examine tubes with metal envelopes for dirt, rust, and corrosion. Inspect tube sockets for dirt, corrosion, and loose wiring connections. Check for firmness of tubes in their sockets by pressing them down into the socket, not by partially withdrawing them and jiggling them from side to side. If a tube tester is available, test the tubes.

Caution: Avoid handling hot envelopes of tubes.

(2) *Capacitors.* Inspect large fixed capacitors for dirt, rust, corrosion, and loose connections at the terminals. Inspect cases of large fixed capacitors for leaks, bulges, and discoloration. Examine small paper and mica capacitors for dirt, discoloration, and fungus growth. Inspect capacitor leads for loose connections and faulty insulation.

(3) *Resistors.* Inspect the body of each resistor for dirt, discoloration, and blistering. Check condition of connections and insulated leads.

(4) *Transformers.* Inspect cases of potted transformers for dirt, discoloration, and leakage of the potting material. Examine condition of insulation on all leads.

(5) *Relays (on Recorder-Reproducer AN/GNQ–7–(*) only).* Inspect relay contacts for dirt and corrosion. Check leads for loose connections. Test the spring tension by operating armature manually.

(6) *Fuses.* Inspect fuse caps for evidence of burning and corrosion. Examine fuse clips for dirt, corrosion, loose connections, and tension.

b. TIGHTEN (T). (1) Resolder loose or broken connections on tube sockets, capacitors, resistors, fuse clips, and terminal strips.

(2) Tighten loose mounting or assembly screws and nuts.

(3) Increase the tension of loose fuse clips by pressing the sides closer together when the fuse is removed.

c. CLEAN (C). (1) Clean accumulations of dust, dirt, or other foreign matter from recesses of the amplifier compartment. Blow out with compressed air, if available, or brush out with a soft hair brush. Remove rust or corrosion from metal surfaces with No. 0000 sandpaper and clean with solvent (SD).

(2) Clean very dirty parts with a clean, dry cloth moistened with solvent (SD).

(3) Clean relay contacts with carbon tetrachloride and burnish with a contact burnishing tool (par. 77).

(4) Clean corroded fuse ends and fuse clips with No. 0000 sandpaper. Remove residue with a clean, dry cloth.

45. Preventive Maintenance Check List

The following check list is a summary of the PM operations to be performed on Recorder-Repro-

ducers AN/GNQ–8 and AN/GNQ–7–(*) and Reproducer AN/GNQ–6. The time intervals shown on the check list may be reduced by the local commander. For best performance of the equipment, perform the operations at least as frequently as called for in the check list. The column headed *Maintenance performed by* indicates which operations are performed by the operator (O) and which operations are performed by maintenance personnel (M). Operations are indicated by the letters of the word FITCAL. For example, if the letters ITC appear in the *Operations* column, the item must be inspected (I), tightened (T), and cleaned (C).

Item No.	Operations	Item	When performed			Maintenance performed by
			Daily	Weekly	Monthly	
1	ITCL	Carrying case or cabinet	...	x	...	O
2	ITC	Cables and connectors	...	x	...	O
3	ITCA	Reproducer head	...	x	...	M
3	L	Reproducer head	...	...	x	M
4	IC	Recorder head	...	...	x	O
5	IC	Turntable shells	x	...	...	O
6	F	Turntable chassis	...	x	...	M
6	ITC	Turntable chassis	...	x	...	O
7	ITC	Microphone	...	x	...	O
8	IC	Headset	...	...	x	O
9	ITCL	Step-back and brake foot control switches.	...	...	x	O
10	IC	Remote control unit	...	x	...	O
11	FICL	Motor and gearbox	...	...	x	M
12	ITC	Amplifier and a-v-c unit	...	...	x	M

F Feel I Inspect T Tighten C Clean A Adjust L Lubricate

Note. X indicates when operations are to be performed.
O indicates operator of equipment.
M indicates maintenance personnel.

Section VIII. LUBRICATION

46. Approved Lubricants

The following table lists the lubricants and cleaner necessary in servicing Recorder-Reproducers AN/GNQ–8 and AN/GNQ–7–(*) and Reproducer AN/GNQ–6.

Symbol	Nomenclature
GG	Grease, Graphited, Light
GL	Grease, Lubricating, Special
OCW	Oil, Clock and Watch
SD	Solvent, Dry Cleaning
WB	Grease, General Purpose

47. Lubrication of Reproducer-head Pivot

Once monthly, apply 1 drop of oil (OCW) to each side of the pivot post of the reproducer arm (C, fig. 23) where it rests on its bottom end.

48. Lubrication of Locks and Hinges

Once monthly, apply a few drops of oil (PL or OCW) to the locks and hinges on the cabinets of all models. Wipe off excess oil with a clean cloth.

49. Lubrication of Step-back Mechanism (AN/GNQ–6 only)

Once monthly, apply 1 drop of oil (OCW) to each of the pivots on the clapper bar (4, fig. 36). Also apply 2 drops of oil (OCW) to pivots on the foot control pedals (fig 4).

50. Lubrication of Parts Requiring Disassembly

Paragraph numbers listed below cover the disassembly and lubrication of the parts to be lubricated by maintenance personnel only.

Part	Par.
Turntable cork ring	69
Turntable motor	70
Turntable brake (AN/GNQ–6 only)	71

Note. The lubricant contained in the rear gearbox (AN/GNQ–8 and AN/GNQ–7–(*)) (fig. 25) is permanent and should not require replacement for the life of the equipment. In the event of trouble in the rear gearbox which necessitates the removal and replacement of parts, refill the rear gearbox with grease (GL).

Section IX. WEATHERPROOFING

51. General

Signal Corps equipment, when operated under the severe climatic conditions which prevail in the tropical, arctic, or desert regions; requires special treatment and maintenance.

52. Tropicalization

a. General. Because fungus growth, insects, corrosion, salt spray, and excessive moisture affect most materials harmfully, a special mois-

tureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. Refer to TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment, for a detailed description of the varnish-spray method of moistureproofing and fungiproofing and the supplies and equipment required in this treatment. The following problems may be encountered:

(1) Resistors, capacitors, transformer windings, etc., fail because of the effects of fungus growth and excessive moisture.

(2) Electrolytic action, visible in the form of corrosion, takes place in resistors and transformer windings, causing eventual break-down.

(3) Hook-up wire insulation and cable insulation break down. Fungus growth accelerates deterioration.

(4) Moisture forms electrical paths on terminal boards and insulation strips.

Caution: Varnish spray may have poisonous effects if inhaled. To avoid inhaling spray, use a respirator if available; otherwise fasten cheesecloth or other cloth material over nose and mouth. Never spray varnish or lacquer near an open flame. Do not smoke in a room where varnish or lacquer is being sprayed; the spray may be explosive.

b. Recorder - Reproducers AN/GNQ–8 and AN/GNQ–7 and Reproducer AN/GNQ–6. When treating these equipments, observe the following precautions:

(1) Only the amplifier units and the interiors of the cabinets are to be sprayed.

(2) Apply lacquer to all parts not treated by spray. Use a small brush and use care to avoid fouling of relay contacts, bearings, gears, motors, and other parts which move during operation of the equipment.

(3) Remove all masking tape from electrical contacts before reassembling equipment in cabinet.

c. Recorder-Reproducer AN/GNQ–7A. This equipment is moistureproofed and fungiproofed during manufacture and does not require further treatment.

d. Moistureproofing and Fungiproofing After Repairs. If the coating of protective varnish has been broken or punctured during repair and if a complete treatment is not needed to reseal the equipment, apply a brush coat to the affected part. Be sure the break is completely sealed.

53. Winterization

a. General. Special precautions are necessary to prevent poor performance or total operational failure of equipment in subzero temperatures. Most signal equipment can be used in winter if difficulties common in low temperatures are anticipated and precautions taken to prevent them. For operation purposes place equipment in heated rooms wherever possible. Wrap it in blankets when on the march to protect it from winds and freezing temperatures. Refer to TB SIG 66, Winter Maintenance of Signal Equipment, for complete information. The following problems may be encountered:

(1) Steel shrinks and becomes brittle in subzero weather.

(2) Glass is especially susceptible to sudden temperature changes.

(3) Certain types of synthetic rubber are unreliable and become brittle.

(4) Canvas freezes and loses its pliability in cold weather.

(5) Lubricants become stiff, causing drag and also causing moving parts to stick. Refer to section VIII for detailed lubrication instructions.

b. Recorder - Reproducer AN/GNQ–8 and AN/GNQ–7–(*) and Reproducer AN/GNQ–6. These equipments operate most satisfactorily at approximately room temperatures. Extremely low temperatures will cause severe drag on the turntable motor and may result in lower turntable speeds. Extreme cold will cause the vinylite disks to become more brittle.

54. Dustproofing

a. General. Signal Corps equipment operated in desert localities is affected by the extremely high temperatures and the amount of dust, dirt, sand, and other foreign matter in the air. Take care to prevent such elements from filtering into lubricated parts. Cover the equipment when it is not in use. Thorough cleanliness is imperative. Instead of merely adding new lubricants at regular intervals, whenever possible clean and lubricate all moving parts. If possible, inspect and clean the equipment daily. Refer to TB SIG 75, Desert Maintenance of Ground Signal Equipment. Some of the problems encountered are the following:

(1) Lubricants become thin and drain rapidly

from the moving metal and fiber parts. Refer to section VIII for detailed lubrication instructions.

(2) Foreign matter, such as dirt, dust, and sand, acts as an abrasive, causing excessive wear.

b. Recorder-Reproducers AN/GNQ–8 and AN/GNQ–7–(*) and Reproducer AN/GNQ/6. These equipments are not dustproofed and, when operated in extremely dusty areas, they should be covered even during operation whenever possible. Inspect the disk surface for dust and sand particles and brush off frequently. On the AN/GNQ –6, check and clean the brake shoe (4, fig. 38) frequently to prevent excessive wear of the brake shoe material.

PART FOUR

AUXILIARY EQUIPMENT

(Not used.)

Section X. THEORY OF EQUIPMENT

55. Operation of Recorder and Reproducer Arms

a. Recorder-arm Operation. (1) *Embossing.* The weight of the recorder head forces the diamond-tipped stylus a predetermined depth into the relatively soft material of the vinylite recording disk and, as the disk rotates, embosses a groove of uniform depth. The stylus vibrates laterally in accordance with changes in voltage and frequency of audio signals fed into a coil surrounding an armature to which the stylus is attached. This results in the embossed groove taking a wave form, with signal voltage controlling wave magnitude and signal frequency controlling wavelength.

(2) *Feed mechanism.* The feed mechanism consists of a feed collar (7) (fig. 19), two clutch springs (5) and (18), two flat washers (6), two tension nuts (4), and a locknut. As the gear in the rear gearbox rotates, its feed spindle causes its feed collar (7) to rotate and transmit this motion through the upper clutch spring (5) to the recorder arm. The end result is that the recorder arm will be made to move across the disk by means of the friction being created by the clutch spring pressing the recorder arm against the feed collar. The rate of feed is such that the diamond stylus in the recorder head makes 200 grooves per inch (220 grooves per inch for AN/GNQ–7A) across the disk when the disk is rotating. The clutch springs are adjusted by their respective tension nuts to insure positive feed of the recorder arm without backlash which might cause overlapping grooves. The lower clutch spring (18) provides a heavy friction load on the gear in the rear gearbox, thus effectively eliminating backlash between this gear and its worm drive pinion.

(3) *Lifting mechanism.* The lifting mechanism raises the recorder head from or lowers the recorder head to the disk. The mechanism consists of a lifting post (13) and spring mounted on the chassis of the recorder, a lifting bracket mounted on the recorder head, and a clamping shoe (11) to engage and release the lifting bracket. The lifting post is actuated by a cam on the shaft of LISTEN-TALK switch S–102 (fig. 20). When the switch is thrown to the LISTEN position, the cam allows the post to be sprung downward, thus causing the clamping shoe on the top of the post to engage the bracket on the recorder head and thereby raise the recorder head from the disk.

b. Reproducer-arm Operation. (1) *Reproducer head.* The reproducer-head sapphire-tipped stylus, under a controlled pressure of less than 1 ounce, rests in the disk groove previously made by the recorder head (*a* above) and is forced to vibrate laterally, in accordance with the groove undulations, as the disk rotates. The reproducer-head stylus transmits its lateral movement to the coil holder of the moving coil located inside the reproducer head. Since the coil is located in a magnetic field produced by a permanent magnet, any movement of the coil holder-stylus assembly will generate a voltage which will appear across the coil at a magnitude and frequency that correspond with the stylus movements. The action of the reproducer head is opposite to that of the recorder head in that, with the latter, audio voltages cause its stylus to move, and in the former, it is the movement of the stylus that generates an audio voltage.

(2) *Neutralizing mechanism.* The counterbalance weight (fig. 22) located on the rear of the reproducer arm minimizes the effects of tilting upon tracking by the arm in a horizontal direction only. This weight has no effect on stylus pressure since the head is connected to the reproducer arm through the flexible hinge. However, the friction between the stylus and the disk can adversely affect proper tracking by the reproducer arm and it is the effect of this tangential force (friction) that is minimized by the neutralizing mechanism. The neutralizing mechanism consists of a bracket and spring (O–107) connected between the movable arm and the fixed D-shaped stanchion. The mechanism exerts a counterforce to the tangential force (which tends to push the reproducer arm outward off the disk) and pushes the arm inward toward the disk center. By lo-

cating the adjustable spring bracket so that the neutralizing spring is in line with the arm when the stylus is in the neutral area of the disk, a uniformly varying counterforce is exerted on either side of the neutral area. Varying the tension of the adjustable neutralizing spring increases or decreases the counterforce against tangential force at any given point on the disk (pars. 83 and 84).

56. Groove Structure

The disk material (vinylite) displaced by the recorder-head stylus piles up along the sides of the groove during the recording process. Normally, the groove width is about four-fifths wider than the land width (space between grooves). However, excessive recorder-head pressure on the stylus will increase groove width to a degree that will cause groove walls to touch adjacent groove walls and the consequent interference during reproduction sometimes results in untintelligible sounds from the loudspeaker. On the other hand, inadequate pressure on the recorder-head stylus means too narrow a groove with resultant skipping and repeats during reproduction.

57. Circuit Analysis of Recorder-Reproducer AN/GNQ–8 (fig. 51)

a. Power Input Circuit. Power is supplied to equipment through male connector P–401, cable W–401, female connector J–491, and connector P–102. Switch S–101 turns on the power to the equipment and also serves to disconnect the power completely from the equipment during servicing. Capacitors C–108 and C–109 suppress the clicks incident to the operation of switch S–101. The equipment is fused with 3-ampere fuse F–101. This fuse protects the equipment from overload damage.

b. Filament and Plate Circuits. The tube filaments are connected in series directly across the power line and are designated by filament symbols for tubes V–101, V–102, V–103, V–104, and V–105. Resistor R–118 (not used on the AN/GNQ–7A) increases the filament voltage on V–103, V–104, and V–105. The amplifier receives its plate current from rectifier tube V–105, whose plate is connected to one side of the power line. This B supply (or d-c voltage) supplied by the cathode of V–105 is filtered by capacitor C–112 (80 mf).

c. Motor. Turntable motor B–101 is a back-geared, shaded-pole, a-c, induction motor. Switch S–103 turns the motor on and off. When this switch is in the STOP position, the 4-ohm output line is shorted to prevent acoustical feedback between the microphone and recorder head, since the turntable, when stopped, tends to act as a sounding board. Capacitor C–110 suppresses electrical clicks incident to the operation of the switch. Although the turntable motor is designed to operate on 60-cycle power, it may be operated on power of either slightly higher or lower frequency. However, a recording must be played back on the same power frequency on which it was produced.

d. Microphone Circuit. The microphone is connected to the a-v-c unit by means of the three-wire shielded cable W–301, male connector P–301, female connector J–201, and cable W–202.

Note. During recording, audio-signals are amplified with the accent on the high frequencies to compensate for losses inherent in the recording process. During reproduction, the amplifier reduces the high-frequency response to produce optimum playback results.

e. Automatic-volume-control Unit. (1) The spade lugs at the end of cable W–205 permit connection of telephone or other audio input lines to the a-v-c unit through connectors J–202 and P–202 and cable W–204. The input line circuit is completed by the primary of isolation transformer T–201, resistors R–201 and R–202, and capacitor C–204. No impedance matching is necessary to this line.

(2) The a-v-c voltage is obtained from the 4-ohm winding of the output transformer T–102 and is applied to the copper-oxide rectifier CR–202 through connectors J–102 and P–201 and cable W–203. Resistors R–204 and R–205 serve as voltage attenuators. Capacitor C–201 acts as a frequency compensator so that the a-v-c action is not applied to some of the higher frequencies.

(3) The resistor-capacitor network, consisting of resistor R–203 and capacitors C–202 and C–203, filters the rectified a-v-c voltage from rectifier CR–202 and controls the time constant of the a-v-c action.

(4) Resistor R–208 is a voltage divider, and potentiometer R–207 controls the amount of signal applied to the amplifier input. This control is factory-set. Resistor R–206 serves as a load to provide constant impedance to the input of the amplifier.

(5) MIC-TEL switch S–201 selects the line

(telephone) or microphone input to the amplifier. The input applied to the amplifier from the a-v-c unit is supplied through cable W–201 and connectors P–203 and J–107.

f. Amplifier Input Circuits. Signal inputs to the amplifier are directed by the five-gang LISTEN-TALK switch S–102-A, -B, -C, -D, -E. This switch is shown in the TALK (record) position on the schematic diagram (fig. 51). With switch section S–102A in the TALK position, the primary of input transformer T–101 is connected to the line and microphone input connector J–107. With the switch section S–102A in the LISTEN position, the reproducer head Y–101 is connected to the primary of input transformer T–101. Capacitor C–103 ties all metal parts of the equipment to B—. Capacitor C–102 ties the primary of input transformer T–101 to B —.

g. First Amplifier Stage. One secondary terminal of input transformer T–101 is connected to the common ground B —; the other terminal is connected to the grid of the first section of tube V–101 by a shielded lead. The plate of the first section of V–101 receives its B supply through load resistor R–115 and decoupling resistor R–107. Capacitor C–101A filters the B supply to that stage. Capacitor C–120 is an h-f bypass capacitor. Capacitor C–107 acts as a tone control when the LISTEN-TALK switch section S–102C is in the LISTEN (reproduction) position. The cathode of tube V–101 is common to the two triode sections of the tube and returns to ground through bias resistor R–103 which is bypassed by capacitor C–116. C–113 in this circuit is an h-f bypass capacitor.

h. Second Amplifier Stage. (1) With the LISTEN-TALK selector switch sections S–102B in the TALK (recording) position, the plate of the first section of tube V–101 is coupled to the grid of the second section of the tube through coupling capacitor C–118 and recorder volume control R–119.

(2) With the LISTEN-TALK selector switch section S–102B in the LISTEN (reproduction) position, the plate of the first section of tube V–101 is coupled to the grid of the second section of the tube through coupling capacitor C–111 and the reproducer volume control R–101. The plate of the second section of the tube V–101 receives its B supply through load resistor R–116 and decoupling resistor R–106. The supply to this stage is filtered by capacitor C–101B.

(3) Coupling capacitor C–115 and the voltage divider network, consisting of resistors R–105, R–108, and R–113, provide coupling from the second amplifier stage to the driver section of tube V–102.

i. Driver and Inverter Stage. Capacitor C–114 in the plate circuit of the driver section of tube V–102 suppresses undesired high frequencies. Resistor R–104 provides cathode bias for both sections of V–102, the first section of which is an amplifier and the second section a phase inverter. The grid of the second section of V–102 is connected in a conventional phase-inversion circuit through the resistor network composed of R–110, R–111, and R–112. Plate load resistors R–109 and R–117 are decoupled by resistor R–114 and filter capacitor C–101C. The plates of the two sections of the tube are coupled through their respective coupling capacitors C–104 and C–105 to the grids of the push-pull power tubes V–103 and V–104.

j. Output Stage. Capacitor C–117, connected across the plates of output tubes V–103 and V–104, suppress undesired high frequency. Resistor R–102 is a cathode self-bias resistor for both output tubes. The screen grids of the tubes are connected directly to the B supply. The plates of V–103 and V–104 are connected in push-pull to the primary winding of output transformer T–102, whose center tap is connected directly to the B supply.

k. Output Transformer. (1) There are two secondary windings on output transformer T–102. The first is a 500-ohm winding which supplies output voltage to phone jack J–101. Capacitor C–106 ties this 500-ohm output line to ground. The second or 4-ohm winding of output transformer T–102 drives the recorder head Y–102, operates the volume flasher bulb I–101, and also provides a-v-c voltage. The a-v-c voltage is not effective, however, unless the LISTEN-TALK selector switch S–102A is in the TALK (recording) position.

(2) With the contacts of S–102D in the LISTEN (reproduction) position, the 4-ohm winding of output transformer T–102 drives loudspeaker LS–101, which is connected on a normally closed switching circuit to phone jack J–101. Loudspeaker LS–101 is automatically disconnected when a phone plug is inserted into phone jack J–101. The 4-ohm winding of output transformer T–102 also provides inverse-feedback voltage to the voltage-attenuator network in the grid circuit of the driver section of tube V-102.

(3) With the LISTEN-TALK selector-switch sections S–102D and S–102E in the TALK (recording) position, resistor R–121 serves as a voltage divider for the inverse-feedback voltage. Capacitor C–119 and resistor R–120 provide a shunting circuit to the inverse-feedback voltage and allow only the lower frequencies to pass through the feedback circuit. This condition gives a high-frequency accentuation to the recording process.

58. Circuit Analysis of Recorder-Reproducer AN/GNQ–7–(*) (figs. 52 and 53)

a. General. The amplifier of Recorder-Reproducer AN/GNQ–7–(*) is virtually identical to that of Recorder-Reproducer AN/GNQ–8. All particulars in which the electrical circuits differ are discussed in *b* through *g* below.

b. Motor. The two back-geared, a-c induction motors (shaded-pole start in the AN/GNQ–7; Capacitor-start in the AN/GNQ–7A) are turned on or off by TURNTABLE switch S–103 through the relay circuits. When switch S–103 is in the stop position, the 6-ohm line in the amplifier output circuit is shorted to prevent spurious signals from actuating the recorder head and volume flasher. Capacitor C–110 suppresses clicks incident to operation of switch S–103. On the AN/GNQ–7A, capacitor C–108 (for unit B motor) and capacitor C–109 (for unit A motor) are connected in series with the motor starting windings to provide leading current for faster starting of the motors (higher torque).

c. Rectifier Output Circuit. Rectifier tube V–105 supplies d-c voltages to operate relays K–101, K–102, K–103, and the plate and screen circuits.

d. Relay Circuits. (1) The coil of remote control relay K–101 is designated as K–101A; the contacts are designated as K–101B. The high side of coil K–101A is connected directly to B +. The low side of the coil is connected through the turntable START-STOP switch S–103 to B —. Remote control ON-OFF switch S–501 is connected directly across switch S–103 through cable W–501 and connectors P–501 and J–108. Capacitor C–125 suppresses the clicks incident to the operation of switches S–103 and S–501. Indicator lamp I–501 lights with S–103 in the STOP position and S–501 in the OFF position. Relay contacts K–101B start motors B–101 and B–102 by completing the circuit from the low side of each motor through relay contacts K–102B and K–103B to the low side of the power line.

(2) The coils of relays K–102 and K–103 (K–102 and K–103 are plug-ins on AN/GNQ–7A) are represented on the schematic diagram (fig. 53) as K–102A and K–103A and their contacts are shown as K–102B, K–102C, K–102D, K–102E, K–103B, K–103C, K–103D, and K–103E. The sequential or simultaneous operation of relays K–102 and K–103 determine whether the left-hand turntable unit A, the right-hand turntable B, or both turntables operate. The contacts of relays K–102 and K–103 connect in the proper circuits for the turntable that is to be operated.

(3) Relay contacts K–102B and K–103B select motors B–101 and B–102, respectively. Capacitors C–121 and C–122 suppress the clicks incident to the operation of K–102B and K–103B. K–102C and K–103C are hold-in contacts for the respective relays and are not open unless the circuits to relay coils K–102A and K–103A are broken.

(4) Relay contacts K–102D and K–103D are not required in the operation of Recorder-Reproducer AN/GNQ–7–(*) on an a-c line. They are provided, however, for the purpose of operating the equipment from a 110-volt, d-c power source with a converter (not supplied with the equipment). Relay contacts K–102E and K–103E select between recorder heads Y–102 and Y–103.

e. Relay Sequential Operation. (1) Switches S–104 and S–107 are located at the inside limit of the lateral travel of recorder head Y–102 and are actuated by the recorder head. Switches S–105 and S–109 are similarly located and actuated at the inside limit of the lateral travel of recorder head Y–103. Switches S–106 and S–108 are momentary push-button switches.

(2) When it is desired to start the left-hand turntable unit A, switch S–101 must be turned ON to allow the tubes to warm up. Depressing switch S–106 energizes relay coil K–103A and the relay is held closed by its contacts K–103C. Relay contacts K–103B and K–103D will close, thus selecting motor B–102 of the left-hand turntable unit A. Relay contacts K–103E will also close, thus selecting recorder head Y–103 of the left-hand turntable unit A. As recorder head Y–103 reaches the end of its recording area, it operates switch S–109, which closes the circuit and operates relay K–102.

(3) The associated contact circuits of relay K–102 start right-hand turntable unit B. From

30 to 60 seconds after recorder head Y–103 has actuated switch S–109, recorder head Y–103 operates switch S–105, which opens the circuit of relay K–103 and stops turntable unit A. When recorder head Y–102 reaches the end of its recording area, it operates switches S–107 and S–104 to start turntable unit A and to stop turntable unit B.

(4) Capacitor C–123 suppresses the clicks incident to the operation of switch S–105. Capacitor C–124 suppresses the clicks incident to the operation of switches S–104, S–108, and S–109. Capacitor C–110 suppresses the clicks incident to the operation of relay contacts K–101B, K–102D, and K–103D. The right-hand and left-hand turntable units are interconnected by cable W–101 with connectors P–106 and P–107, and cable W–102 with connectors J–109 and J–110.

f. Microphone Circuit. The six-position selector switch S–301 (on the AN/GNQ–7 only) permits adjustment of microphone MI–301 sensitivity by the voltage attenuators consisting of resistors R–301, R–302, R–303, R–304, and R–305. Socket J–301 permits another microphone to be connected in parallel with microphone MI–301. The microphone is connected to the a-v-c unit by means of the three-wire shielded cable W–301, connectors P–301 and J–201, and cable W–202.

g. First Amplifier Stage. C–126 is an h-f bypass capacitor in the plate circuit of this stage. The capacitor performing the same function on Recorder-Reproducer AN/GNQ–8 is designated as C–120. This is the only difference in this stage between the two equipments (par. 57*g*).

h. Output Transformer. The 4-ohm winding of output transformer T–102 drives both recorder heads Y–102 and Y–103. Otherwise the output transformer circuits are the same as for Recorder-Reproducer AN/GNQ–8 (par. 57*k*).

59. Circuit Analysis of Reproducer AN/GNQ–6 (fig. 54)

a. General. The basic amplifier of Reproducer AN/GNQ–6 is identical to those of Recorder-Reproducers AN/GNQ–8 and AN/GNQ–7–(*). Particulars in which input and output circuits differ are explained in *b* through *h* below.

b. Power Input Circuit. Power is supplied to the equipment through connector P–301, cable W–301, and connectors J–301 and P–102.

c. Rectifier Output Circuit. Rectifier tube V–105 supplies d-c voltages to operate brake coil L–101 and step-back coil L–102, in addition to the plate and screen circuits.

d. Step-back and Brake Circuits. Step-back coil L–102 is operated by the normally open foot switch S–201. Brake coil L–101 is operated by the normally closed foot switch S–202. Each switch, when closed, connects its associated coil directly across the B supply. Capacitors C–110 and C–118 serve to suppress the clicks incident to the operation of these switches.

e. Amplifier Input Circuit. Reproducer head Y–101 is connected to the primary input transformer T–101. Capacitor C–103 ties all the metal parts of the equipment to B —. Capacitor C–102 ties the primary of input transformer T–101 to B —.

f. First Amplifier Stage. The first stage of the amplifier in Reproducer AN/GNQ–6 has no switch in the grid circuit of the first section of tube V–101 as do the amplifiers in Recorder-Reproducers AN/GNQ–7–(*) and AN/GNQ–8. Capacitor C–107 acts as a tone control. Capacitor C–113 in the cathode circuit functions as an h-f bypass.

g. Second Amplifier Stage. The plate of the first section of tube V–101 is coupled to the grid of the second section of V–101 through coupling capacitor C–111 and the reproducer volume control R–101. There is no alternate path and switching circuit between the stages as in Recorder-Reproducers AN/GNQ–8 and AN/GNQ–7–(*).

h. Output Transformer. There are two secondary windings on output transformer T–102. The first is a 500-ohm winding which supplies output voltage to phone jack J–101. Capacitor C–106 ties this 500-ohm output line to ground. The second or 4-ohm winding of output transformer T–102 provides inverse-feedback voltage to the voltage-attenuator network in the grid circuit of the driver section of tube V–102. It also supplies a signal to an external loudspeaker plugged into J–102.

Section XI. TROUBLE SHOOTING

60. General Trouble-shooting Information

a. General. No matter how well equipment is designed and manufactured, faults occur in service. When such faults occur, the repairman must locate and correct them as rapidly as possible. This section contains information to aid per-

sonnel engaged in the important duty of trouble shooting.

b. Trouble-shooting Data. Take advantage of the information supplied in this manual, to help in the rapid location of faults. Consult the following trouble-shooting data when necessary:

(1) Complete schematic diagrams (figs. 51 through 54), including voltage and resistance data for all socket connections.

(2) Illustrations of components with reference symbols which aid in locating and identifying parts.

(3) Pin connections on sockets and connectors numbered or lettered in the various diagrams. Locate pin numbers as follows:

(*a*) Seen from the bottom, numbers of pin connections of octal tube sockets increase in a clockwise direction around the sockets. The first pin clockwise from the keyway is the No. 1 pin.

(*b*) Individual pins on connectors are identified by numbers which are stamped directly on the connector insulation.

c. Trouble-shooting Steps. The first step in servicing a defective unit is to sectionalize the the fault. Sectionalization means tracing the fault to the *component* or *circuit* responsible for the abnormal operation of the equipment. The second step is to localize the fault. Localization means tracing the fault to the defective *part* responsible for the abnormal condition. Some faults, such as burned-out resistors, can be located by sight or smell. Most faults, however, must be located by checking voltages and resistances.

(1) *Sectionalization.* Careful observation of the performance of the equipment often enables the repairman to sectionalize the fault to a particular component (par. 61*d*).

(2) *Localization.* Paragraph 61*e* describes the method of localizing faults. Paragraphs 62 through 64 contain trouble-shooting charts which list abnormal symptoms and their probable causes. Refer to paragraphs 66 and 67 for instructions on removing units from the cases.

d. Voltage Measurements. Voltage measurements are an indispensable aid to the repairman, because most troubles either result from abnormal voltages or produce abnormal voltages. Voltage measurements are taken easily, because they are always made between two points in a circuit and the circuit need not be interrupted.

(1) Unless otherwise specified, the voltages listed on the voltage charts are measured between the indicated points and B —.

(2) Always begin by setting the voltmeter on the highest range so that the voltmeter will not be overloaded. Then, if it is necessary for increased accuracy, set the voltmeter on the lower range.

(3) When checking cathode voltage, a reading can be obtained when the cathode resistor is actually open. The resistance of the meter may act as a cathode resistor. Thus, the cathode voltage may be approximately normal only as long as the voltmeter is connected between cathode and ground. Before the cathode voltage is measured, make a resistance check with a cold circuit to determine whether the cathode resistor is normal.

e. Voltmeter Loading. It is essntial that the voltmeter resistance be at least 10 times as large as the resistance of the circuit across which the voltage is measured. If the voltmeter resistance is comparable to the circuit resistance, the meter will indicate a voltage lower than the actual voltage present when the meter is removed from the circuit.

(1) The resistance of the voltmeter on any range can always be calculated by the following simple rule: Resistance of the voltmeter equals the ohms per volt multiplied by the full-scale range in volts. For example: The resistance of a 1,000-ohms-per-volt meter on the 300-volt range is 300,000 ohms (R = 1,000 ohms per volt times 300 volts = 300,000 ohms).

(2) To minimize the voltmeter loading in high-resistance circuits, use the highest voltmeter range. Although only a small deflection will be obtained (possibly only 5 divisions on a 100-division scale), the accuracy of the voltage measurement will be increased. The decreased loading of the voltmeter will more than compensate for the inaccuracy which results from reading only a small deflection on the scale of the meter.

(3) When a voltmeter is loading a circuit, the effect can always be noted by comparing the voltage reading on two successive ranges. If the voltage readings on the two ranges do not agree, voltmeter loading is excessive. The reading (not the deflection) on the highest range will be greater than that on the lowest range. If the voltmeter is loading the circuit heavily, the deflection of the pointer will remain nearly the same when the voltmeter is shifted from one range to the other.

f. Resistance Measurements. (1) *Normal*

values. When a fault develops in a circuit, its effect will very often show up as a change in the resistance values. To assist in the localization of such faults, the schematic diagrams include the normal resistance values as measured at the tube sockets. These values are measured between the indicated points and ground, unless otherwise stated. Often it is desirable to measure the resistance from other points in the circuit in order to determine whether the circuit at a particular point is normal. The normal resistance values at any point may be determined by referring to the resistance values shown in the schematic diagrams and by using the resistor color code (fig. 49).

(2) *Precautions.* Turn off the power before making any resistance measurements. An ohmmeter is essentially a low-range voltmeter and battery. If the ohmmeter is connected to a circuit which already has voltages in it, the needle will be deflected off scale and the meter movement may be burned out. Always discharge large filter capacitors before applying ohmmeter leads. If a bleeder circuit is open, the capacitors may be charged. This is especially likely to happen if the power has been turned on while the unit is removed from the cabinet.

(3) *Correct use of low and high ranges.* It is important to know when to use the low-resistance range and when to use the high-resistance range of an ohmmeter. When checking circuit continuity, set the ohmmeter on the lowest range. If a medium or high range is used, the pointer may indicate 0 ohms even if the resistance is as high as 500 ohms. When checking high resistances or measuring the leakage resistance of capacitors or cables, use the highest range. If a low range is used, the pointer will indicate *infinite* ohms even though the actual resistance is less than a megohm.

(4) *Parallel resistance connections.* In a parallel circuit, the total resistance is less than the smallest resistance in the circuit. This is important to remember when trouble shooting with the aid of a schematic diagram. When a resistance is measured and the value is found to be less than expected, make a careful study of the schematic to be certain that there are no resistances in parallel with the one that has been measured. Before replacing a resistor because its resistance measures too low, disconnect one terminal from the circuit and measure its resistance again, to make sure that the low reading does not occur because some part of the circuit is in parallel with the resistor.

(5) *Checking grid resistance.* When checking grid resistance, a false reading may be obtained if the tube still is warm and the cathode is emitting electrons. Allow the tube to cool, or reverse the ohmmeter test leads so that the negative ohmmeter test lead is applied to the grid.

(6) *Tolerance values.* Tolerance means the normal difference that may be expected between the rated value of the resistor and its actual value. Most resistors have a tolerance of at least 10 percent. For example, the grid resistor of a stage might have a rated value of 1 megohm. If the resistor were measured and found to have a value between 0.8 megohm and 1.2 megohms, it would be considered normal. Ordinary resistors are not replaced unless their values are off more than 10 percent. Tolerance values for transformer windings are generally between 1 and 5 percent. As a rule, suspect transformers which show resistances deviating more than 5 percent from the rated value. Allow the transformer to cool before a resistance test is made.

g. Capacitor Tests. (1) *Capacitor defects.* It is often necessary and desirable to check capacitors for leakage and open or shorted circuits. Although sometimes open circuits occur in paper-type capacitors, because of the metal tab pulling away from the tinfoil plates, this trouble is unusual. The usual trouble in a capacitor is a short circuit or leakage caused by the break-down of the dielectric between the plates.

(2) *Open capacitor.* A capacitor suspected of being open can best be checked by shunting a good capacitor across it. In a-f circuits, the test capacitor leads may be several inches long without materially affecting the circuit of which the capacitance is a part.

(3) *Kick indication.* Any good high-resistance voltohmmeter may be used to check for the leakage in a paper or mica capacitor. Tests for an open or shorted circuit may be made with the same instrument. (Test Set I-176 is generally available in the field and is recommended for checking capacitors by using the kick-indication method.) The ohmmeter circuit of the test unit is used to make the check. Proceed as follows:

(*a*) Disconnect one end of the capacitor from its shunting circuit.

(*b*) Set the ohmmeter to read on its highest

range, and place the ohmmeter leads across the capacitor.

(*c*) A good capacitor should cause the needle to kick up the scale and fall back to infinity.

(*d*) A leaky capacitor will cause the needle to remain at some point on the scale other than infinity.

(*e*) An open capacitor will cause no deflection of the needle.

(*f*) The lower the capacitance, the lesser will be the degree of deflection which occurs on the ohmmeter scale. The higher the capacitance the greater will be the deflection which appears on the ohmmeter scale (if the capacitor is normal). Usually capacitors lower than 50,000 micromicrofarads (mmf) do not indicate a measurable kick. Replace defective capacitors.

(4) *Capacitor color code.* An illustration of the capacitor color code is given in figure 50.

61. Trouble-Shooting Procedures

a. Use of Data. The accompanying trouble-shooting charts and data simplify trouble shooting. By proper use of these charts, the operator can isolate the trouble to one particular component of the equipment and thus save time that might otherwise be lost in checking components that are free of trouble.

b. Tubes. Before trouble shooting, replace the tubes with known good tubes to eliminate possible tube trouble.

c. Visual Inspection. Before starting an elaborate test procedure, make a thorough visual inspection in an attempt to locate the fault. A drop of solder, a faulty socket or plug, a corroded fuse holder, a loose connection, or an accidentally grounded tie point may render the amplifier inoperative. If these faults do not show up in a visual inspection, their presence will be determined in a resistance analysis.

d. Sectionalization. To sectionalize trouble on Recorder-Reproducers AN/GNQ–8 and AN/GNQ–7–(*), play a known good disk (recording) to determine whether trouble exists during the recording or reproduction process. If the known good disk reproduces well, the reproducer mechanism is functioning properly and the recording mechanism is at fault. If a recording made on a defective machine plays back well on another machine, the recording process is functioning properly. Sectionalizing in this manner expedites trouble shooting. If trouble occurs during the recording process, make recordings both from the microphone and the line to determine whether the fault lies in the microphone, a-v-c unit, or amplifier. When trouble occurs only during the recording process, the fault must be in the recorder volume control, the recorder head, or the inverse-feedback circuit. If the amplifier is good during recording and defective during reproduction, the fault must lie in either the reproducer head, reproducer volume control, loudspeaker, or feedback circuit.

e. Hints for Localizing Troubles in Amplifier. (1) *Hum.* If hum occurs in the amplifier, short-circuit the grids of the tubes successively to B — (not chassis) to determine in which stage the hum is being introduced.

(2) *Open bypass capacitor.* An open bypass capacitor decreases the amplification of the stage. For a given signal at the grid, if the cathode capacitor is open, the signal at the plate will be less. The best method of checking the suspected capacitor is to shunt another capacitor across it and note the effect on the signal at the plate.

(3) *Low screen or plate voltage.* Low screen or plate voltage decreases the amplification of the stage. This type of fault can be located by resistance and voltage measurements.

(4) *Open coupling capacitor.* When the coupling capacitor between the plate of one stage and the grid of the next stage opens, no signal appears on the grid of the second tube even though there is a signal voltage at the plate of the first tube.

(5) *Shorted coupling capacitor.* When the coupling capacitor between the plate of one stage and the grid of the next stage shorts out or leaks, a weak signal or no signal appears on the grid. The leaking or shorted capacitor allows a positive potential to be applied to the grid of the tube, thus causing a large increase of plate current and considerable distortion with a loss in volume.

(6) *Open grid circuit.* The effect of an open grid resistor in this circuit depends on the type of tube and the circuit. In general, the equipment will perform erratically and hum. An open grid circuit can be discovered by making a resistance check of the stage.

(7) *Open transformer.* An open transformer will render the amplifier inoperative because no signal will appear on the grid of the following stage. In the case of output transformer T–102,

no signal voltage will appear across its secondary terminal to energize the recorder head or listening device (speaker).

(8) *Shorted transformer.* When several or all turns of the primary or secondary of a transformer are shorted, a weak signal or no signal appears on the output terminals of the transformer.

62. Trouble-shooting Chart for Recorder-Reproducer AN/GNQ–8

Symptoms	Probable troubles	Corrections
1. Tubes do not light, turntable does not rotate.	1. *a.* Defective power cable W–401.	1. *a.* Repair or replace.
	b. Fuse blown.	*b.* Replace fuse F–101 (par. 61).
	c. Fuse loose in holder.	*c.* Tighten fuse clip.
	d. Defective TUBE switch S–101.	*d.* Replace.
	e. Tube filament or filament circuit open.	*e.* Replace defective tube; repair broken leads.
2. Tubes light, turntable does not rotate.	2. *a.* Defective power cable connector J–401.	2. *a.* Repair or replace.
	b. Defective turntable switch S–103.	*b.* Replace.
	c. Open motor coil B–101.	*c.* Replace motor.
	d. Open in circuit wiring.	*d.* Repair wiring.
	e. Flexible motor coupling unscrewed.	*e.* Turn turntable counterclockwise manually to tighten up the flexible motor coupling.
3. Tubes light, turntable rotates; set inoperative on LISTEN (reproduction) and TALK (recording).	3. *a.* Shorted tube V–105.	3. *a.* Check B supply voltage at the tube socket; replace defective tube.
	b. Shorted 80-mf capacitor C–112.	*b.* Replace.
	c. Shorted tube V–103 or V–104.	*c.* Replace.
	d. Defective coupling capacitor C–104, C–105, C–111, or C–115.	*d.* Replace.
	e. Defective resistor R–113.	*e.* Replace.
	f. Defective input or output transformer T–101 or T–102.	*f.* Replace.
	g. Open capacitor C–113, C–114, C–116, C–117, or C–120.	*g.* Replace.
	h. Open in circuit wiring.	*h.* Repair broken leads.
4. Tubes light, turntable rotates; set dead on microphone recording but good on line recording.	4. *a.* Open or shorted microphone element.	4. *a.* Replace microphone.
	b. Open leads or defective connector P–301 or J–201.	*b.* Repair broken leads; replace connectors.
	c. Defective switch S–201.	*c.* Replace.
5. Tubes light, turntable rotates; set dead on line recording, but good on microphone recording.	5. Defective a-v-c unit, open in cord W–204 or W–205, or connector J–202 or P–202.	5. Check a-v-c unit with an ohmmeter. Replace defective parts. Repair loose connections or broken wires.
6. Tubes light, turntable rotates; set dead on TALK (recording) but good on LISTEN (reproduction).	6. *a.* Defective recorder head Y–102.	6. *a.* Replace.
	b. Open recorder-arm wiring, connectors P–103 and J–105 or switch S–102.	*b.* Check wiring. Replace connectors or switch S–102.
	c. Defective coupling capacitor C–118 and/or volume control R–119.	*c.* Replace.

Symptoms	Probable troubles	Corrections
7. Tubes light, turntable rotates; set dead on LISTEN (reproduction) but good on TALK (recording).	7. *a.* Defective reproducer head Y–101.	7. *a.* Replace.
	b. Defective selector switch S–102.	*b.* Replace.
	c. Defective coupling capacitor C–111 and/or volume control R–101.	*c.* Replace.
	d. Defective speaker LS–101.	*d.* Replace.
	e. Defective connector J–106 or P–104.	*e.* Replace.
	f. Dirty contacts in jack J–101.	*f.* Clean and burnish jack contacts.
	g. Open in circuit wiring.	*g.* Repair broken leads.
8. Low output on both TALK (recording) and LISTEN (reproduction).	8. *a.* Weak tube V–105 or tubes V–101 and V–102.	8. *a.* Replace.
	b. Low B supply voltage.	*b.* Check plate voltage of tubes.
	c. Defective (usually shorted) capacitor C–104, C–105, C–112, C–113, C–114, C–115, C–116, C–117, or C–120.	*c.* Replace.
9. Low output on TALK (recording) but good on LISTEN (reproduction).	9. *a.* Defective microphone MI–301.	9. *a.* Replace.
	b. Defective recorder head Y–102.	*b.* Replace.
	c. Defective contact on switch S–102.	*c.* Clean switch contacts. Replace switch section found defective.
	d. Leaky capacitor C–118.	*d.* Replace.
10. Low output on LISTEN (reproduction) but good on TALK (recording).	10. *a.* Defective reproducer head Y–101.	10. *a.* Replace.
	b. Defective contacts on selector switch S–102.	*b.* Clean switch contacts, replace switch section found defective.
	c. Leaky capacitor C–111.	*c.* Replace.
	d. Defective speaker LS–101.	*d.* Plug in an external speaker at jack J–101. Replace defective speaker.
11. Poor quality of recording (TALK), but good quality of reproduction (LISTEN).	11. *a.* Defective microphone MI–301.	11. *a.* Replace.
	b. Improperly adjusted or defective recorder head Y–102 or Y–103.	*b.* Check adjustment of the recorder head (pars. 72 and 81). Replace defective recorder head.
	c. Defective a-v-c unit.	*c.* Check a-v-c unit with an ohmmeter. Replace defective parts n the a-v-c unit.
	d. Defective capacitor C–118.	*d.* Replace.
	e. Defective resistor R–105, R–108, or R–121 or capacitor C–119 in the inverse-feedback circuit.	*e.* Replace.
12. Poor quality of reproduction (LISTEN) but good quality of recording (TALK).	12. *a.* Improperly adjusted or defective reproducer head Y–101.	12. *a.* Check adjustment of reproducer head (pars. 74 and 83). Replace defective reproducer head.
	b. Leaky capacitor C–111.	*b.* Replace.
	c. Defective resistor R–105 or R–108.	*c* Replace.
	d. Defective speaker LS–101.	*d.* Plug in an external speaker at jack J–101. Replace defective speaker.
13. Oscillation during recording. (Continuous lighting of the flasher lamp I–101.)	13. *a.* Microphonic tube V–101.	13. *a.* Replace with nonmicrophonic tube.
	b. Defective capacitor C–113, C–114, or C–120.	*b.* Replace.
	c. Capacitor C–117 too close (physically) to the control grid leads of output tubes V–103 and V–104.	*c.* Place capacitor C–117 away from the control grids of the output tubes.

Symptoms	Probable troubles	Corrections
14. Hum.	14. *a.* Defective tube V–101 or V–103. *b.* Defective capacitor C–101A, C–101B, C–101C, C–102, C–103, C–111, C–118, C–115, C–104, or C–105. *c.* Defective volume controls R–115 and R–119.	14. a. Replace. *b.* Replace defective capacitors. Metal parts of the chassis should be connected to B— only through capacitors C–103 and C–104. *c.* Dress volume control leads away from chassis. Replace defective controls.
15. Distortion in reproduction caused by acoustic feedback from recorder head to the microphone during recording.	15. Microphone too close to recorder head.	15. Move microphone away from recorder head.
16. Motor rumble.	16. *a.* No clearance in flexible coupling between motor shaft and turntable spindle (fig. 16). *b.* Motor suspension studs touching strain brackets (fig. 16). *c.* Defective gear in motor. *d.* Flexible coupling rubbing on front gearbox.	16. *a.* Line up motor to provide 1/32-inch clearance between motor shaft and turntable spindle (par. 75). *b.* Line up motor suspension spring so that motor studs do not touch strain brackets. *c.* Replace motor. *d.* Adjust motor suspension springs.
17. Records too close to edge of turntable.	17. Improper adjustment of outside stop.	17. Adjust outside stop (par. 80*a*).
18. Records too close to center of disk.	18. Improper adjustment of inside stop.	18. Adjust inside stop (par. 80*c*).
19. Recorder head lifts at inside disk when LISTEN-TALK switch is turned to LISTEN position.	19. *a.* Inside stop allows recorder-head lifting stud to travel beyond end of clamping shoe (fig. 19). *b.* Clamping shoe out of alignment, does not strike lifting stud.	19. *a.* Adjust inside stop and clamping stem (par. 72*e*). *b.* Adjust clamping shoe (par. 72*e*).
20. Recorder head does not lift high enough.	20. Lifting stud not adjusted properly.	20. Adjust height of lifting stud (par. 72*e*).
21. Recorder head feeds laterally across disk with LISTEN-TALK switch (S–102) in LISTEN position.	21. Recorder head clamping shoe not clamping recorder arm properly.	21. Adjust clamping stem so that the serrated cone of the lifting shoe seats on the edges of the slot in the recorder arm when switch S–102 is in the LISTEN position (par. 72*e*).
22. Warning clicker does not operate.	22. Clicker spring and gear not properly adjusted.	22. Adjust (par. 80*b*).
23. Inaccurate correction marker scale.	23. Scale loose on arm or improperly placed.	23. Adjust scale to read 6 with the recorder-head stylus in the center hole of the adjusting template. Cement the scale in place (par. 80*e*).
24. Poor tracking of reproducer head.	24. *a.* Reproducer head not properly adjusted or neutralized. *b.* Shallow groove in disk.	24. *a.* Adjust (par. 83). *b.* Adjust recorder head to emboss correct groove on TALK (par. 81*a*).

Symptoms	Probable troubles	Corrections
25. Crosstalk.	25. Improper recorder-head weight or diamond stylus angle.	25. Adjust recorder head in accordance with paragraph 81*a*.
26. Bad recorder-head feed or backlash.	26. *a*. Feed clutch springs not properly adjusted. *b*. Mounting screws loose on rear gearbox. *c*. Recorder head loose on arm.	26. *a*. Adjust recorder-arm clutch (par. 72). *b*. Tighten screws. *c*. Tighten recorder-head hinge.

63. Trouble-shooting Chart for Recorder-Reproducer AN/GNQ–7-(*)

Symptoms	Probable troubles	Corrections
1. Tubes do not light, turntables does not rotate.	1. Same as 1, paragraph 62.	1. Same as 1, paragraph 62.
2. Tubes light, turntable does not rotate.	2. *a*. Defective power cable connector J–401.	2. *a*. Repair or replace.
	b. Defective turntable switch S–103.	*b* Replace.
	c. Defective relay K–101, K–102, or K–103.	*c*. Clean and burnish contacts; Adjust relay; replace relays which cannot be adjusted or which have open coils (par. 77).
	d. Defective motor starting capacitor C–108 or C–109 (on AN/GNQ–7A only).	*d*. Replace.
	e. Open motor coil B–101 or B–102.	*e*. Replace motor.
	f. Defective switch S–104, S–107, S–105, or S–109.	*f*. Be sure recorder head is not at the inside of disk where the switches are operated, but is instead in its normal unoperated position. Replace defective switches.
	g. Shorted tube V–105 or capacitor C–112.	*g*. Replace.
	h. Flexible motor coupling unscrewed.	*h*. Turn turntable counterclockwise manually to tighten the coupling.
3. Tubes light, turntable rotates; set dead on LISTEN (reproduction) and TALK (recording).	3. *a*. Shorted tubes V–103 and V–104.	3. *a*. Replace.
	b. Defective coupling capacitor C–104, C–105, or C–115, Filter capacitor C–112, C–113, C–114, C–116, C–117, or C–126.	*b*. Replace.
	c. Defective input or output transformer T–101 or T–102.	*c*. Replace.
	d. Defective resistor R–113.	*d*. Replace.
	e. Open in circuit wiring.	*e*. Repair broken leads.
4. Tubes light, turntable rotates; set dead on microphone but good on line recording.	4. *a*. Open or shorted microphone element.	4. *a*. Replace microphone.
	b. Defective resistor R–301, R–302, R–303, R–304, or R–305.	*b*. Replace.
	c. Open leads or defective connectors P–301 and J–201.	*c*. Repair broken leads or connections. Replace broken connectors.
	d. Defective switch S–201 or S–301.	*d*. Replace.
5. Tubes light, turntable rotates; set dead on line recording but good on microphone recording.	5. Defective a-v-c unit; open in cord W–204 or W–205 or connector J–202 or P–202.	5. Check the a-v-c unit with an ohmmeter. Replace defective parts. Repair broken leads.

Symptoms	Probable troubles	Corrections
6. Tubes light, turntable rotates; set dead on TALK (recording) but good on LISTEN (reproduction).	6. *a.* Defective recorder head Y–102 or Y–103.	6. *a.* Replace.
	b. Open recorder-arm wiring.	*b.* Check wiring.
	c. Connectors P–103 or J–105 and J–111 or P–104.	*c.* Replace.
	d. Poor contacts or open winding in relay K–102 or K–103.	*d.* Clean and adjust relay contacts; replace defective relay (par. 77).
	e. Defective switch S–102.	*e.* Clean switch contacts; replace switch.
	f. Defective capacitor C–118.	*f.* Replace.
	g. Defective recorder volume control R–119.	*g.* Replace.
	h. Open in circuit wiring.	*h.* Repair broken leads.
7. Tubes light, turntable rotates; set inoperative on LISTEN (reproduction) but good on TALK (recording).	7. *a.* Defective reproducer head Y–101.	7. *a.* Replace.
	b. Open in reproducer-arm wiring, connector P–101 or J–103, or in switch S–102.	*b.* Repair broken wiring; replace defective connector or switch.
	c. Defective capacitor C–111 or volume control R–101.	*c.* Replace.
	d. Defective speaker LS–101.	*d.* Replace.
	e. Open in wiring or connector J–106 or P–105.	*e.* Replace faulty connector; repair broken leads.
	f. Dirty contacts in jack J–101.	*f.* Clean and burnish jack contacts.
8. Low output on both TALK (recording) and LISTEN (reproduction).	8. *a.* Poor tube V–105, V–101, or V–102.	8. *a.* Replace.
	b. Low B supply voltage.	*b.* Check B supply and plate voltage at tubes.
	c. Defective capacitor C–112, C–104, C–105, C–113, C–114, C–115, C–116, C–117, or C–126.	*c.* Replace.
9. Low output on TALK (recording) but normal on LISTEN (reproduction).	9. *a.* Defective microphone MI–301.	9. *a.* Replace.
	b. Improperly adjusted or defective recorder heads Y–102 and Y–103.	*b.* Adjust recorder heads (pars. 72 and 73). Replace defective recorder heads.
	c. Dirty contacts on relay K–102 or K–104 or on switch S–102.	*c.* Clean (par. 77).
	d. Leaky capacitor C–118.	*d.* Replace.
10. Low output on LISTEN (reproduction) but normal on TALK (recording).	10. *a.* Improperly adjusted or defective reproducer head Y–101.	10. *a.* Adjust (par. 74). Replace defective reproducer head.
	b. Dirty contacts on switch S–102.	*b.* Clean.
	c. Leaky capacitor C–111.	*c.* Replace.
	d. Defective speaker LS–101.	*d.* Replace.
11. Poor quality of recording (TALK) but normal on reproduction (LISTEN).	11. *a.* Defective microphone MI–301.	11. *a.* Replace.
	b. Improperly adjusted or defective recorder head Y–102 or Y–103.	*b.* Check adjustment of recorder head (pars. 72 and 73). Replace defective recorder head.
	c. Defective a-v-c unit.	*c.* Check the a-v-c unit with an ohmmeter and replace defective parts.
	d. Defective capacitor C–118.	d. Replace.
	e. Defective resistor R–105, R–108, R–120, or R–121 or capacitor C–113 in the inverse-feedback circuit.	*e.* Replace.

Symptoms	Probable troubles	Corrections
12. Poor quality of reproduction (LISTEN) but good quality on recording (TALK).	12. *a.* Improperly adjusted or defective reproducer head Y–101.	12. *a.* Check adjustment (pars. 74 and 83); replace defective reproducer head.
	b. Leaky capacitor C–111.	*b.* Replace.
	c. Defective resistor R–105 or R–108 in the inverse-feedback circuit.	*c.* Replace.
	d. Defective speaker LS–101.	*d.* Replace.
13. Oscillation during recording. (Continuous lighting of flasher lamp I–101.)	13. *a.* Microphonic tube V–101.	13. *a.* Replace with nonmicrophonic tube.
	b. Defective capacitor C–113, C–114, or C–126.	*b.* Replace.
	c. Capacitor C–117 too close (physically) to grid leads of output tubes V–103 and V–104.	*c.* Dress capacitor C–117 away from grids of output tubes.
14. Hum.	14. *a.* Defective tube V–101 or V–102.	14. *a.* Replace.
	b. Defective capacitor C–101A, C–101B, C–101C (AN/GNQ–7 only), C–102, C–103, C–104, C–105, C–111, C–115, or C–118. (Also capacitor C–101, C–128, or C–129 on AN/GNQ–7A.)	*b.* Replace defective capacitors. Metal parts of chassis should be connected to B—only through capacitor C–103.
	c. Defective volume control.	*c.* Dress volume control leads away from chassis. Replace defective volume control.
15. Distortion in reproduction caused by acoustic feedback from recorder head to microphone during recording.	15. Microphone too close to recorder head	15. Move microphone away from recorder head.
16. Motor rumble.	16. Same as 16, paragraph 62.	
17. Records too close to edge of turntable.	17. Same as 17, paragraph 62.	
18. Records too close to center of disk.	18. Same as 18, paragraph 62.	
19. Recorder head lifts at inside disk when LISTEN-TALK switch is turned to LISTEN position.	19. Same as 19, paragraph 62.	
20. Recorder head does not lift high enough.	20. Same as 20, paragraph 62.	
21. Recorder head feeds laterally across disk with LISTEN-TALK switch (S–102) in LISTEN position.	21. Same as 21, paragraph 62.	
22. Warning clicker does not operate.	22. Same as 22, paragraph 62.	
23. Inaccurate correction marker scale.	23. Same as 23, paragraph 62.	
24. Poor tracking of reproducer head.	24. Same as 24, paragraph 62.	
25. Crosstalk.	25. Same as 25, paragraph 62.	
26. Bad recorder-head feed or backlash.	26. Same as 26, paragraph 62.	

Symptoms	Probable troubles	Corrections
27. On continuous recording, turntable B does not start before turntable A stops.	27. *a.* Switch S–109 or switch S–105 not properly adjusted. *b.* Defective relay K–102 or K–103.	27. *a.* Adjust (par.80). *b.* Clean and adjust relay contacts (par. 77). Replace defective relay.
28. Turntable A does not start before turntable B stops.	28. *a.* Switch S–107 or S–104 not properly adjusted. *b.* Defective relay K–102 or K–103.	28. *a.* Adjust (par. 80). *b.* Clean and adjust relay contacts (par. 77). Replace defective relay.

64. Trouble-shooting Chart for Reproducer AN/GNQ–6

Symptoms	Probable troubles	Corrections
1. Tubes do not light, turntable does not rotate.	1. Same as 1, paragraph 62.	
2. Tubes light, turntable does not rotate.	2. *a.* Defective connector J–301 or P–102. *b.* Open motor coil B–101. *c.* Open in motor circuit wiring. *d.* Flexible motor coupling unscrewed.	2. *a.* Repair or replace. *b.* Replace motor. *c.* Repair broken leads. *d.* Turn turntable counterclockwise manually to tighten motor coupling.
3. Tubes light, turntable rotates; set inoperative.	3. Same as 3, paragraph 62.	
4. Weak reproduction.	4. *a.* Poor tube V–105, V–101, or V–102. *b.* Low B supply voltage. Defective capacitor C–104, C–105, C–111, C–113, C–114, C–116, C–117, or C–120. *c.* Defective reproducer head Y–101. *d.* Defective headset HT–401.	4. *a.* Check and replace. *b.* Check plate voltage of tubes. Replace. *c.* Replace. *d.* Replace.
5. Poor quality reproduction.	5. *a.* Improperly adjusted or defective reproducer head. *b.* Leaky capacitor C–111, C–114, C–104, or C–105. *c.* Defective resistor R–105 or R–108 in inverse-feedback circuit. *d.* Defective headset HT–401.	5. *a.* Check adjustment (par. 84). *b.* Replace. *c.* Replace. *d.* Replace.
6. Hum.	6. Same as 14, paragraph 62.	
7. Motor rumble.	7. Same as 16, paragraph 62.	
8. Poor tracking.	8. *a.* Reproducer head not properly adjusted or neutralized. *b.* Shallow grooves on disk.	8. *a.* Adjust (pars. 74 and 84). *b.* Play back a disk made on a different recorder.
9. Stylus jumps out of groove when brake is operated.	9. Brake-arm travel too great.	9. Readjust brake (par. 86).

Symptoms	Probable troubles	Corrections
10. Brake does not operate when foot switch S–202 is released.	10. *a.* Open brake coil L–101. *b.* Defective switch S–202. *c.* Open in connector P–201 or J–105, or in cable W–201 or wiring.	10. *a.* Check coil and replace if open. *b.* Replace. *c.* Replace; or repair broken wires.
11. Motor stalls when brake is operated.	11. Binding between turntable and shell.	11. Check that screw H (fig. 21) is not tightened down. Check under side of shell for burrs. Check cork or felt ring on turntable for proper lubrication (par. 69).
12. Turntable shell does not stop when brake is operated.	12. *a.* Brake mold is dirty or worn. *b.* Edge of turntable shell greasy. *c.* Brake-arm pressure weak.	12. *a.* Clean or replace brake mold. *b.* Clean shell. *c.* Adjust brake (par. 86).
13. Step-back does not operate.	13. *a.* Defective switch S–201. *b.* Open in cable W–201, connector P–201 or J–105, or in wiring. *c.* Open in step-back coil L–102.	13. *a.* Replace. *b.* Replace; or repair broken leads. *c.* Replace.
14. Improper step-back operation.	14. Step-back relay out of adjustment.	14. Adjust (par. 85).

Section XII. REPAIRS

65. General Repair Instructions

a. Use of Proper Tools. Handle tools carefully and always use screwdrivers and pliers of the correct size for removing or replacing parts in the equipment.

b. Leads. (1) When a part which has several lead-in connections is removed, tag each lead to insure the part can be replaced correctly and quickly.

(2) Be careful not to damage leads adjacent to parts being removed or replaced by pulling on them or pushing them out of the way.

c. Soldering. It is important to make a good solder joint because poorly soldered connections cause trouble which is difficult to find. Use the soldering iron carefully so that insulation on wiring and other adjacent parts will not be damaged by overheating. Use only enough solder to make a good solder joint. Do not permit drops of solder to fall inside the amplifier chassis. Solder drops may cause short circuits and damage the equipment.

d. Defective Part Caused by Another Part. When a defective part such as a burned-out resistor or transformer is located, check the associated circuit thoroughly to determine whether this condition is caused by another faulty part. For example, a shorted bypass capacitor may result in the burning-out of a transformer or resistor in the associated circuit. If the transformer or resistor is replaced without replacing the defective capacitor which caused the break-down, the new part will be burned out in the same way. Careless replacement of parts often causes new faults.

66. Removal of Recorder-Reproducer Units from Cabinets

a. Before attempting to remove the unit, remove all external electrical connections such as the power cable, cables from the a-v-c unit, the cable from the remote control unit on Recorder-Reproducer AN/GNQ–7–(*), and the interconnecting cables (figs. 14 and 15). Remove the rear door from the cabinet and loosen screw A (figs. 6, 8, and 10) that holds the MIC-TEL selector shaft to the bakelite cap over the handle of toggle switch S–201.

b. Loosen the setscrews in the LISTEN-TALK knob and remove the knob.

c. Take out screws B (figs. 5 and 7) in the front corners of the turntable chassis plate (AN/GNQ–7–(*)).

d. Disconnect the recorder volume control shaft which extends through the top of the case.

e. Remove screws C (figs. 6, 8, and 10) from the back of the unit and slide the chassis out

enough so that speaker connector J–106 inside the case can be disconnected. Then slide the chassis out the rest of the way. On the AN/GNQ–7A, move the recorder and reproducer heads to near the outside of the disk, set the LISTEN-TALK switch to the TALK position, and rotate the shadow wire on each head one quarter turn so that it will clear the top of the cabinet when the chassis is being removed from the cabinet.

Caution: When working on the chassis outside of its cabinet, always place a wooden block under the chassis. The block must be high enough so that the unit will not rest on the motor and thus damage the motor coupling.

f. Remove the a-v-c unit by taking out the four screws which mount the unit on the rear panel. On the AN/GNQ–7A, remove the a-v-c unit by lifting it vertically off the four mounting screws on the rear panel of unit B.

g. Remove the screws under the a-v-c unit and lower the rear panel to gain access to pin connections, fuse F–101, and other parts mounted on the back of the amplifier chassis (figs. 39 through 44).

h. If for any reason it is necessary to remove the amplifier chassis from the turntable unit, remove the reproducer arm and connector P–101 (par. 74) and the four Phillips-head screws from the top of the turntable chassis plate.

67. Removal of Reproducer AN/GNQ–6 from Cabinet (figs. 3 and 4)

a. Before attempting to remove the chassis, remove the reproducer from the cradle and disconnect all external electrical connections, such as the power cable, the step-back and brake unit, and headset.

b. Remove the screws in the front corners of the turntable chassis plate.

c. Push in listening device jack J–101 from the front of the cabinet after removing the jack retaining nut.

d. Remove the two screws at the lower corners in back of the unit and slide the chassis out. If the correction-marker post sticks against the battens to prevent removal of the chassis, remove the post. Loosen the two setscrews, and turn the nut until the post unscrews from the chassis plate.

Caution: When working on the chassis outside of the cabinet, always place a wooden block under the front part of the chassis. The block must be high enough so that the unit will not rest on the motor and damage the motor coupling.

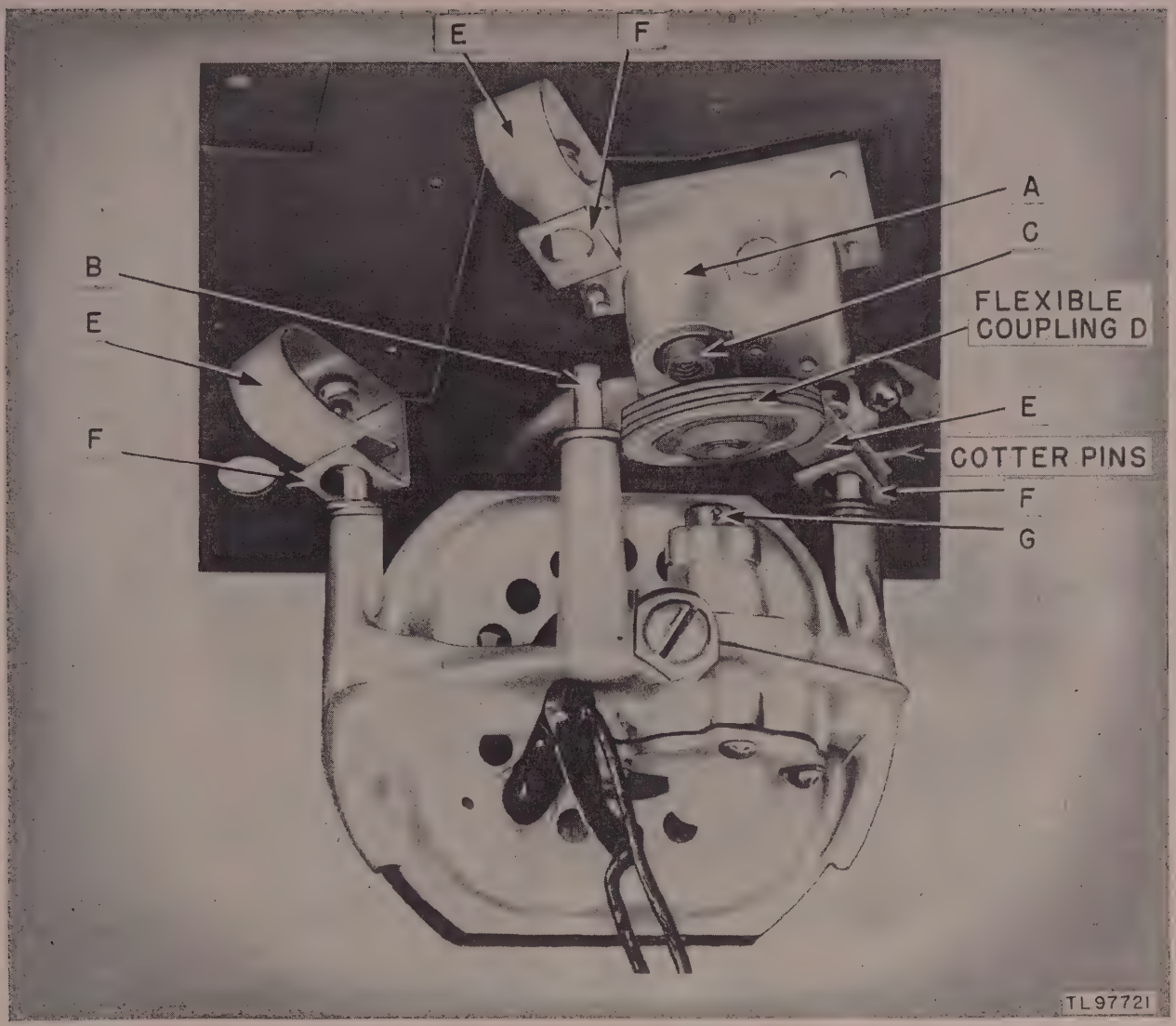
e. Remove the screws holding the back panel in place and lower the back panel (fig. 4) to gain access to pin connections, fuse F–101, and other parts mounted on the back of the amplifier chassis (figs. 45 and 46).

f. If it is necessary to remove the amplifier chassis from the turntable unit, remove the four Phillips-head screws from the top of the turntable chassis plate. Be careful not to damage tubes or other parts mounted on the amplifier chassis when separating the two chassis.

68. Motor Assembly

a. Removal and Installation of Coupling. (1) The coupling is provided with a left-hand thread to fit the spindles from the turntable and motor shaft G which are drilled and tapped. To change the coupling, remove the cotter pin from rear motor stud B (fig. 16) and turn the turntable clockwise until spindle C unscrews from the coupling. Then unscrew coupling D from motor shaft G by turning the coupling clockwise.

Note. On the AN/GNQ–7A, remove the retainer clip and washer (fig. 17) from either of the front motor studs and turn the turntable clockwise until the spindle unscrews from the coupling.



A. Front gearbox.
B. Rear motor stud.
C. Turntable spindle.
D. Flexible motor coupling.
E. Motor spring
F. Strain bracket.
G. Motor shaft.

Figure 16. Turntable motor assembly (AN/GNQ–8, –7, and –6).

(2) Before installing a new coupling, be sure that turntable spindle C and motor shaft G line up properly. If they do not, bend motor springs E either forward or backward to line up the shafts. If motor shaft G is out of line to either side of the spindle, swing the motor springs sideways to correct the misalinement.

(3) When installing a new coupling, first screw the coupling on motor shaft G by turning the coupling counterclockwise; be sure that the rivet heads on the coupling are towards the motor. Screw the spindle on the coupling by turning the turntable counterclockwise. As a final check for shaft alinement, start the motor and see that the coupling does not wobble enough to strike gearbox A.

b. Removal of Motor (AN/GNQ–8, 7, and 6). (1) Disconnect all cables and remove chassis from case (par. 66).

(2) Turn the turntable clockwise to unscrew the flexible motor coupling.

(3) Remove the three cotter pins from the mounting studs.

(4) Disconnect motor wires and lift motor from chassis and place on bench.

c. Installation of Motor (AN/GNQ–8, 7 and 6). (1) Line up the mounting springs with the motor spindle.

(2) Screw motor studs B (fig. 16) into motor, using necessary washers.

(3) Mount spring E and strain bracket F to the chassis with the spring under the bracket. The brackets should be facing the motor exactly as shown in figure 16.

(4) Hold the motor in position with the studs going through the holes in the brackets and springs. Put one washer on each stud and put the cotter pins through the holes in the studs, spreading the pins well so that they will not fall out. Adjust the springs to correct any misalinement between the turntable spindle and the motor shaft. A pair of long-nose pliers or the stylus shank bender (fig. 27) may be used to bend the springs either forward or backward or to one side or the other, in order to correct for misalinement. There should be a clearance of one-thirty-second inch between shafts C and G. If the shafts are closer than this, they may butt and cause motor rumble. Be certain that the motor studs do not strike the brackets and that the springs are bent so that they do not rest on the strain brackets.

(5) Reconnect the motor wires and reinstall motor and chassis in case.

(6) Reconnect all cables and test the unit for motor rumble.

d. Removal of Motor (AN/GNQ–7A). (1) Remove chassis from case and place on bench with rear panel off.

(2) Unsolder the black and red motor leads from terminals on motor capacitor C–108 (C–109 on turntable A) and the brown motor lead from the lug of the terminal strip on top of the amplifier chassis.

(3) Remove the retainer clip and washer on rear stud of motor (fig. 17).

(4) Unscrew the flexible motor coupling from the motor (*a* above).

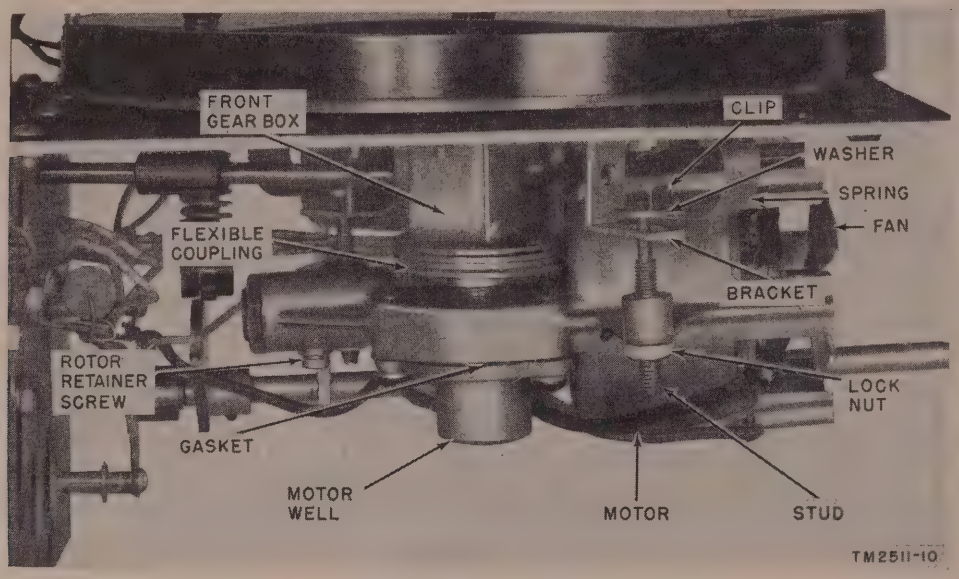


Figure 17. Turntable motor assembly (AN/GNQ–7A).

(5) Remove the retainer clips and washers from front studs.

(6) Remove and place motor on bench.

e. Installation of Motor (AN/GNQ–7A). (1) Line up the mounting springs with the motor spindle (fig. 17).

(2) Insert studs in motor so that all studs project about three-fourth inch through the top side of the motor casting.

(3) With the chassis standing on end, insert front studs of new motor in spring holes and place washers over stud and motor retainer clips on each of the front studs.

(4) Connect flexible coupling to motor spindle by gently rotating turntable shell counterclockwise.

(5) Insert rear stud through rear spring and place washer and motor retainer clip over rear stud.

(6) Reconnect the black and red motor leads to the terminal lugs on capacitor C–108 (C–109 on turntable A) and the brown lead to the lug on the terminal strip on top of the amplifier chassis.

(7) Support the chassis so that it does not sag and plug in the power cable. Start motor.

(8) The motor should hang level with the studs away from the sides of the brackets. The springs should not be resting on the lower arms of brackets and the flexible coupling should not be scraping the front gearbox. The motor spindle should be in line with the turntable spindle.

(9) Be sure the two front springs are bent to conform with the contour of the rear spring already mounted on the chassis.

Note. The motor study should be at the right length above the motor casting. If too short, they will pull the motor up and press the flexible coupling against the turntable spindle. If too long, they will pull on the flexible coupling and cause vibration.

(10) If the motor runs easily, starts and stops promptly, and is free of vibration, tighten and lock the studs in position on the motor casting with No. 10-32 nuts.

(11) Remount chassis in case and check overall operation.

69. Changing Lubricant on Turntable Cork Ring (AN/GNQ–6 only)

The cork ring under the turntable shell of early models of Reproducer AN/GNQ–6 was lubricated with grease (GL) or graphite powder. Whenever a reproducer which has been so lubricated is overhauled by maintenance personnel, change the lubricant to grease (GG) which is graphited. Proceed as follows:

a. Remove turntable shell retaining screw H (fig. 21).

b. Lift the shell from the turntable, thus exposing the cork ring which is cemented to the turntable. Do not remove the cork ring.

c. Clean the cork ring with a clean, lint-free cloth dipped in solvent (SD). Remove powder glaze with No. 0000 sandpaper or emery cloth.

d. Apply a coat of grease (GG) to the cork ring surface. Remove excess grease.

e. Place the shell back on the turntable and rotate it about 20 times by twirling the outside of the shell with the fingers. This is done to work the new grease into the cork ring.

f. Remove the turntable shell again and apply another thin film of grease (GG) to the cork ring surface. Remove excess grease from the edge of the cork ring.

g. Before replacing the turntable shell, be sure it is free of grease on the inside edge of the rim where the brake makes contact. Check for burrs. If burrs are present, work the emery cloth until the noise is eliminated. Remove residue of lint by cleaning with a clean cloth dipped in solvent (SD).

h. Replace turntable shell and readjust the turntable brake (par. 86) to compensate for the lighter drag of the new lubricant.

Note. No lubrication is required on the felt ring used instead of the cork ring on later models of the AN/GNQ–6.

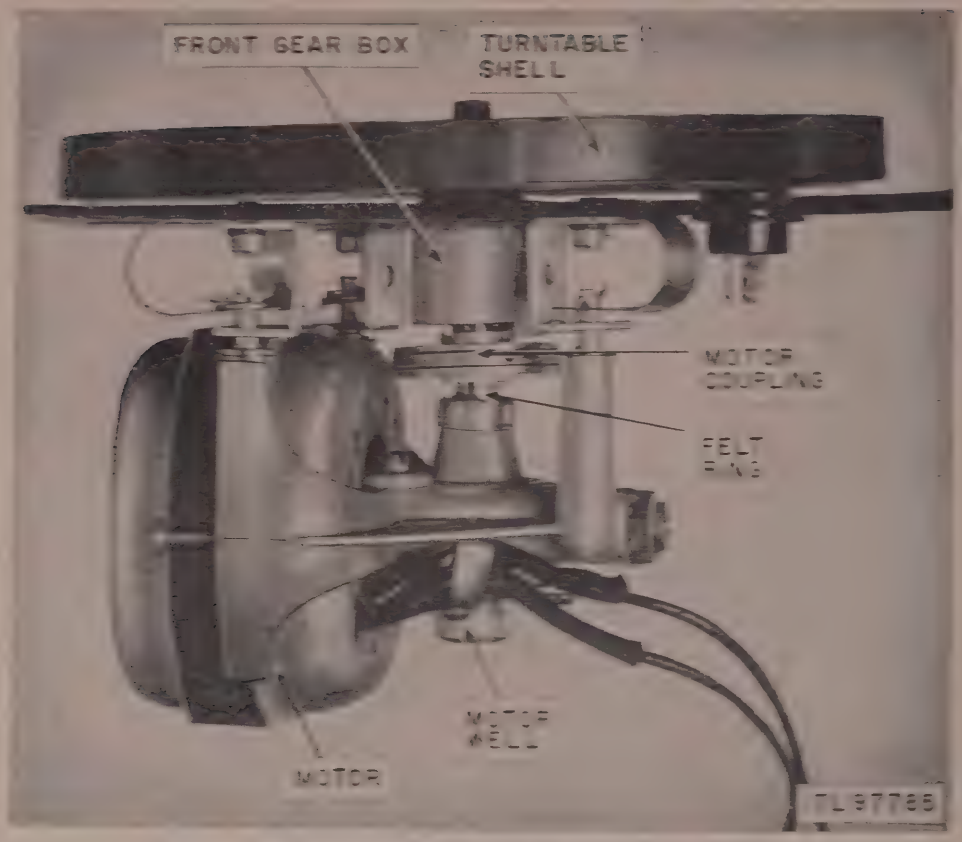


Figure 18. Lubrication points on turntable motor (AT/GNQ–5, –7, and –8).

70. Lubrication of Turntable Motor

a. Receiver-Receiver AN/GNQ–7 and –8 and Receiver AN/GNQ–6. (1) *Motor well.* (a) Remove chassis from cabinet (pars 66 and 67).

(b) Remove the three retaining screws on the motor well (fig. 18) and remove the well.

(c) Remove old lubricant from motor well and clean the well interior with solvent (SD).

(d) Refill motor well with approximately 12 drops of oil (OCW).

(e) Replace the motor well carefully. Be sure the gasket is in place. Tighten the three screws evenly to prevent binding of the motor shaft.

(2) *Felt ring.* Apply 2 or 3 drops of oil (OCW) on the felt ring located on the motor shaft (fig. 18).

(3) *Front gearbox.* Remove grease cup on front gearbox (fig. 18) and fill opening with grease (GL).

b. Receiver-Receiver AN/GNQ–7A. (1) *Motor well.* (a) Remove chassis from cabinet (par. 66).

(b) Remove the three retaining screws on the motor well cap and remove cap (fig. 17).

(c) Remove the fiber gear (located on the spindle) from motor well.

(d) Loosen the motor retaining screw and remove motor.

(e) Apply grease (GL) to the front and rear bearing surfaces.

(f) Replace motor.

(g) Place a small quantity of grease (GL) into the motor well.

(h) Replace the fiber gear carefully. Be sure the gear teeth mesh with the wormed rotor shaft.

(i) Replace motor well cap. Be sure to tighten the three retaining screws evenly over the gasket.

(2) *Front gearbox.* Remove grease cup on front gearbox (fig. 17) and fill the opening with grease (GL).

71. Lubrication of Turntable Brake (AN/GNQ–6 only)

a. Remove the chassis from its cabinet and place on a firm surface (par. 67).

b. Apply 1 drop of oil (OCW) to each pivot point on the brake arm (5, fig. 38).

c. Replace chassis in cabinet.

72. Recorder-head Assembly (AN/GNQ-8 and -7)

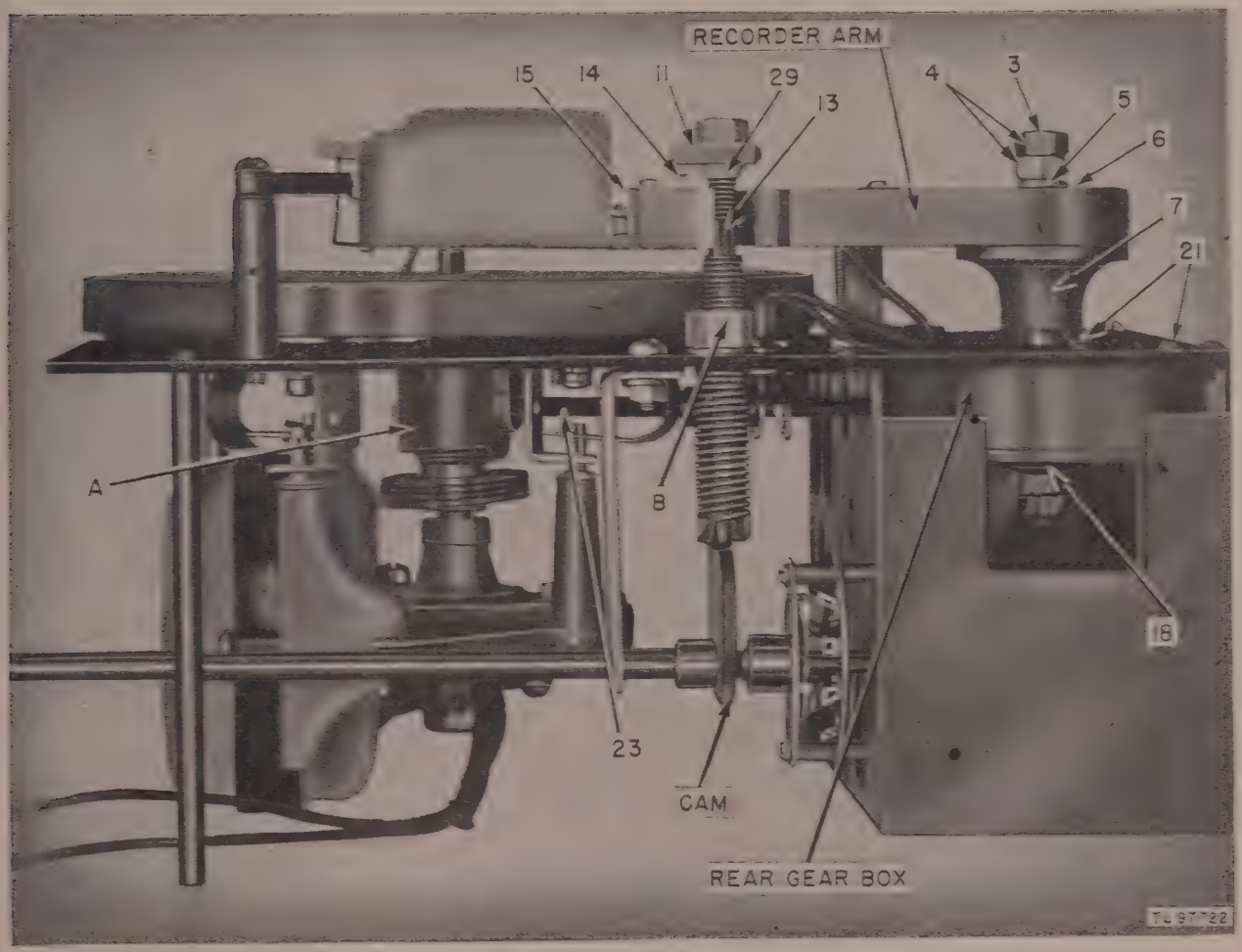
a. Removal of Recorder Head (fig. 19). (1) Turn LISTEN-TALK switch to TALK.

(2) Remove the retaining nut on clamping shoe.

(3) Loosen the clamping shoe setscrew and remove clamping shoe 11.

(4) Remove the two recorder shaft nuts 4 and upper feed-clutch spring 5 and washer 6.

(5) Lift the recorder arm from shaft 3.



A. Front gearbox.
3. Feed-clutch shaft.
4. Recorder-shaft nuts.
5. Upper feed-clutch spring.
6. Washer.
7. Feed collar.
11. Clamping shoe.
13. Stem.
14. Lifting stud.
15. Limiter bar.
18. Lower feed-clutch spring.
21. Rear gearbox screw.
23. Rear gearbox drive shaft.
29. Serrated clamping shoe cone.

Figure 19. Motor and recorder-head assemblies (AN/GNQ-8 and -7).

b. Installation of Recorder Head. To install a new recorder head, reverse the procedure for removal (*a* above). Before placing the recorder arm on the feed collar (7, fig. 19), apply a smear of grease (GL) between the arm and the feed collar and also on washer 6. Tighten nuts 4 so that the top (locking) nut is flush with the top of shaft 3. Move the recorder head across the turntable shell. Movement should be firm and even. Refer to section XIII for proper adjustment of recorder head after it is mounted.

c. Backlash. (1) Backlash occurs when the recorder head does not begin to feed as soon as the motor is turned on (records in the same groove more than once). Backlash may be caused by any one of the three following conditions:

(*a*) Improper relation of the upper feed-clutch tension to the lower feed clutch. The tension on the lower spring (18, fig. 19) should always be greater than that on upper spring 5. The bottom spring should be depressed so that not more than one coil of the spring is showing. The tension of the upper feed-clutch spring on the arm can then be properly adjusted. Never set the top spring tension so strong that it overcomes the bottom tension.

(*b*) Loose rear gearbox screws 21.

(*c*) The large gear in the rear gearbox may be loose on the spindle.

(2) To check for backlash, place the recorder arm on the outside edge of a stationary disk. Move the arm inward about one-fourth inch with the recorder-head stylus resting on the disk, thus making a horizontal mark. Leave the recorder arm in this position and start the turntable. Rotate the disk 1½ revolutions. Check to see that the second line is not cut by the horizontal line.

d. Feed During Reproduction (fig. 19). The term *feed during reproduction* means that the raised and inoperative recorder arm moves in toward the center of the disk more than one-sixteenth inch during reproduction. This occurs when cone 29 of clamping shoe 11 does not grip the recorder arm securely. Adjustment of the cone is made by bending stem 13 forward or backward by tapping with a screwdriver and hammer until the teeth in the serrated cone engage the arm securely.

e. Installation of Clamping Shoe (fig. 19). The clamping shoe lifts the recorder head by pressing down lifting stud 14. The cone, 29, on the bottom of the shoe, engages the recorder arm when the recorder head is lifted off the disk so that the arm is locked during reproduction and prevented from moving more than one-sixteenth inch. To install the clamping shoe properly, screw it onto the stem so that the top of the locking nut on top of the shoe is approximately flush with the top of lifting stud 13. Then lock clamping shoe 11 so that it will not strike limiter bar 15 when the recorder head is in the raised position at the outside edge, middle, or inside area of the disk. Loosen hexagonal nut B and screw lifting stud 13 up or down so that when the recorder head is in the raised position there will be approximately one-half inch between the bottom front end of the recorder head and the disk. Lock the lifting stud in place by tightening its hexagonal nut, B. The cone should hold the arm securely.

73. Recorder-head Assembly (AN/GNQ-—7A)

Although the reference symbols used in the following procedures pertain to Y–102 on turntable B, the procedures are exactly the same for Y–103 on turntable A.

a. Removal of Assembly (fig. 20). (1) Turn the LISTEN-TALK switch to the TALK position.

(2) Remove the unit from its cabinet and place it in a jig.

(3) Lift the shadow-wire assembly out of its stanchion.

(4) Hold clamping shoe O–108 firmly with one hand while using wrench to loosen locknut H–113 just under the shoe.

(5) Remove the clamping shoe by rotating it counterclockwise from the lifting post and then remove the previously loosened locknut and washer H–113 in similar manner. Take care not to break pin in post.

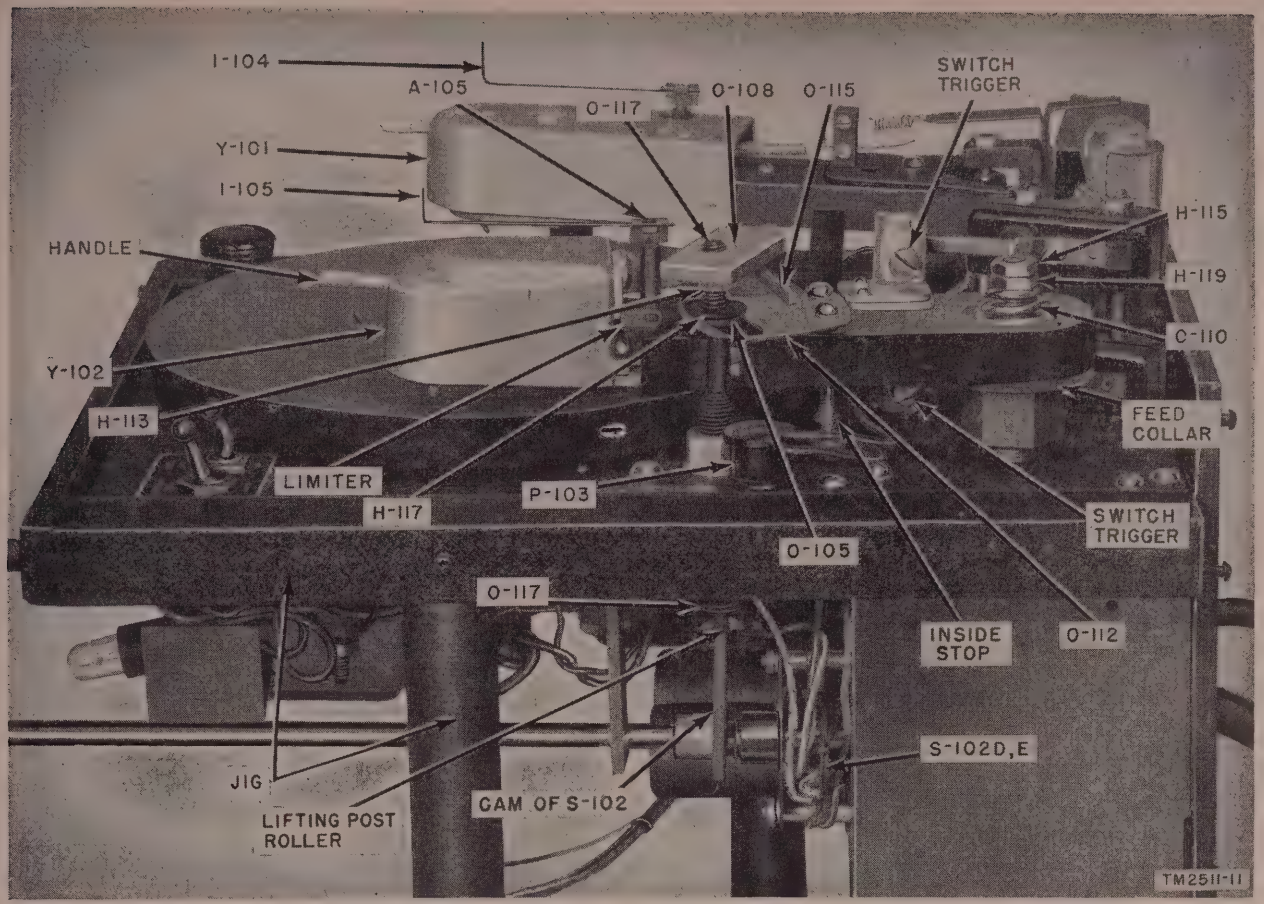
(6) Remove fiber washer H–117.

(7) Use wrench to hold tension nut H–119 in place on feed spindle and remove locknut H–115 with another wrench.

(8) Remove tension nut and conical clutch spring O–110 from feed spindle at pivot end of recorder arm.

(9) Raise recorder arm assembly carefully at pivot end and remove arm from feed spindle.

b. Reassembly of Recorder Arm. (1) Mount the chassis in a chassis-holding jig. Attempts to aline the various parts of the arm will not be



A–105.	Guide wire for shadow assembly.	H–119.	Feed spindle tension nut.	O–105.	T-collar.	P–103.	Connector.
H–113.	Locknut for clamping shoe.	I–104.	Shadow wire indicator (on Y–101).	O–108.	Clamping shoe.	S–102.	LISTEN-TALK switch.
H–115.	Locknut for spindle tension.	I–105.	Shadow wire indicator (on Y–102).	O–110.	Conical clutch spring.	Y–101.	Reproducer head (turntable B)
H–117.	Fiber washer.			O–112.	Friction plate.	Y–102.	Recorder head (turntable B)
				O–115.	Lifting bracket.		
				O–117.	Lifting post (stud).		

Figure 20. Recorder-head assembly, turntable B (AN/GNQ–7A).

successful unless the chassis plate is supported evenly all around in a strong jig.

(2) Put a smear of No. 2 grease (WB) on the feed collar.

(3) Check hinge connections to the recorder head and arm; be sure screws are tight.

(4) Remount the recorder arm on the chassis so that friction plate O–112 drops over the lifting post onto T-collar C–105 and the pivot hole of the arm drops over the feed spindle. The T-collar should be raised on the post so that the top of the T clears the arm.

(5) Hold arm firmly on the feed spindle, measure stylus pressure and if necessary adjust as described in paragraph 81.

(6) Insert connector P–103 of the recorder head into connector J–105 on the recorder chassis.

(7) Replace the limiter bar, being careful to insert screws in *holes other than those used for the flexible hinge.*

(8) Place small fiber washer H–117 over the lifting post.

(9) Apply a thin film of No. 2 grease (WB) to the inside of the recess around the pivot hole of the arm.

(10) Place large black fiber washer H–109 over

the feed spindle so that it will seat in the greased recess.

(11) Apply thin coating of No. 2 grease (WB) on the top of the large fiber washer.

(12) Place the conical spring over the feed spindle so that the cone tip is on top.

(13) Screw the two hexagonal nuts, H–115 and H–119, onto the feed spindle. Be sure that the nut in contact with the spring has its smooth face downward and is free of burrs.

(14) Tighten the bottom hexagonal nut and adjust for correct clutch friction of drag as described in *e* below. Then lock it with top nut H–115.

(15) Screw nut H–113 onto lifting post when post is in TALK position.

(16) Set cam on LISTEN-TALK switch to LISTEN position and adjust the hexagonal nut on the lifting post until there is 1/16-inch clearance (thickness of the adjusting template) between the cam on the shaft of the LISTEN-TALK switch and the roller on the end of the lifting post.

(17) Seat the lockwasher onto lifting post nut H–113.

(18) Turn the LISTEN-TALK switch to TALK position and screw clamping shoe O–108 onto lifting post O–117. The clamping shoe should be mounted on the post so that the greatest area is toward the rear center of the machine.

(19) Be sure that the clearance between clamping shoe O–108 and lifting bracket O–115 in the TALK position, is at least one-sixteenth inch (thickness of the adjusting template). If this distance is less than one-sixteenth inch, bend lifting bracket O–115 downward, taking care to keep it parallel to the clamping shoe.

(20) Be sure that with the LISTEN-TALK switch in the TALK position, the front of the recorder head is at least seven-sixteenth inch above the disk.

(21) Check the screws holding lifting bracket O–115 to the recorder head. Be sure that screws are sufficiently tight.

(22) Remount shadow-wire assembly A–105 in its stanchion on the recorder head.

(23) Be sure that the recorder arm is aligned properly with the inside and outside stops. Be sure that the wires from the recorder head are clear of both stops.

(24) The lower arm of the clicker spring (fig. 29) should be perpendicular to the chassis of the recorder. The arm should engage the teeth of the gear on the drive spindle (from the front gearbox) at about 14½ on the log scale. It should not seat below the level of the gear teeth at their lowest point.

(25) Make a tone quality check of the recorder as follows:

(*a*) Place a clean, blank vinylite disk on the turntable.

(*b*) Lower recorder head to disk at No. 1 on the log scale.

(*c*) Speaking in a normal tone of voice into the microphone, and with the recorder volume set for correct flash from the volume flasher, count from 1 to 5, allowing about 2 seconds between numbers.

(*d*) Turn the LISTEN-TALK switch to the LISTEN position while the turntable is still rotating.

(*e*) After a brief pause (1 or 2 minutes), return the switch to the TALK position and observe the distance between the two sets of grooves on the disk. If the distance is greater than one-sixteenth inch, the recorder head is feeding during reproduction and a drag test and adjustment should be made as outlined in *d* and *e* below.

(*f*) Now set the recorder head down at No. 7 on the log scale and repeat steps (*c*), (*d*), and (*e*) above.

(*g*) Similarly set the recorder head down at No. 13 on the log scale and repeat steps (*c*), (*d*), and (*e*) above.

(*h*) Play back all three sections of recorder material, listening carefully for any crosstalk. If there is crosstalk and the recording volume is satisfactory, check the stylus pressure (par. 81) and the embossing angle of the diamond stylus (par. 82).

(26) Reinstall the chassis in its cabinet and recheck operation.

c. Replacement of Recorder-head Stylus Assembly. Poor tone quality not attributable to any oother part of the machine is reason for replacing the recorder-head stylus assembly. The procedure is as follows:

(1) Remove the recorder arm from the recorder as described in paragraph 73.

(2) Remove the shadow-wire assembly.

(3) Remove the two screws holding the stylus assembly in the recorder head.

(4) Loosen screw in clip under the recorder arm.

(5) Remove stylus assembly O–120 or O–121.

(6) Take new stylus assembly and check pole pieces through cellophane wrapper. The pole pieces should not be touching the movable armature in which the stylus is mounted.

(7) Check hinge action; there should be no side play between head case and arm. If there is side play, tighten screws holding head to hinge.

(8) Set new stylus assembly carefully in the recorder-head case. Do not remove cellophane.

(9) Replace screws holding stylus assembly in case.

(10) Replace clip on arm and secure leads from new stylus assembly beneath clip and tighten screw holding clip.

(11) Replace arm on machine and check stylus pressure (par. 81) and drag (*e* below).

(12) Make a test recording on ungrooved vinylite disk and check for quality and crosstalk at the outside, middle, and inside of the disk. (There probably will be crosstalk at the inside of the disk.)

(13) If cross talk appears and it is not traceable to overmodulation from the amplifier (too loud a voice at the microphone or too high a recorder volume setting), then the stylus angle may be at fault (par. 82).

d. Feed During Reproduction. If during reproduction the recorder head moves in toward the disk center more than one-sixteenth inch beyond the last recorded groove, the recorder head feeds during reproduction. This will occur if the locking mechanism does not bring sufficient pressure to bear upon the fiber washer which holds the friction plate (and consequently the recorder arm) stationary (fig. 20). Adjustment is made

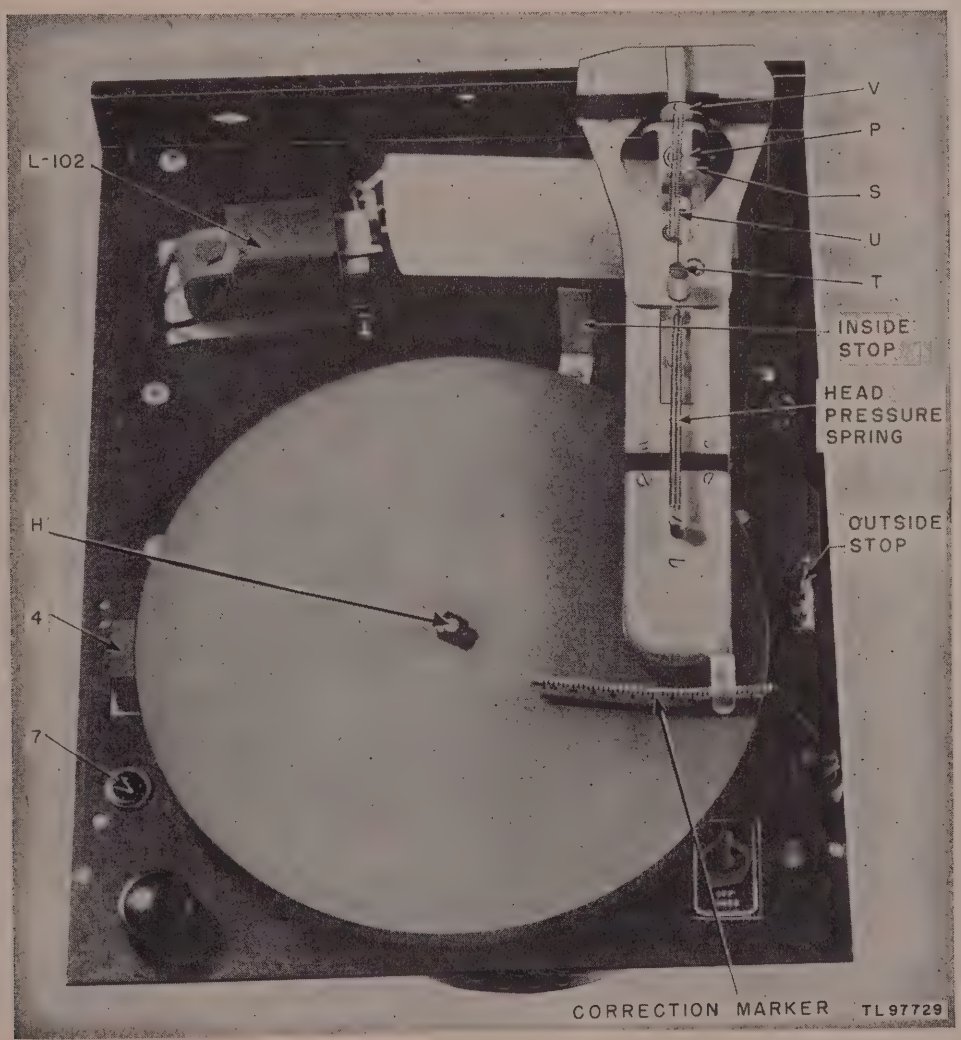


Figure 21. Reproducer-head assembly (AN/GNQ–6).

by lowering the clamping shoe locknut slightly on the lifting post (*a* above).

e. Drag Measurement. (1) Place a blank disk on the turntable shell.

(2) Place a small piece (less than a square inch) of disk material under the diamond stylus of the recorder head.

(3) Set the recorder head (with the small piece of disk beneath its stylus) down at 15 on the log scale.

(4) Hook recorder-head weighing scales H–105 onto the recorder-head handle and pull the head laterally across the disk from 15 on the log scale to near 0 on log scale.

(5) Observe the tension on the scales while pulling. If it is between 5 and 7, the clutch friction is correct.

Caution: Be sure the scale is parallel with the turntable shell and perpendicular to the recorder arm during the pulling operation.

74. Reproducer-head Assembly

a. Removal and Installation of Reproducer Arm (AN/GNQ–6, 7, and 8). To remove the reproducer arm, remove the two screws that hold the D stanchion (M) to the chassis and remove connector P–101 from its receptacle. Install a new arm by reversing these two operations. Before installation, check to see that the end play has not been changed (*c* below). After installation, check head pressure and neutralization (pars. 81 and 84). On the reproducer arm for Reproducer AN/GNQ–6, check for drift (par. 84).

b. Replacement of Reproducer Stylus Assembly (AN/GNQ–7A). Reproducer-head assembly Y–101 consists of stylus assembly O–119 and shield A–103. To replace the stylus assembly, proceed as follows:

(1) Remove the reproducer arm from the chassis of the machine and remove tape and clip holding the twisted leads to the arm.

(2) Remove cap screw H–111 from sleeve H–112 on the case of the reproducer head.

(3) Remove shadow-wire assembly I–104 and A–104.

(4) Lift the shield up so as to expose lifting sleeve H–112 on top of the reproducer head. It is not necessary to remove the shield itself.

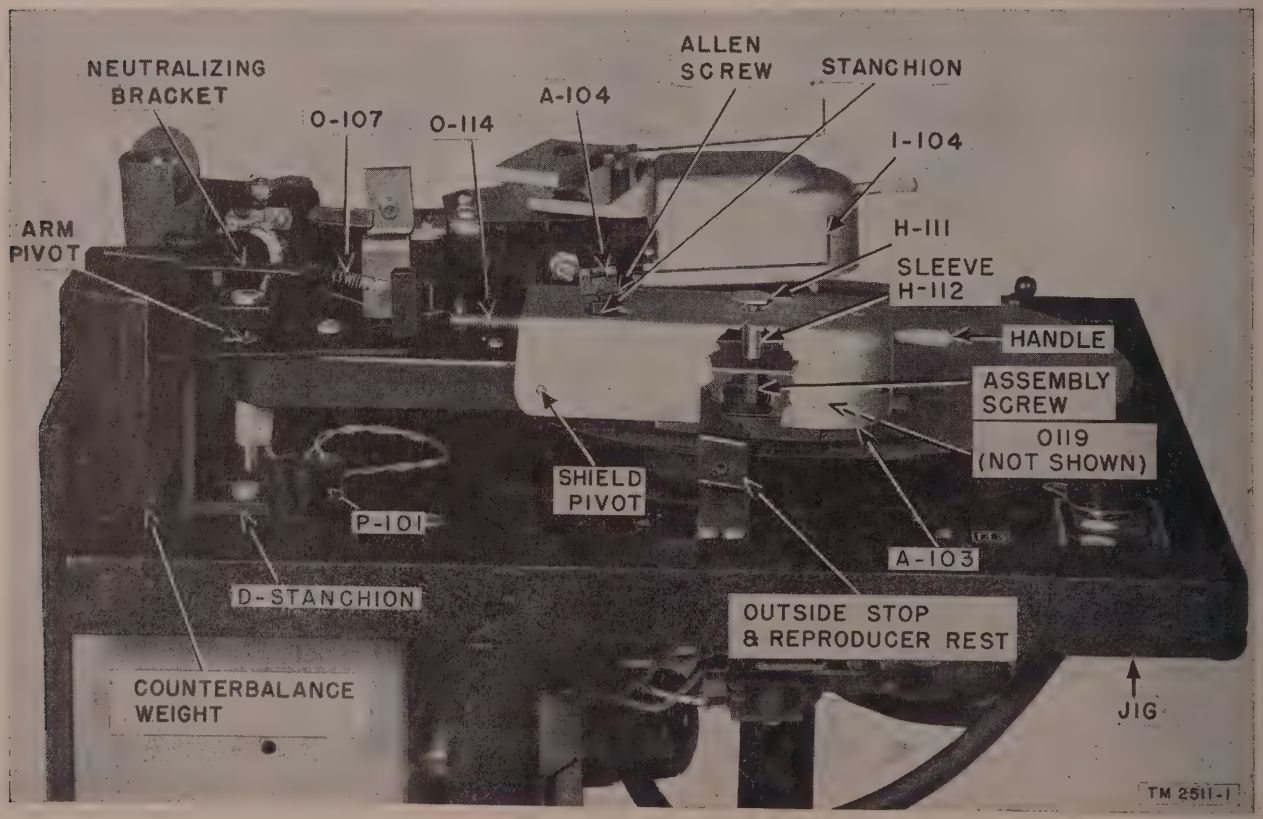


Figure 22. Reproducer-arm assembly (AN/GNQ–7A).

(5) Unscrew lifting sleeve H–112 from the case. Do not attempt to loosen the insert assembly screw. Remove stylus assembly.

(6) Remove masking tape from new stylus assembly.

(7) Place new stylus assembly in case of reproducer head and fasten it to the case with the lifting sleeve. Do not turn or in any way move the assembly screw. Such movement can displace the magnet within the insert.

(8) Tape the twisted lead wires to the reproducer arm as before.

(9) Lower shield over the case and insert cap screw H–111 into sleeve H–112 as before.

(10) Remount shadow-wire assembly in stanchion on reproducer arm.

(11) Remount arm on machine and check stylus pressure (par. 81), shield clearance (*e* below), neutralization (par. 83), and quality of reproduction; make adjustment where necessary.

(12) Set the cap screw in the sleeve so that the shield will lift it, and therefore will lift the head off the disk. Be sure that the cap screw is not set so deeply into the sleeve that the shield will tend to lift the reproducer head off the disk during normal operation.

c. Pivot Adjustment (AN/GNQ–8, 7–(*) and 6) (figs. 21 and 23). The end play between pivots P and reproducer arm post C is adjusted during manufacture. Before installing the reproducer arm, always check to see that the end play has not changed. If it has changed, proceed as follows to make the proper adjustment:

(1) Loosen nut S (fig. 21) and tighten pivot screw P so that there is no upward and downward motion between the post and pivot.

(2) Unscrew pivot screw P gradually to the point where upward-downward play between pivots P and post C (fig. 23) just becomes apparent. This play can be determined by grasping the reproducer arm as shown in figure 23 and moving the post vertically up and down.

(3) When proper play is obtained, hold pivot screw P with a screw driver and tighten pivot nut S to lock the pivot securely.

(4) Recheck end play to make sure adjustments have not been disturbed.

(5) Mount reproducer assembly to chassis securely with two screws through base of bracket M.

d. Replacement of Reproducer-head Hinge. (1) Remove the head-pressure spring from head-pressure spring stud T (fig. 21).

(2) Remove the four Phillips-head screws in the head and arm.

(3) Remove hinge and hinge retaining plate.

(4) Insert new hinge and hinge retaining plate in place on under side of reproducer arm and replace the Phillips-head screws.

(5) Refasten the head-pressure spring.

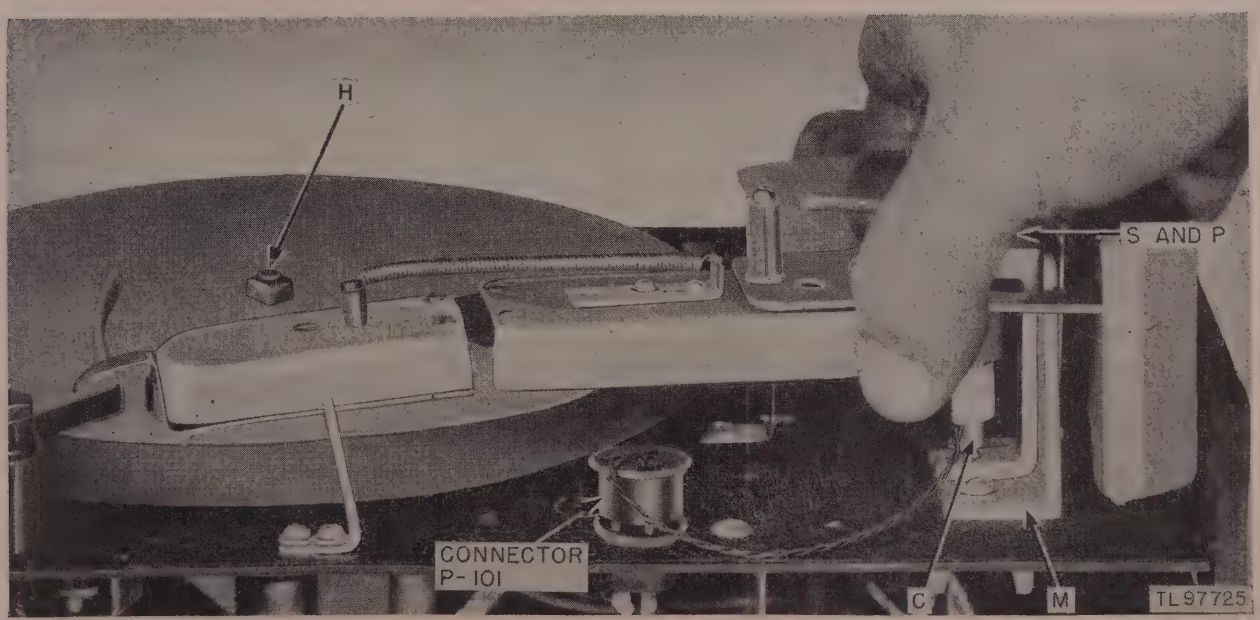


Figure 23. Determining end play of reproducer arm.

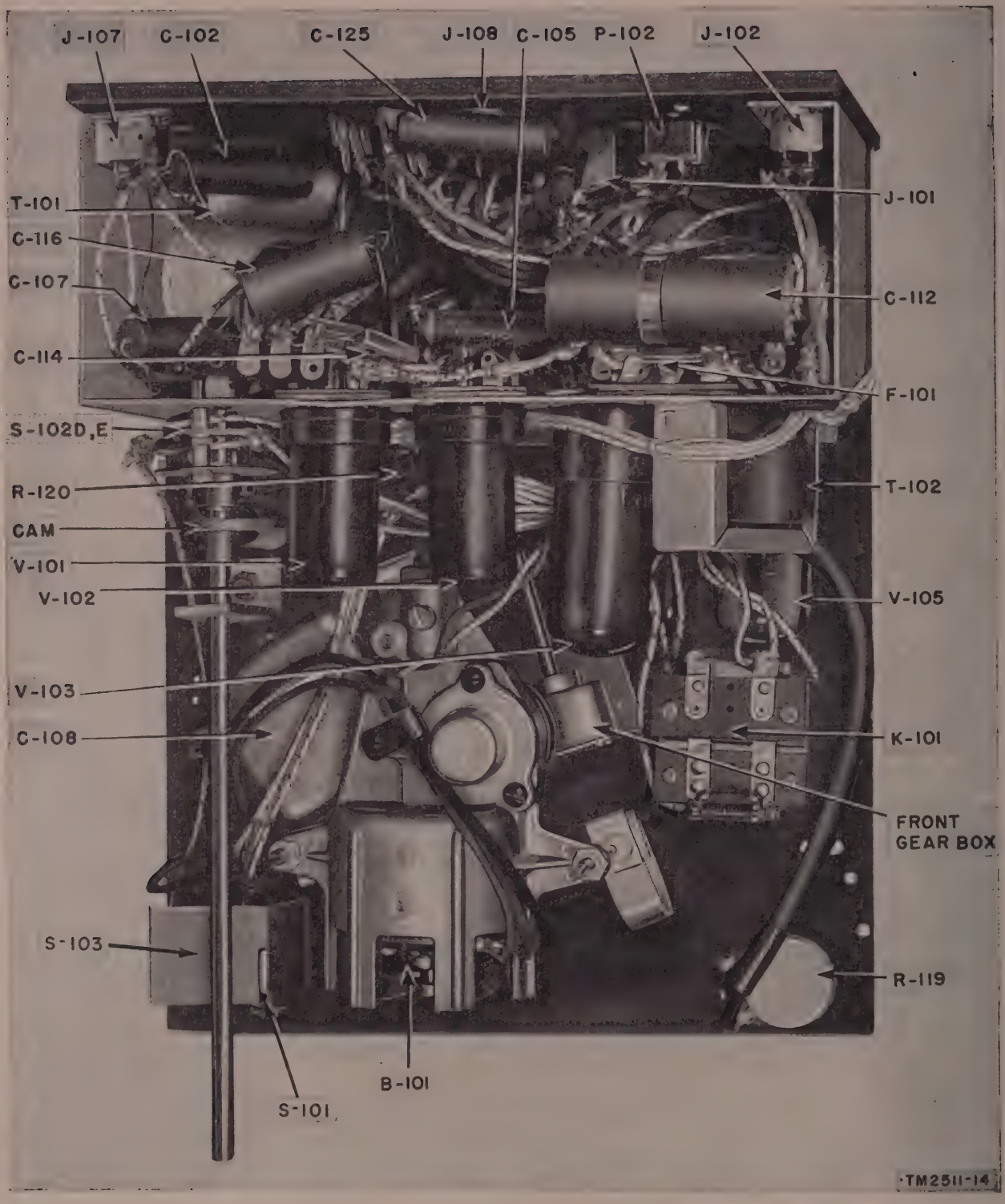


Figure 24. Turntable B (Recorder-Reproducer AN/GNQ–7A), bottom view.

(6) Check the head pressure and neutralization as described in paragraphs 81 and 84. For AN/GNQ–6 reproducer-head neutralization, refer to paragraph 84.

e. Shield Adjustment (AN/GNQ–7A only). The No. 6 Allen screw, accessible from the top of the shield on Y–101, allows adjustment of the shield height with respect to the reproducer head (fig. 33). Adjust the screw so that the shield does not rest upon the reproducer head at any time. Adjust lifting screw H–111 so that the shield will lift the head when raised from the disk (fig. 22).

75. Turntable Assembly

a. Removal and Installation of Turntable. (1) Remove recorder head (AN/GNQ–8 and AN/GNQ–7–(*)) (pars. 72 and 73).

(2) Remove reproducer head (par. 74).

(3) Remove turntable shell (*b* below).

(4) On Recorder-Reproducers AN/GNQ–8 and –7–(*), remove the front plate of the front gear-

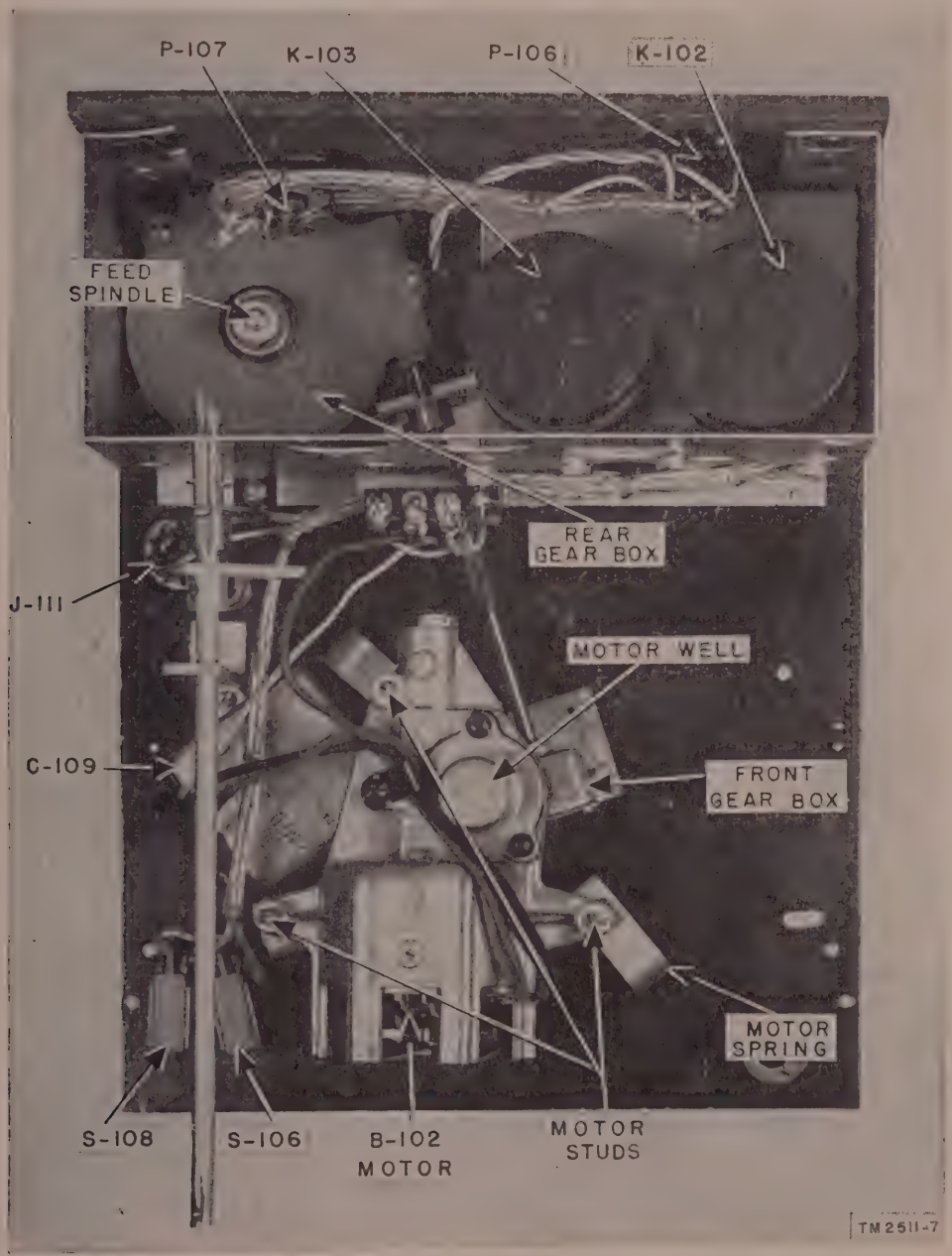


Figure 25. Turntable A (AN/GNQ–7A), bottom view.

box by removing the three screws that hold the plate to gearbox A (fig. 19). Push rear gearbox drive shaft 23 so that the front gear is disengaged from the turntable shaft worm.

(5) Unscrew the coupling from the turntable shaft by holding the coupling and rotating the turntable clockwise (par. 68).

(6) Lift out the turntable.

(7) To install a new turntable, reverse the procedure for disassembly. On Recorder-Reproducers AN/GNQ–8 and –7–(*), shaft 23 must be rotated so that its key fits the key inside the coupling.

b. Removal and Installation of Bakelite Turntable Shell. (1) Remove reproducer head (par. 74).

(2) On Recorder-Reproducers AN/GNQ–8 and –7–(*), remove recorder head (pars. 72 and 73).

(3) Remove screw H (figs. 21, 28, and 29). Take out the turntable shell.

(4) To replace the turntable shell, reverse the procedure. Do not tighten screw H. This screw is used only to keep the turntable shell in place. Tightening the screw will lessen the damping effect of the ring under the shell.

76. Volume Indicator Lamp

Volume indicator (flasher) lamp I–101 can be removed without removing the unit from the chassis. Remove LISTEN-TALK plate N–103 (or N–102) (figs. 5, 7, and 9). Insert a piece of flexible tubing over the end of the lamp and remove the lamp. A new lamp can be inserted in a similar manner. There is no volume indicator lamp on Reproducer AN/GNQ–6.

77. Relays on Recorder-Reproducer AN/GNQ–7

a. Relay K–101 (fig. 24). Clean and adjust as follows:

(1) Pass the contact burnishing tool over the relay contacts and remove dirt. If the contacts cannot be cleaned satisfactorily with the burnishing tool, dip a toothpick into carbon tetrachloride

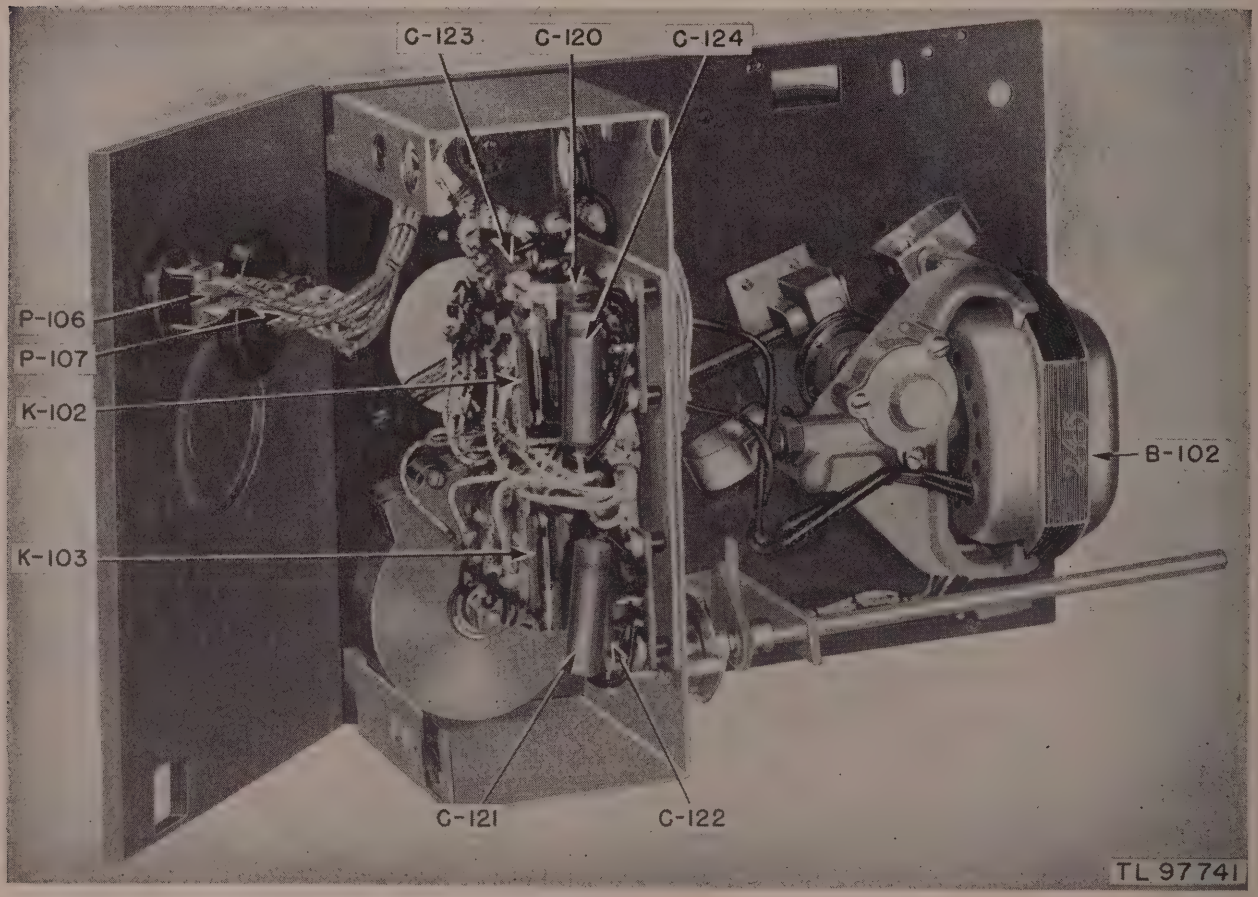


Figure 26. Turntable A (AN/GNQ–7), bottom view.

and apply 1 drop to each contact. Brush loosened dirt from contacts by repeating the process with fresh toothpicks. Reburnish the contacts.

(2) Adjust the contact pressure by bending the contact spring as required with a duck-bill plier. Grasp the butt of the spring with the pliers and twist slightly.

b. Relays K–102 and K–103 (fig. 26). These relays are mounted on a plate that can be removed from the chassis of turntable unit A by removing three screws. Remove each relay separately from the plate by removing the screws that fasten it to the plate. Repair relays K–102 and K–103 in the same manner as relay K–101 (*a* above).

Note. Plug-in type relays K-102 and K-103 (fig. 25) used on AN/GNQ–6A are easily replaceable. In event of failure, replace relay with a known good one.

78. Special Tools (fig. 27)

The following special tools are needed to obtain best performance of the equipment. Refer to section XIII for proper use of these tools.

Signal Corps stock No.	*Name*
6Q45232	Adjusting template
6Z8078	Recorder-head pressure weighing scale
6Z8078–1	Reproducer-head pressure weighing scale
4A2366/B2	Stylus shank-bender
6Z8078–3	Reproducer-head pressure weighing scale (AN/GNQ–7A)
6Z8078–4	Reproducer-head pressure weighing scale (AN/GNQ–7A)

79. Unsatisfactory Equipment Report

a. WD AGO Form 468 (War Department Unsatisfactory Equipment Report) for Equipment Used by the Army. WD AGO Form 468 will be filled out and forwarded through channels to the office of the Chief Signal Officer, Washington, 25, D. C., when trouble occurs more often than is normal, as determined by qualified repair personnel.

b. AF Form 54 (Unsatisfactory Report) for Equipment Used by the Air Force. AF Form 54 will be filled out and forwarded to Commanding General, Air Matériel Command, Wright-Patter-

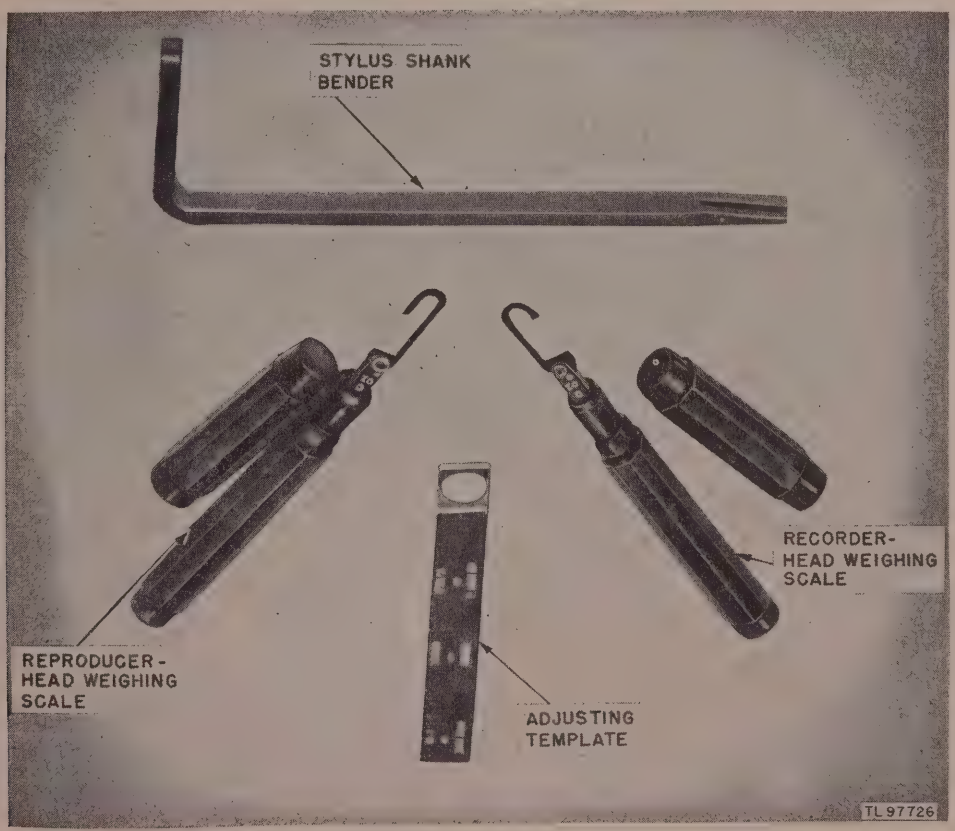
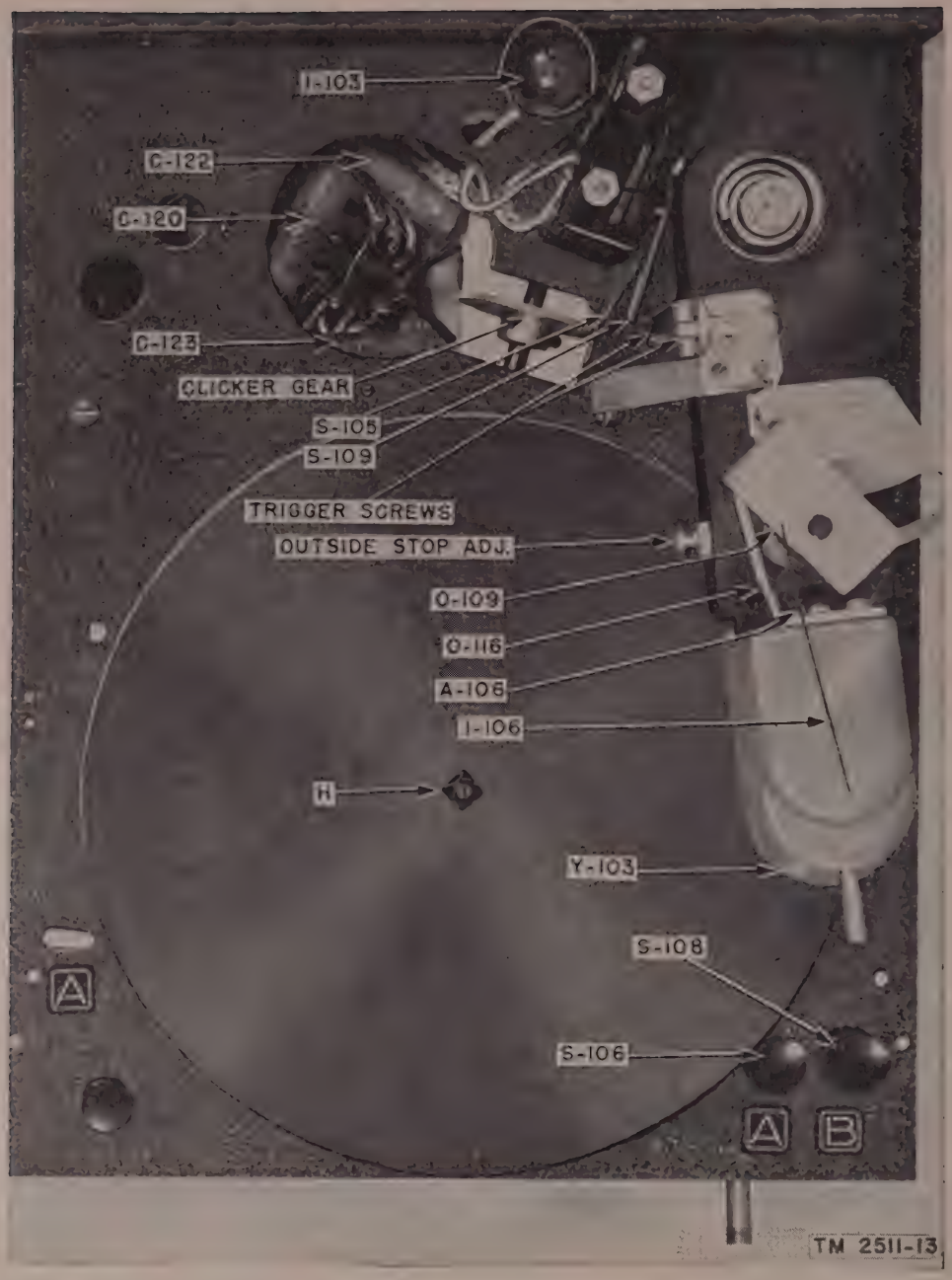
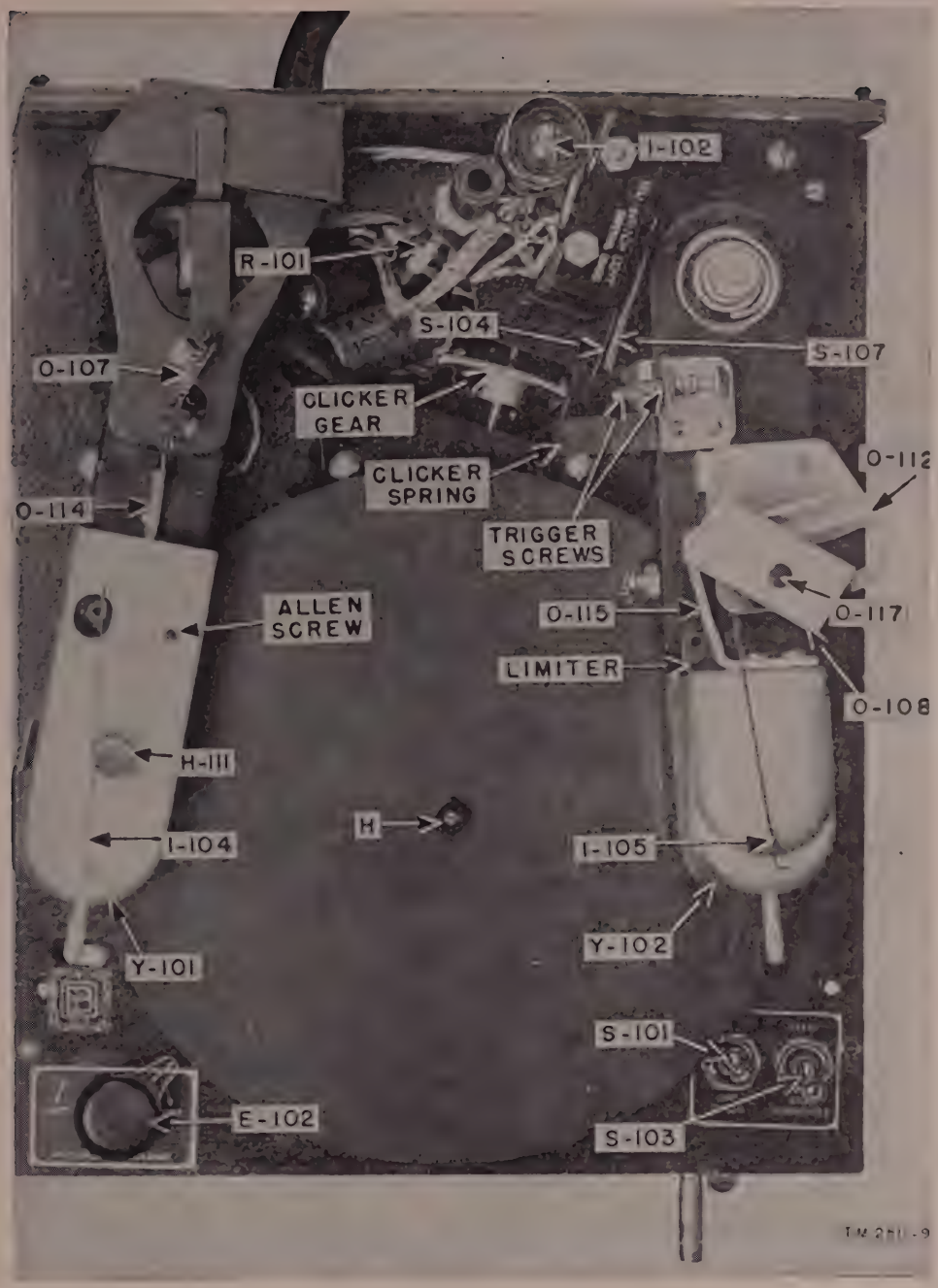


Figure 27. Special tools.



A-106. Wire guide for shadow-wire assembly.
H Turntable spindle square.
I-103. Lamp for log-scale illumination.
I-106. Shadow-wire indicator.
O-109. Clamping shoe.
O-116. Lifting bracket.
S-105. Inside stop switch.
S-106. Selector switch, turntable A.
S-108. Selector switch, turntable B.
S-109 Inside starting switch.
Y-103. Reproducer head, turntable A.

Figure 28. Turntable A (AN/GNQ-7A), top view.



E–102. Recording volume control.
H–111. Lifting screw.
I–104. Shadow-wire indicator (reproducer head)
I–102. Lamp for log scale illumination.
I–105. Shadow-wire indicator (recorder head)
O–107. Neutralizing spring.
O–112. Friction plate.
O–114. Counterbalance spring.
O–115. Lifting bracket
O–117. Lifting post.
R–101. Reproducer volume control.
S–101. TUBES ON-OFF switch.
S–103. TURNTABLE ON-OFF switch.
S–104. Inside stop switch.
S–107. Inside starting switch.
Y–101. Reproducer head.
Y–102. Recorder head.

Figure 29. Turntable B (AN/GNQ–7A), top view.

son Air Force Base, Dayton, Ohio, in accordance with AF Regulation 15-54.

Section XIII. ADJUSTMENTS

80. Use of Adjusting Template

a. Adjustment of Recorder Head Outside Stop (AN/GNQ–8 and –7–(*)). The outside stop of the recorder head provides a uniform starting point at the outside of the disk. To set the outside stop, proceed as follows:

(1) Place the large hole of the adjusting template (fig. 27) over the square center spindle of turntable H (fig. 28).

(2) With the LISTEN-TALK switch in the TALK position, place the diamond stylus of the recorder head in the outside hole of the template.

(3) Adjust the outside stop screw (figs. 28 and 31) so that it is firm against the lifting stud (14, fig. 19).

(4) Lock the outside stop screw in this position with the locknut.

b. Adjustment of Clicker Spring (AN/GNQ–8 and –7–(*)). The clicker spring indicates audibly that the end of the disk is being approached.

(1) Place the diamond stylus of the recorder head in the hole of the adjusting template nearest to the center of the turntable.

(2) Adjust the clicker gear by loosening its setscrew and sliding the gear on its shaft so that the spring (figs. 29 and 31) is engaged halfway on the face of the gear.

(3) Tighten the setscrew of the clicker gear.

(4) Bend the clicker spring up or down as required, to insure positive spring clicks as the gear rotates.

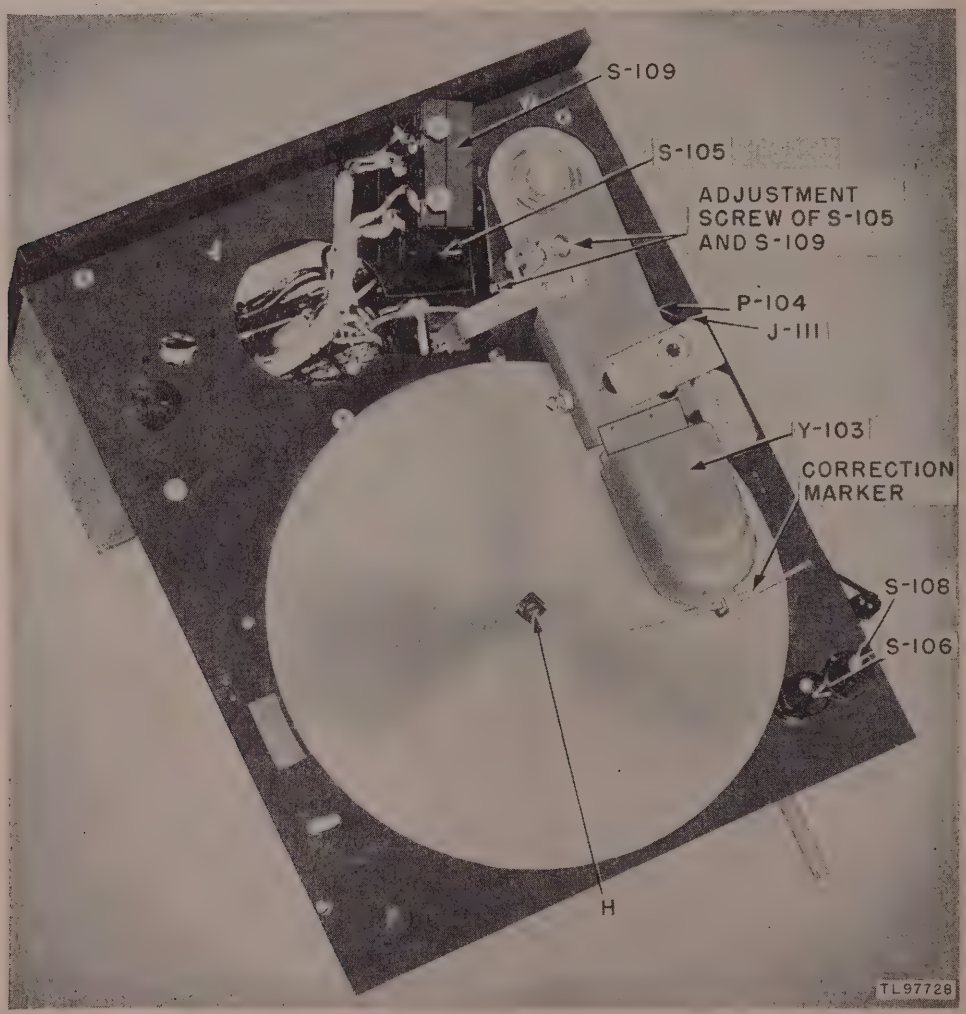


Figure 30. Turntable A (AN/GNQ–7), top view.

c. Adjustment of Recorder Head Inside Stop (AN/GNQ–8 and –7–(*)). The inside stop prevents the recorder arm from feeding too far in toward the center of the disk. This stop is set so that it is beyond the clicker spring adjustment, but so that the recorder head lifting stud does not come out from under the clamping shoe O–109 (fig. 28) when the recorder head is at the innermost portion of the disk. Make this adjustment by bending the stem (13, fig. 19) until the lifting stud is at the edge of the lifting shoe.

d. Adjustment of Switch Adjusting Screws (figs. 28, 29, 30, and 31). (1) The inside-stop switch, S–104 or S–105 (bottom switches) depending on which turntable unit of Recorder-Reproducer AN/GNQ–7–(*) is being worked on, is adjusted by its associated adjusting screw on the recorder arm. Adjust the switch to operate as close as possible to the inside stop of the recorder head, but allow enough distance for positive action of the switch *before* the recorder head reaches its inside stop.

(2) Starting switches S–107 and S–109 (top switches) are adjusted to operate 30 to 60 seconds before the inside-stop switches operate. This adjustment provides the proper overlap recording time between the two turntable units.

e. Correction Marker Adjustment (AN/GNQ–8, –7, and –6) (fig. 30). (1) Place the recorder head (or reproducer-head on AN/GNQ–6) stylus in the center hole of the adjusting template. With the head in this position, the log indicator wire or line on the front of the head should read 6 on the correction marker log scale. This adjustment is seldom necessary because it is preset at the factory.

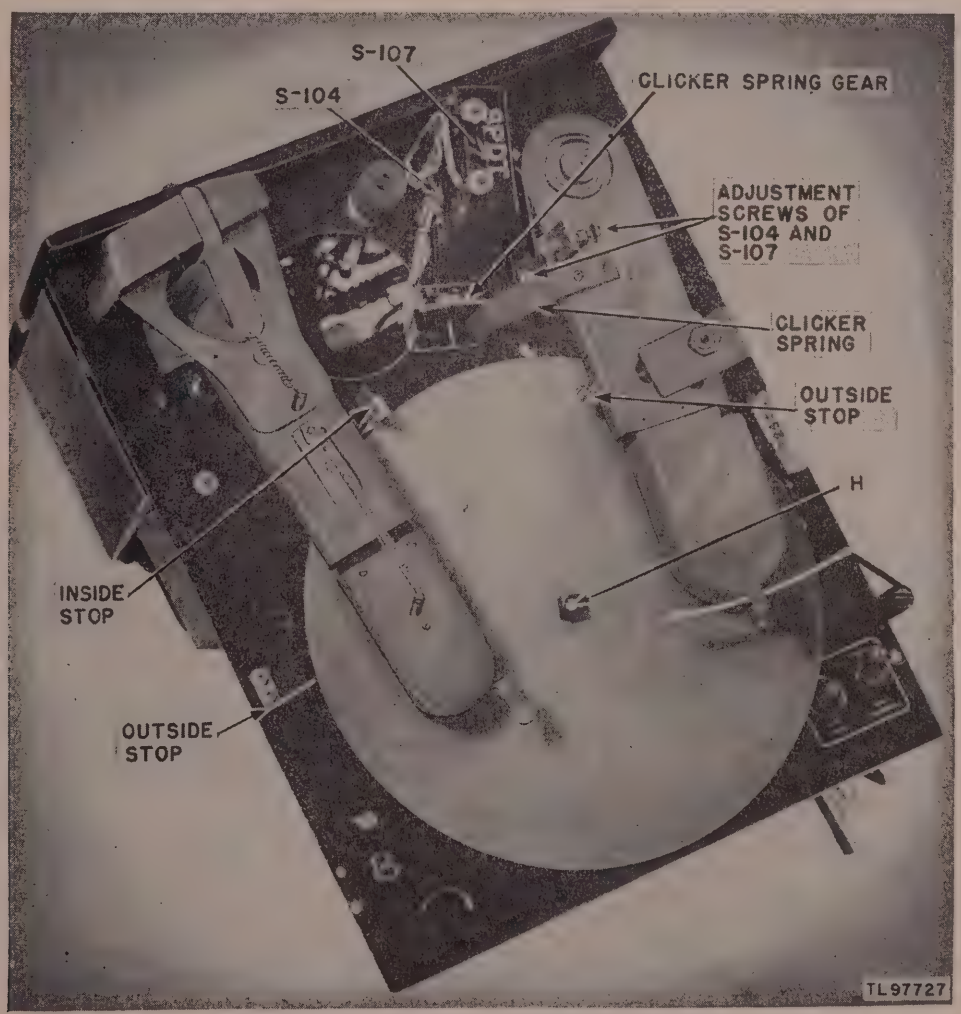


Figure 31. Turntable B (AN/GNQ–7), top view.

(2) If it is necessary to adjust the correction marker, slide the cellulose scale to either side after removing the glue holding it in place. After adjustment, glue the right end so that the scale does not go out of adjustment.

f. Calibration of Log Scales (AN/GNQ–7A) (1) Be sure log scale lamps I–102 and I–103 are as vertical as possible.

(2) Throw the TUBES ON-OFF switch to ON. The log scale lamp should illuminate the log scale.

Note. The shadow wires should cast vertical shadows on the log scale. (A nonvertical shadow may be made vertical by rotating the shadow wire with the fingers.)

(3) If necessary adjust inside and outside stops using adjusting template H–101. Push the adjusting template toward center of turntable to take up play between the template hole and the turntable post.

(4) Set the shadow wire exactly at the 6-minute mark on the log scale, using the hole provided for that purpose on adjusting template.

(5) Now check accuracy of shadow wires at 0- and 15-minute marks on log scales. At 0 the shadow should coincide with or touch either side of the 0 division mark. At 15 on the log scale the shadow should coincide with or touch the 15-minute division mark.

(6) If a head assembly is at the inside and outside stops (on adjusting template) and the shadow indicates more than 15 or less than 0, the shadow wire should be pushed back slightly in its support. If the shadow is less than 15 or more than 0, the shadow wire should be pulled forward slightly. When pushing or pulling the shadow wire through the fingers of its support, use long-nose pliers.

g. Reproducer-head Outside and Inside Stops (figs. 22 and 31). (1) *Outside Stop.* Adjust the reproducer-head outside stop (or reproducer-head-rest) so that the stylus rests halfway between the edge of the turntable shell and the outermost groove of a recording made on a properly adjusted recorder-reproducer unit. To make this adjustment, bend the reproducer-head outside stop so that the reproducer head stylus rests halfway between the outside-stop adjustment on the adjusting template and the edge of the turntable.

(2) *Inside Stop.* Adjust the reproducer-head inside stop by bending it, permitting the reproducer head to travel to approximately one-fourth inch beyond the clicker-spring adjustment hole in the adjusting template.

81. Recorder and Reproducer-head Pressures

a. Recorder-Head Pressure (AN/GNQ–8 and –7). (1) To weigh the recorder head, hook the recorder-head weighing scale under the lifting stud at the end of the head and lift up the head with the scale. This scale is graduated in ounces and should read between 4½ and 5½ ounces just as the diamond stylus leaves the disk. Correct head pressure, with proper diamond-stylus angle, will assure a properly formed groove on the disk.

(2) The recorder arm is so designed that when the stylus rests on the disk, the hinge-spring ten-

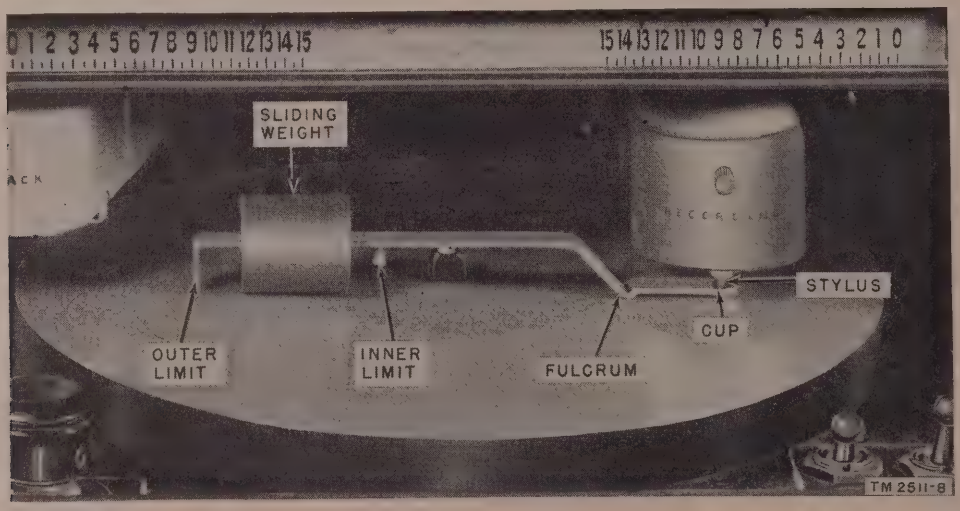


Figure 32. Measuring stylus pressure of recorder head (AN/GNQ–7A).

sion is zero and the recorder-stylus pressure equals the dead weight of the recorder head. If the recorder-head weight changes, check the tension of the hinge spring. To adjust the head weight, remove the recorder arm and bow the spring slightly by bending up or down to get the hinge spring in the repose position. In some instances, the limiter (fig. 29) must be removed in order to obtain working space.

b. Recorder-head Pressure (AN/GNQ–7A) (fig. 32). The pressure of the AN/GNQ–7A recorder-head stylus is measured directly by means of stylus pressure weighing scale H–102, which consists of a single strip of metal, bent to form two lever arms, and a sliding weight. The point at which the strip is bent is used as a fulcrum. The short lever arm ends in a small cup which holds the diamond stylus; the longer arm has two stops between which a weight can slide and thus balance the pressure of the recorder-head stylus. To determine whether or not the pressure of the diamond stylus upon the turntable is correct, proceed as follows:

(1) Lift the recorder-head from the turntable and move it manually to the outside edge of the turntable shell.

(2) Remove disk, if any, from turntable shell and place scale on turntable (fig. 32).

(3) Lower the stylus to the cup of the stylus pressure weighing scale and move the sliding weight along the arm of the scale to the outer limit.

(4) If the recorder-head pressure is normal, the cup should raise enough to permit insertion of a piece of writing paper between the cup and shell. Moving the weight to the inner limit should cause the cup to drop back on the shell.

(5) If the stylus and cup remain in contact with the turntable shell when the weight is against the outer limit, the stylus pressure is too great and should be adjusted as follows:

(*a*) Remove the chassis from its cabinet (par. 66).

(*b*) Remove the recorder arm from its feed spindle (par. 73).

(*d*) Hold the recorder head in the hand with the stylus facing the floor and bend the head slightly *upward* to bow the hinge and thus return the hinge to a neutral position with respect to the head.

(*e*) Remount the limiter and reinstall the recorder arm on its feed spindle.

(*f*) Measure the stylus pressure again and if it is still too great, repeat steps (*b*) through (*e*) until the correct pressure is obtained ((4) above).

(6) If the stylus and cup rise from the turntable shell when the scale weight is against the inner limit, the pressure is too light and should be adjusted as follows:

(*a*) Holding the recorder head in the hand with the stylus facing the floor, bend the head slightly *downward* to bow the hinge to a neutral position with respect to the head.

(*b*) Reassemble the recorder-head and again measure the pressure.

(*c*) If still too light, repeat step (*a*) above un-

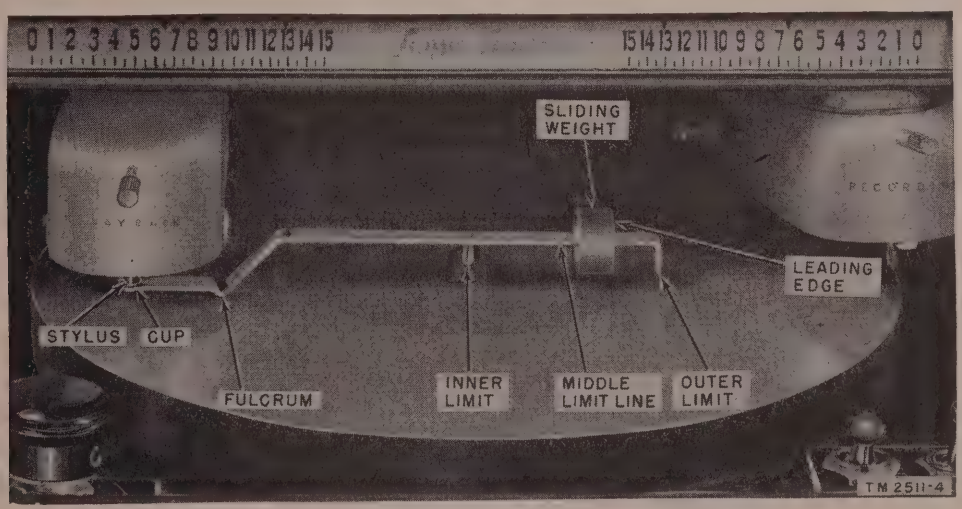


Figure 33. Measuring stylus pressure of reproducer head (AN/GNQ–7A).

til the correct pressure is obtained ((4) above).

(7) After the stylus pressure has been correctly adjusted, complete the reassembly of the arm and reinstall chassis into its cabinet.

c. Reproducer-head Pressure (AN/GNQ–8, –7, and –6). Hook the reproducer-head pressure weighing scale under the handle at the end of the head and lift the head with the scale. Head should weigh seven-eighth ounce just as the reproducer stylus leaves the disk. If it is necessary to adjust the reproducer-head pressure, move the bracket which holds the spring or stretch or shorten the spring.

Note. The reproducer-head weighing procedure described above applies only to the AN/GNQ–6, –7, and –8. The reproducer-head weighing procedure given below applies to AN/GNQ–7A in addition to AN/GNQ–8, –7, and –6. Stylus pressure weighing scale H–103 is furnished only with the AN/GNQ–7A.

d. Reproducer-head Pressure (AN/GNQ–7A) (fig. 33). The pressure of the AN/GNQ–7A reproducer-head stylus is measured directly by means of stylus pressure weighing scale H–103. It is similar in appearance and function to scale H–102 (used on the AN/GNQ–8, –7, and –6), the difference being in the mass of the sliding weight and the position of the limits on the long lever arm. The longer of the two lever arms on this gauge has a *middle limit* line in addition to an *inner* and an *outer limit*. To measure and, if necessary, to adjust the stylus pressure of a reproducer head, proceed as follows:

(1) Remove disk from the turntable shell and place the scale on the shell.

(2) Set the stylus of the reproducer head in the cup of the scale.

(3) Move the sliding weight along the lever arm of the scale until the cup holding the stylus begins to leave the turntable shell. (The sliding weight is now balancing the pressure of the stylus.) The cup has left the shell when a sheet of writing paper can be inserted between the cup and the shell.

Note. On the AN/GNQ–7 and –8 reproducer heads the cup should begin to leave the shell when the sliding weight is somewhere between the *middle limit* line and the *outer* limit of the scale. On an AN/GNQ–6 reproducer head, the limits are the *middle limit* line and the *inner limit* of the gauge.

(4) If the stylus pressure is too light, it should be adjusted by releasing tension on the headspring (par. 83).

(5) If the stylus pressure is too great, it should be adjusted by increasing the tension on the headspring (par. 83).

(6) After each adjustment of headspring tension, recheck the stylus pressure.

82. Diamond Stylus Angle

a. Adjust the angle of the recorder stylus by bending the shank of the stylus without removing it from the recorder head. The internal construction of the head permits this operation without damage to the recorder-head stylus assembly. The stylus shank is made of soft steel and may be bent with the stylus shank bender. *Be careful not to strike the diamond tip.* Before making a diamond-angle adjustment, be sure the recorder-head pressure is adjusted to the proper weight (par. 81), since proper head weight and diamond angle are necessary to produce the proper groove structure in the recording disk.

b. In setting the diamond angle, bear in mind that a steep diamond angle (A, fig. 34) makes a wide groove because the stylus digs in deeper. This results in excellent tracking of the reproducer stylus. However, the narrow land between grooves may result in crosstalk. A diamond angle that is too flat (D) may eliminate crosstalk but will result in a narrow groove with poor tracking qualities. From this it may be seen that proper diamond angle adjustment produces optimum performance at an angle (B or C) between the two extremes. The proper diamond angle may be determined in the following manner:

(1) Increase the diamond angle to a point where a test recording produces groove crosstalk when making a record at normal recording level.

(2) Then decrease the angle to a point where there is a slight susceptibility to crosstalk. The optimum point will be obtained by bending the angle slightly below this point. Under this condition, good quality and good tracking of the reproducer stylus should be obtained.

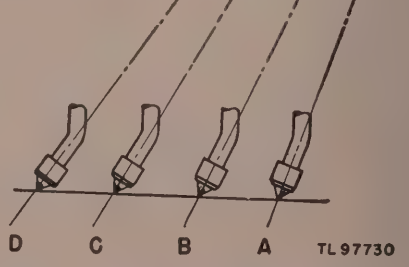


Figure 34. Diamond stylus angles.

83. Neutralizing Reproducer Head (AN/GNQ–8 and AN/GNQ–7-(*)

With the LISTEN-TALK switch in the LISTEN position and with the reproducer-head stylus on a blank disk on the rotating turntable, the reproducer head should not drift laterally toward the outside or inside of the disk from any point on the disk where the reproducer head has been placed. It is spring O–107 and the neutralizing bracket that prevents the reproducer head from drifting either to the outside or center of the disk (fig. 22). Adjust the bracket to one side or the other to eliminate this action. Tighten the bracket in place.

84. Neutralizing Reproducer Head (AN/GNQ–6)

a. In many cases, failure of the reproducer head to drift properly is due to misadjustment of the tangential-force spring bracket V (fig. 35). Remove the chassis from the case (par. 66) and place in level position. Before adjusting tangential-force neutralizing spring U, see whether proper drift can be obtained by adjusting this bracket to the right if the drift is too great or to the left if the head does not drift.

b. If above method does not correct faulty drift, proceed as follows:

(1) Check the reproducer-head weight (par. 81).

(2) Loosen screw T (fig. 35).

(3) Remove kinks out of the straight portion of spring U by squeezing the wire with a pair of pliers.

(4) Bend the end of the spring into a small hook.

(5) Hook the recorder-head weighing scale to the bend of the spring as shown in figure 35.

(6) With the reproducer head in the center of the recording area of the disk and with the tangential-force spring-mounting bracket V in the center position, stretch the spring with the weighing scale until a tension of 3¼ ounces is obtained. Tighten screw T but not enough to crimp the spring and make readjustments necessary.

c. Adjust tangential-force spring-mounting bracket V so that reproducer head drifts slowly inward from the outer edge of a blank disk. Use a clear, transparent disk for this adjustment.

d. Check drift at inner portion of blank disk as follows:

(1) If the reproducer head drifts inward slowly, check drift across entire disk area. If it drifts slowly inward everywhere and takes 1 minute or longer to drift across the entire disk, the adjustment is correct.

(2) If the reproducer head drifts inward too fast, decrease the tension of neutralizing spring U and repeat steps *c* and *d* above.

(3) If the reproducer head drifts outward or does not drift at all, increase the tension of neutralizing spring U and repeat steps *c* and *d* above.

e. Ater a slow inward drift is obtained everywhere across a blank disk, check to see that the drift is not violent enough to make the reproducer head jump grooves. Play back a recording

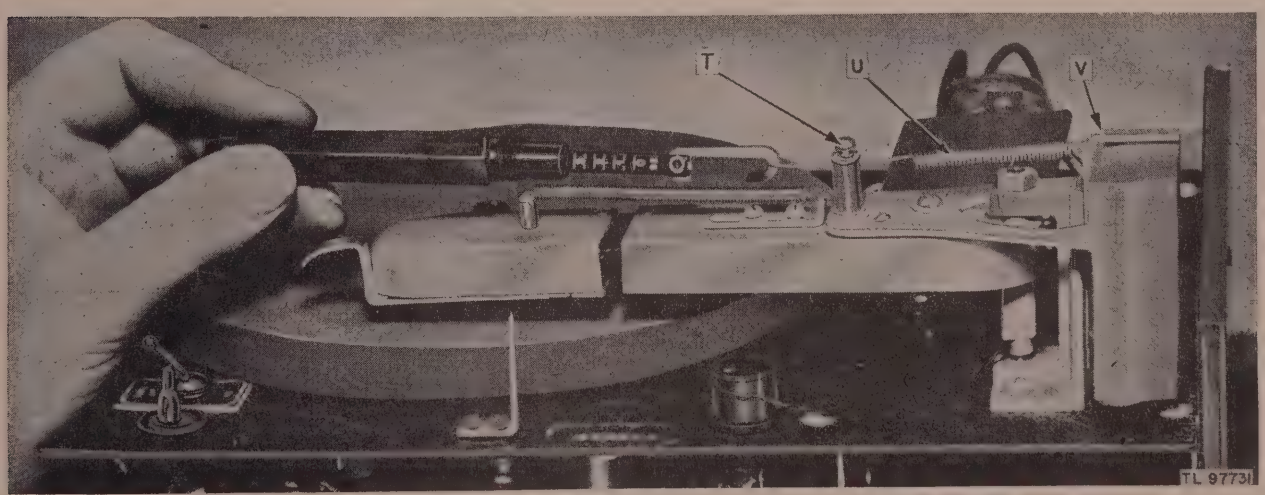


Figure 35. Neutralizing reproducer head for drift (AN/GNQ–6).

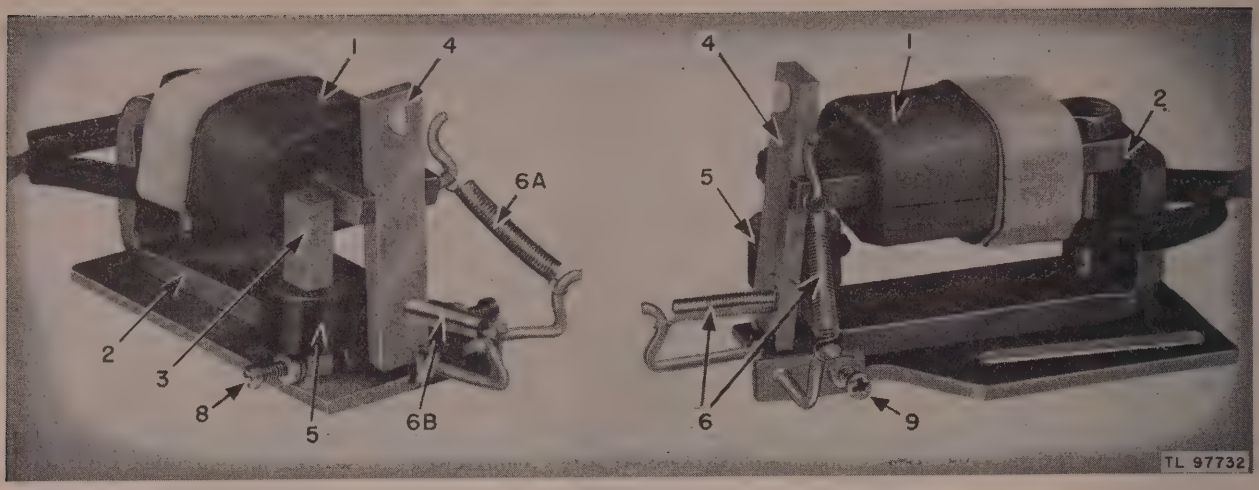


Figure 36. Step-back mechanism (AN/GNQ–6 only).

with blank spaces no more than one-sixteenth inch across at different parts of the disk.

f. When all adjustments are satisfactory, put the machine back into the cabinet, and place it where it is to be used. Check the drift again. Then play back a recording at the outside, center, and inside of the recording area and operate the brake while listening to the recording. If the brake operation causes the reproducer head to skip any grooves, readjust the brake (par. 86).

85. Step-back Adjustments (AN/GNQ–6)

a. The step-back mechanism (fig. 36) backspaces the reproducer arm two or more grooves, permitting repetition of a phrase or sentence as desired. It is a magnetically operated mechanism consisting of a coil (1), yoke (2), stationary armature (3), movable armature (4), collar (5), and springs (6A and 6B).

b. When the coil (1) is energized, the mechanism has four distinct motions as follows (fig. 37):

(1) The movable armature (4) swings on its pivots the lower end being attracted toward the bottom end of the yoke and the upper end swinging out to contact the sector plate (10) of the reproducer arm.

(2) The entire yoke (2) then moves forward to the stationary armature (3, fig. 36) carrying the sector plate with it and moving the reproducer head laterally the width of two grooves.

(3) When the coil is de-energized, the movable armature is pulled away from the sector by the spring (6B), releasing the reproducer arm.

(4) The yoke (2) is then returned to the starting position by the spring (6A).

c. Adjust the step-back mechanism as follows:

(1) Set the reproducer arm pivots in the reproducer base so that only the slightest amount of play is felt in the pivot bearings (par. 74).

(2) Make sure the sector plate (10, fig. 37) is tight on the reproducer arm.

(3) Make sure the weight of the reproducer head is correct (par. 81).

(4) Check all moving parts of the reproducer mechanism and make sure that they operate freely.

(5) Set the step-back assembly so that the distance X1 (fig. 37) between the knife edge (7) and the sector plate (10) when the unit is *not energized* is equal to one-half the distance X2 between the bottom of the movable armature (4) and the magnetic yoke (2) when the unit *is energized.* The space X1 should be equal throughout the swing of the reproducer arm. If it is not, loosen the screws holding the sector plate to the reproducer arm and position the sector plate to obtain the proper clearance.

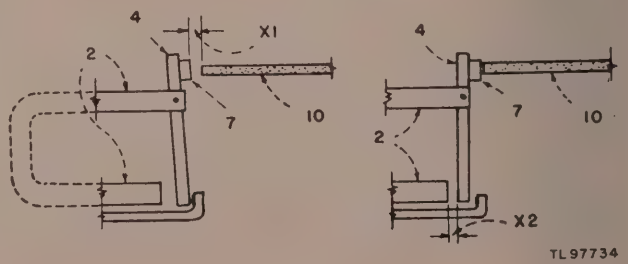


Figure 37. Step-back adjustment.

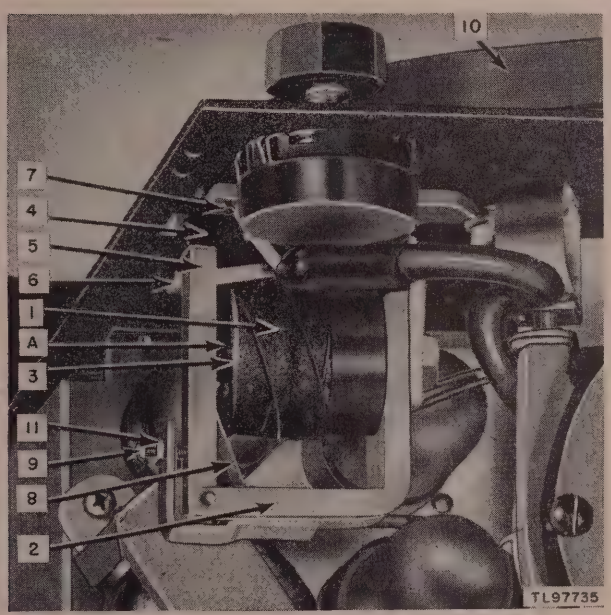
(6) In performing operation given in (5) above, be sure that the position of the movable armature is such that with the reproducer head against the outside stop, the knife edge (7) will still engage the sector plate (10) when the step-back mechanism is energized.

(7) Set the tension of the spring (6B) for a pull of one-half ounce, measured with the *reproducer* weighing scale applied to the top of the movable armature (4). Take this reading when the armature is in the vertical position.

(8) Set the tension of the spring (6A) for a pull of 1½ ounces, measured with the *recorder* weighing scale applied to the point where the movable armature (4) is pinned to the magnetic yoke (2). Take this reading when the yoke (2) is against the stationary armature (3, fig. 36).

Note. If the step-back operation is erratic after making the above adjustments, *do not change spring settings* but proceed to the next step.

(9) With the step-back energized, set the air gap between the magnetic yoke (2) and the stationary armature (3) to 0.018 inch, top and bottom, by adjusting the screw (8, fig. 36).



(1) Field winding
(2) Yoke
(3) Pole piece
(4) Brake mold
(5) Brake arm
(6) Mounting bracket
(7) Brake mounting screws
(8) Spring
(9) Clearance adjustment screw
(10) Turntable shell
(11) Locknut

Figure 38. Brake mechanism (AN/GNQ–6 only).

(10) Set the collar (5) to clear the magnetic yoke (2) by 0.002 inch when the step-back is not energized. (Some step-backs do not have this collar.) The step-back mechanism is now ready to operate.

(11) The number of grooves the stylus jumps in the backspace movement is determined by the setting of the adjusting screw (9). This adjustment is set to provide, with the turntable stopped, a minimum of 65 steps per inch and a maximum of 100 steps per inch.

86. Brake Adjustments

a. General. The brake stops the turntable shell of Reproducer AN/GNQ–6 instantaneously. The brake assembly (fig. 38) consists of a field winding (1), yoke (2), pole piece (3), brake mold (4), brake arm (5), mounting bracket (6), mounting screws (7), spring (8), and clearance adjustment screw (9). When the brake is operated, the brake arm (5) is attracted toward the pole piece (3), causing the brake mold (4) to press against the turntable shell. The force by which the brake arm holds the shell is varied by increasing or decreasing the gap (A) between pole piece (3) and brake arm (5) when the brake is actuated. This is done by adjusting screw (9).

b. Brake Pressure Insufficient, Allowing Turntable to Slip. (1) If the brake slips, thoroughly clean the turntable rim and the brake mold (4) to remove any grease. With the brake off, hold the finger against the edge of the rotating turntable shell. The shell should slip with a steady force and without grabbing.

(2) If the shell grabs, remove it (par. 75). Examine the under side of the shell for burrs; the surface of the felt ring (cork ring on older models) should be smooth. Check for binding between the shell and turntable.

(3) If the brake is too loose, allowing the turntable to slip when the brake is on, loosen the brake-mounting screws (7) and move the brake mechanism toward the turntable until the proper pressure is obtained.

c. Brake Pressure too Great Causing Wow in Starting or Slow Start. If the brake is too tight, the motor flexible coupling will wind up and cause wows in starting. In some cases, this tightness may even stop the motor. To correct this condition, loosen the brake-mounting screws (7) and move the brake-mounting mechanism out slightly away from the turntable until the cor-

rect pressure is obtained. Retighten the screws (7).

d. Too Much Travel in Brake Arm (5), Causing Reproducer Head to be Jarred Out of Groove. Too much travel in the brake arm (5) may cause the arm to strike the turntable with sufficient force to knock the reproducer head out of the groove, causing skips or repeats. Brake-arm travel is regulated by the adjustment screw (9). This screw is preset during manufacture so that the distance between the brake mold (4) and turntable shell (10), with the brake released, is approximately 0.010 inch. If the adjustment has been changed, loosen the nut (11) and adjust the screw (9) to obtain the proper 0.010 inch clearance between brake mold (4) and turntable shell (10). Hold the screw (9) with the screwdriver and tighten the locknut (11) firmly.

e. Insufficient Travel in Arm, not Allowing Brake to Release Completely. Insufficient travel in the brake arm (5) will not allow the brake to fall away from the turntable (10), thus causing a continuous rub between the brake mold (4) and the turntable. Remedy this condition by following instructions for adjusting clearance (*c* above).

APPENDIX I

REFERENCES

Note. For availability of items listed, check FM 21–6 and SIG 1 & 2. Also see the latest issue of FM 21–6 for applicable technical bulletins, supply bulletins, modification work orders, and changes.

1. Parts List

SIG 1 & 2	Department of the Army Signal Supply Catalog, Introduction and Index.
SIG 3	List of Items for Troop Issue.
SIG 4–1	Allowances of Expendable Supplies.
SIG 4–2	Allowances of Expendable Supplies, for Schools, Training Centers, and Boards.
SIG 5	Stock List of All Items.
SB 11–17	Electron Tube Supply and Reference Data.
SB 11–76	Signal Corps Kit and Materials for Moisture- and Fungi-Resistant Treatment.

2. Technical Manuals on Test Equipment

TM 11–2613	Voltohmmeter I–166.
TM 11–2626	Test Unit I–176.
TM 11–2627	Tube Tester I–177.

3. Packaging and Packing Instructions

a. Joint Army-Navy Packaging Specifications.

JAN–D–169	Desiccants, Activated.
JAN–P–100	General Specifications.
JAN–P–106	Boxes, Wood, Nailed.
JAN–P–116	Preservation, Methods of.
JAN–P–125	Barrier Material, Waterproof.
JAN–P–131	Barrier Material, Moisture-Vaporproof, Flexible.

b. U. S. Army Specifications.

100–2E	Marking Shipments by Contractors (and Signal Corps Supplement thereto).

c. Signal Corps Instructions.

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

4. Other Publications

FM 5–25	Explosives and Demolitions.
FM 21–6	List and Index of Department of the Army Publications.
TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 66	Winter Maintenance of Signal Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TM 1–455	Electrical Fundamentals.
TM 3–220	Decontamination.
TM 11–453	Shop Work.
TM 11–455	Radio Fundamentals.
TM 11–462	Signal Corps Reference Data.
TM 38–650	Basic Maintenance Manual.

5. Forms

AAF Form 54	Unsatisfactory Report.
WD AGO Form 468	Unsatisfactory Equipment Report.

6. Abbreviations

ac	alternating current
a-f	audio-frequency
a-v-c	automatic-volume-control
CONF	conference
cps	cycles per second
db	decibel (s)
dc	direct current
EXT	external
F	Fahrenheit
h-f	high-frequency
mf	microfarad(s)
MIC	microphone
mmf	micromicrofarad(s)
PM	preventive maintenance
quan	quantity
rpm	revolutions per minute
TEL	telephone
w	watt(s)

APPENDIX II

IDENTIFICATION TABLE OF REPLACEABLE PARTS

1. The fact that an item appears in this technical manual is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as T/O & E, TE, TA, T/BA, SIG 6, SIG 7 & 8, SIG 7-8-10, SIG 10, list of allowances of expendable material, or other authorized supply basis. For an index of available supply catalogs in the signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1 & 2.

2. Identification Table of Replaceable Parts for Reproducer AN/GNQ–6

Note. The following parts, in addition to the parts listed in paragraph 6 below, constitute the replaceable parts for Reproducer AN/GNQ–6:

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	REPRODUCER AN/GNQ–6: electromagnetic; uses 7″ plastic disk; w/amplifier 2 thru 3 w; portable; 12″ wd x 10½″ d x 9″ h; 115 v AC, 60 cyc, 125 w; high-impedance magnetic reproducer head; stylus not replaceable; table model, wooden cabinet, walnut finish.	Reproduces sound from disk.	6C263–10
C–108, C–109, C–118	CAPACITOR, fixed: paper; 50,000 mmf +30% −10%; 600 vdcw; HS metal can; 1 13/16″ lg x 11/16″ diam; JAN type CP26A1DF503M.	C–108—Suppresses arc across S101. C–109—Suppresses arc across S101. C–118—Suppresses arc across S202.	3DA50–313
	COIL, solenoid: #40 enamel wire; 4500 ohms ±500 ohms; round; 1⅛″ lg x 1.25″ OD; single hole 0.375″ diam; Soundscriber part/dwg #A–1–27B.	Energizes magnet of stepback mechanism.	3C1999–26A
P–201	CONNECTOR, plug: 3 rectangular pol male cont; straight; 1″ lg x 15/16″ d x 7/16″ wd overall; 5 amp, 45 v; Jones HB #P–303–CCT.	Connects stepback and brake foot control unit to reproducer.	2Z7113.12
J–105	CONNECTOR, receptacle: 3 rectangular pol female cont; straight; 1″ lg x ¾″ d x 7/16″ wd; 5 amp max, 45 v; incl cable clamp; Jones HB #S–303AB.	Connects stepback and brake foot control unit to amplifier.	2Z8673.19
	DISK, indicator: white vinylite; straight; 3⅜″ over-all lg x 3/16″ wd x 0.035″ thk; ¼″ loop ea end for left-hand mtg; graduated block letters from 0 to 15; Soundscriber part #5–47.	Indicates position of reproducer head needle on disk.	6C263–10.1
	FOOT, mounting: felt; round; ½″ OD x 7/32″ d; #6 wood screw ¼″ lg; Soundscriber part #7–13B.	Prevents damage to table surface.	6C263–10.2
HT–401	HEADSET: reproducer; magnetic 300 ohms impedance; 2 receivers 1⅜″ OD x 15/16″ diam ea; fabric headband 1⅜″ wd; Murdock per Soundscriber #8–677A.	Converts electrical energy into sound.	2B934
I–101	LAMP, incandescent: 2.9 v, 0.17 amp; bulb T–3¼ clear; 1⅛″ lg over-all; miniature bayonet base; white bead; Sylvania Prod #S–292–A.	Illuminates inside of cabinet.	2Z5878–11
P–401	PLUG, telephone: male; straight; single prong, 2 circuit; 2 cont; 15/32″ lg from tip to handle; 0.248″ diam; over-all 2 25/32″ lg x 23/32″ diam; Mallory #75; Collins #361N104.	Connects headset to amplifier output circuit.	2Z7111.63
R–119	RESISTOR, fixed: comp; 240,000 ohms ±5%; ½″ w; max body dimen 0.468″ lg x 0.249″ diam; JAN type RC20BF244J.	Voltage dropping resistor.	3RC20BF244J

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
R–101	RESISTOR, variable (potentiometer): comp; 500,000 ohms; ½″ w; 3 solder lug term; body 1¼″ diam x 9/16″ d less term; shaft ¼″ diam x 2″ lg; bushing thd ⅜″–32 x ⅜″ lg, incl hardware for mtg; IRC type #CS 13–133.	Controls playback volume.	2Z7272–40
H–102	SCALES, weighing: avoirdupois; spring; hanging type; 0 to 1 oz in ⅛-oz divisions; 4 13/16″ lg x 9/16″ max diam; plastic body w/pointer indicator; exact weight scale "Post-a-lette" modified; Soundscriber #8–307M.	Measures reproducer head weight.	6Z8078–1
	SCREW, machine: stainless steel; 0.110″ diam; #4–36 thd; 9/16″ lg over-all; 3/16″ lg, screw thd; 5/32″ diam hd.		6L20904–9S
	SHOE, brake: Hycor 30 to 45 durometer rubber; rectangular; 0.93″ lg x 0.66″ wd x 0.26″ thk; Soundscriber part #A–1–101.	Provides friction surface against turntable run.	6C263–10.3
S–202	SWITCH, sensitive: SPST; 10 amp, 125 v; bakelite body; 2½″ lg x 15/16″ wd x 15/16″ h; plunger type actuated; 8 oz operating pressure; momentary action, normally closed; 2 locking screw term; 0.162″ mtg holes, 1⅝″ centers; Micro Sw #RN–6 SKEL.	Actuates brake solenoid.	3Z9558–34.2
S–201	SWITCH, sensitive: SPST; 10 amp, 125 v; bakelite body; 2½″ lg x 15/16″ wd x 15/16″ h; plunger type actuated; 8 oz operating pressure; momentary action, normally open; 2 binding screw term; 0.162″ mtg holes, 1⅝″ centers; Micro Sw #GN–6 SKEL.	Actuates stepback mechanism.	3Z9558–34.3
S–101	SWITCH, toggle: DPST; 5 amp, 125 v; bakelite body; 1 25/32″ h x 2 3/32″ wd x 31/32″ thk; solder lug term; single hole mtg bushing 15/32″–32 x ¼″ lug; JAN type ST27K.	Connects amplifier to power source (TUBE SWITCH).	3Z9863–27K
H–101	TEMPLATE: steel; 3 holes marked CLICKER 15 MIN; rectangular 4 1/16″ lg x ¼″ wd x 5/64″ thk; Soundscriber #8–309.	Used to adjust outside stop, correction marker, and clicker spring.	6Q45232

3. Identification Table of Replaceable Parts for Recorder-Reproducer AN/GNQ–7

Note. The following parts, in addition to the parts listed in paragraphs 6, 7, and 8 below constitute the replaceable parts for Recorder-Reproducer AN/GNQ–7.

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	RECORDER-REPRODUCER AN/GNQ–7: electromagnetic; dual operation; uses 7″ plastic dish; w/2 thru 3 w amplifier; portable; 33 rpm; 18¾″ wd x 13¼″ d x 8¼″ h; 115 v AC, 60 Cyc, 125 w; high-impedance recorder and reproducer heads; needle and stylus not replaceable; fabrikoid covered, luggage type case.	Records and reproduces sound.	6C263–11
C–108, C–109	CAPACITOR, fixed: paper; 50,000 mmf +30% — 10%; 600 vdcw; HS metal can; 1 13/16″ lg x 11/16″ diam; JAN type CP26A1DF503M.	C–108—Suppresses arc across S–101. C–109—Suppresses arc across S–101.	3DA50–313
C–101A, C–101B, C–101C	CAPACITOR, fixed: electrolytic; 3 sect; 8-8-8 mf; 150 vdcw; 2″ lg x 1⅜″ diam; 4 solder lug term; Dubilier #UP7C584.	Decouples plate circuits of V–101 and V–102 from B supply.	3DB8–129
J–301	CONNECTOR, receptacle: 4 rectangular pol female cont; straight; ¾″ thk x ¾″ lg x 11/16″ wd; 5 amp, 45 v; Jones HB part #S–304AB.	Provides parallel microphone connection.	2Z8639–11

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
E–301	KNOB: bar; black bakelite; for ¼″ diam shaft; single #8–32 setscrew; white filled indicator line; 1¼″ lg x ¾″ wd x ⅝″ h; brass shaft hole insert; ½″ d shaft hole; Kurtz Kasch #S–292–3L.	Rotates microphone selector control.	2Z5838
E–103, E–104	KNOB: round; black bakelite; for ¼″ diam shaft; double #8–32 setscrew; 1⅛″ diam x ⅝″ h; metal shaft hole insert; fluted; w/metal pointer; Croname #6462.	E–103—Rotates LISTEN-TALK shaft on turntable B. E–104—Rotates LISTEN-TALK shaft on turntable A.	2Z5748.11
E–102	KNOB: round; black bakelite; for ¼″ diam shaft; double #8–32 setscrew; 1⅝″ diam x ¾″ h; metal shaft hole insert; fluted; ½″ d shaft hole; w/metal pointer; Croname part #6465.	Rotates recorder volume control shaft.	2Z5748.22
I–101	LAMP, incandescent: 2.9 v, 0.17 amp; bulb T–3¼ clear; 1⅛″ lg over-all; miniature bayonet base; white bead; Sylvania Prod #S–292–A.	Illuminates remote control ON-OFF guide.	2Z5878–11
K–101a	RELAY, armature: SPDT; ½ amp, 110 v AC; silver cont, ¼″ diam; coil single wound, 110 v DC, 0.007 amp, 15,500 ohms; 1½″ lg x 2¼″ wd x 1¼″ over-all; fast acting; Auto Elec #R–31D.	Starts and stops recorder when operated by remote control unit.	2Z7587–112
K–102, K–103a, b, c, d, e	RELAY, armature: SPST; ½ amp, 110 v AC; silver cont, ¼″ diam; coil single wound, 110 v DC, 0.007 amp, 15,500 ohms; 1½″ lg x 2¼″ wd x 1¼″ h over-all; fast acting; Auto Elec #K–30D.	Controls selection of circuits on turntable B.	2Z7593–73
R–205, R–302 thru R–305	RESISTOR, fixed: comp; 24 ohms ±5%; ½ w; 0.655″ lg x 0.249″ diam; JAN type RC21BF240J.	R–205—AVC voltage dropping. R–302 thru R–305—Microphone control resistors.	3RC21BF240J
R–101	RESISTOR, variable (potentiometer): comp; 500,000 ohms; ½ w; 3 solder lug term; body 1¼″ diam x 9/16″ d less term; shaft ¼″ diam x 2″ lg; bushing thd ⅜″–32 x ⅜″ lg incl hardware for mtg; IRC type #CS–13–133.	Controls playback volume.	2Z7272–40
H–102	SCALES, weighing: avoirdupois: spring; hanging type; 0 to 1 oz in ⅛-oz divisions; 4 13/16″ lg x 9/16″ max diam; plastic body w/pointer indicator; exact weight scale "Post-a-lette" modified; Soundscriber #8–307M.	Measures reproducer head weight.	6Z8078–1
H–101	TEMPLATE: steel; 3 holes marked CLICKER 15 MIN; rectangular; 4 1/16″ lg x ¼″ wd x 5/16″ thk; Soundscriber #8–309.	Used to adjust outside stop, correction marker, and clicker spring.	6Q45232

4. Identification Table of Replaceable Parts for Recorder-Reproducer AN/GNQ–7A

Note. The following parts, in addition to the parts listed in paragraphs 6, 7, and 8 below constitute the replaceable parts for Recorder-Reproducer AN/GNQ–7A.

Ref symbol	Name of part and description	Function of part	Signal Corps stock No
	RECORDER-REPRODUCER AN/GNQ–7A: electromagnetic; dual operation; uses 7″ plastic disk; w/2 thru 3 w amplified; portable; 33 rpm; 18¾″ wd x 13¼″ d x 8¼″ h; 115 v AC, 60 cyc, 125 w; high-impedance recorder and reproducer heads; needle and stylus not replaceable; fabrikoid covered, luggage type case.	Records and reproduces sound.	
C–127	CAPACITOR, fixed: paper; 50,000 mmf +30% — 10%; 600 vdcw; HS metal can; 1 11/16″ lg x 1 1/16″ diam; JAN type CP26A1DF503M.	Couples ground to metal chassis.	3DA50–313

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
C–108, C–109	CAPACITOR, fixed: paper; 2 mf; 220 vdcw; HS metal case; 2 1/16″ lg x 2 1/16″ wd x 2 1/16″ thk; 2 solder lug term; Capacitron #A1530 type BAR.	Furnish leading current for high torque a-c motor operation.	3DB2–156
C–101, C–128, C–129	CAPACITOR, fixed: electrolytic; 8 mf; 150 vdcw; 11/16″ diam x 1 17/32″ lg; HS metal case; Dubilier type #BR815.	C–101—Decouples plate circuit of V–101A from B supply. C–128—Decouples plate circuit of V–101B from B supply. C–129—Decouples plate circuits V–102A and V–102B from B supply.	3DB8–59
E–102	KNOB: bar; black croplastic; for 1/4″ diam shaft; single #6–32 setscrew; 19/32″ h x 1 9/64″ lg x 3/4″ wd; metal shaft hole insert; shaft hole 1/2″ d; w/metal pointer; Croname part #6141.	Rotates recorder volume control shaft.	2Z5822–206
E–103, E–104	KNOB: round; black bakelite; for 1/4″ diam shaft; double #8–32 setscrews; 1 5/8″ diam x 3/4″ h; metal shaft hole insert; fluted; 1/2″ d shaft hole; w/metal pointer; Croname part #6465.	E–103—Rotates the LISTEN-TALK shaft on turntable B. E–104—Rotates LISTEN-TALK shaft on turntable A.	2Z5748.22
I–101	LAMP, incandescent: 3.2 v, 0.16 amp; bulb T–3 1/4 clear; 1 3/16″ lg over-all; miniature bayonet base; GE #1490.	Indicates volume level.	2Z5878–10
I–102, I–103	LAMP, incandescent: 6 w, 115 v; bulb 6S–6 clear; 1 7/8″ lg over-all; candelabra base; GE #6S6.	I–102—Illuminates turntable A log scale. I–103—Illuminates turntable B log scale.	2Z5941
K–101a, b	RELAY, armature: SPDT; cont rating 15 amps; 1/4″ diam silver cont; single wound coil, 110 v DC, 6.5 ma operating, 3 ma release current, 15,500 ohms; insulated solder lug term on coil and cont; 2 1/16″ lg x 1 11/16″ wd x 2 1/8″ h; fast acting; Auto Elec type #R30.	Starts and stops recorder when operated by remote control unit.	2Z7587–180
K–102, K–103a, b, c, d, e	RELAY, armature: cont arrangement 4A; cont rating 15 amp; 11/16″ diam silver cont; single wound coil, 110 v DC, 7 ma operating current, 14,300 ohms, pol, insulated; 11-prong octal plug; 2″ diam x 2 1/4″ h; fast acting; Auto Elec type #R–45.	Controls selection of circuits on turntable B.	2Z7599A–21
R–205	RESISTOR, fixed: wire-wound; 24 ohms ±5%; 1/2 w; max body dimen 21/64″ lg x 15/64″ diam; axial wire leads; JAN type RU3B240J.	Avc voltage dropping resistor.	3RU1960
R–101	RESISTOR, variable (potentiometer): comp; 500,000 ohms ±20%; 2 w; 3 solder lug term; molded bakelite base; 1 1/8″ diam x 1/2″ d; round metal shaft 1/4″ diam x 1 1/8″ lg; type C taper; bushing 3/8″ diam x 3/8″ lg; IRC midget size type D.	Controls playback volume.	3Z7498–50.71
H–102	SCALES, weighing: avoidupois; lever balance; counterbalance type; max and min calibration 4 1/2 to 5 1/2 oz; 3.46″ lg x 1/4″ wd x 0.046″ thk over-all; steel; slide bar indicator; Soundscriber part/dwg #8–967A.	Measures reproducer head weight.	6Z8078–4
H–103	SCALES, weighing: avoirdupois; lever balance; counterbalance type; max and min calibration 6 1/2 to 7 1/2 oz in 1/8-oz divisions; 3.46″ lg x 1/4″ wd x 0.046″ thk over-all; steel; slide bar indicator; indicator line marked T and H; Soundscriber part/dwg #8–968A.	Measures weight of recorder head.	6Z8078–3
H–111	SCREW, adjustment: brass, cadmium pl; hex head; #3–48 thd; Soundscriber part/dwg #9–1323.	Adjusts position of reproducer head inside the shield.	6L4713
X–106, X–107	SOCKET, tube: octal, 11 cont; steel mtg plate molded in body; round, black bakelite body 7/64″ OD x 9/16″ thk; beryllium copper, silver pl cont; Amphenol #77M1P11.	Supports plug-in relays K–102 and K–103.	2Z8681.17
H–101	TEMPLATE: white vinylite; rectangular; 4.120″ lg x 0.5″ wd x 0.062″ thk; 7 calibration holes; Soundscriber part/dwg #8–309D.	Used to adjust outside stop, logging indicator, and clicker spring of the recorder arm.	6R36291

5. Identification Table of Replaceable Parts for Recorder-Reproducer AN/GNQ–8

Note. The following parts, in addition to the parts listed in paragraphs 6 and 7 below, constitute the replaceable parts for Recorder-Reproducer AN/GNQ–8.

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	RECORDER-REPRODUCER AN/GNQ–8: electromagnetic; uses 7″ plastic disk; w/amplifier, 2 thru 3 w; portable; 33 rpm; 12″ wd x 16″ d x 10½″ h; 115 v AC, 60 cyc, 115 w; high-impedance reproducer head; stylus not replaceable; fabrikoid covered, luggage type case.	Records and reproduces sound.	6C263–15
C–101A, C–101B, C–101C	CAPACITOR, fixed: electrolytic; 3 sect; 8-8-8 mf; 150 vdcw; 2″ lg x 1⅜″ diam; 4 solder lug term; Dubilier #UP7C584.	Decouples plate circuits of V–101 and V–102 from B supply.	3DB8–129
P–104	CONNECTOR, plug: 5 round pol male cont; straight; 1¾″ lg x ⅞″ wd x 3/32″ thk less cont; Jones HB #1405.	Connector plug for speaker receptacle.	2Z3025–42
E–102	KNOB: round; black bakelite; for ¼″ diam shaft; double #8–32 setscrew; 1⅝″ diam x ¾″ h; metal shaft hole insert; fluted; ½″ d shaft hole; w/metal pointer; Croname part #6465.	Rotates recording volume control shaft.	2Z5748.22
E–103	KNOB: round; black bakelite; for ¼″ diam shaft; double #8–32 setscrew; 1⅛″ diam x ⅝″ h; metal shaft hole insert; fluted; w/metal pointer; Croname #6462.	Rotates LISTEN-TALK shaft.	2Z5748.11
I–101	LAMP, incandescent: 2.9 v, 0.17 amp; bulb T–3¼ clear; 1⅛″ lg over-all; miniature bayonet base; white bead; Sylvania Prod #S–292–A.	Indicates volume level.	2Z5878–11
MI–301	MICROPHONE, dynamic: 50 ohms impedance; −52 db; freq response 50 to 7000 cyc; semidirectional; 3 3/16″ h x 3″ lg x 2¼″ wd; w/2 12″ lg wire leads; Turner Co type CD per dwg #A–80.	Converts sound into electric energy.	2B1745
R–205	RESISTOR, fixed: comp; 24 ohms ±5%; ½ w; max body dimen; 0.655″ lg x 0.249″ diam; axial wire leads; JAN type RC21BF240J.	Avc-voltage dropping resistor.	3RC21BF240J
R–101, R–119	RESISTOR, variable (potentiometer): comp; 500,000 ohms; ½ w; 3 solder lug term; body 1¼″ diam x 9/16″ d less term, shaft ¼″ diam x 2″ lg; bushing thd ⅜″–32 x ⅜″ lg, incl hardware for mtg; IRC type #CS 13–133.	R–101—Controls reproducer volume. R–119—Controls recording volume.	2Z7272–40
H–102	SCALES, weighing: avoirdupois; spring; hanging type; 0 to 1 oz in ⅛-oz divisions; 4 13/16″ lg x 9/16″ max diam; plastic body w/pointer indicator; exact weight scale "Post-a-lette" modified; Soundscriber #8–307M.	Measures reproducer head weight.	6Z8078–1
	SCREW, adjustment: brass; cadmium pl; hex head; #3–48 thd; Soundscriber part #9–1323.	Adjusts stylus head in reproducer shield.	6L4713
H–101	TEMPLATE: steel; 3 holes marked CLICKER 15 MIN; rectangular, 4 1/16″ lg x ¼″ wd x 5/64″ thk; Soundscriber #8–309.	Used to adjust outside stop, correction marker, and clicker spring of the recorder arm.	6Q45232

6. Identification Table of Replaceable Parts Common to Reproducer AN/GNQ–6 and Recorder-Reproducers AN/GNQ–7, –7A, and –8

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	CABLE, power: 2 #18 AWG cond ea comprising 41 #34 AWG strands, color-coded black and white; RC; Underwriters type #SJ.	Conductor for cable assembly.	1B818.14
W–401, W–301 (AN/GNQ–6)	CABLE ASSEMBLY, power: 2 cond type SV #18 AWG stranded; 300 v working; round 9/32″ max OD; 12 ft lg excluding term; w/Jones female plug #S306 CCT one end, Soundscriber #6–919 male plug other end; Soundscriber part/dwg #6–918A.	Connects recorder or reproducer to power line.	3E7350.1–144
C–113, C–114	CAPACITOR, fixed: mica; 510 mmf ±5%; 500 vdcw; 51/64″ lg 15/32″ wd x 7/32″ h; molded low-loss bakelite case; JAN type CM20B511J.	C–113—High frequency suppressor of V–101 cathode. C–114—High frequency suppressor.	3K2051122
C–111, C–117	CAPACITOR, fixed: paper; 5000 mmf ±10%; 600 vdcw; wax sealed cardboard case; 1¼″ lg x 13/32″ diam; wax impregnated; Dubilier type #DT6D5.	C–111—Playback coupling between V–101A and V–101B. C–117—Output stage oscillator suppressor.	3DA5–59.2
C–115	CAPACITOR, fixed: paper; 20,000 mmf +30% — 10%; 600 vdcw; HS metal can; 1 11/16″ lg x 11/16″ diam; JAN type CP26A1DF203M.	Coupling between V–101B and V–102A.	3DA20–195
C–116	CAPACITOR, fixed: electrolytic; 25 mf; 25 vdcw; 1¼″ lg x 11/16″ diam; HS metal case; Dubilier type #BR252A.	Bypasses V–101 cathode.	3DB25–14.1
C–112	CAPACITOR, fixed: electrolytic; 80 mf; 150 vdcw; 2⅝″ lg x 15/16″ diam; HS metal can; Solar #630.	Filters B supply.	3DB80–6
O–103	CLIP: special spring type; motor retainer; 7/16″ lg x 5/16″ wd x 3/16″ h; Holden #310A.	Provides spring suspension for turntable motor.	6C13A
P–401, P–301 (AN/GNQ–6)	CONNECTOR, plug: 2 flat parallel male cont; straight; 2″ lg x 1 1/16″ wd x ⅝″ thk; 10 amp 200 v, 15 amp 125 v; GE part #M–211.	Connects power cable to power receptacle.	6Z1735.7
P–101	CONNECTOR, plug: 3 round pol male cont; straight; ⅝″ diam x ⅝″ lg; Amphenol part #86–CP–3S.	Connects reproducer head Y–101 to amplifier.	2Z3023–58
W–401, W–301 (AN/GNQ–6)	CONNECTOR, plug: 6 rectangular pol female cont; straight; 1″ lg x 11/16″ wd x 1 1/16″ d; 5 amp, 45 v; Jones HB part #S–306CCT.	Connects power cord to power supply of amplifier.	2Z8639–7
J–102	CONNECTOR, receptacle: 2 rectangular pol female cont; straight; ¾″ lg x 21/32″ diam; 5 amp, 45 v; incl bkt for mtg; Jones HB part #S–302AB.	Connects avc unit to amplifier.	2Z7228.32
J–103	CONNECTOR, receptacle: 3 round pol female cont; straight; ¾″ diam x ⅞″ lg; 5 amp, 45 v; ⅝″ hole w/retainer ring; Amphenol part #3S.	Receptacle for reproducer and recorder heads (head on Reproducer AN/GNQ–6).	2Z8673.3
P–102	CONNECTOR, receptacle: 6 rectangular pol male cont; straight; 1″ lg x 11/16″ wd x ¾″ thk, set in recessed plate 1½″ diam; 5 amp, 45 v; Jones HB part #P–306RP.	Connects power cord to recorder (or reproducer).	2Z7116.2
O–101, O–103	COUPLING, flexible: drive; fabric disk riveted together between 4 metal rings; 1 7/16″ diam x ½″ thk; mts w/LH female thd ends to motor shaft and turntable; fabric disks are specially treated to increase rigidity; Soundscriber #3–23A.	Provides flexible coupling between motor and turntable.	4A2366–16/C5
F–101	FUSE FU–50: cartridge; 3 amp, 250 v; glass body; ferrule term; 1¼″ lg x ¼″ diam over-all.	Prevents overload damage.	3Z1950
	GASKET: paper; 3 mtg holes 0.093″ and 0.005″ diam; rectangular 0.010″ thk x 1.562″ lg x 0.978″ wd; Auburn Co. #1–6.	Prevents leakage of front gearbox lubricant on motor.	2Z4866.298
	GASKET: fiber velumoid; 3 mtg holes 0.171″ diam, 1/32″ thk x 1.234″ diam; Auburn Co. #6125.	Prevents leakage of motor well lubricant on motor.	2Z4866.297

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
O–119	HEAD, reproducer: electrical magnetic type; 50 ohms impedance; 2″ lg x 1¼″ wd x ⅝″ h; freq response 200 to 4000 cyc ± 4 db; single mtg screw #3–48 x ⅝″ lg; two insulated flexible wire leads from rear; Soundscriber part/dwg #4–148AD.	Converts mechanical energy into electrical energy.	6C26–20
	HINGE: spring type; steel; 0.970″ lg x 0.625″ wd x 0.003″ thk; 4 mtg holes 0.104″ diam; Greist Mfg Co #9–82.	Provides for vertical movement of reproducer head.	2Z5038–2
J–104	HOLDER, fuse: extractor post type; for single #3AG cartridge fuse; black bakelite body; 10 amp max; 2⅛″ lg x ⅝″ diam; red extractor post; Littelfuse #341001.	Holds fuse between contacts.	3Z3275
J–101	JACK, telephone: for 2 cond 0.25″ diam plug; 1⅝″ lg x 13/16″ wd x 1⅜″ d; Mallory #32851–4 and #702A.	Provides headset connection to amplifier output circuit.	2Z5534A.1
E–101	KNOB: octagon; brown bakelite; for ¼″ diam shaft; molded spring type shaft hole w/single #8–32 setscrew; vertical line on one face; 13/16″ wd across flats, 1/53″ h; shaft hole, 23/64″ d; Kurtz and Kash #S–280–7AAL.	Rotates reproducer volume control shaft.	2Z5823–5
B–101, B–102	MOTOR, AC: capacitor start induction; 0.02 hp, 33 rpm; open-frame type; splined shaft 1 9/32″ lg x 0.3705″ diam, spline 0.350″ to 0.354″ diam, 20 to 22 pitch; 4⅞″ lg x 2 5/16″ wd x 4 1/16″ h excluding shaft; shaft 0.3705″ diam, protrudes 7/32″ from frame; 110 v AC, 60 cyc, single ph, 0.17 amp; mtg of motor is adjustable; Soundscriber part/dwg #6010A. *Note.* Capacitor type motor is interchangeable with old type motor used with AN/GNQ–6, –7, and –8; stock No. 3H3000–83.	Drives turntable.	3H3000–149
R–102	RESISTOR, fixed: wire-wound; 100 ohms ±10%; 2 w; max body dimen 1 25/32″ lg x 11/32″ diam; axial wire leads; JAN type RU6B101K.	Provides bias voltage for V–103 and V–104.	3RU25606
R–103	RESISTOR, fixed: comp; 2000 ohms ±5%; ½ w; max body dimen 0.468″ lg x 0.249″ diam; JAN type RC20BF202J.	Provides cathode bias for V–101.	3RC20BF202J
R–104	RESISTOR, fixed: comp; 3900 ohms ±5%; ½ w; max body dimen 0.468″ lg x 0.249″ diam; JAN type RC20BF392J.	Provides cathode bias for V–102.	3RC20BF392J
R–105, R–114	RESISTOR, fixed: comp; 5100 ohms ±5%; ½ w; max body dimen 0.468″ lg x 0.249″ diam; JAN type RC20BF512J.	R–105—Part of feedback voltage divider. R–114—Decouples V–102 from B supply.	3RC20BF512J
R–106	RESISTOR, fixed: comp; 30,000 ohms ±5%; ½ w; max body dimen 0.468″ lg x 0.249″ diam; JAN type RC20BF303J.	Decouples V–101B from B supply.	3RC20BF303J
R–107, R–113, R–115, R–116	RESISTOR, fixed: comp; 100,000 ohms ±10%; ½ w; max body dimen 0.468″ lg x 0.249″ diam; JAN type RC20BF104K.	R–107—Decouples V–101A from B supply. R–113—Suppresses V–102A control grid. R–115—Loads V–101A plate. R–116—Loads V–101B plate.	3RC20BF104K
R–108, R–112	RESISTOR, fixed: comp; 150,000 ohms ±5%; ½ w; max body dimen 0.468″ lg x 0.249″ diam; JAN type RC20BF154J.	R–108—Divides feedback voltage. R–112—Loads control grid of V–102B.	3RC20BF154J
R–109, R–117	RESISTOR, fixed: comp; 240,000 ohms ±5%; ½ w; max body dimen 0.468″ lg x 0.249″ diam; JAN type RC20BF244J.	R–109—Loads V–102B plate. R–117—Loads V–102A plate.	3RC20BF244J
R–110, R–111	RESISTOR, fixed: comp; 510,000 ohms ±5%; ½ w; max body dimen 0.468″ lg x 0.249″ diam; JAN type RC20BF514J.	R–110—Loads V–104 control grid. R–111—Loads V–103 control grid.	3RC20BF514J

Ref symbol	Name of part and description	Function of part	Signal Corps stock No
X–101, X–102, X–103, X–104, X–105	SOCKET, tube: wafer, octal; 8 medium cont; under chassis mtg; laminated plastic body, 1 13/16″ lg x 1 3/8″ wd x 1/8″ thk; phosphor-bronze silver pl cont; Franklin AW part #39M–1–EL.	Supports tubes and provides connecting terminals for tube elements.	2Z8678.66
	SPRING: flat; spring steel, blued, cad pl; 1/2″ wd x 1 1/4″ lg x 0.015″ thk; 2 mtg holes 0.192″ diam and 0.250″ diam; Soundscriber part #3–16.		6C293B–12
O–114	SPRING: helical extension type; counterbalance spring for reproducer head; 0.014″ diam music wire; 2 3/4″ lg extended, 1 1/2″ lg x 0.143″ OD; full loop at side 0.125″ ID; Soundscriber part/dwg #9–30B.	Counterbalances reproducer head weight.	6C293B–9
O–107	SPRING: helical extension type, for neutralizing reproducer head; 0.010″ diam music wire; 1 13/16″ lg x 0.144″ diam; 10 turns, close wound, 1 9/16″ tail one end, hook term other end; Soundscriber part/dwg #4–287B.	Neutralizes reproducer head.	6C293B–10
	STUD: steel, copper flash pl; 1 5/8″ lg overall; Soundscriber part #9–1239.		6C294–B
T–101	TRANSFORMER, AF: input type; pri 50 ohms, secd 50,000 to 55,000 ohms impedance; fully shielded steel case; 1 1/8″ h x 7/8″ wd x 1 3/8″ lg, mtg base; 1 mw operating level; 30:1 turns ratio; freq response 100 to 4000 cyc ±2 db; 4 flexible wire leads 6″ lg, one shielded lead; Permaflux #PT2–303.	Couples input circuits to amplifier.	2Z9631.167
T–102	TRANSFORMER, AF: output type; pri 5000 ohms CT, secd #1–500 ohms, #2–6 ohms impedance; open type steel frame; 2 7/8″ d x 1 3/4″ wd x 1 5/8″ h overall; 4 w operating level; 30:1 turns ratio ; freq response 100 to 4000 cyc ±2 db; electrostatic shielding; pri, three 3 3/8″ lg flexible wire leads, secd #1, two 6 7/8″ lg flexible wire leads, secd #2, two solid copper wire leads 4 1/4″ lg, Freed #13731.	Couples amplifier to various output circuits.	2Z9632.237
V–101, V–102	TUBE, electron: JAN–12SC7.	V–101—Voltage amplifier. V–102—Driver and phase inverter.	2J12SC7
V–103, V–104	TUBE, electron: JAN–35L6GT.	V–103—Output tube. V–104—Output tube.	2J35L6GT/G
V–105	TUBE, electron: JAN–35Z5GT.	Rectifier tube.	2J35Z5GT/G
H–107	WASHER, flat: steel; round; 0.144″ ID, 3/8″ OD x 0.31″ thk; Soundscriber part #9–69.	Part of studs on turntable motor.	6L58022–10

7. Identification Table of Replaceable Parts Common to Recorder-Reproducers AN/-GNQ–7, –7A, and –8

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
H–104	BENDER, stylus: steel, black oxidized; 5 1/2″ lg x 1/4″ wd x 3/16″ thk; slot at one end 1/16″ wd x 1/2″ lg; Soundscriber part/dwg #8–312.	Adjust diamond stylus angle.	4A2366/B2
C–118	CAPACITOR, fixed: paper; 2000 mmf +30% –20%; 600 vdcw; cardboard case; 1 1/4″ lg x 13/32″ diam: Dubilier type #DT–6D2.	Recording coupling between V–101A and V–101B.	3DA2–147.1
C–204	CAPACITOR, fixed: paper; 1 mf +20% –10%; 400 vdcw; wax sealed cardboard case; 2 1/2″ lg x 1 1/16″ diam; Aerovox type #484.	Telephone input blocking capacitor.	3DB1.484–3
C–201	CAPACITOR, fixed: electrolytic; 25 mf; 25 vdcw; 1 1/4″ lg x 11/16″ diam; HS metal case; Dubilier type #BR–252A.	Bypasses high frequencies in avc circuit feed.	3DB25–14.1

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
C–202, C–203	CAPACITOR, fixed: electrolytic; 100 mf; 6 vdcw; 1 1/16″ lg x 5/8″ diam; HS metal case w/mtg strap; Dubilier type #BRH601.	Filter rectified avc energy.	3DB100–10
P–103	CONNECTOR, plug: 3 round pol male cont; straight; 5/8″ diam x 7/8″ lg; Amphenol #86–CP–3S.	Connects recorder head Y–102 to amplifier.	2Z3023–58
P–201, P–202	CONNECTOR, plug: 2 rectangular pol male cont; straight; 11/16″ lg x 21/32″ diam over-all; 5 amp, 45 v; Jones HB part #P–302–CCT.	Connects input and output of recorder to avc unit.	2Z7228–19
P–203, P–301	CONNECTOR, plug: 4 rectangular pol male cont; straight; 3/4″ lg x 1 1/16″ wd x 15/16″ d; 5 amp, 45 v; Jones HB part #P–304–CCT.	P–203—Connects avc unit to amplifier. P–301—Connects microphone to amplifier.	2Z7228.9
J–202	CONNECTOR, receptacle: 2 rectangular pol female cont; straight; 1 5/16″ lg x 27/32″ diam over-all; 5 amp, 45 v; Jones HB part #S–302–CCT.	Connects avc unit to amplifier.	2Z3063–9
J–105	CONNECTOR, receptacle: 3 round pol female cont; straight; 3/4″ diam x 7/8″ lg; 5 amp, 45 v; 5/8″ hole w/retainer ring; Amphenol part #S3S.	Connects recorder head Y–102 to amplifier.	2Z8673.3
J–107	CONNECTOR, receptacle: 4 rectangular pol female cont; straight; 3/4″ thk x 3/4″ lg x 1 1/16″ wd; 5 amp, 45 v; Jones HB part #S–304AB.	Connects avc unit to amplifier.	2Z8639–11
J–201	CONNECTOR, receptacle: 4 rectangular pol female cont; straight; 3/4″ lg x 1 1/16″ wd x 15/16″ d; 5 amp, 45 v; w/cable clamp; Jones HB part #S–304–CCT.	Connects microphone to amplifier.	2Z8674.26
J–106	CONNECTOR, receptacle: 5 round pol female cont; straight; 2 1/8″ lg x 5/8″ wd x 3/4″ d, includes cont flat phenolic body; Jones HB part #1405.	Connects loud-speaker to amplifier.	2Z3066–79
W–301	CORD, microphone: two #20 AWG stranded copper cond; 10 #30 AWG strands ea cond; shielded; one cond covered w/black rubber, one cond covered w/red rubber; 300 v working; cotton braid w/black rubber outer jacket; 0.255″ max OD; 12 ft lg; Whitney Blake #10/30T.	Connects microphone to avc unit.	3E3158–1
	DISK, blank recording: green, acetate base; 7″ diam over-all, one square shape center hole; approx 0.010″ thk; for 15-min recording on both sides; Soundscriber #54–M–24980.	Recording medium.	6C15–4
O–120, O–121	HEAD, recorder: magnetic type; 4 ohms impedance; 3″ lg x 1 1/4″ wd x 7/8″ h; freq response 200 to 4000 cyc ±4 db; mtg hole for #4 x 1/4″ screw w/one slot for #2 x 5/16″ screw; two insulated flexible shielded leads from rear w/plug; Soundscriber part #5–123A.	Converts audio signals into lateral stylus movement.	6C26–19
	HINGE: spring type; steel; 1 1/4″ lg x 0.50″ wd x 0.006″ thk; slot in center 1/16″ wd x 3/4″ lg; Greist Mfg Co #5–54.	Provides for vertical movement of recorder head.	2Z5038–1
CR–201, CR–202	RECTIFIER, metallic: copper oxide; max input 2.9 v AC; output DC 10 ma, halfwave, variable impedance; 1/2″ wd x 13/16″ h x 3/4″ d overall; Bradley Lab #GO–121–H.	Converts ac to dc.	3H4811–1
R–204	RESISTOR, fixed: wire-wound; 10 ohms ±10%; 1/2 w; max body dimen 21/64″ lg x 15/64″ diam; axial wire leads; JAN type RU3B100K.	Avc loading resistor.	3RU16003
R–206	RESISTOR, fixed: wire-wound; 68 ohms ±10%; 1/2 w; max body dimen 21/64″ lg x 15/64″ diam; axial wire leads; JAN type RU3B680K.	Avc loading resistor.	3RU24001
R–203	RESISTOR, fixed: wire-wound; 200 ohms ±5%; 1/2 w; max body dimen 21/64″ lg x 15/64″ diam; axial wire leads; JAN type RU3B201J.	Avc filter resistor.	3RU28403
R–208	RESISTOR, fixed: comp; 510 ohms ±5%; 1/2 w; 0.468″ lg x 0.249″ diam; JAN type RC20BF511J.	Avc voltage divider.	3RC20BF511J

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
R–118, R–120, R–201, R–202	RESISTOR, fixed: comp; 1000 ohms ±10%; ½ w; max body dimen 0.468″ lg x 0.249″ diam; JAN type RC20BF102K.	R–118—Increases filament voltage on V–103, V–104, and V–105. (On AN/GNQ–7A, R–118 increases control grid load on V–101B.) R–120—Tunes feedback circuit. R–201 and R–202—Isolate avc circuit from telephone input.	3RC20BF102K
R–121	RESISTOR, fixed: comp; 5100 ohms ±5%; ½ w; max body dimen 0.468″ lg x 0.249″ diam; JAN type RC20BF512J.	Voltage divider in feedback circuit.	3RC20BF512J
R–207	RESISTOR, variable (potentiometer): comp; 500 ohms ±20%; 2 w; 3 solder lug term; molded bakelite base 1″ diam x ½″ d; slotted shaft ¼″ diam x ⅜″ lg; type C taper; bushing ⅜″ diam x ¼″ lg; IRC midget size type D.	Controls avc voltage input to amplifier.	3Z7250–48
H–103, H–105	SCALES, weighing: avoirdupois; spring; hanging type; 0 to 8 oz in ½-oz divisions; 4¾″ lg x ½″ diam w/cap; plastic body; Soundscriber #8–306.	Measures recorder head weight.	6Z8078
LS–101	SPEAKER, dynamic: cone 3″ diam; input 0.5 w normal, 3 w peak; voice coil, 3.2 ohms impedance at 400 cycles; 3 7/16″ lg x 3 7/16″ wd x 1⅞″ d; Utah type #V3A2, #SA12453, #3PY–2.	Converts electric energy intc sound.	6C43–29
S–102 a, b, c, d, e	SWITCH, rotary: 5 pole 3 position; 2 section; brass, silver plated cont; bakelite body; 1 13/16″ wd x 1⅞″ lg x ¼″ thk; Oak #20617–QH2.	Selects either recording or playback circuit.	3Z9826–30
S–103	SWITCH, toggle: DPDT; 125 v 6 amp, 250 v 3 amp; black phenolic body; 23/32″ wd x 1 9/32″ lg; bat type handle 1 1/16″ lg; normally open; 4 solder lug term; 15/32″–32 x ¼″ lg bushing; JAN type ST13V.	Starts and stops turntable B and controls relay K101.	3Z9863–13V
S–201	SWITCH, toggle: DPDT; 125 v 6 amp, 250 v 3 amp; black phenolic body; 23/32″ wd x 23/32″ d x 1 9/32″ lg; bat type handle 1 1/16″ lg; normally open; 6 solder lug term; 15/32″–32 x 15/32″ lg bushing; JAN type ST22N.	Selects either microphone or telephone input to amplifier.	3Z9849.135
T–201	TRANSFORMER, AF: output type; pri 500 ohms, secd 1000 ohms impedance; open type steel frame; 2 15/16″ d x 1½″ wd x 1 11/16″ h over-all; 3:1 turns ratio; freq response 100 to 4000 cyc ± 2db; 5 color-coded flexible insulated wire leads; Freed #Q1552.	Couples telephone or radio to amplifier input.	2Z9631.156

8. Identification Table of Replaceable Parts Common to Recorder-Reproducers AN/GNQ–7 and –7A

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
C–126	CAPACITOR, fixed: mica; 510 mmf ±5%; 500 vdcw; 51/64″ lg x 15/32″ wd x 7/32″ h; molded low-loss bakelite case; JAN type CM20B511J.	High frequency suppressor of V–101A plate.	3K2051122
C–102, C–103, C–104, C–105, C–106, C–107, C–110, C–119 thru C–125	CAPACITOR, fixed: paper; 50,000 mmf +30% −10%; 600 vdcw; HS metal can; 1 13/16″ lg x 11/16″ diam; JAN type CP26A1DF503M.	C–102—Couples ground of input to metal chassis. C–103—Couples ground to metal chassis. C–104—Couples V–102B to V–104. C–105—Couples V–102A to V–105. C–106—Couples one side of 500-ohm line to ground. C–107—Suppresses high frequencies on plate of V–101A. C–110—Suppresses arc between K–101B contacts. C–119—Tunes the feedback circuit. C–120—Suppresses arc across S–106 contacts. C–121—Suppresses arc across K–102B contacts. C–122—Suppresses arc across K–103B contacts. C–123—Suppresses arc across S–105 contacts. C–124—Suppresses arc across S–108 contacts. C–125—Suppresses arc across S–103 contacts.	3DA50–3B
P–104	CONNECTOR, plug: 3 round pol male cont; straight; 5/8″ diam x 7/8″ lg; Amphenol part #CP–3S.	Connects recorder head Y–103 to amplifier.	2Z3023–58
P–501	CONNECTOR, plug: 3 rectangular pol male cont; straight; 1″ lg x 15/16″ d x 7/16″ wd overall; 5 amp, 45 v; Jones HB #P–303–CCT.	Connects remote control unit to recorder.	2Z7113.12
P–105	CONNECTOR, plug: 5 round pol male cont; straight; 1 3/4″ lg x 7/8″ wd x 3/32″ thk less cont; Jones HB part #1405.	Speaker plug connector.	2Z3025–42
J–108	CONNECTOR, receptacle: 3 rectangular pol female cont; straight; 1″ lg x 3/4″ d x 7/16″ wd; 5 amp max, 45 v; incl cable clamp; Jones HB #S–303AB.	Connects remote control unit to amplifier.	2Z8673.19
J–111	CONNECTOR, receptacle: 3 round pol female cont; straight; 3/4″ diam x 7/8″ lg; 5 amp, 45 v; 5/8″ hole w/retainer ring; Amphenol part #S3S.	Connects recorder head Y–103 to amplifier.	2Z8673.3
J–109	CONNECTOR, receptacle: 4 rectangular pol female cont; straight; 3/4″ lg x 11/16″ wd x 15/16″ d; 5 amp, 45 v; w/cable clamps; Jones HB part #S–304CCT.	Connects turntables A and B.	2Z8674.26
P–106	CONNECTOR, receptacle: 4 rectangular pol male cont; straight; 3/4″ lg x 11/16″ wd x 3/4″ d; 5 amp, 45 v; retangular bakelite body set in round steel recessed plate; Jones HB part #P–304RP.	Connects turntables A and B.	2Z7114.15
J–110	CONNECTOR, receptacle: Sig C Plug PL–237; 8 rectangular pol female cont; straight; 1 1/4″ lg x 11/16″ wd x 13/32″ d; 5 amp, 45 v; Jones HB part #S308CCT.	Connects turntables A and B.	2Z7226–237

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
P–107	CONNECTOR, receptacle: 8 rectangular pol male cont; straight; 1¼″ lg x 11/16″ wd x ¾″ d; 5 amp, 45 v; rectangular bakelite body set in round steel recessed plate; Jones HB part #P–308–RP.	Connects turntables A and B.	2Z7118.30
I–501	LAMP, glow: 105–125 v, ¼ w; bulb T–4½ clear; 1½″ lg over-all; candelabra screw base; GE #47.	Indicates remote control unit operation.	2Z5889–13
MI–301	MICROPHONE, dynamic: 10 ohms impedance; −52 db; freq response 300 to 3500 cyc; semi-directional; 3 7/16″ lg x 2¾″ wd x 2 7/16″ h over-all; incl 12-ft rubber-shielded cable w/4 prong Jones male connector; Soundscriber part/dwg #8–89AE.	Converts sound into electric energy.	2B1755–4
Q–301	MICROPHONE ELEMENT: dynamic; low impedance, 10 ohms; freq response 300 to 3500 cyc; −52 db; approx 2″ diam x ⅞″ h; Telephonics type #DM–101.	Converts sound into electric energy.	2B1772
O–112, O–113	PLATE, friction: steel; approx 1 47/64″ wd x 1⅝″ lg x 0.005″ thk; Greist Mfg Co #5–154.	O–112—Locks feed on recorder arm on turntable B. O–113—Locks feed on recorder arm on turntable A.	6C177–3
R–119	RESISTOR, variable (potentiometer): comp; 500,000 ohms ±20%; 2 w; 3 solder lug term; molded bakelite base 1⅛″ diam x ½″ d; round metal shaft ¼″ diam x ⅜″ lg; type C taper; bushing ⅜″ diam x ¼″ lg; IRC midget size type D.	Controls recording voltage fed to recorder head.	3Z7498–50.72
H–112	SLEEVE, coupling: steel, copper flash; 0.375″ lg x 0.125″ wd x 1″ thk over-all; Soundscriber part/dwg #9–971.	Lifts reproducer head.	6C284
O–110	SPRING: helical compression type; 0.080″ diam music wire; 0.37″ free lg. bottom 0.62″ ID, top 0.28″ ID; 3 turns; Soundscriber part/dwg #1–26.	Provides tension for turntable B clutch.	6C293B–11
S–106, S–108	SWITCH, push: 1 amp, 125 v; laminated fiber body w/steel case; 1⅛″ lg x ½″ d x ½″ wd; momentary action, normally open; 2 solder lug term; bushing 7/16″ lg x 15/32″–32; AH&H #3391.	S–106—Actuates relay K–102. S–108—Actuates relay K–103.	3Z9824–250
S–104, S–105, S–107, S–109	SWITCH, sensitive: SPDT; 10 amp, 125 v AC; phenolic body; 2.406″ lg x 11/16″ wd x ¾″ h from mtg/-c to top of leaf; leaf actuated; one cont normally closed, one normally open; JAN type SS04A10.	S–104—De-energizes relay K–102. S–105—De-energizes relay K–103. S–107—Actuates relay K–103. S–109—Actuates relay K–102.	3Z9558–39.2
S–501	SWITCH, toggle: DPDT; 6 amp, 125 v; 3 amp, 250 v; black phenolic body; 23/32″ wd x 23/32″ d x 1 9/32″ lg; bat type handle 11/16″ lg; normally open; 4 solder lug term; JAN type ST13V.	Starts and stops turntable B and controls relay K–101 (remote control).	3Z9863–13V
H–117, H–118	WASHER, flat: black fiber; round, 0.255″ ID, ⅝″ OD; Soundscriber part #9–1155.	Part of lifting posts of turntables A and B.	6L50524–16
H–109, H–110	WASHER, flat: black fiber; round, 0.255″ ID, ⅞″ OD x 1/32″ thk; Soundscriber part #1–23.	Part of spindles of turntables A and B.	6L50524–17

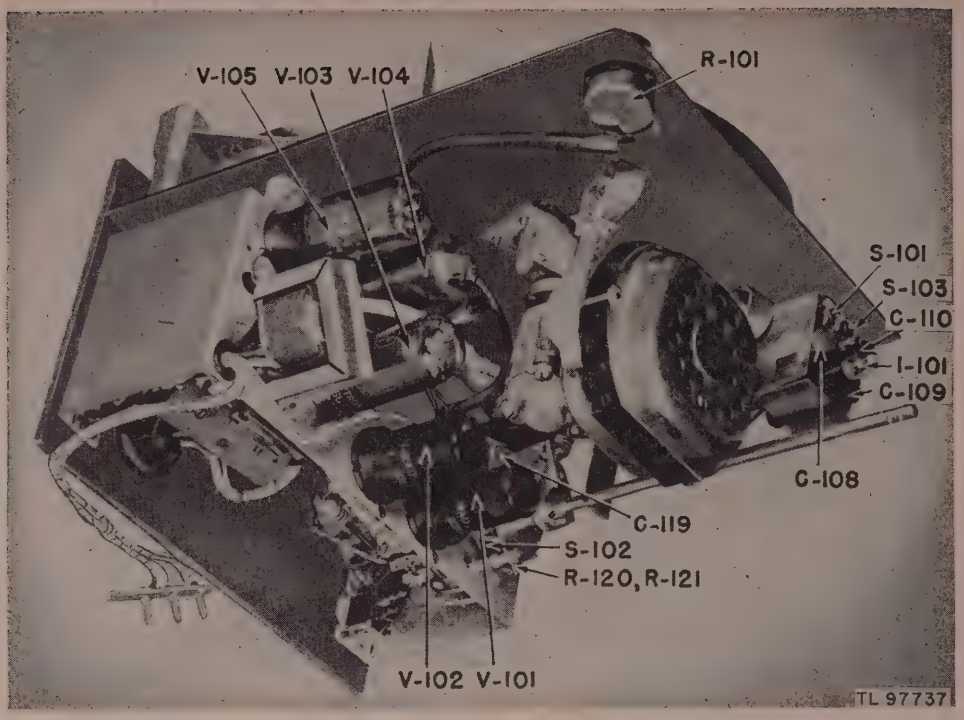


Figure 39. Recorder-Reproducer AN/GNQ–8, amplifier parts.

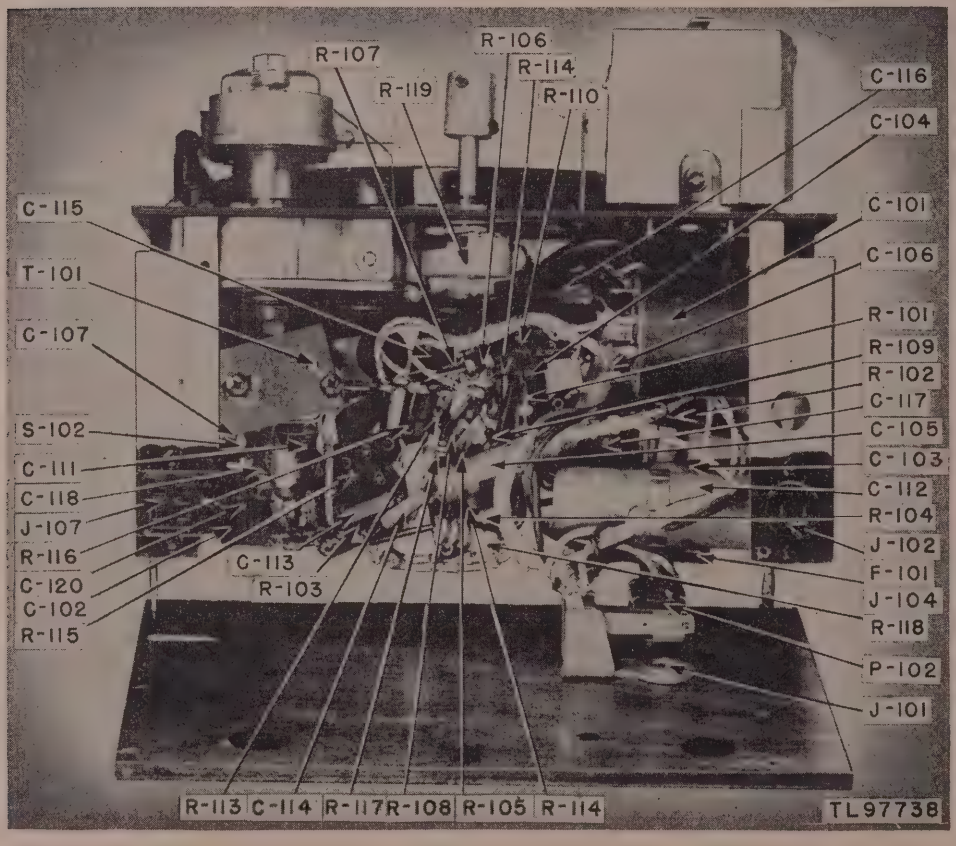


Figure 40. Recorder-Reproducer AN/GNQ–8, amplifier parts.

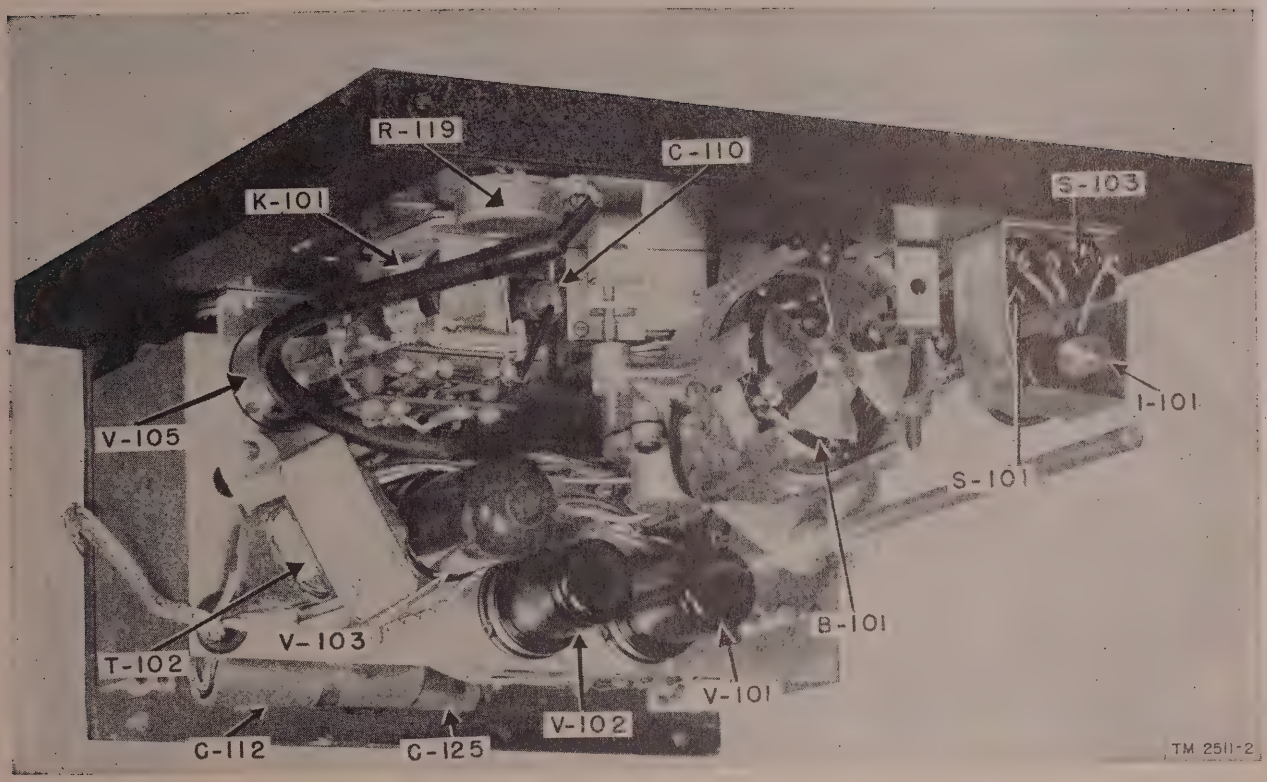


Figure 41. Recorder-Reproducer AN/GNQ-7A, amplifier parts.

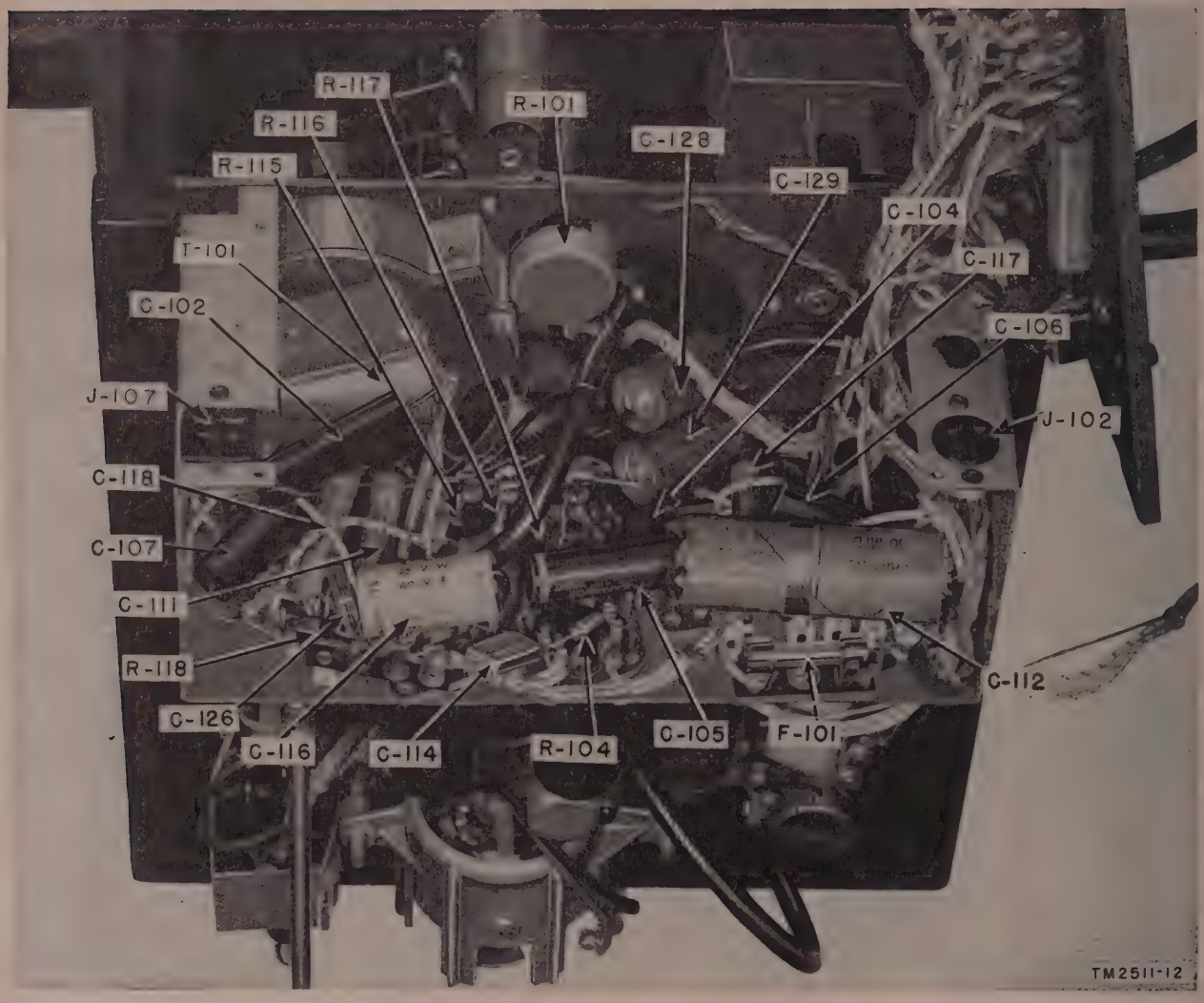


Figure 42. Recorder-Reproducer AN/GNQ-7A, amplifier parts.

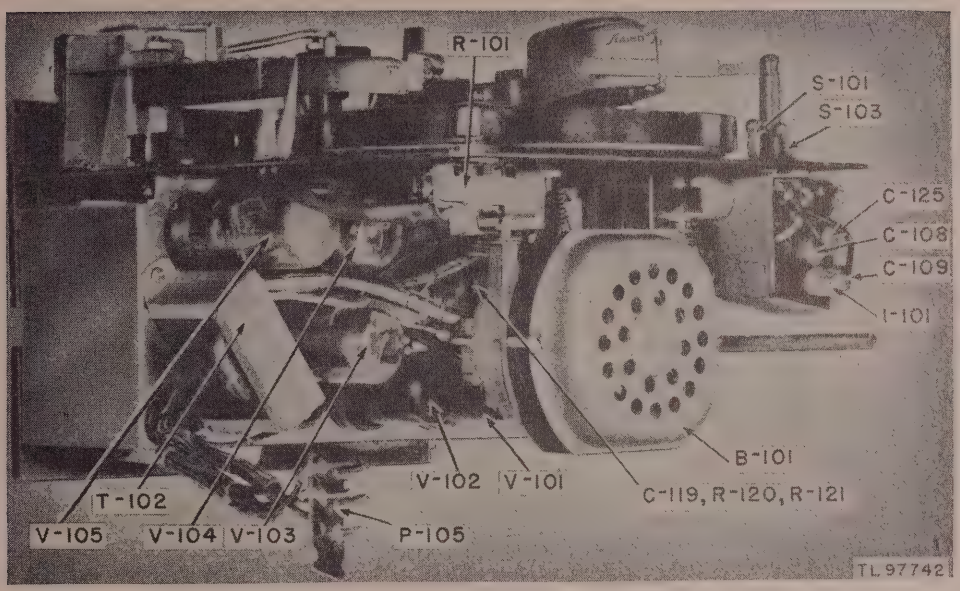


Figure 43. Recorder-Reproducer AN/GNQ-7, amplifier parts.

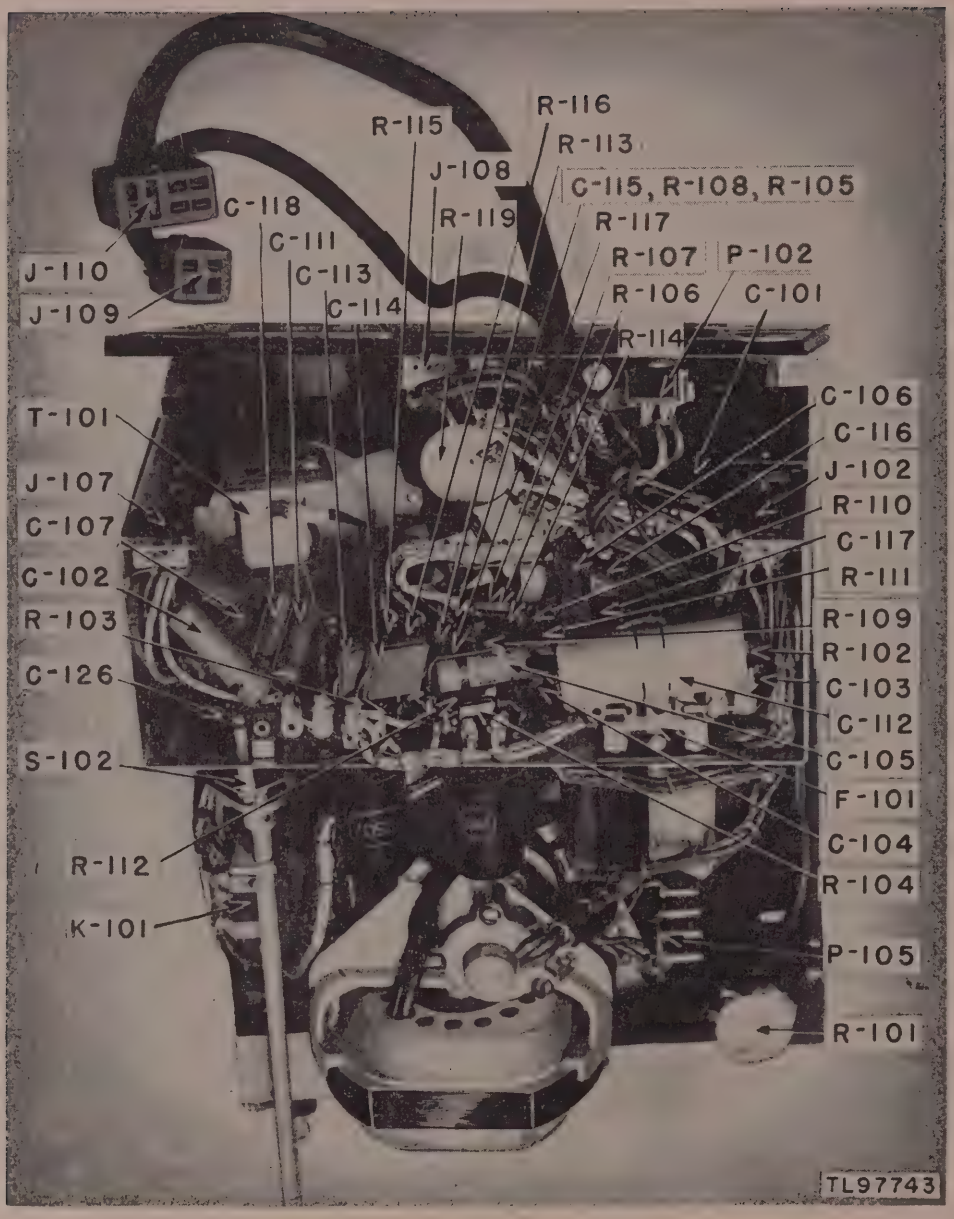


Figure 44. Recorder-Reproducer AN/GNQ–7, amplifier parts.

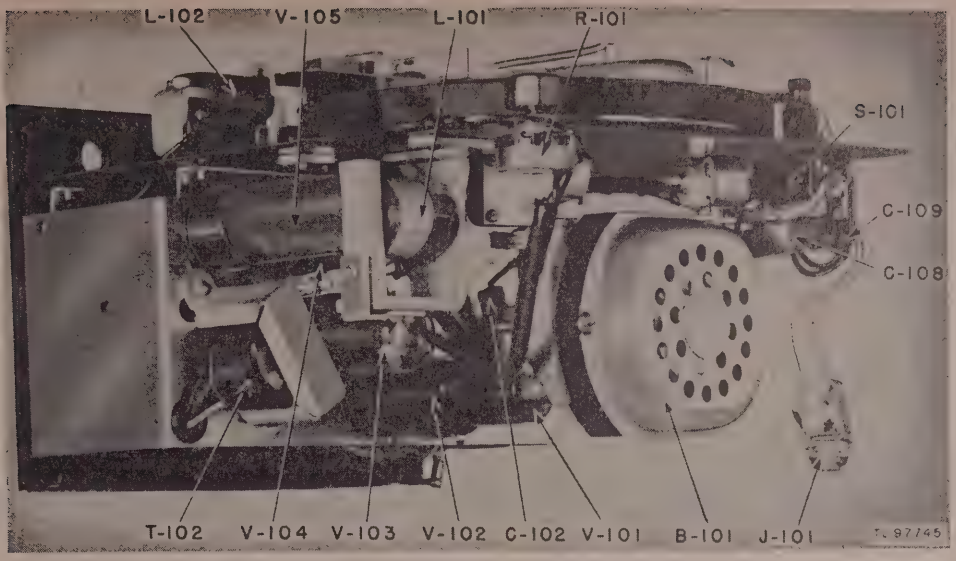


Figure 45. Reproducer AN/GNQ–6, amplifier parts.

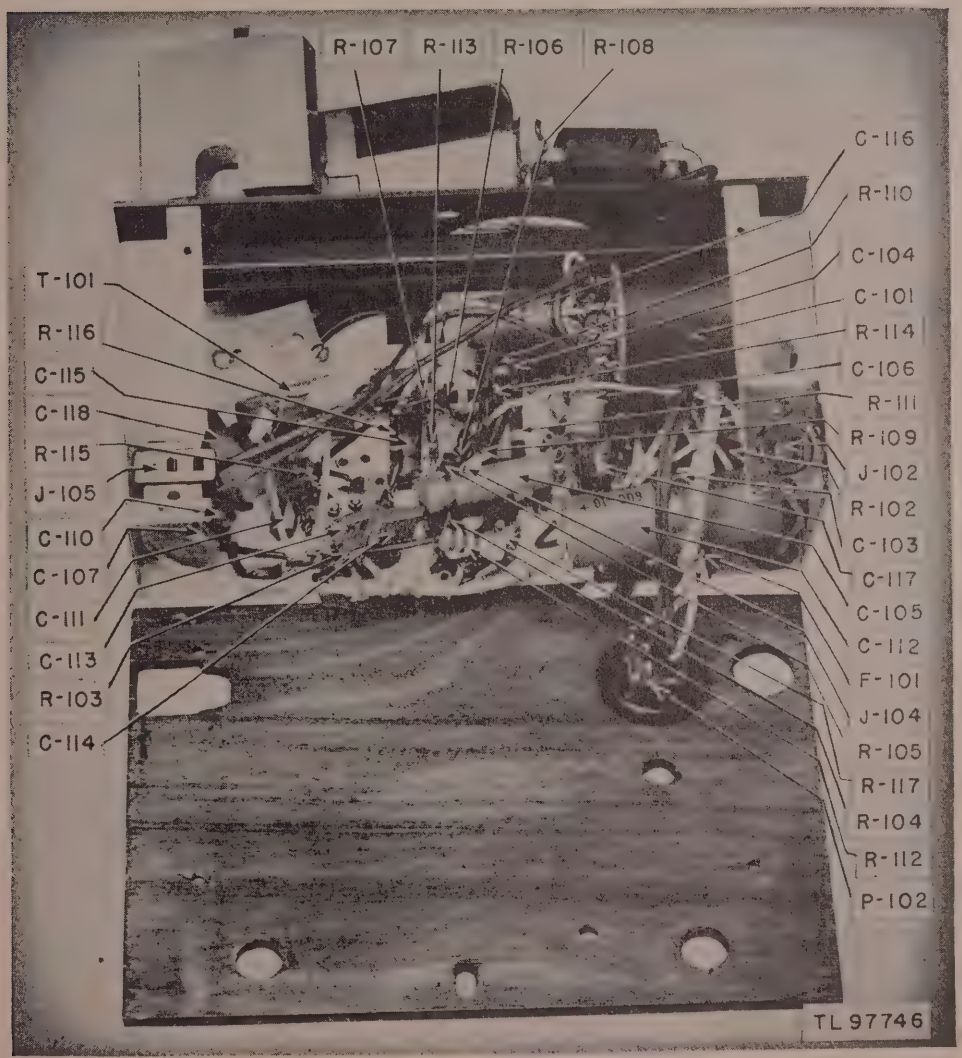


Figure 46. Reproducer AN/GNQ–6, amplifier parts.

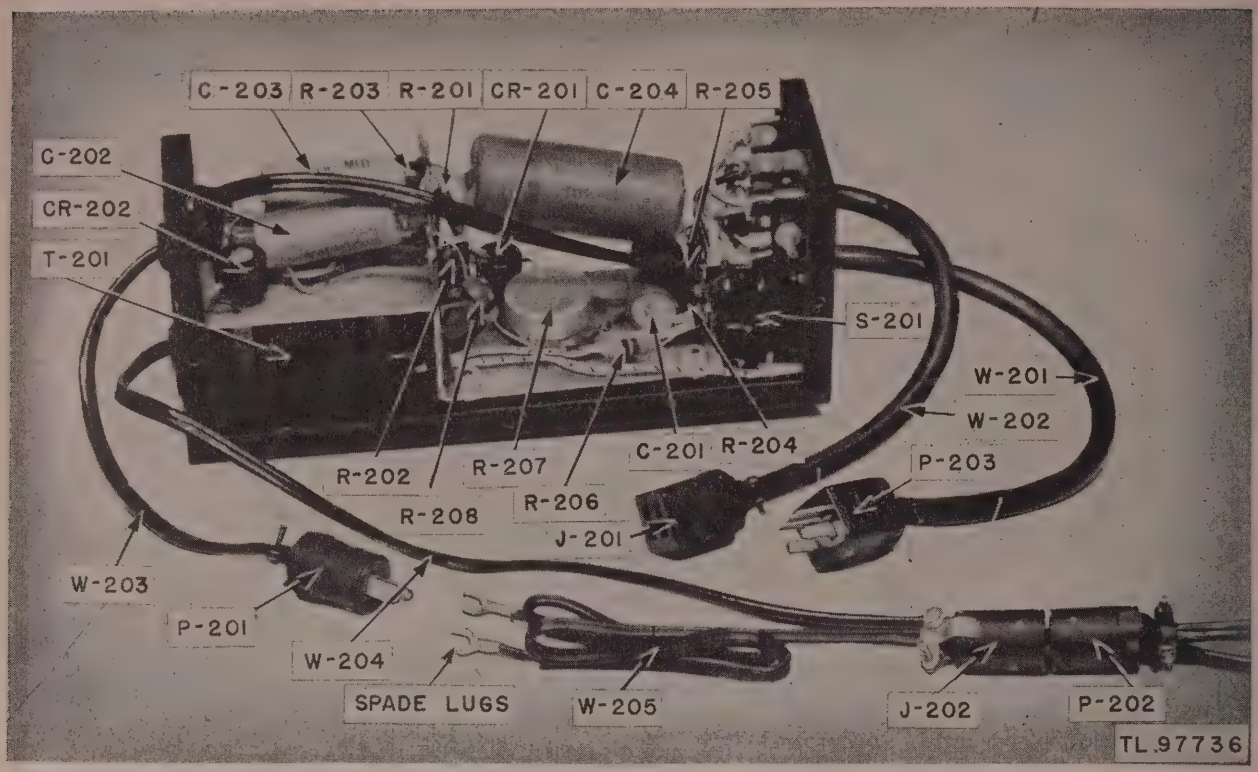


Figure 47. A-v-c unit, interior view showing parts.

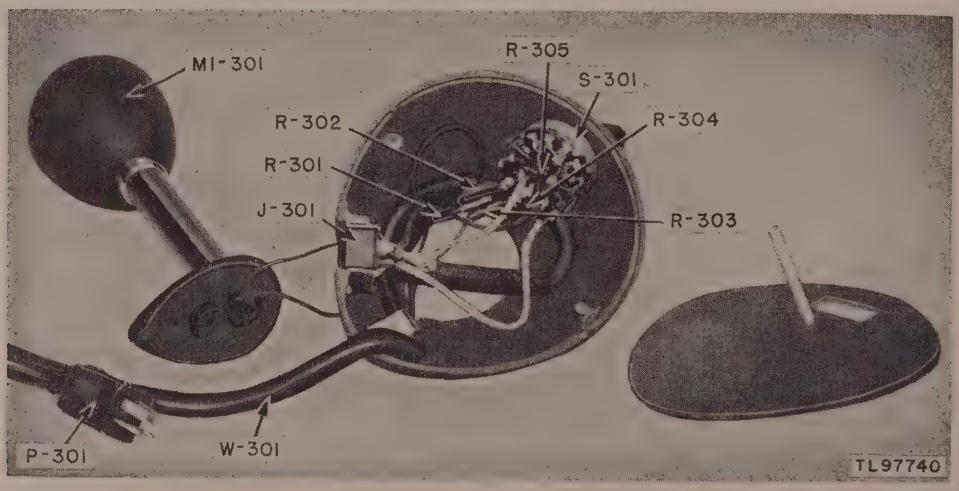
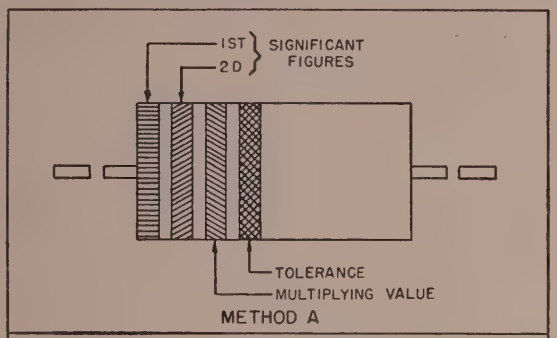
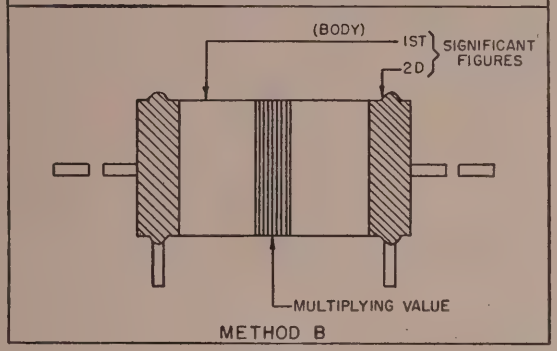


Figure 48. Microphone MI-301, parts in base.

RESISTOR COLOR CODES

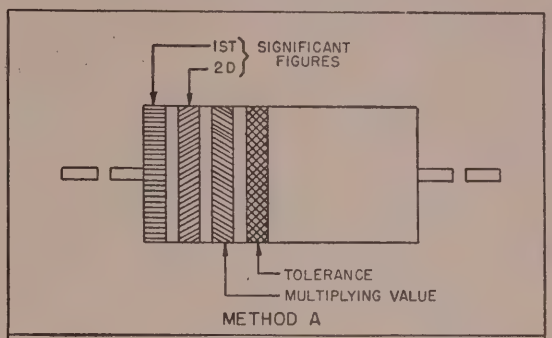
RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS*

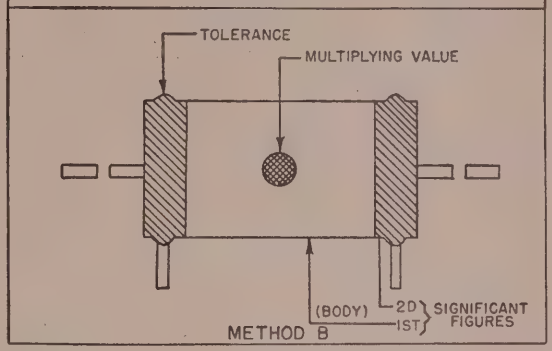




A

JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS≠





B

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

NOTES

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

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

RMA: RADIO MANUFACTURERS ASSOCIATION

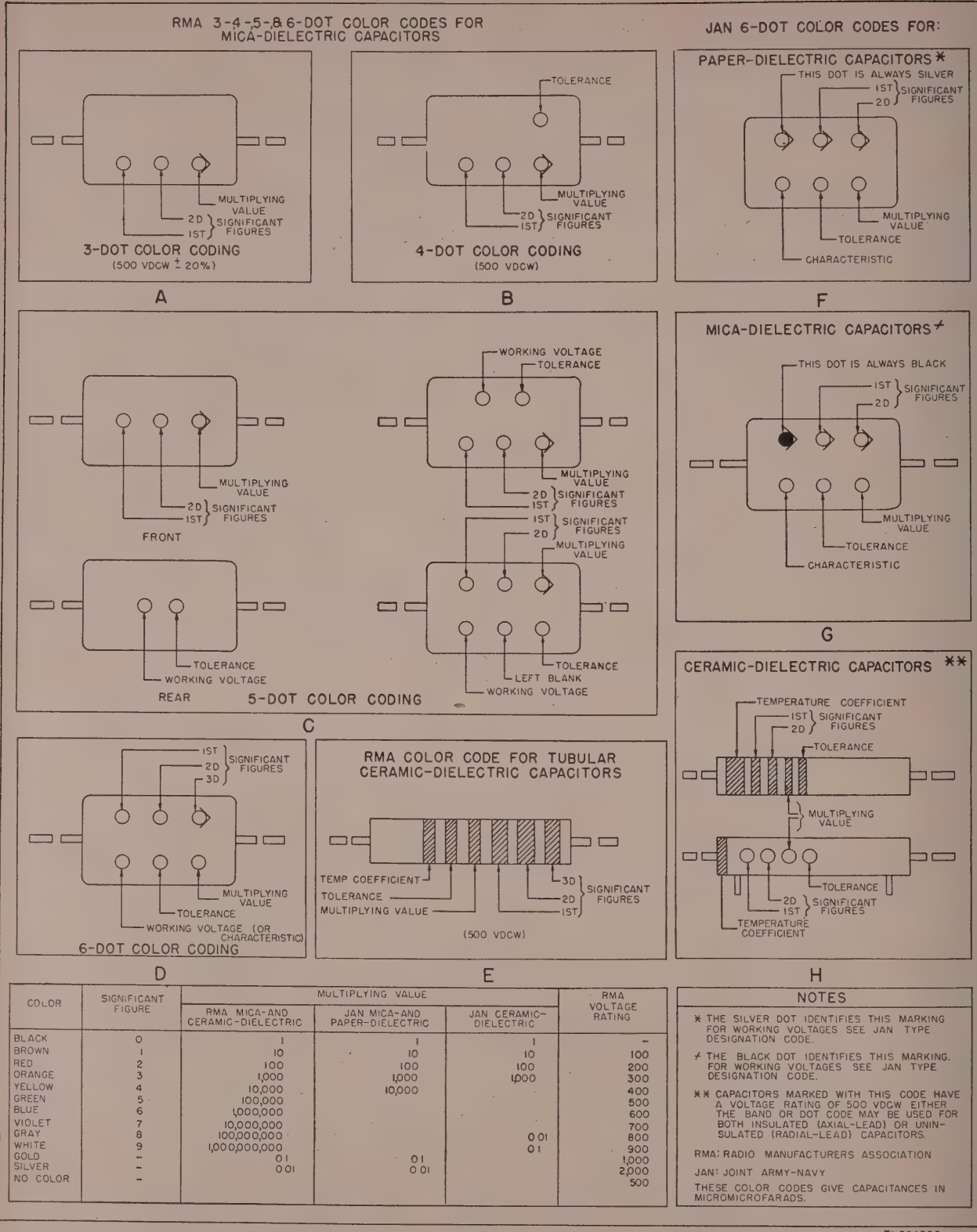
JAN: JOINT ARMY-NAVY

THESE COLOR CODES GIVE ALL RESISTANCE VALUES IN OHMS.

TL32454S

Figure 49. Resistor color code.

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.

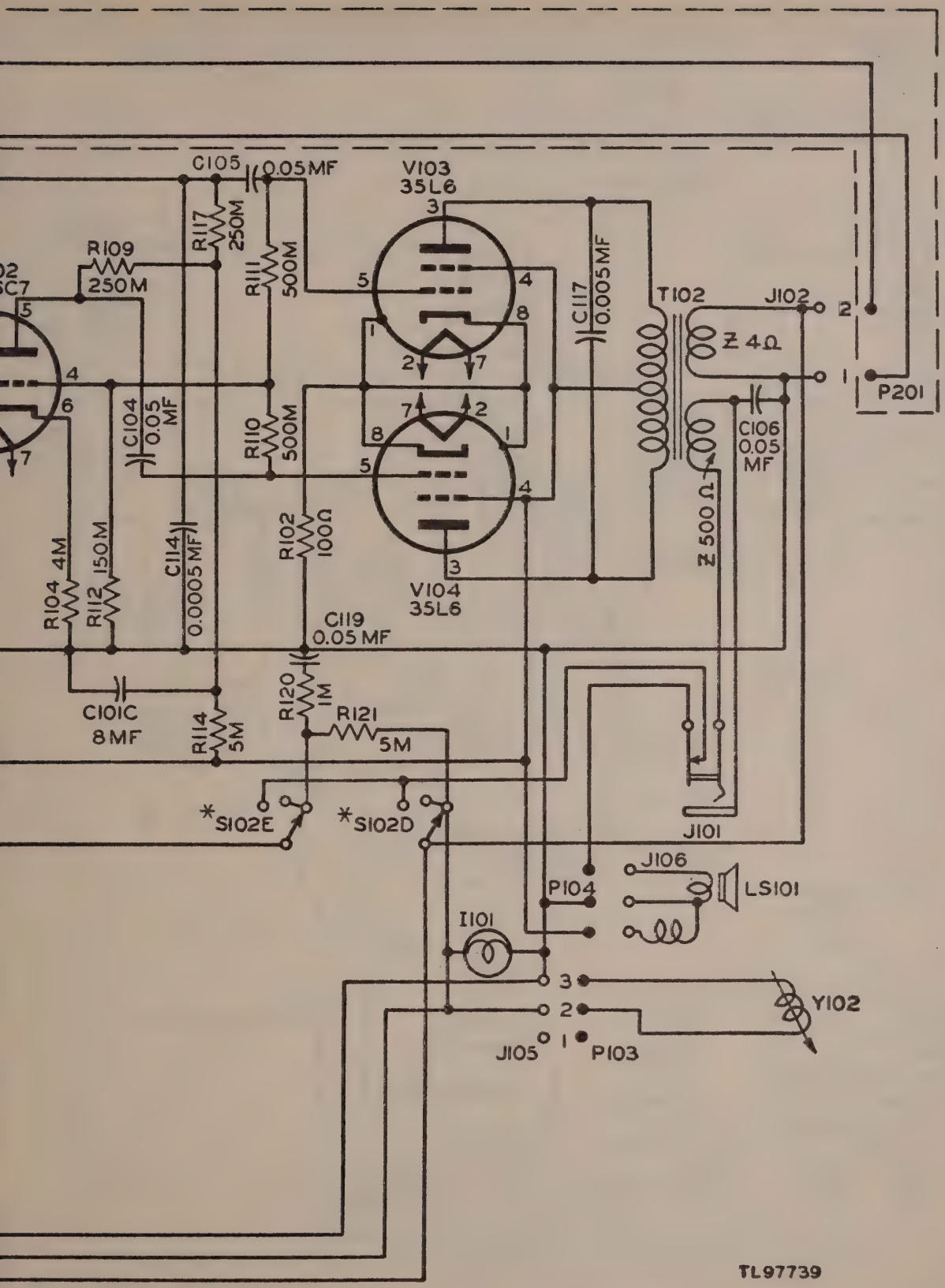
RMA: RADIO MANUFACTURERS ASSOCIATION

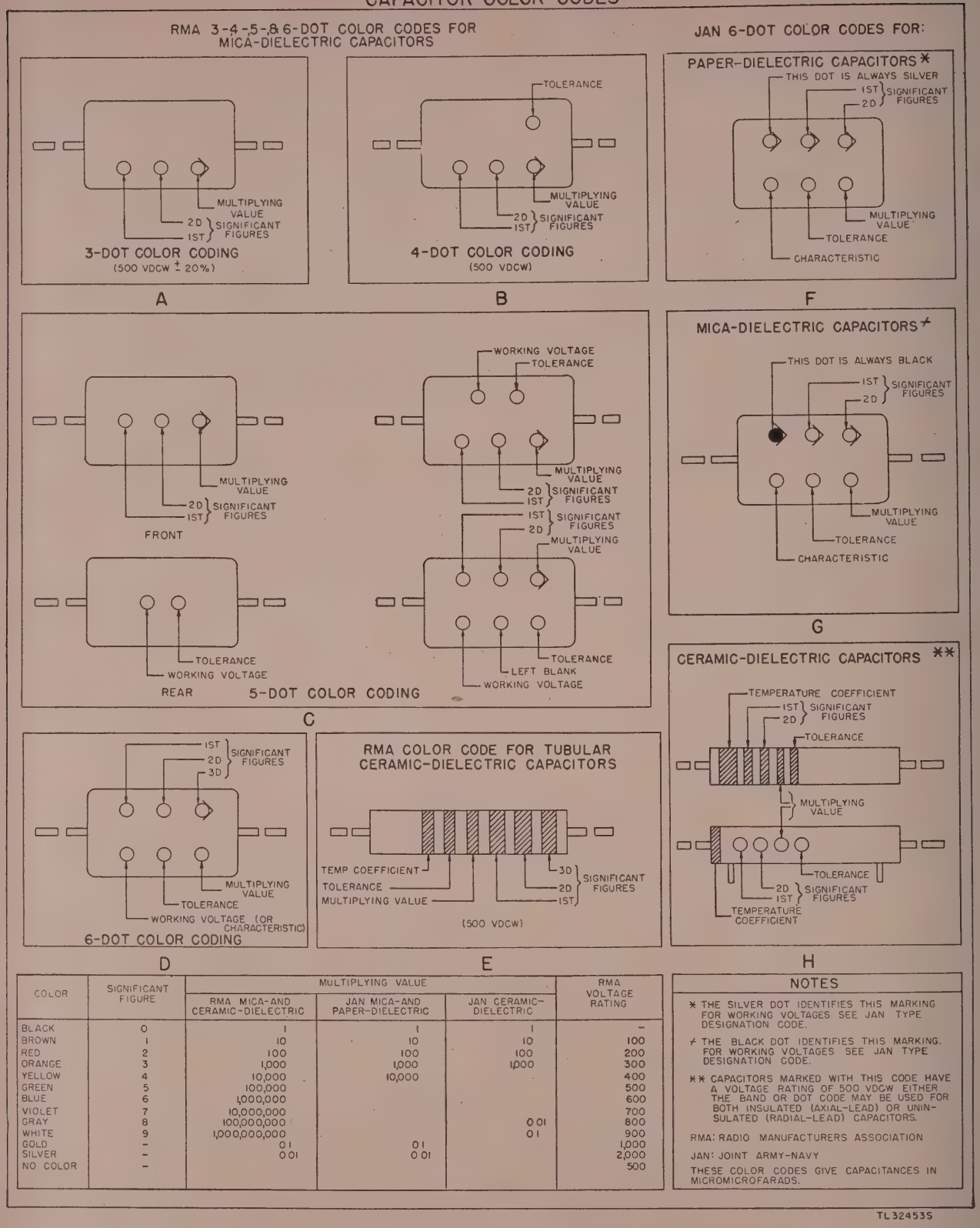
JAN: JOINT ARMY-NAVY

THESE COLOR CODES GIVE CAPACITANCES IN MICROMICROFARADS.

TL 32453S

Figure 50. Capacitor color code.


C105
0.05MF
V103
35L6
R117
250M
R109
250M
R111
500M
C117
0.005MF
T102
J102
Z 4Ω
P201
C104
0.05
MF
R110
500M
C106
0.05
MF
Z 500Ω
R102
100Ω
R104 4M
R112 150M
C114
0.0005MF
V104
35L6
C119
0.05 MF
R120
1M
R121
5M
C101C
8MF
R114
5M
*S102E
*S102D
J101
J106
LS101
P104
I101
Y102
J105
P103
TL97739



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.

TL 32453S

Figure 50. Capacitor color code.

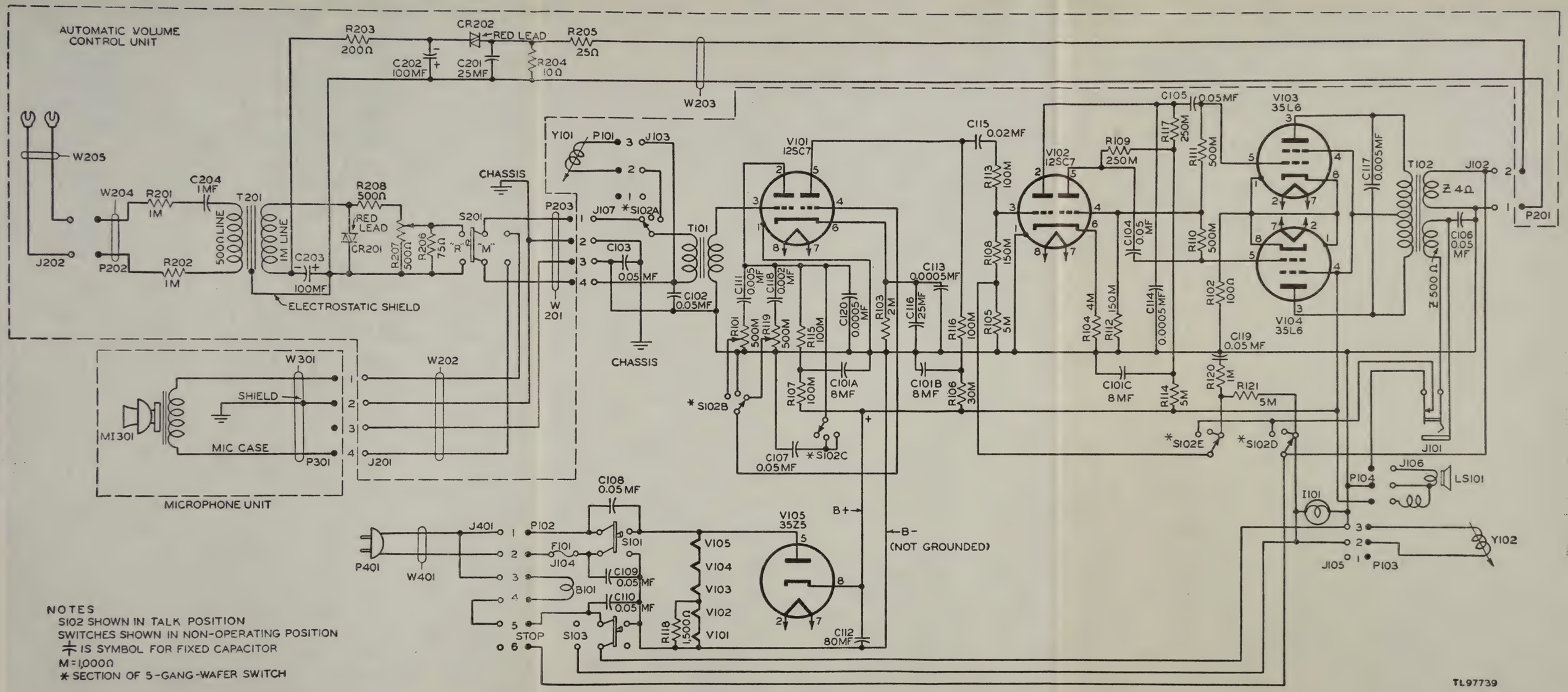
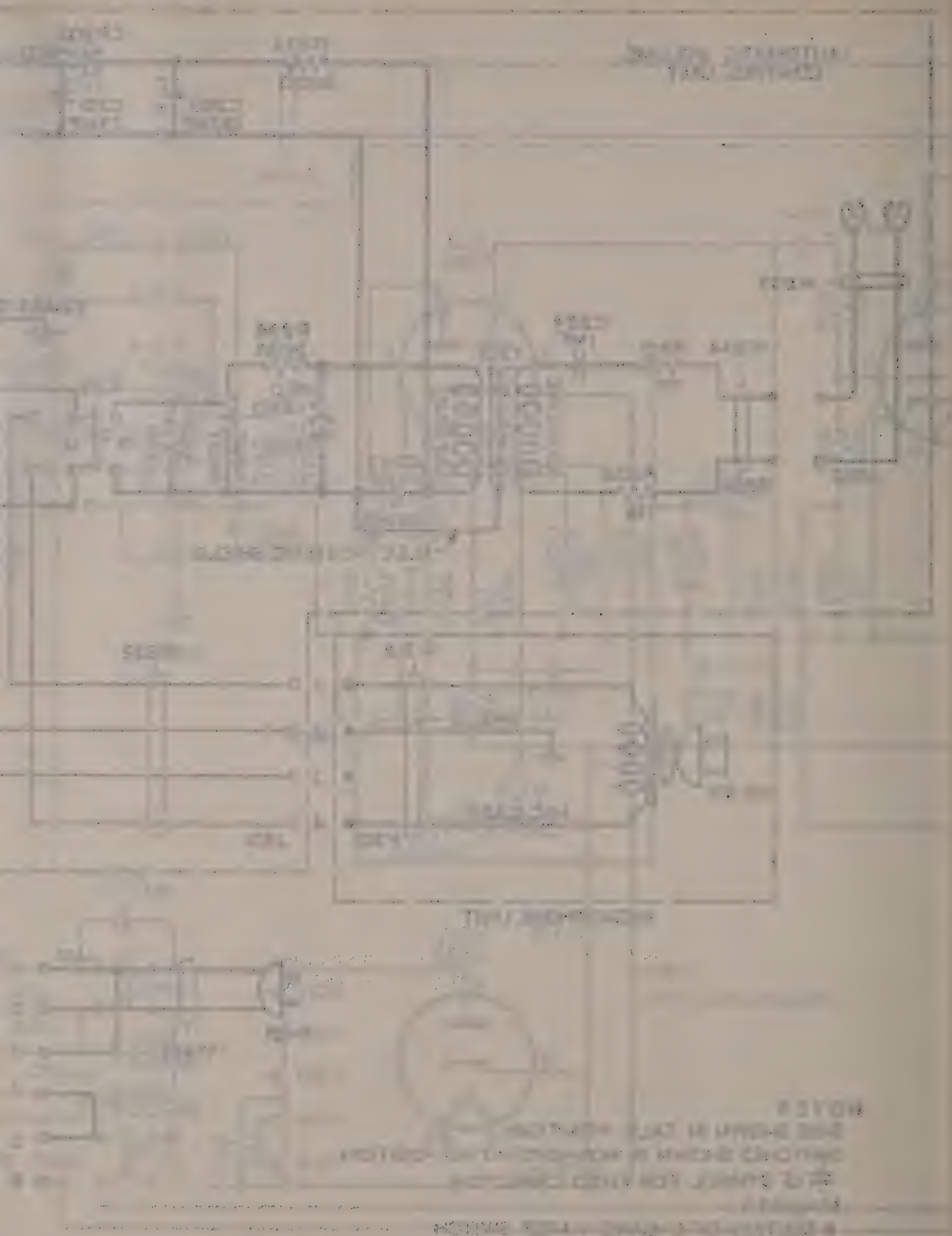


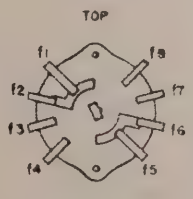
Figure 51. Recorder-Reproducer AN/GNQ-8, schematic diagram.



REAR WAFER
REAR VIEW
(S102 A, B, C)



FRONT WAFER
FRONT VIEW
(S102 D, E)



LISTEN-TALK SWITCH S102

The five portions of this switch (S102 A,B,C,D, and E) shown schematically in the circuit diagram above are drawn pictorially here. The switch contacts are coded to the diagram (r1, r2, etc. represent terminals on the rear wafer; f1, f2, etc. represent terminals on the front wafer).

NOTES:

S102 SHOWN IN RECORD (TALK) POSITION. (SEE BOX ON THIS DIAGRAM)

RELAY CONTACTS AND SWITCHES SHOWN IN NON-OPERATING POSITION. (CONNECTIONS TO SOCKETS OF K102 AND K103 ARE SHOWN ON DIAGRAM)

⊣⊢ IS SYMBOL FOR FIXED CAPACITOR.

M = 1000 Ω

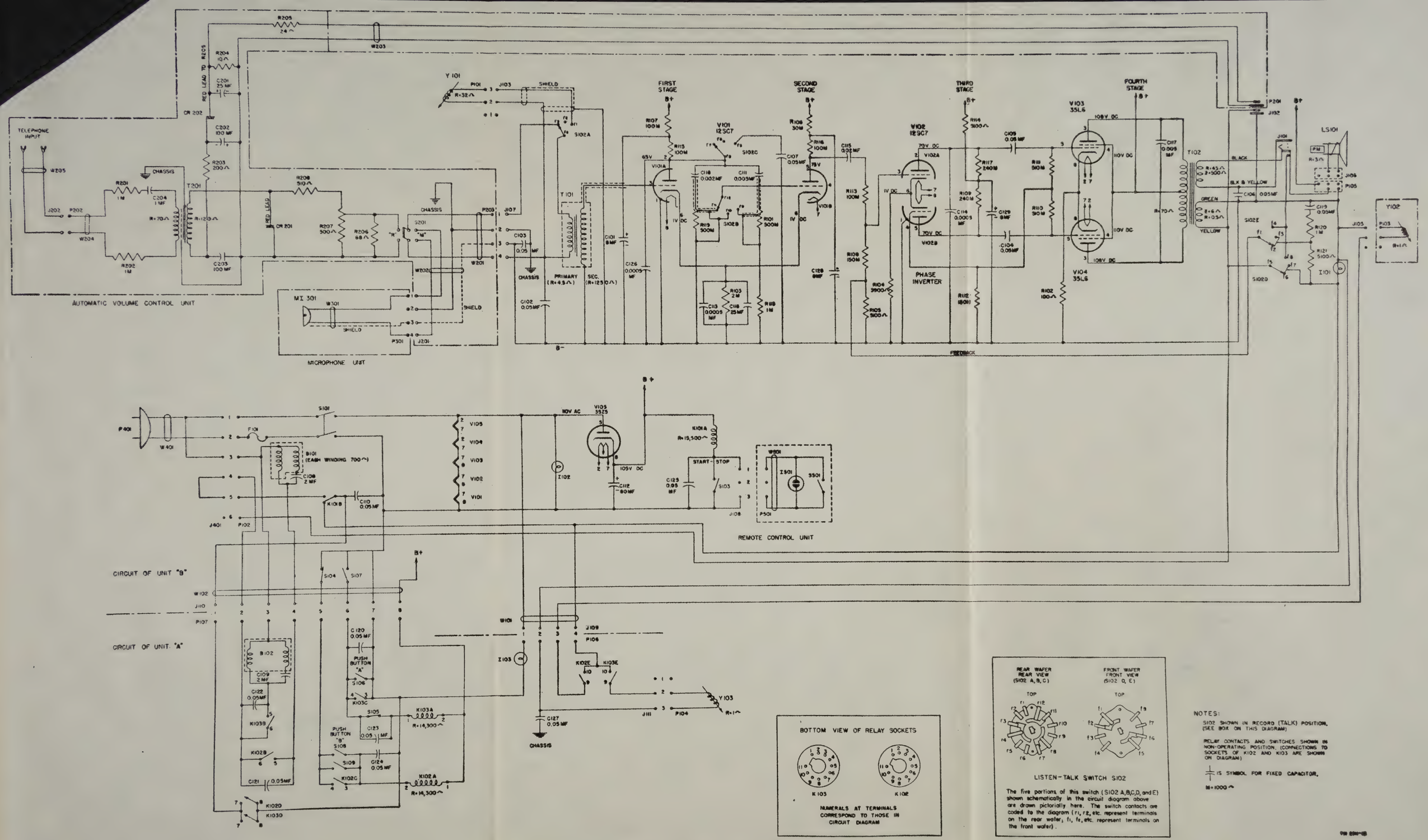
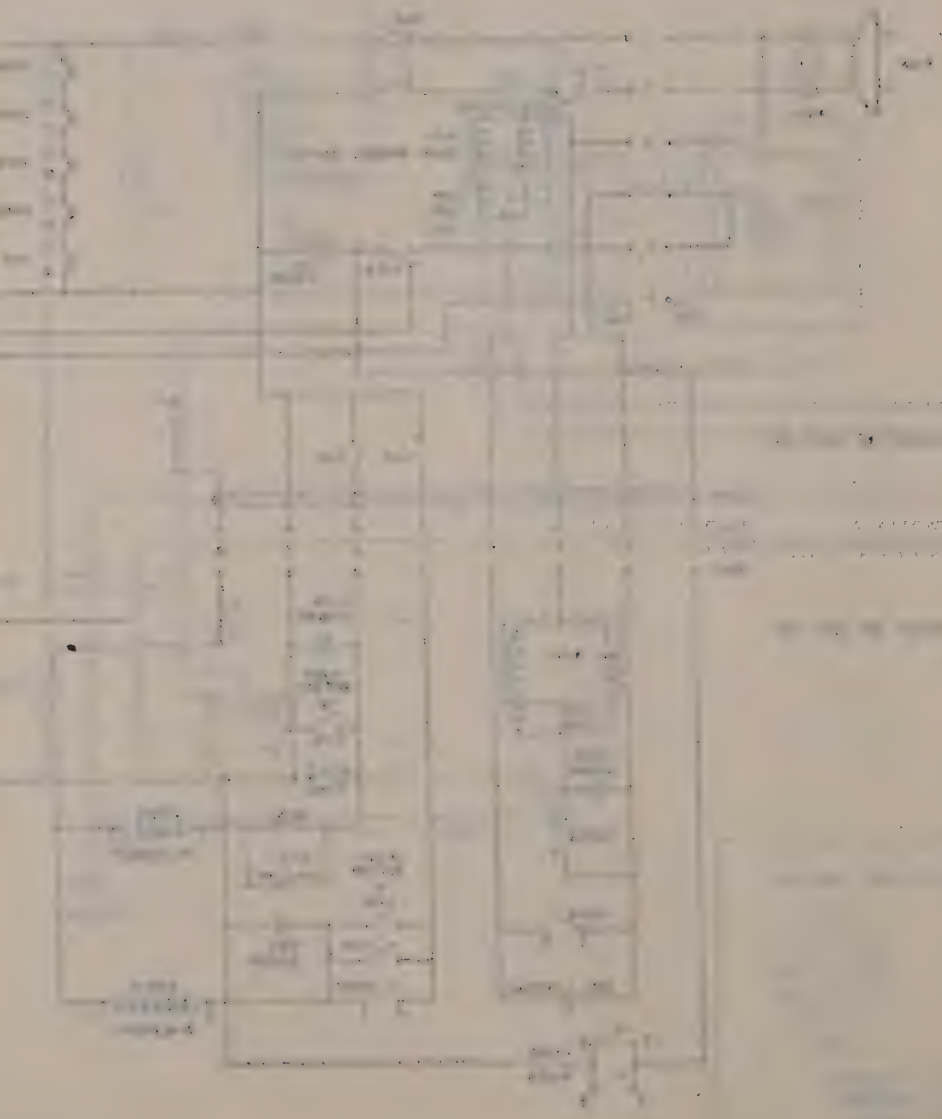
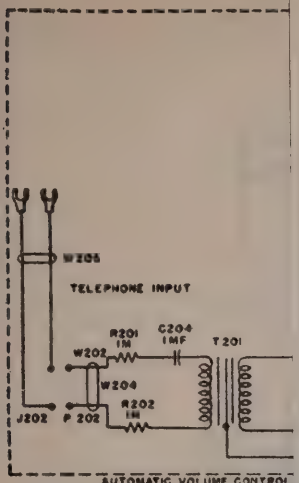
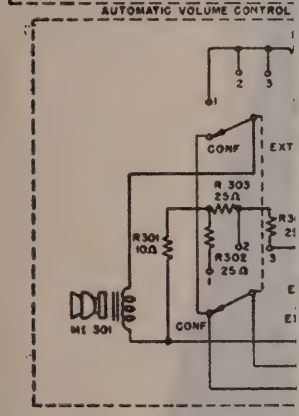


Figure 52. Recorder-Reproducer AN/GNQ-7A, schematic diagram.





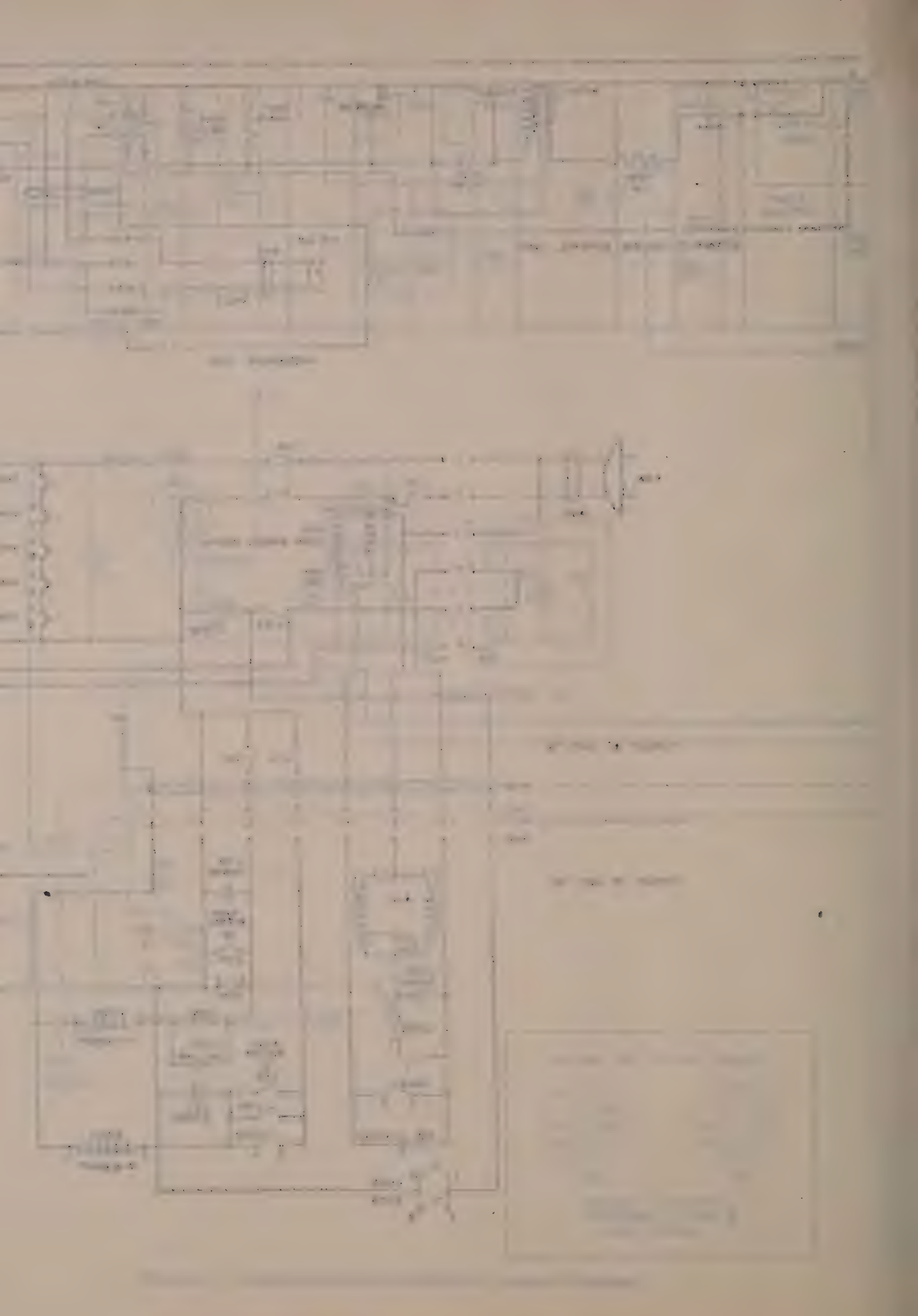




POWER HO
60∿A

WIRING OF R
SHOWN ABO
AS VIEWED

WIRING OF
SHOWN BE
AS VIEWED



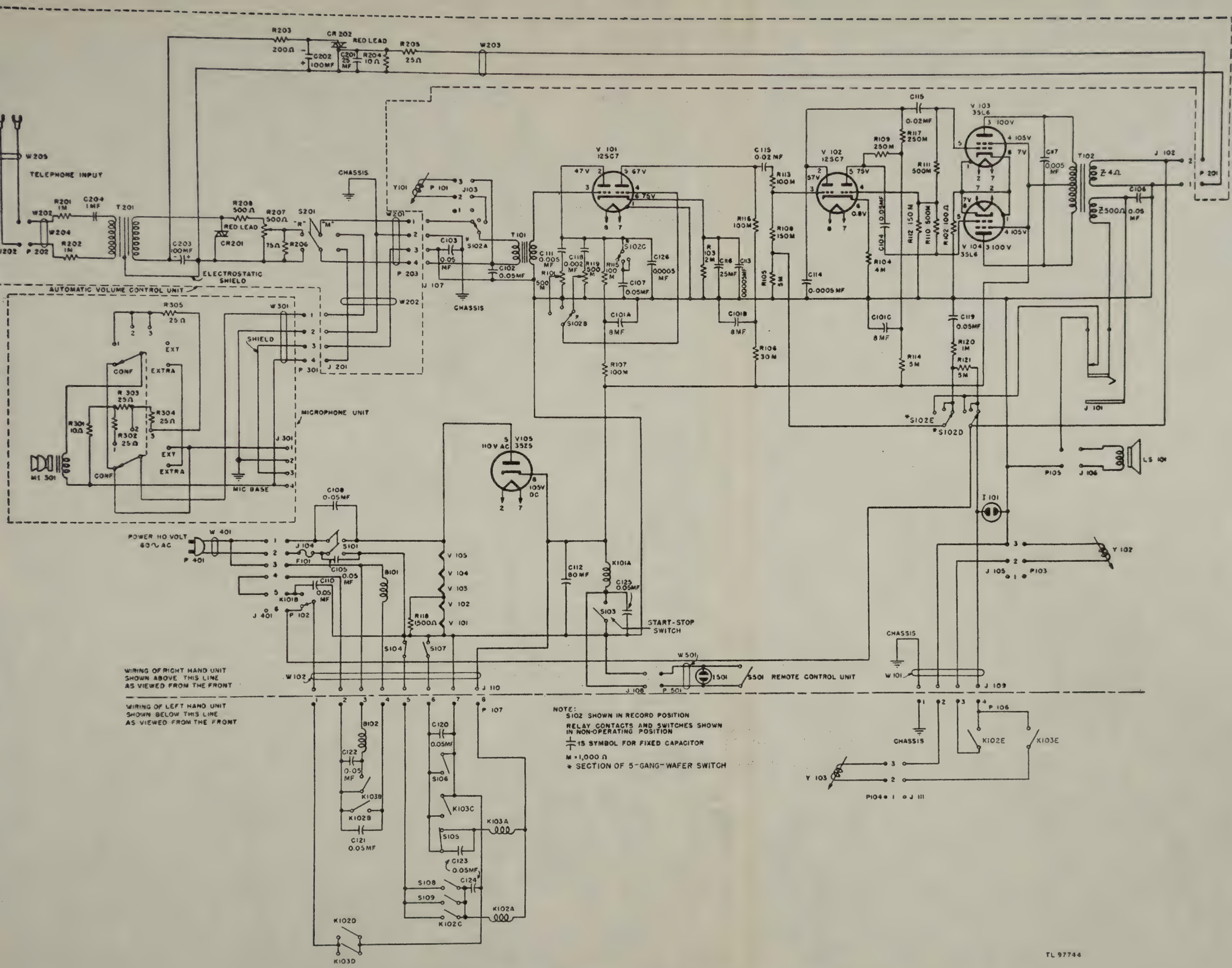
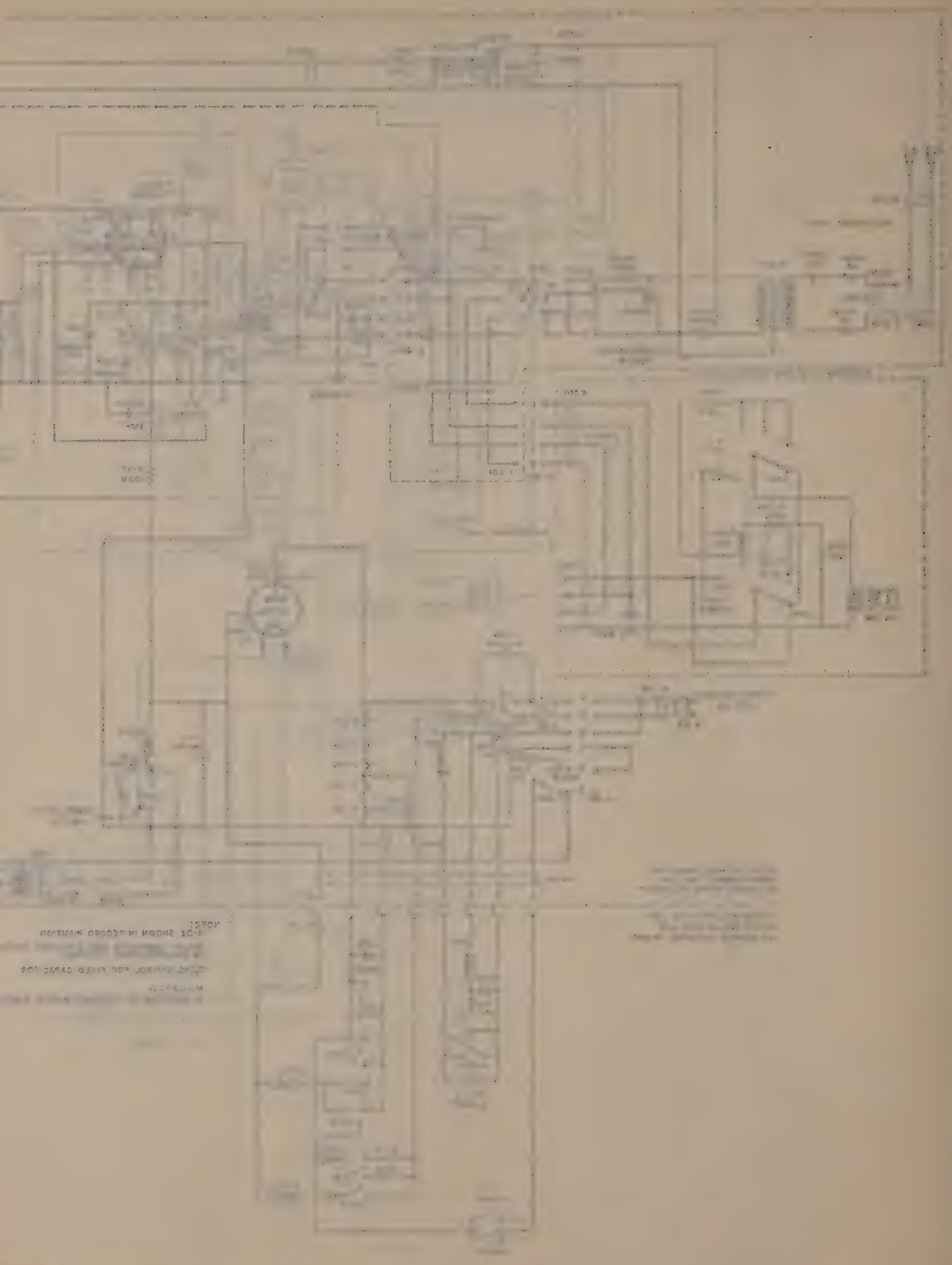


Figure 53. Recorder-Reproducer AN/GNQ-7; schematic diagram.



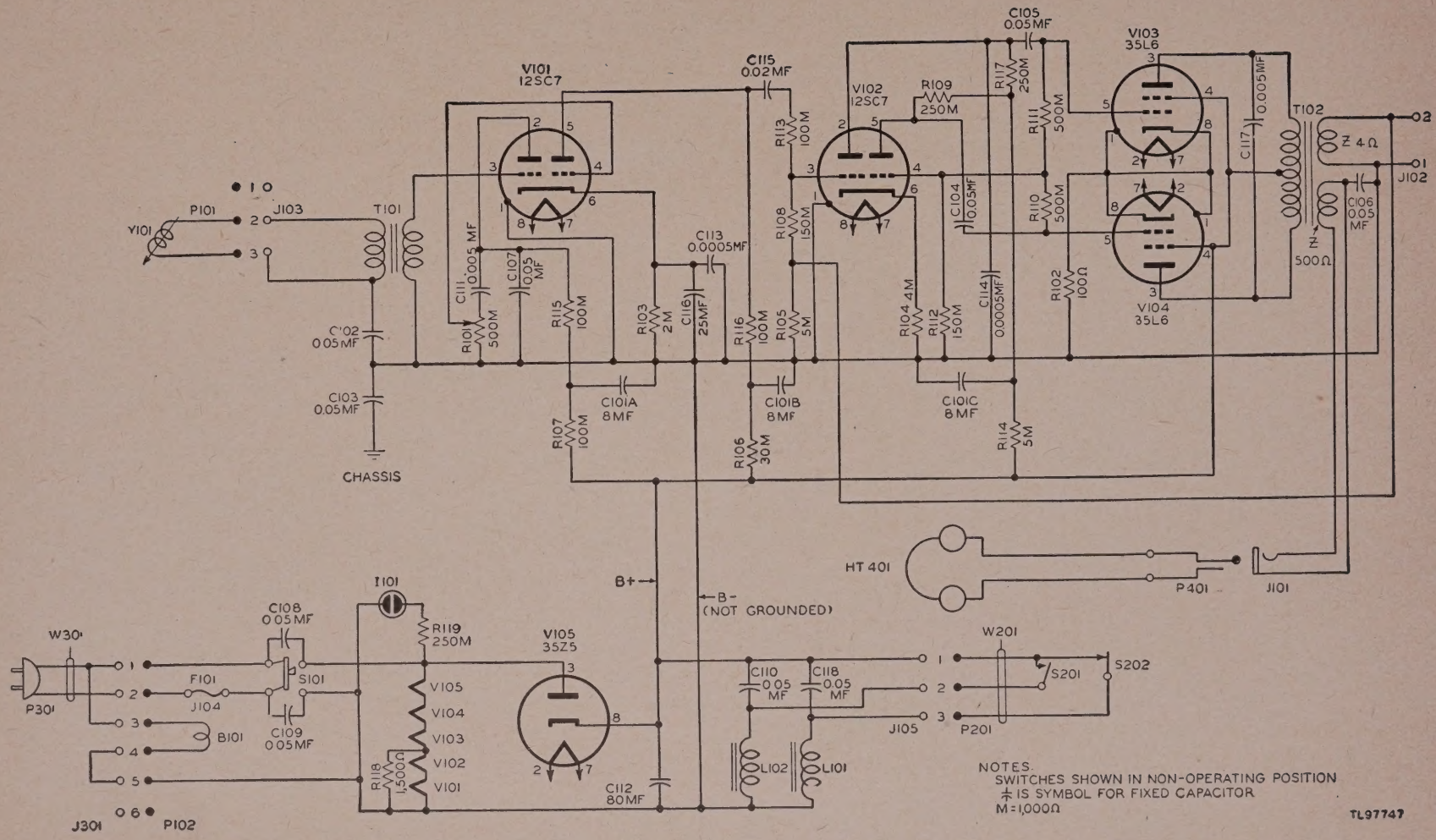


Figure 54. Reproducer AN/GNQ-6, schematic diagram.

U. S. GOVERNMENT PRINTING OFFICE: 1948 J769141/400