TM 11-5039
TO 16-35 AM 65-5

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

AF AMPLIFIER
AM-65/GRC

DEPARTMENT OF THE ARMY • JANUARY 1951

Changes in force: C 6, C 7, and C 8

TM 11-5039
C8

CHANGE
No. 8

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 14 December 1973

AF AMPLIFIERS AM-65/GRC AND AM-65A/GRC

TM 11-5039, 4 January 1951, is changed as follows:

Page 1, paragraph 1.1. Delete paragraph 1.1 and substitute:

1.1. Indexes of Publications

a DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment. Paragraph 2. Delete paragraph 2 and substitute:

2. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill our and forward DD Form 6 (Report of Packaging and Handling deficiencies) as prescribed in AR 700-58 (Army)/NAVSUP PUB 378 (Navy)/AFR 71-4 (Air Force)/and MCO P4030.29 (Marine Corps).

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38 (Army)/NAVSUP PUB 459 (Navy)/AFM 75-34 (Air Force)/and MCO P4610.19 (Marine Corps).

22.1.Reporting of Errors

The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028, Recommended Changes to Publications, and forwarded direct to Commander, US Army Electronics Command, ATITN: AMSEL-MA-C, Fort Monmouth, NJ 07703.

Page 4. After paragraph 5, add:

5.1. Items Comprising an Operable Equipment

AF Amplifiers AM-65/GRC and AM-65AIGRC each comprises an operable equipment.

Page 47. Delete appendix B in its entirety.

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-51, (qty rqr block No. 1) Operator maintenance requirements for AM-65/GRC.

United States Government Printing Office:1981--341-662/9406
04-220O

CHANGE
No. 7

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 1 March 1967

AF AMPLIFIERS AM-65/GRC AND AM65A/GRC

TM 11-5039, 4 January 1951, is changed as follows:

Page 47, Appendix C (as changed by C 6, 15 Nov 66), delete and substitute.

APPENDIX C
MAINTENANCE ALLOCATION
Section I. INTRODUCTION

C-1. General

This appendix provides a summary of the maintenance operations covered in the equipment literature for AF Amplifiers AM-65/GRC and AM-65A/GRC. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

C-2. Explanation of Format for Maintenance Allocation Chart

a. Group Number. Not used.

b. Component Assembly Nomenclature. This column lists the item names of component units, assemblies, subassemblies, and modules on which maintenance is authorized.

c. Maintenance Function. This column indicates the maintenance category at which performance of the specific maintenance function is authorized. Authorization to perform a function at any category also includes authorization to perform that function at higher categories. The codes used represent the various maintenance categories as follows:

Code	Maintenance Category
C	Operator/Crew
0	Organizational Maintenance
F	Direct Support Maintenance
H	General Support Maintenance
D	Depot Maintenance

d. Tools and Equipment. The numbers appearing in this column refer to specific tools and equipment which are identified by these numbers in section III.

e. Remarks. Self explanatory.

C-3. Explanation of Format for Tool and Test Equipment Requirements

The columns in the tool and test equipment requirements chart are as follows:

a. Tools and Equipment. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool for the maintenance function.

b. Maintenance Category. The codes in this column indicate the maintenance category normally allocated the facility.

c. Nomenclature. This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

d. Federal Stock Number. This column lists the Federal stock number.

e. Tool Number. Not used.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United State8 Army,
Chief of Staff.

Official:
KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:
USASA (2)
CNGB (1)
OCC-E (7)
Dir of Trans (1)
CofEngrs (1)
TSG (1)
CofSptS (1)
USAARENBD (2)
USACDCEA (1)
USACDCCBRA (1)
USACDCCEA (1)
USACDCCEA Ft Huachuca (1)
USACDCOA (1)
USACDCQMA (1)
USACDCTA (1)
USACDCADA (1)
USACDCARMA (1)
USACDCAVNA (1)
USACDCARTYA (1)
USACDCSWA (1)
USAMC (5)
USC ONARC (5)
ARADCOM (5)
ARADCOM Rgn (2)
OS Mad Comd (4)
USARYIS (5)
USARHAW (5)
LOGCOMD (2)
USAMICOM (4)
USASTRATCOM (4)
USAESC (70)
MDW (1)
Armies (2) except
Eighth USA (5)
Corps (2)
USAC (3)
319th USASA Bn (5)
177th USASA Co (5)
183rd USASA Co (5)
184th USASA Co (5)
52nd USASA Sp Op Comd (5)
420th USASA Sp Op Comd (5)
Svc Colleges (2)
USASCS (5)
USASESCS (100)
USAADS (5)
USAAMS (5)
USAARMS (5)
USAIS (5)
USAES (2)
USASA Tng Cen & Sch (60)
USATC Armor (2)
USATC Engr (2)
USATC Inf (2)
USASTC (2)
WRAMC (1)
Army Pic Cen (2)
USACDCEC (10)
USAJFKCENSPWAR (5)
Instl (2) except
Fort Hancock (4)
Fort Gordon (10)
Fort Huachuca (10)
Fort Carson (25)
Fort Knox (12)
WSMR (5)
Army Dep (2) except
LBAD (14)
SAAD (30)
TOAD (14)
LEAD (7)
SHAD (3)
NAAD (5)
SVAD (5)
CHAD (3)
ATAD (10)
SXAD (5)
GENDEPS (2)
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9-167	17	17-157	37-100
11-57	17-15	29-1	4485
11-97	17-16	29-7	44486
11-98	17-17	29-15	51-2
11-117	17-18	29-25	52-2
11-127	17-27	2936	5527
11-155	17-61	2937	55-47
11-157	1752	29-75	55500
11-158	17-55	29-79	57
11500 (AA-AC)	17-6	3247	57-100
11-687			

NG: State AG (3); units-same as active Army except allowance is one (1) copy per unit.
USAR: None.
For explanation of abbreviations used, see AR 320-6.

☆U.S. GOVERNMENT PRINTING OFFICE: 1969-342-016/2522

Section II. MAINTENANCE ALLOCATION CHART

MAINTENANCE ALLOCATION CHART

GROUP NUMBER	COMPONENT ASSEMBLY NOMENCLATURE	MAINTENANCE FUNCTIONS											TOOLS AND EQUIPMENT	REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
	AUDIOFREQUENCY AMPLIFIER AM-65/GRC, AM-65A/GRC	C											20	Exterior
		O											9,20,21,22	Exterior and interior
			O											Tubes, relay, capacitor, continuity
			F										1 thru 5,9, 11,13,17,19, 21,22,23	Test in accordance with Section I, Field Trouble-Shooting
			H										2 thru 8,10, 11,12,14 thru 19,21,22,23	Test in accordance with Section V, General Support Testing Procedures
				C										Exterior preventive maintenance
				O										Extérior and interior preventive maintenance
									O				20	
										C				Fuse
										O			20,21	Running spares
										F			19,21	In accordance with Section I, Field Trouble-Shooting
										H				In accordance with Section II, General Support Testing Procedures
											D		2 thru 8,10, 11,12,14 thru 19,21,22,23	

AMSEL-MR Form 1 Jan 66 6031, (Supersedes edition of 1 Feb 65, which is obsolete) AM-65/GRC; AM-65A/GRC 3 ESC-FM 97-66

SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	FEDERAL STOCK NUMBER	TOOL NUMBER
		AM-65/GRC, AM-65A/GRC (continued)		
1	F	AUDIO DEVICES, COMBINATION OF:		
		CHEST SET GROUP AN/GSA-6 WITH	5965-329-9085	
		HEADSET-MICROPHONE H-63U	5965-237-8049	
		OR		
		MICROPHONE M-29/U AND	5965-194-9770	
		HEADSET NAVY TYPE CW-49507		
2	F,H,D	CAPACITOR, PAPER DIELECTRIC, 2 uf, 600 vdcw	5910-112-7431	
3	F,H,D	DUIWMY LOAD RESISTORS, AS FOLLOWS:		
		RESISTOR, 150 ohms, 5 watts (1 ea)	5905-258-7362	
		RESISTOR, 600 ohms, 5 watts (2 ea)	5905-755-8792	
		RESISTOR, 100 ohms, 5 watts (1 ea)	5905-258-7361	
		RESISTOR, 1,200 ohms, 10 watts (1 ea)	5905-270-7079	
		RESISTOR, 39 ohma, 5 watts (1 ea)	5905-846-7426	
		RESISTOR, 17.5 ohms, 5 watts (1 ea)	5905-074-8997	
4		F,H,D DYNAMIC LOUDSPEAKER LS-166/U	5965-243-6420	
5	F,H,D	GENERATOR, SIGNAL TS-382F/U	6625-151-7479	
6	H,D	HANDSET H-33F/PT	5965-163-9947	
7	H,D	HEADSET HS-30	5965-164-7529	
8	H,D	LIGHT ASSEMBLY MX-1292/PAQ	6230-378-5449	
9	O,F	MULTIMETER AN/UIIM-105/U	6625-581-2036	
10	H,D	MULTIMETER TS-352( )/U	6625-242-5023	
11	F,H,D	MULTMIMER TS-505( )/u	6625-243-0562	
12	H,D	OUTPUT METER T8-585( )/U	6625-244-0501	

AMSEL-MR Form
1 Jan 66 6013 (Supersedes edition of 1 Jan 65, which is obsolete) 01. 3 AM-65/GRC; AM-65A/GRC

SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	FEDERAL STOCK NUMBER	TOOL NUMBER
AM-65/GRC; Am-65A/GRC (continued)				
13.	F	POWER SUPPLY, COMBINATION OF:		
		12 VOLT STORAGE BATTERY AND		
		POWER SUPPLY PP-281/GRC	5820-500-4375	
		OR		
		24 VOLT STORAGE BATTERY AND		
		POWER SUPPLY PP-282/GRC	5820-500-1648	
14	H,D	POWER SUPPLY, COMBINATION OF:		
		POWER SUPPLY PP-281/GRC AND	5820-500-4375	
		POWER SUPPLY PP-1104A/G	6130-635-4900	
		OR		
		POWER SUPPLY PP-282/GRC AND	5820-500-1648	
		BATTERY, WET, BB-46 (2 required)		
15	H,D	RECEIVER-TRANSETTER RT-70( )/GRC	5820-503-1518	
16	H,D	SPECTRUM ANALYZER TS-723A/U	6625-668-9418	
17	F,H,D	SWITCH, SINGLE-POLE, SINGLE-THROW	5930-655-1514	
18	H,D	TEST FACILITIES KIT MK-153/GRC	6625-322-4903	
19	F,H,D	TOOL KIT, RADAR AND RADIO REPAIRMAN TK-87( )/U	5180-690-4552	
20	0	TOOL KIT, RADIO REPAIRMAN TK-115( )/U	5180-856-1578	
21	O,F,H,D	TUBE ELIER TL-201	5120-498-8903	
22	O,F,H,D	TUBE TESTER, ELECTRON TUBE TV-7D/U	6625-820-0064	
23	F,H,D	VOLTETHER, ME-30( )/U	6625-669-0742	

AMSEL-MR Form
1 Jan 66 6013 (Supersedes edition of 1 Jan 65, which is obsolete) 01. 3 AM-65/GRC; AM-65A/GRC

Changes in force: C 6

CHANGE
No. 6

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 15 November 1966

AF AMPLIFIERS AM-65/GRC AND AM-65A/GRC

TM 11-5039. 4 January 1951, is changed as follows:

(As changed by C 3, 3 Mar 58) TM 11-5039, 4 January 1951, is changed so that the manual also applies to AF AMPLIFIER' AM-65A/ GRC.

(As changed by C 3, 3 Mar 58). Change the title to AF AMPLIFIER AM-65/GRC AND AM-65A/GRC.

Page viii. Figure 1. (As changed by C 1, 22 Aug 52, and C 3, 3 Mar 58). Add the following notes to figure 1.

NOTES:

1. THE FOLLOWING CAUTION NOTE APPEARS ON THE FRONT PANEL DIRECTLY ABOVE THE FUSEHOLDEK: CAUTION: DON'T SWITCH TO RT-7 WITHOUT RT-7 CONNECTED.
2. ON AF AMPLIFIER AM-65A/GRC, A DUST CAP, HELD BY A BEADED CHAIN, HAS BEEN ADDED TO THE FRONT PANEL. THIS CAP IS USED TO PROTECT THE AUDIO CONNECTOR, WHEN THE AUDIO CONNECTOR IS NOT BEING USED.

Page 1, paragraph 1 (as changed by C 3, 3 Mar 58). Delete paragraph 1 and substitute:

1. Scope

This manual contains information pertaining to the following:

a. Description and functioning of AF Amplifiers AM-65/GRC and AM-65A/GRC, and provides instructions for the maintenance, repair, and test of these units. Two appendixes furnish a list of references and a maintenance allocation chart.

b. AF Amplifier AM-65A/GRC is similar to AF Amplifier AM-65/GRC. The information in this manual applies to both audio frequency amplifiers unless otherwise specified. (As added by C 5, 24 Jun 63). Add paragraph 1.1 after paragraph 1:

1.1 Index of Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to your equipment. DA Pam 310-4 is a current index of technical manuals, supply manuals (types 7, 8, and 9), technical bulletins, supply bulletins, lubrication orders, and modification work orders that are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc.) and the latest changes to and revisions of each equipment publications.

Paragraph 2. Delete paragraph 2 (as changed by C 5, 24 Jun 63) and substitute:

2. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38-750.

b. Report of Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment), as prescribed in AR 700-58 (Army), NAVSAN-DA Publication 378 (Navy), and AFR 71-4 (Air Force).

c. Reporting of Equipment Manual Improvements. The direct reporting of errors, omissions, and recommendations for improving this manual by the individual user is authorized and encouraged. DA Form 2028 (Recommended changes to DA Publications) will be used for reporting these improvements. This form will be completed using pencil, pen, or typewriter and forwarded direct to Commanding General, U. S. Army Electronics Command, ATTN: AMSEL-MR-NMP-AD, Fort Monmouth, N.J., 07703.

***This change supersedes C 1. 22 August 1952; C 2, 23 October 1953; C 3. 3 March 1958; C 4, 14 April 1959; and C 5, 24 June 1963; and TM 11-5820-21-1P, 7 May 1959.**

Page 4, paragraph 5 (as changed by C 1, 22 Aug 52). Delete the technical characteristics located on line 14 and substitute:

	Set 1 +	Set 2+ Inter-. phone channel	Set: 1 + Inter. phone channel	Set 2 + Inter. phone channel
For .25-volt signal at terminal C of J-1 (Interphone input)	280	280	1,200	

Page 5, figure 3 (As changed by C 1, 22 Aug 52 and C 3, 3 Mar 58). Change position references for switch S-1 from-

6V 12V 24V to 6 12 24 VOLTS

S-1 S-1

Add the word "HOLDER" after: CIRCUIT LABEL.

Add the following:

NOTE:

AF AMPLIFIER AM-65A/GRC DOES NOT HAVE A CIRCUIT LABEL HOLDER.

Page 7, paragraph 7, Function column, line 22, RT-70 position (As changed by C 2, 23 Oct 53). Add after last line.

RT-70 position: Applies *** Receiver-Transmitter RT-70/GRC. On later models, a stop pin is inserted into the lower blind hole near the switch lever to prevent accidental switching to the RT-70 position when the RT-70/GRC is not connected to the amplifier (fig. 5.1).

Page 8, figure 5 (As changed by C 1, 22 Aug 52). Add the following note to figure 5:

NOTE: The following caution note appears on the front panel directly above the FUSE holder: CAUTION: DON'T SWITCH TO RT-70 WITHOUT RT-70 CONNECTED.

Figure 5.1. Delete figure 5.1 (changed by C 3, 3 Mar 58) and substitute:

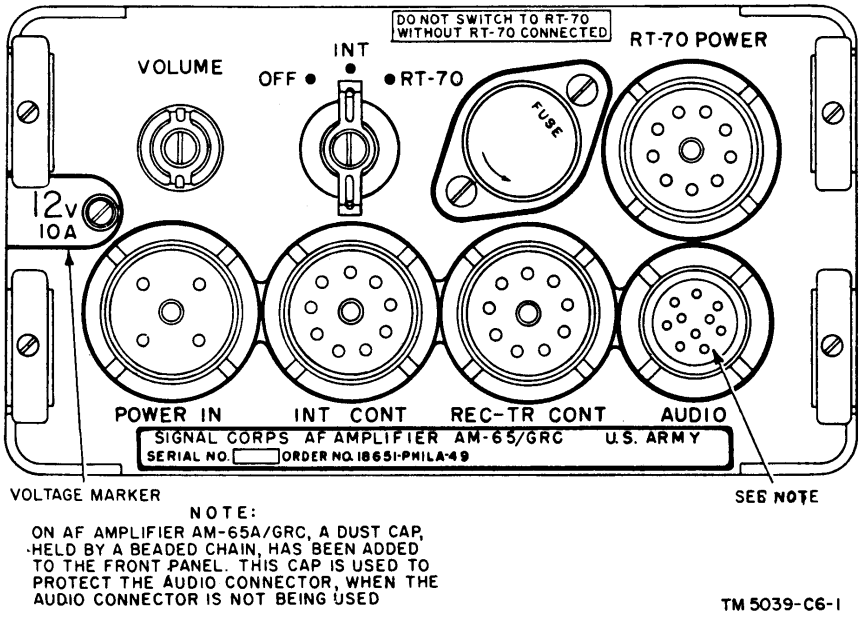

Figure 5.1 Panel controls and connectors

Paragraph 10.1 (as changed by C 3, 3 Mar 58). Delete paragraph 10.1 and substitute:

10.1 Difference in Models

a. The following changes have been made on AF Amplifier AM-65/GRC, procured on all orders except No. 18651-Phila-49:

(1) The parallel connected combination of resistors R9A and R9B has been replaced by a single 3,900-ohm resistor, designated R9.

(2) The parallel connected combination of resistors R10A and R1OB has been replaced by a single 3,900-ohm resistor, designated R10.

(3) The values of the following resistors are changed as indicated.

Reference symbol	From (ohms)	To (ohms)
R27	31	40
R28	63	71
R29	71	90
R30	35	45
R35	220	150

(4) Resistor R34 is changed from 10 ohms, 1/2 watt, to 22 ohms, 1 watt.

(5) Two blind holes have been made in the front panel at the OFF-INT-RT-70 switch location and a stop pin has been provided for insertion in either one of these holes (for models on order No. 2909-Phila-52 and 2921-Phila-52).

b. In addition to the differences outlined in a above, the following changes and additions have been made on AF Amplifier AM-65A/GRC:

(1) One blind hole has been made in the front panel below and to the left of AUDIO connector J1 and a dust cap, held by a beaded chain, has been provided to protect the AUDIO connector when it is not in use.

(2) The nonshorting type rotary switch S2 has been replaced by shorting type rotary switch.

(3) The nylon circuit label and holder have been deleted.

(4) Four catch assemblies, HI through H4, have been deleted from the case assembly.

(5) The power supply clamp (fig. 11) has been modified.

(6) Connector J5 has been mounted on the outside of the main chassis rear wall and retained in position with retainer plate 0-12. The retainer ring is secured by three 6-32-by 1/4-inch screws, three lockwashers, a steel spring, and three hexagonal nuts.

Page 11, figure 7 (as added by C 2, 23 Oct 53). Add the following note to figure 7:

NOTE:

FOR MODELS PROCURED ON ALL ORDERS EXCEPT NO. 18651-PHILA-49, THE PARALLEL COMBINATION OF RESISTORS R9A AND R9B IS DELETED AND IS REPLACED WITH A SINGLE RESISTOR, R9, 3,900 OHMS; THE PARALLEL COMBINATION OF RESISTORS R1OA AND R1OB HAS BEEN DELETED AND REPLACED WITH A SINGLE RESISTOR, R10, 3,900 OHMS.

Page 12, paragraphs 12b and c (as changed by C 2, 23 Oct 53). Make the following changes:

Subparagraph b. Add after last line: (For models on all orders except No. 1851-Phila-49, "(A and B)" is deleted.)

Subparagraph c. Add after second sentence: (For models on all orders except No. 18651-Phila-49, "(A and B)" is deleted.) A strap connection between terminal A of J-3 and terminal B of connector J-4 routes these signals to Control C-435/GRC for retransmission through another receiver-transmitter (if used). Page 15, paragraph 16b(2) (as changed by

C 1, 22 Aug 52). Delete the second sentence and substitute: An additional drop of 5.7 volts (6 volts for models procured on orders No. 16820-Phila-51 and 21444-Phila-50) occurs across ballast tube R-32, leaving 6.7 volts (6.4 volts for models procured on orders No. 16820- Phila-51 and 21444-Phila-50) available at pin 7 of K-1 for the filaments of the receiver-transmitter and for bias on power output tube V-5.

Page 16, paragraph 16c and d (as changed by C 2, 23 Oct 53).

Subparagraph c. Delete the last two sentences and substitute: When plug P1 of Cable

Assembly CX-1213/U is plugged into J3 (RT-70 POWER connector), terminal E of J3 is

connected to terminal E of PI in Cable Assembly CX-1213/U. Terminal E of P1 is connected through the cable to terminal E of P2 at the other end of Cable Assembly CX-1213/U. Terminal E of P2 is jumped to terminal D of P2 which connects (through the cable) to terminal D of P1 and to terminal D of J3 which is grounded in the amplifier. The voltage regulator tubes, V6 and V7, therefore draw current only when Cable Assembly CX-1213/U is plugged into J3 (RT-70 POWER). The purpose of this arrangement is to prevent the voltage regulator tubes from operating when Receiver-Transmitter RT-70/GRC is not connected to the amplifier. Under such conditions the tubes would be overloaded and their life would be shortened. It is therefore important, when connecting Cable Assembly CX-1213/U between the amplifier and Receiver-Transmitter RT-70/GRC, that plug P2 of the cable assembly be connected to the POWER receptacle of the receiver-transmitter before plug P1 is connected to the RT-70 POWER connector (J3) of the amplifier.

Subparagraph d, line 2. Change "X-1 or" to X-1 of.

Subparagraph d(1), line 2. Change "6 or J5" to 6 of J5.

Page 17, figure 10 (as changed by C 2, 23 Oct 53). Add note 5 to figure 10.

5. THE FOLLOWING CHANGES ARE MADE FOR MODELS PROCURED ON ALL ORDERS EXCEPT NO. 18651-PHILA-49: R-27 IS CHANGED FROM 31 TO 40.
   R-28 IS CHANGED FROM 63 TO 71.
   R-29 IS CHANGED FROM 71 TO 90.
   R-30 IS CHANGED FROM 35 TO 45.
   R-34 IS CHANGED FROM 10 TO 22.
   R-35 IS CHANGED FROM 220 TO 150.

Page 19. Add chapter 2.1 after chapter 2:

CHAPTER 2.1

OPERATOR'S AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. OPERATOR'S PREVENTIVE MAINTENANCE

20.1 Scope of Maintenance

The maintenance duties assigned to the operator of AF Amplifiers AM-65/GRC and AM-65A/GRC are listed below together with a reference to the paragraphs covering the specific maintenance function. The tools and test equipment required are listed in appendix B.

a. Daily preventive maintenance checks and services (para 20.6).

b. Weekly preventive maintenance checks and services (para 20.7).

c. Cleaning (para 20.5).

20.2 Tools and Equipment Required for Preventive Maintenance

a. Cleaning cloth.

b. Cleaning Compound (Federal stock No. 7930-395-9542); used for cleaning equipment and electrical contacts.

20.3 Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 20.4 and 20.5 cover routine systematic care and cleaning essential to proper upkeep of this equipment when it is used separately. When this equipment is used as part of a set or system, follow the procedures established in the set or system manual.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services charts (paras 20.6 and 20.7) outline functions to be performed at specific intervals; however, if the equipment is used as part of a set or system, follow the procedures established in the set or system manual. For equipments

operated separately, these checks and services are to maintain Army electronic equipment in a combat serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the charts indicate what to check, how to check, and what the normal conditions are; the References column lists the illustrations, paragraphs, or manuals that contain supplementary information. If the defect cannot be remedied by the operator, higher category of maintenance or repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

20.4 Preventive Maintenance Checks and Services Periods

Preventive maintenance checks and services of the AM-65/GRC and AM-65A/GRC are required on a daily and weekly basis unless the equipment is to be placed in storage. In that case, check the equipment as follows:

a. Before the equipment is placed in storage.

b. When the equipment is removed from storage.

c. Paragraph 20.6 specifies operator checks and services that must be accomplished daily.

d. Paragraph 20.7 specifies organizational checks and services, that must be performed once each week. In addition to the routine daily checks and services, the equipment should be rechecked and serviced immediately before going on a mission and as soon after completion of the mission as possible.

20.5 Cleaning

a. Use No. 0000 sandpaper to remove corrosion.

Warning: **Prolonged breathing of cleaning compound is dangerous; make certain that adequate ventilation is provided. Cleaning compound is flammable; do not use near a flame. Avoid contact with the skin; wash off any that spills on your hands.**

b. Use a clean, dry, lint free cloth or a dry brush for cleaning equipment and electrical contacts. Moisten the cloth or brush with cleaning compound (Federal stock No. 7930-395-9542); then wipe dry with a dry cloth.

Warning: **Compressed air is dangerous and can cause serious bodily harm. It can also cause mechanical damage to the equipment. Do not use compressed air to dry parts where cleaning compound has been used.**

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

20.6 Operator's Daily Preventive Maintenance Checks and Services Chart

Seq No.	Item to be inspected	Procedure	Reference
1	Installation	Check for completeness and satisfactory condition of the amplifier.	Fig. 1.
2	Case	Inspect the case and exposed metal surfaces for rust, corrosion, and moisture.	Fig. 1.
3	Panel mountings	Clean and tighten the panel mountings ---__-----_-	Fig. 1.
4	Fuse	Inspect the seating of the fuse on front panel.	Fig. 1.
5	Plugs and connectors	Inspect the seating of the plugs and connectors for proper contact.	Fig. 1.
6	Controls	Inspect the VOLUME control and the OFF-INT-RT-70 switch for binding, scraping, excessive looseness, and positive action.	Figs. 1 and 4.

20.7 Operator's Weekly Preventive Maintenance Checks and Services Chart

Caution: **Disconnect all power before performing the following operations. Upon completion, reconnect power and check for satisfactory operation.**

Seq No.	Item to be inspected	Procedure	Reference
1	Cable assemblies	Inspect all cable assemblies that interconnect the amplifier with the radio equipment for damage to the insulation such as cuts or breaks.	
2	Connector plugs	Examine all connector plugs and receptacles for cleanliness and effective contact.	Fig. 1.
3	Receptacles	Examine all receptacles for evidence of excessive wear and ineffectual contact.	Fig. 1.
4	Installation	Inspect the AM-65!GRC or AM-65A/GRC to see that it is properly installed.	Fig. 2.

Section II. ORGANIZATIONAL PREVENTIVE MAINTENANCE

20.8 Scope of Maintenance

a. This section contains instructions covering organizational maintenance of AF Amplifiers AM-65/GRC and AM-65A/GRC.

b. Organizational maintenance consists of the following:

(1) Monthly preventive maintenance checks and services chart (para 23).

(2) Disassembly for monthly preventive maintenance checks. and services (para 22).

(3) Removal of pluck-out parts (para 25).

(4) Testing of pluck-out parts para 26).

(5) Cleaning (para 27).

(6) Replacement of fuse (para 26).

(7) Replacement of pluck-out parts (para24).

(8) Reassembly (para 24).

20.9 Tools, Materials, and Test Equipment Required

The tools, materials, and test equipment required for organizational maintenance are as follows:

a. Tools.

(1) Tool Kit, Radio Repair TK-115/G.

(2) Tube Puller TL201.

b. Materials.

(1) Cleaning compound (FSN 7930-395- 9542).

(2) Cleaning cloth.

c. Test Equipment.

(1) Test Set, Electron Tube TV-7/U.

(2) Multimeter AN/URM-105.

(3) Test Lead Set CX-1331/M.

20.10 Organizational Preventive Maintenance Checks and Services Periods

Preventive maintenance checks and services of AF Amplifiers AM-65/GRC and AM-65A/GRC are required monthly. Paragraph 23 specifies the items to be checked and serviced. In addition to the routine monthly checks and services, the equipment should be rechecked and serviced immediately before going on a mission and as soon after completion of the mission as possible.

21. Preparation for Monthly Checks and Services

After the unit has been disassembled (para 22), it is possible to inspect parts and wiring in accordance with the monthly preventive maintenance checks and services chart (para 23). Thoroughly inspect the unit for any abnormal conditions. If any are found, the cause of such conditions should be determined and the defects remedied before proceeding with the troubleshooting and other tests described in paragraphs 29 through 38 and 45 through 49. Removal and testing information for pluck-out parts is given in paragraphs 25 and 26. Repair instructions are given in paragraphs 39 through 41.

22. Disassembly for Monthly Maintenance Checks and Services

The arrangement of AF Amplifier AM-65/GRC is such that, even though the unit is disassembled, electrical continuity exists between all parts of the unit. The unit may be

left unassembled for the test and repairs to be described in chapter 3. Proceed as follows: Note. Save screws and washers which will be removed during the disassembly procedure that follows. They will be needed for reassembly of the unit.

a. Fuse. The fuse is accessible from the front panel (fig. 1). Unscrew the fuse cap at the top of the panel. Removal of the cap also will cause the fuse to come out of its holder, since the cap is also a fuse extractor.

Note. A spare fuse is mounted on the rear wall of the chassis assembly (fig. 3).

b. Immersion Proof Cover.

(1) Loosen the four Dzus fasteners located on the right and left edges of the front panel.

(2) Stand the unit on the front panel and lift off the cover. Be careful not to damage any wiring or components while removing the cover, or at any time while the panel-and-chassis assembly is being handled without the cover on.

c. Panel.

(1) Remove the six screws which hold the panel to the chassis assembly. Two screws are located at the top, two on the bottom, and one on each side of the assembly.

(2) Carefully pull the panel away from the chassis as far as the cable wiring will permit. Be careful not to loosen any soldered connections. Do not place undue strain on the cable. Handle switch assemblies only when necessary.

d. Side Bracket. To reach the components located within the small compartment in the rear of the chassis, remove the right side wall as follows:

(1) Remove the five screws which hold the side wall of the assembly. Two screws are located at one end of the wall, two toward the middle of the wall, and one at the front of the assembly.

(2) Carefully disengage the side wall from the tabs on the bottom portion of the chassis; be careful not to damage the wiring to sockets X-8 and X-9. Caution: Disconnect all power before performing the following operations. Upon completion, reconnect power and check for satisfactory operation.

23. Organizational Monthly Preventive Maintenance Checks and Services Chart

Caution: **Disconnected all power before reforming the following operations. Upon completion, reconnect power and check for satisfactory operation.**

Seq No.	Item to be inspected	Procedure	Reference
1	Amplifier	Check for completeness and satisfactory condition of the amplifier; refer to the top and bottom views of the chassis.	Figs. 3 and 4.
2	Power supply	Check to see that the voltage marking on the power supply unit and the voltage indicated by the markings on the front panel agree.	Fig. 1.
3	Electrolytic capacitors	Inspect the electrolytic capacitor for discoloration, corrosion, bulging, or leakage of liquid. If these conditions are observed, substitute a new electrolytic capacitor known to be in good condition.	Fig. 3
4	Tubes, thermal relay, ballast tube	Inspect glass envelopes of tubes, thermal relay, and ballast tube. Replace them if the envelope is loose or cracked. Wipe off dirt or dust.	Fig. 3
5	Bases of pluck-out parts.	Inspect the bases of pluck-out parts for evidences of damage. Clean dirty or corroded pins by rubbing them lightly with fine emery cloth. Dust them with a' small, clean brush. Clean the base and shell of the capacitor with a clean,	Fig. 3

Seq No.	Item to be inspected	Procedure	Reference
		lint free cloth moistened with cleaning compound (Federal stock No. 7930-395-9542). Dry in an air draft. Warning: Prolonged breathing of cleaning compound is dangerous. Make certain that adequate ventilation is provided. Cleaning compound is flammable; do not use near a flame. Avoid contact with the skin: wash off any that spills on your hands.	
6	Chassis	Examine the chassis for mechanical defects, dirt, and corrosion.	Figs. 8 and 11.
7	Wiring	Examine for charred, loose, defective, or broken wiring and insulation. Examine lugs on capacitors, transformers, chokes, switches, and connectors, and on tube and relay sockets.	Fig. 11.
8	Mounting hardware	Examine all nuts, bolts, and other mounting hardware on the chassis to make sure that they are not loose. Loose mounting hardware may cause intermittent noises in the amplifier and in the set associated with it.	
9	Sockets	Inspect tube and other sockets for broken or excessively spread or corroded and dirty contacts. Check mounting rivets to determine that sockets are :held firmly to the chassis. See that the tube shields hold firmly to their bases.	Fig. 11.
10	Connectors	Examine connectors for corrosion of contacts, breaks or damage to insulation. and defective wiring.	Fig. 1.
11	Resistors	Examine bodies of resistors for blistering, discoloration, or other signs of overheating. Inspect connecting leads for corrosion, dirt, dust, looseness and broken or trailing strands in the connecting wires. Discoloration of the resistor may indicate that the component has been operated under overload and overheating, and may be taken as a sign of a defect in another part. (Power resistors may show discoloration as a result of burning of the fungicidal lacquer; hence the discoloration does not always indicate a defective resistor.) Be careful when examining or removing resistors which have pigtail connections. These connections may break at the point of entry into the body of the resistor and render it useless.	Fig. 11.
12	Transformers	Leakage of potting compound fiom transformers is evidence of a short circuit in a winding of that part or of overloading because of associated faulty resistors ,or capacitors.	Fig. 3.

Seq No.	Item to be inspected	Procedure	Reference
13	Fuse holder	Check the fuse holder for signs of burning, charring, corrosion, or poor contact with the fuse. Note. A burned out fuse is usually a sign of failure in another Part of the circuit. When a fuse is found to be burned out, the trouble is automatically localized to the filament, relay, or plate supply circuits in the amplifier.	Fig. 3.
14	Switches	Operate the switches on the front panel to each of the operating positions to determine that it works easily with no searching for contacts. Examine switch contacts for evidences of corrosion, improper contact, or dirt. Do not place excessive strain on the solder connections of the switch.	Fig. 3.
15	Gaskets and miscellaneous parts.	Inspect for leaking waterproof gaskets, and worn or loose parts.	
16	Moisture proofing and fungusproofing	Check adequacy of moisture proofing and fungiproof treatment.	
17	Switch S-1	Clean and tighten switch S-1 and interior of chassis.	Figs. 3 and 4.

24. Reassembly

After the organizational monthly maintenance checks and services described in the preceding paragraphs have been made, the unit is ready for reassembly. To reassemble the unit, follow the reverse of the procedure described in paragraph 22. Proceed as follows: Re-attach the side brackets, if they have been removed. Reassemble the left side bracket first. Align it so that the slits in the bracket slide over the notches on the side of the chassis. Restore the mounting screws. Follow the same procedure to reassemble the right side bracket. Reattach the front panel with the six mounting screws; be careful to tuck the connecting cable carefully in place and not to damage the wiring. Tighten all mounting screws. Check to see that all plug-in parts are firmly seated in their sockets. Replace the outer case and tighten the Dzus fasteners.

Page 20, chapter 3. Make the following changes:
Delete the title of the chapter and the note below the title and substitute:

CHAPTER 3
DIRECT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Note. The troubleshooting procedures given in section II of this chapter and the repair procedures given in section III of this chapter are based on the assumption that the unit is disassembled in accordance with the procedures given in chapter 2.1. Replace pluck-out parts as directed in the procedure for the particular test. After the necessary repairs have been made, (Sec III), reassemble the unit in accordance with the procedure given in paragraph 24.
Delete section I (added by C 1, 22 Aug 52) and substitute:

Section I. PREREPAIR PROCEDURES

25. Removal of Pluck-out Parts

Remove the pluck-out parts as follows:

a. Plug-In Power Supply Unit.

(1) Loosen the clamp bracket at the rear of the power supply compartment (fig. 11).

(2) Pull the power supply unit out of the compartment. A handle is provided on the power supply unit for this purpose.

b. Tubes.

(1) Place the unit in its normal operating position, and remove the tube shields.

(2) Remove tubes V-1 through V-7 from their sockets (fig. 3) with a tube puller. If a tube puller is not available, pull up the tubes with the fingers; use a straight upward pull. Do not rock or jiggle the tube in its socket; prongs may become damaged.

c. Ballast Tube R-S2 and Thermal Relay K-1. The ballast tube and the thermal relay are mounted horizontally in the rear of the chassis (fig. 3). Remove these parts with a straight horizontal pull; follow the precaution indicated in b above.

d. Electrolytic Capacitor C-1. Remove capacitor C-1 (fig. 3).

26. Testing Pluck-out Parts

Test the pluck-out parts as follows:

*a. Tubes V-1 Through V-*5. Check vacuum tubes V-1 through V-5 with Test Set, Electron Tube TV-7/U (or equivalent). If a tube checker is not available, the most reliable test is to substitute the tube in a unit known to be operating properly.

b. Thermal Relay K-1. Use Multimeter AN/URM-105, to check the continuity as follows:

Pins	Meter reading (ohms)
5 and 7	0
2 and 3	27.7

c. Ballast Tube R-32. Use multimeter AN/URM-105 to check the continuity between pins 2 and 7 of the ballast tube. A reading of approximately 3 ohms should be obtained.

d. Electrolytic CapacitorC-1. Triple-section electrolytic capacitor C-1 may be tested by the substitution of one from an amplifier known to be in good operating condition and observing whether the unit continues to operate unsatisfactorily when the capacitor is installed. The capacitor may be tested also by the use of the ohmmeter section of Multimeter AN/URM-105. For testing capacitor sections C-1B and C-1C, which have high voltage ratings, use the high resistance scale (at least 5 megohms) of the ohmmeter. For testing low voltage section C-IA, use the 50,000-ohm range of the meter. Test each section of the capacitor separately as indicated below.

Warning: **Before making any measurements, discharge the capacitor by shorting the positive and negative terminals. This applies also if a measurement is to be repeated. Note that the negative terminal is common to all three sections of the capacitor.**

(1) Connect the positive lead of the ohmmeter to the positive terminal of the capacitor section under test. Connect the negative lead of the meter to the common negative terminal of the capacitor.

(2) Observe the meter pointer. The ohmmeter first should indicate a very low value of resistance. The pointer should then creep up slowly in the high resistance direction on the scale. The final resistance reading should be at least 1 megohm for each of the high voltage sections, C-1B and C-1C, and about 15,000 ohms for the low voltage section, C-1A.

(3) If the final resistance reading is less than 250,000 ohms for C-1B or C-1C or less than 3,000 ohms for C-1A, replace the capacitor.

e. Voltage Regulator Tubes V-a and V-7. Check the emission of the tubes with a tube checker. Use Multimeter AN/URM-105, to make the continuity checks indicated below:

Point of measurement	Meter reading (ohms)
Pins 1 to 5	0
Pins 2 to 4	0
Pins 2 to 7	0
Pins 2 to 5	Infinity

f. Fuse F-1. Use Multimeter AN/URM-105, to check the continuity of fuse F-1. Discard the fuse if the check shows it to be open.

27. Cleaning

a. Dirt or corrosion will interfere with electrical continuity and mechanical efficiency of the parts and the unit by causing circuits to be shorted or insulated, or by causing switches to be jammed. It is important to clean all parts of the chassis and panel carefully and thoroughly.

b. No set method can be given for removal of

dirt because of the many ways and places in which it collects. Cleaning should be done with a lintless cloth, fine (No. 000) sandpaper, crocus cloth, a soft brush, or, in more difficult cases, with an orangestick. Dust and grease usually can be removed with a cloth or brush moistened in cleaning compound. Never use gasoline for cleaning. Be extremely careful in cleaning spots which are difficult to reach or parts which are delicate in order to avoid damage to wiring or parts. When it is necessary to remove portions of the moisture-fungiproofing from a part, retropicalization is essential (para 43b).

c. If available, use an airhose to blow out dust and lint from the chassis. Make sure, however, that no oil or water is carried along with the airstream and that the stream is controlled so that damage to small resistors and capacitors does not result.

d. Clean the cases of fixed capacitors, the relay, and other components. Remove all dirt and corrosion. In most cases, a dry cloth will do the job. If deposits of dirt are hard to remove, moisten the cloth with cleaning compound. Dry carefully.

e. Clean small components, such as resistors, with a small brush.

f. Clean dirty or corroded socket and switch contacts carefully. Use crocus cloth to remove corrosion. The wafer of switch S-1 is fragile; handle it with care.

28. Reassembly.

(See paragraph 24.)

Sections designated III, IV, V, and VI (renumbered by C 1, 22 Aug 52). Renumber as II, III, IV, and V respectively.

Page 22, figure 11 (as changed by C 3, 3 Mar 58). Add the following note to figure 11:

Note. On AF Amplifier AM-65A/GRC, J5 is mounted on the outside of the chassis rear wall. It is held in place with modified retainer plate 0 12.

Page 25, figure 12 (as added by C 1, 22 Aug 52). Add the. following to note 2: (FOR MODELS PROCURED ON ORDERS NO. 16820-P-51 AND 21444P-50, 220 OHMS IS CHANGED TO 150 OHMS.)

Page 28, paragraph 33 chart, "Required reading (ohms)" column (As changed by C 2, 23 Oct 53).

Line 10. Change "20" to 20 (32 for models procured on all orders except No. 18651-Phila49).

Lines 13 and 14. Change 200 to 200 (246 for models procured on all orders except No. 18651-Phila-49).

Page 29, paragraph 35b (as changed by C 2, 23 Oct 53). Delete the note.

Page 31, figure 14 (as changed by C 1, 22 Aug 52). Add the following note to figure 14:

NOTE S: FOR MODELS PROCURED ON ORDERS NO. 16820-P-51 AND 21444-P-50, READ-INGS AT X-9, PIN 7, AND X-8, PIN 5, ARE CHANGED TO 6.4V.

Page 33, paragraph 40c (as changed by C 3, 3 Mar'58). After the heading, designate the existing subparagraph as "(1)" and add:

(2) On AF Amplifier AM-65A/GRC, connector J5, is mounted on the outside of the main chassis rear wall. It is retained in position with modified retainer plate 0 12. The retainer plate is secured in position by three 6-32-by l/4-inch screws, three lockwashers, a steel spring, and three hexagonal nuts.

Page 34. Delete section V.1 (added t4, 14 Apr 59) and substitute:

Section IV.1 GENER SUPPORT TESTING PROCEDURES

44.1 General

Testing procedures are prepared for use by Signal field maintenance shops and Signal service organizations responsible for general support maintenance of signal equipment to determine the acceptability of repaired signal equipment. These procedures set forth specific requirements that repaired signal equipment must meet before it is returned to the using organization. The testing procedures can also be used as a guide for testing equipment repaired at the direct support level if the proper tools and test equipments are available.

Note. Depot Overhaul Standards (DOS) are identical with the performance standards for General Support Testing Procedures (GSTP). Measurements are made by the use of the same tests and test procedures as for this section.

44.2 Test Equipment and Materials

All test equipment and materials required to perform the tests are authorized under TA 11-17 and TA 11-100 (11-17). These items, along with their Federal stock number, are listed in paragraphs 44.8 and 44.9. The test equipment and materials required for each test will be found listed in the heading of each test.

44.3 Test Procedure

a. Since each test is dependent on the preceding one for certain operating procedures and test equipment calibrations, the tests must be conducted in1 sequence starting with physical tests and inspection (para 44.11).

b. The instructions in the heading of each test are to be complied with before beginning the test. The test is divided into steps, each of which must be-. completed before preceding to the next step.

c. Each step is to be performed by completing the procedure in each column in turn, starting with the left column (Control settings, test equipment). Perform each specific test procedure and verify it against its performance standard.

44.4 Test Facilities

A dc power source of 6, 12, or 24 volts plus an internal vibrator-type power supply with the same voltage rating is required to furnish the operating voltages for the amplifier. Power Supply PP-282/GRC (24 volts) is authorized for shop use. However, any one of the power supplies listed in the chart below may be used.

Caution: Be sure that the dc power source is correct for the internal power supply being used.

Vibrator Dower supplies		Power sources	
PP-448/GRC	6 vdc	PP-1097A/G	0-32 vdc
PP-281/GRC	12 vdc	PP-1104A/G	11.5-35 vdc
PP-282/GRC	24 vdc	Battery, wet, BB-46 (2 required for operation with PP-282/GRC).	12 de

44.5 Modification Work Orders

Perform all modification work orders pertaining to this equipment before making the tests specified. A full listing of modification work orders will be found in DA Pam 310-4.

44.6 Moistureproofing and Fungiproofing

Areas, parts, and connections disturbed by repairs and/or testing will be checked for proper moistureproofing and fungiproofing.

44.7 Time Required to Perform Testing Procedures

Approximately 30 minutes per equipment is required to perform the testing procedures.

44.8 Test Equipment Required

Nomenclature	FSN	Reference
Audio Oscillator TS-382(*)/U[a]	6625-192-5094	TM 11-626-261-12
Output Meter TS-585(*)/U[b]	6625-244-0501	TM 11-5017
Spectrum Analyzer TS-732A/U	6625-668-9418	TM 11-5097
Multimeter TS-352 (*)/U[e]	6625-500-4508	TM 11-5527
Electric Light Assembly MX-1292/PAQ	6695-537-4470	TM 11-5540
Handset H-33 (*)/PT	6965-163-9947	
Power Supply PP-1097A/G	6130-669-6640	TM 11-5111
Power Supply PP-1104/G	6130-63-4900	TM 11-5126
Receiver-Transmitter RT-70/GRC	65820-37-3913	TM 11-290
Test Facilities Kit MK-1563/GRC	6625-322-4903	
Loudspeaker LS-166/U	5965-243-6420	
Headset HS-30	596-164-7529	

[a]Official nomenclature followed by (e) is used to indicate T382 (A thru P)/U.
[b]Offical nomenclature followed by (*) is used to indicate T-585A/U, TS5SB/U, or T-868C/U.
[e]Officlal nomenclature followed by (*) Is used to indicate T--352/U, T-352A/U., or T352B/U.

44.9 Test Materials Required

Nomenclature	FSN
Cable Assembly W-2, 2 ea.....	5995-243-0612
Battery clips, 4 ea.....	65940-177-1719

44.10 Cable Assembly W-2

This cable assembly is a part of Mount MT-297/GRC. The color code for the assembly is indicated in the chart below:

Wire color	Connector pin	Wire color	Connector pin
Blue	A	Red	H
Brown	B	White	J
Yellow.....	C	Black, cotton-covered.....	K
Black, plastic-insulated.....	D	Tan	SPARE
Gray.....	E	Green.....	SPARE
Violet.....	F		

44.11 Physical Tests and Inspection

a. Test Equipment and Materials. Electric Light Assembly MX-1292/PAQ.

b. Test Connections and Conditions. None.

c. Procedure.

Step No	Control Settings: Test equipment	Control Settings: Equipment under test	Test procedure	Performance standard
1	MX-1292/PAQ: Connect mercury vapor lamp. Install in wide transmission filter.	Controls may be in any position.	Inspect case and chassis for damage, missing parts, and condition of paint. Note. Touchup painting is recommended in lieu of refinishing whenever practicable. Screwheads, binding posts, receptacles, and plated fasteners will not be painted or polished with abrasives.	No damage or missing parts are evident. External surfaces intended to be painted do not show bare metal.
2			Examine all sockets, connectors, and mounting hardware for tightness, corrosion, or damage to contacts, breaks or damage to insulation, or defective wiring.	All sockets, connectors, and mounting hardware are tight and in good condition. Insulation and wiring are in good condition.
3			Check fuseholder for signs of overheating or poor contact with fuse. Make sure that fuse is of proper value for voltage to be used in operational tests.	Fuse is 10 amp for 6-volt operation and 12 volt, 4 amp for 24-volt operation. Fuse holder makes positive contact and shows no signs of overheating.
4			Operate all switches and controls, and check for smooth, positive action. Examine switch contacts for cleanliness and proper contact.	All controls and switches are clean, operate smoothly, and make positive contact.

Step No	Control Settings: Test equipment	Control Settings: Equipment under test	Test procedure	Performance standard
5	.....	.....	Turn on lamp (switch labeled 245V) and expose to the direct rays of the lamp the portion of the equipment that has been repaired or disturbed. Note. There will be no moistureproofing or fungiproofing varnish on switch contacts, variable capacitor plates, or dial mechanisms.	All repaired electronic components and chassis surfaces are covered with moistureproofing and fungiproofing varnish.

44.12 Distortion and Audio Power Tests

a. Test Equipment and Materials.
(1) Spectrum Analyzer TS-723A/U
(2) Output Meter TS-585(*)/U.
(3) Test Facilities Kit MK-153/GRC.
(4) Audio Oscillator TS-382(*)/U.
(5) Cable Assembly W-2.

b. Test Connections and Conditions. Connect the equipment as shown in figure 14.1, step 1. Turn on the TS-382 (*)/U and TS-723A/U and allow 5 minutes to warm up.

c. Procedure.

Step No	Control Settings: Test equipment	Control Settings: Equipment under test	Test procedure	Performance standard
1	TS-382(*) /U: TUNING: 100 FREQUENCY MULTIPLIER: X10 ATTENUATOR: X1 OUTPUT: max ccw TS-723A/U: INPUT: max ccw FUNCTION: SET METER RANGE: 100% RANGE: X10 AF-RF:AF MT-2917/GR (P/O MK-153/GRC) :	VOLUME: max cw. OFF-INT-RT-70: INT	a. Adjust TS-382A/U OUTPUT control for 0.5-volt indication on its OUTPUT meter. b. Set MT-297/GR OFF-REMOTE-ON switch c. Adjust TS-723A/U INPUT CONTROL until meter indicates full scale (0-1 scale). Set FUNCTION switch to DISTORTION and adjust FREQUENCY control for minimum indication. d. Adjust BALANCE controy for minimum meter indication. If indication drops to an. unreadable minimum, reduce METER RANGE to 10% or 3% for more accurate indication. Readjust FREQUENCY and BALANCE until no further reduction in	a. None. b. None. to ON. c. None. d. None.

Step No	Control Settings: Test equipment	Control Settings: Equipment under test	Test procedure	Performance standard
	OFF-REMOTE-ON switch: OFF TS-585(*) /U: IMPEDANCE: 60 X10 RANGE: X100		meter indication is obtained.	
			e. Note and record the indication on the TS-723A/U meter.	e. 10% max.
			f. Note and record the TS-585 (*)/U indication.	f. 280 milliwatts minimum.
			g. Set MT-297/GRC OFF-REMOTE-ON switch to OFF and reconnect equipment as shown in figure 14.1, step 2.	g. None.
2	No change from end of step 1.	No change from end of step 1.	a. Repeat a through f of step 1 for set 2 channel.	Same as in step 1.
			b. Set MT-297/GRC OFF-REMOTE-ON switch to OFF and reconnect equipment as shown in figure 14.1, step 3.	
3	No change from end of step 2, except TS-82 (*)/U OUTPUT: .25 V.	No change from end of step 2.	a. Repeat b through f of step I for interphone channel.	a. None.
			b. Set MT-297/GRC OFF-REMOTE-ON switch to OFF. Leave test equipment turned on and proceed to the next test.	b. None.

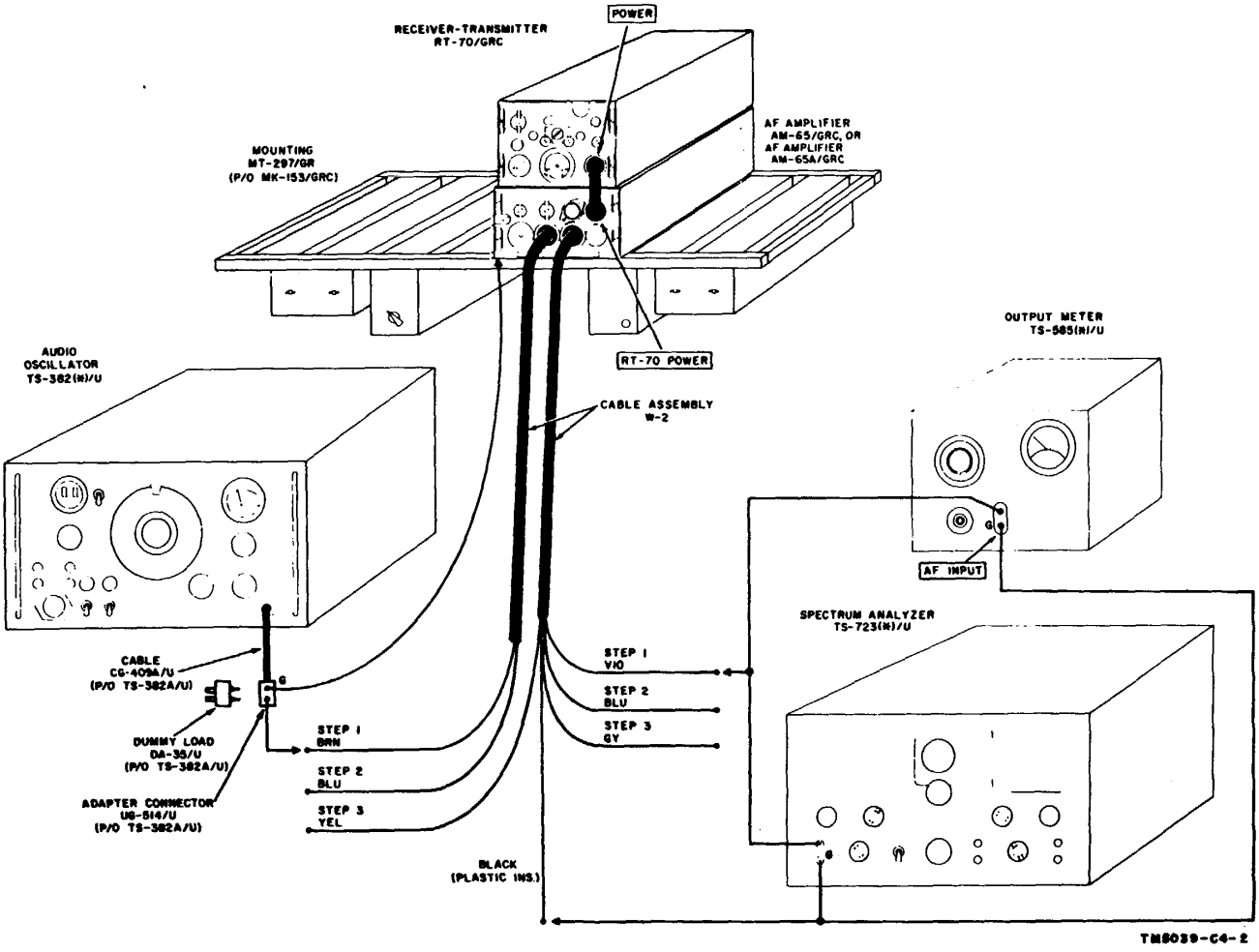

Figure 14.1 Distortion and audio power test.

44.13 Crosstalk Test

a. Test Equipment and Materials.

(1) Spectrum Analyzer TS-723/U.
(2) Output Meter TS-585/U.
(3) Audio Oscillator TS382(*)/U.
(4) Headset HS-30.
(5) Cable Assembly W-2, 2 each.

b. Test Connections and Conditions. Connect as shown in figure 14.2, step 1. Turn on all test equipment and allow 3 minutes minimum warm up before proceeding.

c. Procedure.

Step no.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	TS-382(*)/U: TUNING: 100 FREQUENCY MULTIPLIER: X10 OUTPUT: .5 V indication on-OUTPUT meter ATTENUATOR: X10 TS5856(*)1U: IMPEDANCE: 60 x 10 RANGE: X100/U. TS-723A/U: FUNCTION: METER RANGE: +10.	VOLUME: max cw OFF-INT-RT-70: INT.	a. Note and record indication of TS-585(*)/U b. Reconnect the TS-723/U and HS-30 as shown in figure 14.2, step lb. Note and step lb. Note and record the indication -of the TS-723A/U. c. Reconnect the TS-723A/U and HS--0 as shown in figure 14.2, step la. Note and record the indication of the TS-723A	a. None. b. Indication must be 45 db min below indication noted in a above. c. Same as b above.
2	No change from step 1	No change from step 1	a. Reconnect equipment as shown in figure 14.2, step 2a. Note and record TS-728A/U indication. b. Reconnect TS-728A/U and HS-80 as in figure 14.2, step 2b Note and record indication on TS-728A/U. e. Reconnect TS-728A/U and HS-80 as in figure 14.2, step 2c. Note and record indication of TS-728A/U.	a. None. b. Indication must be 45 db min below indication noted in a above. c. Same as in b above.
3	No change from step 2 except:	No change from step 2	a. Reconnect equipment as shown in figure 14.2, step 3a. Note' and record TS-728A/U indication.	a. None.

Step no.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
	TS-382(*)/u OUTPUT: self for .25 V indication on OUTPUT meter ATTENUATOR: X1		b. Reconnect TS-723A/U and HS-30 as in figure 14.2 step 3b. Note and record TS- c. Reconnect TS-723AA/U and HS-30 as in figure 14.2, step 3c. Note and record TS-723A.U indication.	b. Indication must be 45 db min below that noted In a above. c. Same as in b above.

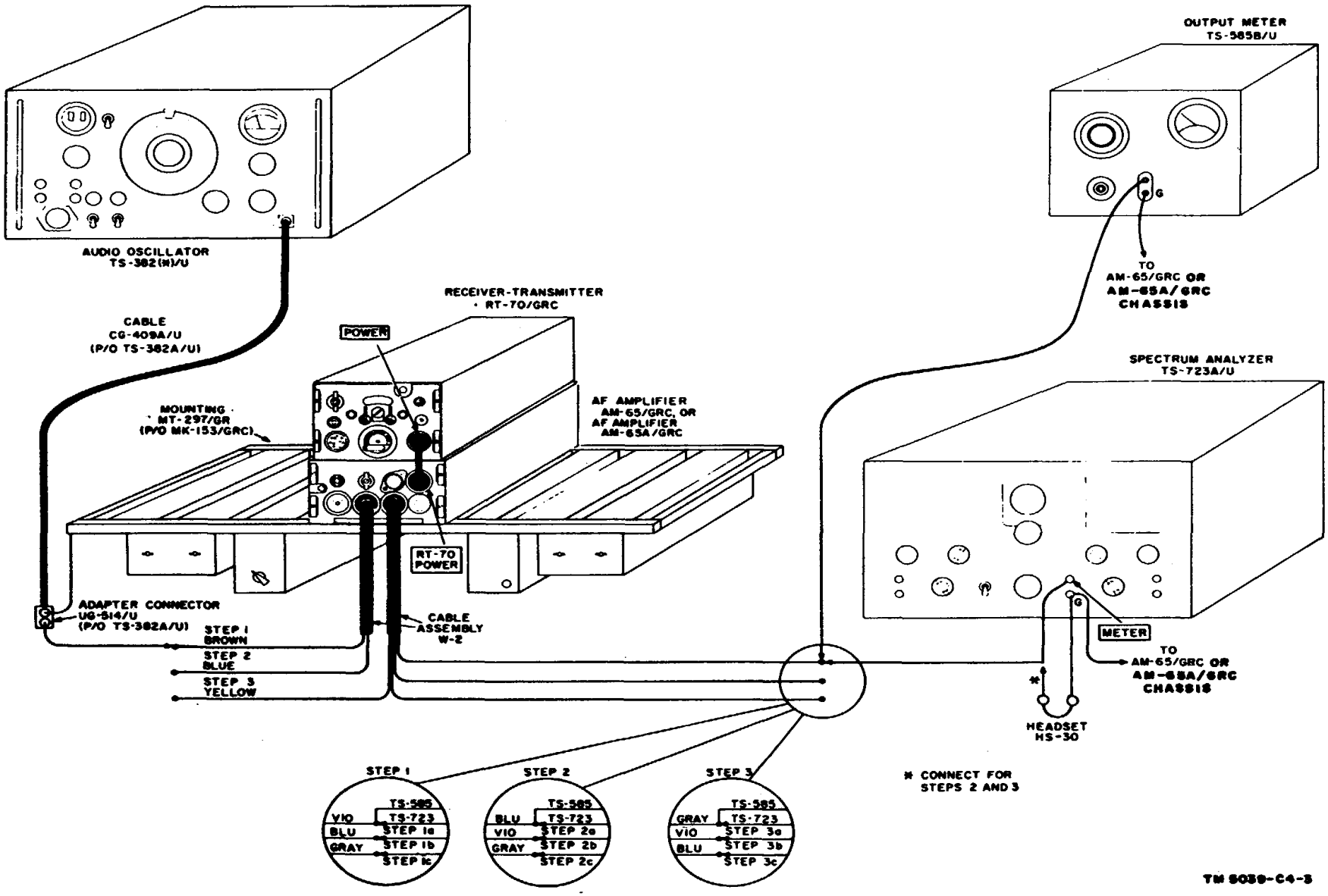

Figure 14.2. Crosstalk test.

44.14 C Power and Control Voltage Tests

a. Test Equipment and Materials.

(1) Test Facilities Kit MK-1563/GRC.
(2) Multimeter TS-52(*) /U.
(3) Receiver-Transmitter RT-70/GRC.
(4) Handset H-388(*)/PT.

b. Test Conditions and Connections. Connect equipment as shown in figure 14.3. Do not apply power until instructed to do so in TEST PROCEDURE.

c. Procedure.

Step no.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	TS-352(*)/U:		Caution: Be sure that switch S-1 inside AM-65/	
	FUNCTION: 20,000 Ω/V DIRECT	VOLUME: max cw	GRC is set to match the power source voltage and	
	MT-297/GR (P/O MK-158/GRC):	OFF-INT-RT-70 sw: RT-70	that the plug-in power supply is the proper voltage rating for the power source being used.	
	OFF-REMOTE-ON aw.: OFF		a. Turn MT-297/GRC OFF-REMOTE-ON switch to ON.	a. None.
	RT-7O/GRC POWER: ON VOLUME: max ccw		b. Read and record the indication noted on TS-352(*)/U.	b. 90 +5%
			c. Turn OFF-REMOTE-ON switch to OFF.	c. None.
2	Same as above in step 1 except: Red lead changed to 10-volt range	Same as above. ----	a. Connect TS-352(*)/U as shown in figure 14.2, step 2.	a. None.
			b. Turn OFF-REMOTE-ON switch to ON.	b. None.
			c. Read and record indica- tion of TS-352(*)/U.	c. 6.3 + 0.4 volt.
			d. Turn OFF-REMOTE-ON switch to OFF.	d. None.
	Same as step 2 above	Same as step 1.-----	a. Connect TS-352(*)/U as shown an figure 14.3, step 3.	a. None.
			b. Turn OFF-REMOTE-ON switch to ON.	b. None.
			c. Depress push-to-talk switch on H-83/PT. Read and record indij cation on TS-352(*)/U.	c. 6.3 + 0.4 volt.
			d. Turn off all equipment.	d. None.

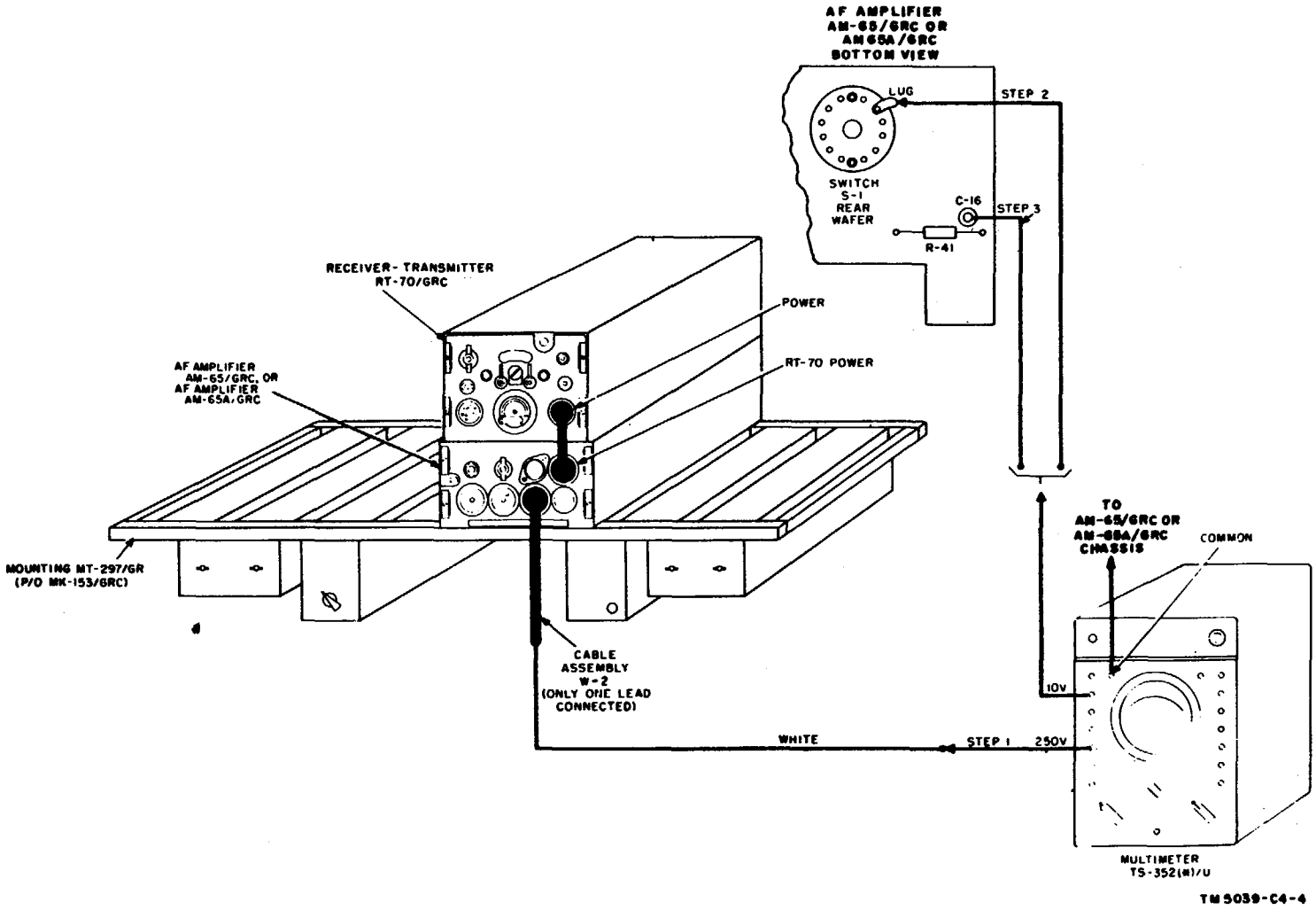

Figure 14.3 Dc power and control voltage tests.

44.15 Test Data

Personnel may find it convenient to arrange test data in a manner similar to that shown below:

AF Amplifier AM-65/GRC

Serial No ---------- Model ----------
Work Order No ------Technician ----------
Date ----------Inspector ----------

(S) Satisfactory
(U) Unsatisfactory

1 PHYSICAL TESTS AND INSPECTION

a	Paint & MFP----------	_____
b	Controls and Mechanical----------	_____
	Assemblies----------	_____
c	Connectors, Sockets----------	_____
	& Receptacles ----------	_____
d	Case and Chassis----------	_____
e	Controls (Operation) .----------	_____
f	MWO (list those not applied) --------	_____

2 DISTORTION, POWER AND CROSS TALK TESTS

a	Set 1 channel		
	Supply	_____	6.3 +.4 v
	(1) Distortion	_____	10% max
	(2) Power Output	_____	280 mw min
	(3) Crosstalk	_____	45 db below (2) above
b	Set 2 channel		
	(1) Distortion	_____	10% max
	(2) Power Output	_____	280 mw min
	(3) Crosstalk	_____	45 db below (2) above
c	Interphone Channel		
	(1) Distortion	_____	10% max
	(2) Power Output	_____	280 mw min
	(3) Crosstalk	_____	45 db below (2) above

3 D. C. POWER AND CONTROL VOLTAGE

a	Set 2 Plate Supply	_____	90 v +50%
b	Set 2 Filament Supply	_____	6.3 +.4 v
c	Set 2 Relay and Microphone Supply		

APPENDIX A

REFERENCES

Following is a list of applicable references available to the repairman of AF Amplifiers AM65/GRC and AM-65A/GRC:

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, Lubrication Orders, and Modification Work Orders
TM 9-213	Painting Instructions for Field Use
TM 9-6140-200-15	Operation and Organizational, Field, and Depot Maintenance: Storage Batteries, Lead-Acid Type
TM 11-415	Primary Batteries (Dry and Reverse Types)
TM 11-483	Radio Interference Suppression
TM 11-486-2	Electrical Communication Systems Engineering: Traffic
TM 11-486-6	Electrical Communication Systems Engineering, Radio
TM 11-661	Electrical Fundamentals (Direct Current)
TM 11-681	Electrical Fundamentals (Alternating Current)
TM 11-4000	Troubleshooting and Repair of Radio Equipment
TM 11-5017	Output Meters TS-585A/U, TS-585B/U, TS-585C/U, TS-585D/U
TM 11-5097	Spectrum Analyzers TS-723A/U, TS-723B/U, TS-723C/U, and TS-723D/ U
TM 11-5527	Multimeters TS-352/U, TS-352A/U, and TS-352B/U
TM 11-5540	Electrical Light Assembly MX-1292/PAQ
TM 11-5820-281-20P	Organizational Maintenance Repair Parts and Special Tools List and Maintenance Allocation Chart for Audio Frequency Amplifier AM-65/GRC and AM-65A/GRC
TM 11-5820-281-35P	Field and Depot Maintenance Repair Parts and Special Tools List for Audio Frequency Amplifier AM-65/GRC and AM-65A/GRC
TM 11-6625-261-12	Operator’s and Organizational Maintenance Manual: Audio Oscillators TS-382A/U, TS-382B/U, TS-382D/U, TS-382E/U, and TS-382F/U
TM 38-750	Army Equipment Record Procedures

APPENDIX B

BASIC ISSUE ITEMS

Section I. INTRODUCTION

1. General

This appendix lists items for Amplifier, Audio Frequency AM-65/GRC, AM-65A/GRC, the component items comprising it, and the items which accompany it, or are required for installation, operation, or operator's maintenance.

2. Explanation of Columns

An explanation of the columns in section II is given below.

a. Source, Maintenance, and Recoverability Codes (Column 1). Not used.

b. Federal Stock Number, Column 2. The Federal stock number for the item is indicated in this column.

c. Description, Column 3. The Federal item name, a five-digit manufacturer's code, and part number are included in this column.

d. Unit of Issue, Column 4. The unit used as a basis of issue (e.g. ea, pr, ft, yd, etc.) is noted in this column.

e. Quantity Incorporated in Unit Pack, Col umn 5. Not used.

f. Quantity Incorporated in Unit, Column 6.

The total quantity of the item used in the equipment is given in this column.

g. Quantity Authorized, Column 7. The total quantity of an item required to be on hand and necessary for the operation and maintenance of the equipment is given in this column.

h. Illustration, Column 8.

(1) Figure number, column 8a. The number of the illustration in which the item is shown is indicated in this column. Refer only to those illustrations contained in the narrative and parts lists manuals on the same item of equipment as covered by this manual; that is, manuals with the same serial and FSC number.

(2) Item or symbol number, column 8b. The callout number used to reference the item in the illustration appears in this column.

3. Federal Supply Codes

This paragraph lists the Federal supply code with the associated manufacturer's name.

Code	*Manufacturer*
18876	Army Missile Command
71400	Bussmann Mfg Division of McGraw Edison Co.
80063	Army Electronics Command
81349	Military Specifications
96906	Military Standard

SECTION II. BASIC ISSUE ITEMS LIST

(1) SOURCE CD (a)	(1) MAINT. CD (b)	(1) REC. CODE (c)	BASIC ISSUE ITEMS LIST (2) FEDERAL STOCK NUMBER	MODEL 1	2	3	4	5	6	(3) DESCRIPTION	(4) UNIT OF ISSUE	(5) QTY INC IN UNIT PACK	(6) QTY INC IN UNIT	(7) QTY AUTH	(8) ILLUSTRATIONS (a) FIGURE NUMBER	(b) ITEM OR SYMBOL NUMBER
			5820-194-8303							AMPLIFIER, AUDIOFREQUENCY AM-65/GRC, AM-65A/GRC: 80063; SC-DL-40826 (NX)	ea				1	
			ORD THRU AGC							TECHNICAL MANUAL TM 11-5039	ea			1		
										NOTE: For technical manuals the quantity indicates the maximum number of copies authorized for packing (or issue) with the equipment. Where a number of these equipments are concentrated in a small area, the quantity on hand may be reduced to practical levels. Excess publications must be returned to publication supply central through AG channels.						
			5960-262-3763							ELECTRON TUBE: 18876; OB2WA	ea		2	1	1	V6, V7
			5960-188-3551							ELECTRON TUBE: 81349; 6AK6	ea		2	1	1	V2, V3
			5960-166-7663							ELECTRON TUBE: 81349; 12AU7	ea		3	1	1	V1, V4, V5
			5920-843-2284							FUSE, CARTRIDGE: 96906; F09G4R00A	ea		1	3	1	F1
			5920-142-7365							FUSE, CARTRIDGE: 71400; AGU10	ea		1	3	1	F1
			5945-222-2087							RELAY, THERMAL: 80063; SC-A-46762A	ea		1	1	1	K1
			5905-258-0794							RESISTOR, CURRENT, REGULATING: 81349; TJ601K01	ea		1	1	1	R32

SECTION II. BASIC ISSUE ITEMS LIST

(1) SOURCE CD (A)	(1) MAINT. CD (B)	(1) REC. CODE (C)	(2) FEDERAL STOCK NUMBER	MODEL 1	2	3	4	5	6	(3) DESCRIPTION	(4) UNIT OF ISSUE	(5) QTY INC IN UNIT PACK	(6) QTY INC IN UNIT	(7) QTY AUTH	(8) ILLUSTRATIONS (A) FIGURE NUMBER	(8) ILLUSTRATIONS (B) ITEM OR SYMBOL NUMBER
			5820-194-8303							AMPLIFIER, AUDIOFREQUENCY AM-65/GRC, AM-65A/GRC: 80063; SC-DL-40826 (NX)	ea				1	
			ORD THRU AGC							TECHNICAL MANUAL TM 11-5039	ea			1		
										NOTE: For technical manuals the quantity indicates the maximum number of copies authorized for packing (or issue) with the equipment. Where a number of these equipments are concentrated in a small area, the quantity on hand may be reduced to practical levels. Excess publications must be returned to publication supply central through AG channels.						
			5960-262-3763							ELECTRON TUBE: 18876; OB2WA	ea		2	1	1	V6, V7
			5960-188-3551							ELECTRON TUBE: 81349; 6AK6	ea		2	1	1	V2, V3
			5960-166-7663							ELECTRON TUBE: 81349; 12AU7	ea		3	1	1	V1, V4, V5
			5920-843-2284							FUSE, CARTRIDGE: 96906; F09G4R00A	ea		1	3	1	F1
			5920-142-7365							FUSE, CARTRIDGE: 71400; AGU10	ea		1	3	1	F1
			5945-222-2087							RELAY, THERMAL: 80063; SC-A-46762A	ea		1	1	1	K1
			5905-258-0794							RESISTOR, CURRENT, REGULATING: 81349; TJ601K01	ea		1	1	1	R32

APPENDIX C

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

1. General

a. This appendix assigns maintenance functions to be performed on components, assemblies, and subassemblies by the lowest appropriate category of maintenance.

b. Columns in the maintenance allocation chart are as follows:

(1) Part or component. This column shows only the nomenclature or standard item name. Additional descriptive data are included only where clarification is necessary to identify the component. Components, assemblies, and subassemblies are listed in top-down order. That is, the assemblies which are part of a component are listed immediately below that component, and subassemblies which are part of an assembly are listed immediately below that assembly. Each generation breakdown (components, assemblies, or subassemblies) is listed in disassembly order or alphabetical order.

(2) Maintenance function. This column indicates the various maintenance functions allocated to the maintenance categories.

(a) Service. To clean, to preserve, and to replenish lubricants.

(b) Adjust. To regulate periodically to prevent malfunction.

(c) Inspect. To verify serviceability and detect incipient electrical or mechanical failure by scrutiny.

(d) Test. To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, etc.

(e) Replace. To substitute serviceable components, assemblies, or subassemblies, for unserviceable components, assemblies, or subassemblies.

(f) Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes but is not limited to welding, grinding, riveting, straightening, and replacement of parts other than the trial and error replacement of running spare type items such as fuses, lamps, or electron tubes.

(g) Align. To adjust two or more components of an electrical system so that their functions are properly synchronized.

(h) Calibrate. To determine, check, or rectify the graduation of an instrument, weapon, or weapons system, or components of a weapons system.

(i) Overhaul. To restore an item to completely serviceable condition as prescribed by serviceability standards. This is accomplished through employment of the technique of "Inspect and Repair Only as Necessary" (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the item during the overhaul process.

(j) Rebuild. To restore an item to a standard as near as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through

the maintenance technique of complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements using original manufacturing tolerances and/ or specifications and subsequent reassembly of the item.

(3) 0, Org, 8S, GS, and Depot Maintenance. The symbol X indicates the category responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Categories higher than the one marked by X are authorized to perform the indicated operation.

(4) Tools required. This column indicates codes assigned to each individual tool equipment, test equipment, and maintenance equipment referenced. The grouping of codes in this column of the maintenance allocation chart indicates the tool, test, and maintenance equipment required to perform the maintenance function.

(5) Remarks. Entries in this column will be utilized when necessary to clarify any of the data cited in the preceding columns.

c. Columns in the allocation of tools for maintenance functions are as follows: (

(1) Tools required for maintenance functions. This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

(2) 0, Org. DS, GS, and Depot Maintenance. The dagger (!) symbol in these columns indicates the maintenance categories normally allocated the facility.

(3) Tool code. This column lists the tool code assigned.

2. Maintenance by Using Organizations

When this equipment is used by Signal services organizations organic to theater headquarters or communication zones to provide theater communications, those maintenance functions allocated up to and including general support maintenance are authorized to the organization operating this equipment.

Section II. MAINTENANCE ALLOCATION CHART

Part or component	Maintenance Function	Echelon 1	2	3	4	5	Tools required	Remarks
AUDIO FREQUENCY AMPLIFIER AM-65/GRC, AM-65A/GRC	service	--	x	--		--	4, 7, 10	
	inspect	--	x					
	test	--		x	--	--	2, 3, 5	
						x	1, 6	
				x		--	2, 8	
					x	--	9, 11	
	replace	--	x	--		--	10	
	repair	--		x	--	--	5, 8	
	overhaul	--	--	--	--	x	1, 6	

Section III. ALLICATION OF TOOLS FOR MAINTENANCE FUNCTIONS

Tools required for maintenance functions	Echelon 1	2	3	4	5	Tool code	Remarks
AM-65/GRC, AM-65A/GRC (continued)							
ANALYZER, SPECTRUM TS-723/U	--	--	--	--	†	1	
AUDIO OSCILLATOR TS-382/U	--	--	†	†	†	2	
MULTIMETER, ELECTRONIC ME-26/U	--	--	†	†	†	3	
MULTIMETER AN/URM-105	--	†	--	--	--	4	
MULTIMETER TS-352/U	--	--	†	†	†	5	
TEST SET, ELECTRON TUBE TV-2/U	--	--	--	--	†	6	
TEST SET, ELECTRON TUBE TV-7/U	--	†	†	†	--	7	
TOOL KIT TK-87/U	--	--	†	†	†	8	
TOOL KIT TK-88/U	--	--	--	†	†	9	
TOOL KIT TK-115/G	--	†	--	--	--	10	
VOLTMETER, METER ME-30( )/U	--	--	--	†	†	11	

Page 50, figure 17 (foldout) (as changed by C 2, 23 Oct 53). Add the following notes:

Note 5. For models procured on all orders except No. 18651-Phila-49, the values of the following resistors are changed:

R-27 from 31 to 40.
R-28 from 63 to 71.
R-29 from 71 to An
R-30 from 35 to 45.
R-34 from 10 to 22.
R-35 from 220 to 150.

Note 6. For models procured on all orders except No. 18651-Phila-49, R-9A and R-9B is changed to R-9, 3000; R-1OA and R-1OB is changed to R-10, 3000.

By Order of the Secretary of the Ai

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General United States Army
Chief of Staff

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USACDCCBRA (1)
USACDCCEA (1)
USACDCCEA Ft Huachuca (1)
USACDCOA (1)
USACDCQMA (1)
USACDCTA (1)
USACDCADA (1)
USACDCARMA (1)
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USAESC (85)
USARHAW (5)
USARYIS (5)
USACOMZEUR (10)
MDW (1)
Armies (2) except
Eighth (8)
Corps (2)
USAC (3)
1st Cav Div (5)
Svc Colleges (2)
USASESCS (100)
USAADS (40)
USAAMS (40)
USAARMS (10)
USAIS (40)
USAES (2)
USATSCH (10)
USATC Armor (2)
USATC Engr (2)
USATC Inf (2)
USASTC (2)
WRAMC (1)
Army Pic Cen (2)
USACDCEC (10)
USAJFKCENSPWAR (5)
USAINTC (5)
Instl (2) except
Ft Hancock (4)
Ft Gordon (10)
Ft Huachuca (10)
WSMR (5)
Ft Carson (19)
Ft Knox (12)
Ft Devens (5)
Ft Belvoir (5)
USATCFE (5)
Army Dep (2) except
LBAD (14)
SAAD (30)
TOAD (14)
LEAD (7)
SHAD (3)
NAAD (5)
SVAD (5)
CHAD (3)
ATAD (10)
.PUAD (5)
SXAD (5)
GENDEPS (2)
Sig Sec GENDEPS (5)
Sig Dep (12)
Sig FLDMS (2)
AMS (1)
USAERDAA (2)
USAERDAW (13)
USACRREL (2)
Edgewood Arsenal (5)
Detroit Arsenal (5)
Units org under fol TOE:
(2 cys each)
5-7
5-64
5-127
5-145
5-147
5-148
5-155
5-600
5-605
5-617
6-37
6-166

6300
6-315
6-316
6-317
6-345
6-346
6-347
6-355
6-356
6-357
6-358
6-385
6-386
6-415
6-425
6-427
6-558
7 17-135
7-42
7-45
7-46
7-47
7-100
7-102
9-167
11-7
11-57
11-68
11-97
11-98
11-117
11-127
11-155
11-167
11-158
11-00 (AA-AC,SD)
11-587
11-592
11-597
11-608
17 55-47
17-4
17-15
17-16
17-17
17-18
17-27
17-35
17-36
17-37
17-42
17-51
17-52
17-55
17-56
17-57
17-98
17-100
1’7-2
12-105
17-106
17-107
17-136
17-157
29-7
29-15
29-16
29-17
29-21
29-35
29-36
29-37
29-75
29-79
32-500 (GH,HD,IB)
37
37-42
37-100
37-102
44-85
44-86
44-87
44-112
56-27
57
57-4
57-100

NG: State AG (3); units-same as active Army except allowance is one (1) copy per unit.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

U.S. GOVERNMENT PRINTING OFFICE: 1967- 302-012/919

821-240-2

DEPARTMENT OF THE ARMY TECHNICAL M,ANUAL

TM 11-5039

AF AMPLIFIER AM-65/’GRC

DEPARTMENT OF THE ARMY **JANUARY 1951**

United States Government Printing Office
Washington : 1951

DEPARTMENT OF THE ARMY

TM 11-5039 is published for the information and guidance of all concerned.
[AG 413.47 (19 Dec 50)1

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SPECIAL DISTRIBUTION.

For explanation of distribution formula, see SR 310-90-1.

WARNING

HIGH VOLTAGE

is used in the operation of this equipment.

DEATH ON CONTACT

may result if operating personnel fail to observe safety precautions.

CONTENTS

RESCUE.

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

SYMPTOMS.

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

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

TREATMENT.

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

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

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

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

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

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

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

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

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

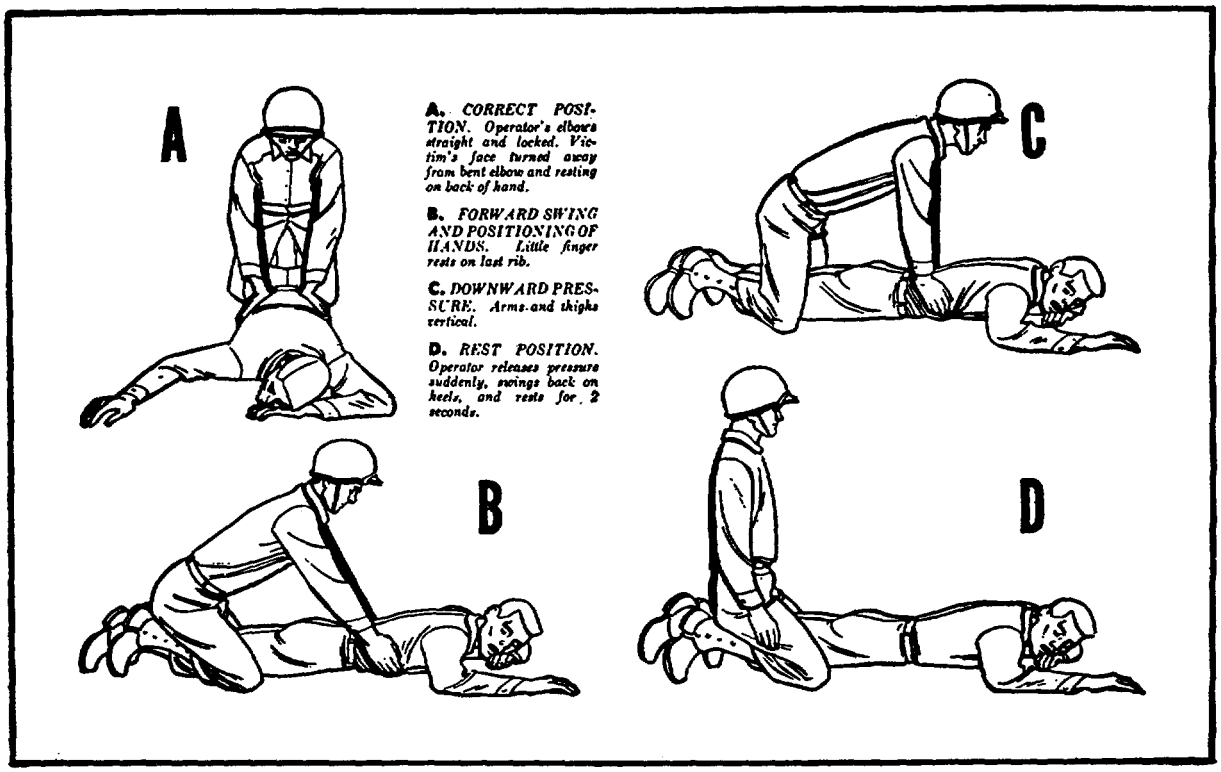
f. The resuscitation procedure is as follows:

(I) Exert downward pressure, not exceeding GO pounds, for I second.

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

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

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



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

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

RELIEVING OPERATOR.

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

STIMULANTS.

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

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

CAUTIONS.

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

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

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

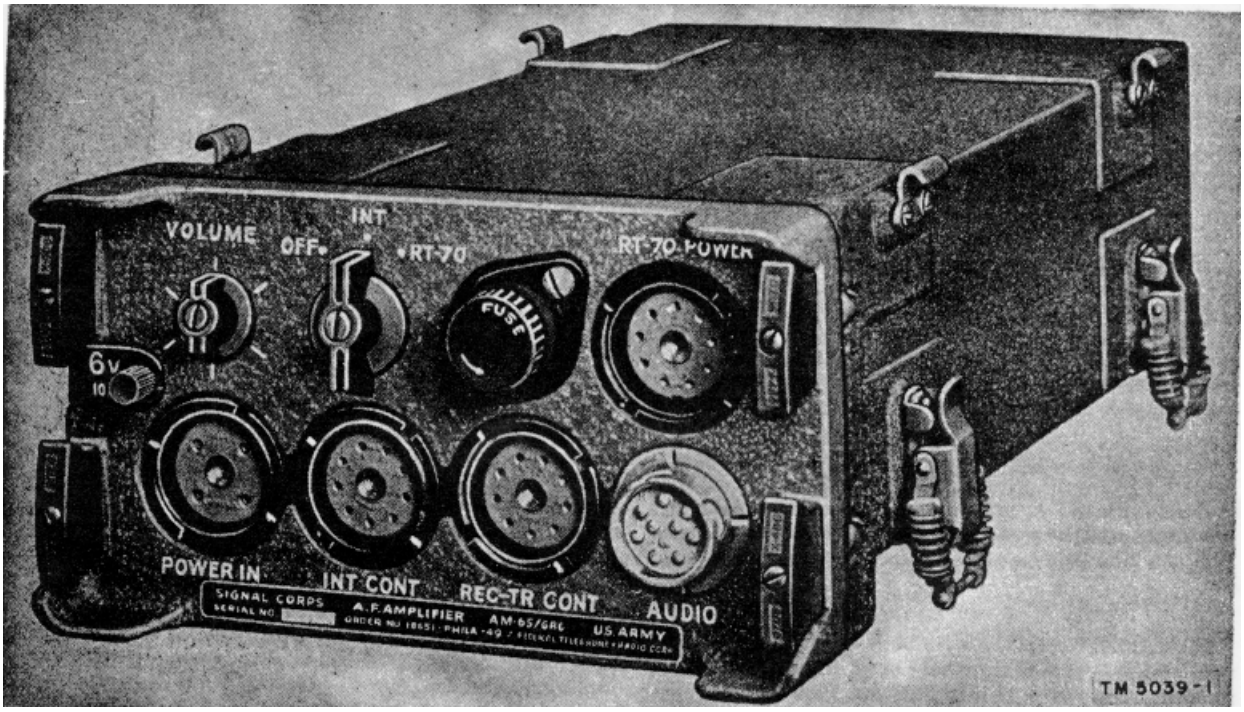


Figure 1. AP Amplifier AM-65/GRC, front view.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

This technical manual contains information pertaining to the description and theory of AF Amplifier AM-65/GRC, and provides instructions for the maintenance, repair, and test of this unit. Two appendixes furnish a list of references and an identification table of parts.

2. Forms and Records

The following standard forms will be used for reporting unsatisfactory conditions of materiel

a. DD Form 6, Report of Damaged or Im proper Shipment will be filled out and forwarded as prescribed in SR 745-45-5.

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

c. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Purpose and Use (figs. 1 and 2)

a. AF Amplifier AM-65/GRC is a lightweight, compact, three-channel a-f (audio-frequency) amplifier and electronic mixer. It is designed to provide interphone operation and radio monitoring in vehicular installations which use one or two receiver-transmitters and one or more interphone control boxes.

b. The unit contains the audio amplifier and electronic mixer circuits necessary for amplifying and mixing signals from the receiver portions of two radio sets (Receiver-Transmitter RT-70/GRC and one Receiver-Transmitter RT-66/GRC, RT-7/GRC, or RT-8/GRC) with the high-level output of the self-contained interphone. amplifier. Separate channels are provided for monitoring the output of the receivers of each type of receiver transmitter while simultaneously monitoring the low-level output of the interphone amplifier.

c. Since the unit is intended primarily for vehicular operation, it contains all the power supply circuits required for operation from 6-, 12-, or 24-volt vehicular battery systems in con junction with a plug-in type vibrator unit, Power Supply PP-448/GR, PP-281/GRC, or and equipment, or improper preservation, package ing, packing, marking, 'loading, stowage, or handling thereof. PP-282/GRC, respectively. Provisions are made within the amplifier for the power supply circuits required for the operation of Receiver-Transmitter RT-70/GRC. In addition, the unit acts as a junction box for all system connections of that receiver-transmitter.

4. System Application (fig. 2)

a. GENERAL. AF Amplifier AM-65/GRC may be used in any vehicular installation in which the amplification and mixing of signals from one, two, or three sources of audio are required. Some typical applications are discussed briefly in the following subparagraphs..

b. INTERPHONE COMMUNICATION. The amplifier, in conjunction with Control Boxes C--375/ VRC and suitable audio devices (microphones, loudspeakers, headsets), may be used in a vehicular installation to provide communication between several control stations within the vehicle, as for example, between the driver inside a tank and the observer in the turret of the tank.

c. RADIO SET AN/VRC-7. The combination of AF Amplifier AM-65/GRC, Receiver-Transmitter RT-70/GRG, Control Boxes C-375/VRC, Power I

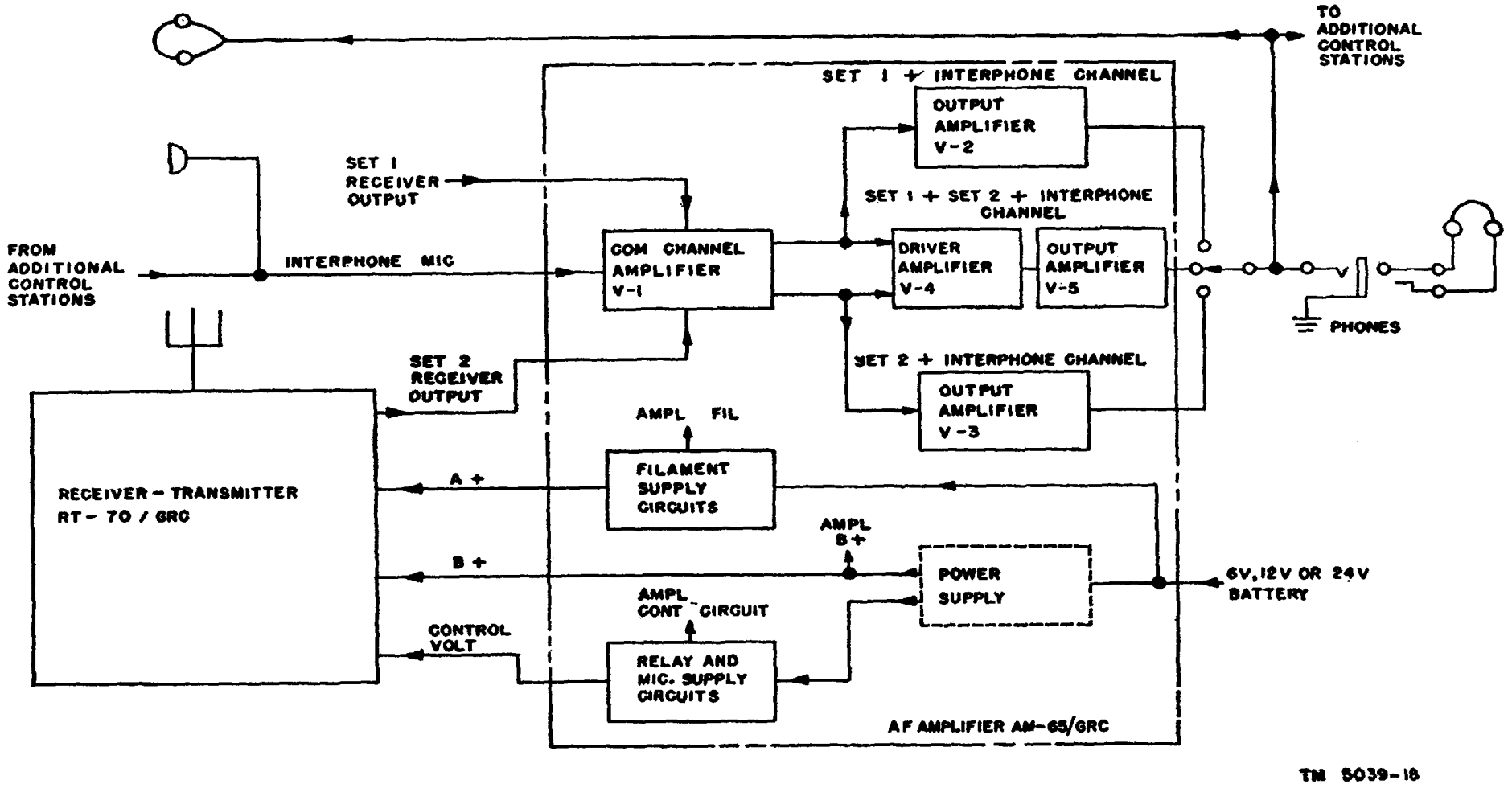


Figure 2. System application. 2

Supply PP-448/GR, PP-281/GRC, or PP-282/ GRC, and suitable mountings, cables, audio accessories, and other installation components may be used in the radio installation known as Radio Set AN/VRC-7. Figure 2 is a functional block diagram of this set. In this arrangement, the amplifier provides an interphone channel between control stations, monitoring of the interphone channel and the receiver output of Receiver-Transmitter RT-70/GRC (Set 2), and all operating potentials for its own circuits and for those of the receiver-transmitter. These functions are described below.

(1) Signal circuits. Speech signals from the microphone, shown connected directly to the amplifier (fig. 2), or signals from any one of the control stations associated with the installation enter the common amplifier channel and are amplified there.Speech signals from the output of the receiver in Receiver-Transmitter RT70/GRC (Set 2) enter the common channel amplifier over a separate path and are amplified also. (Set 1 is not used in Radio Set AN/VRC-7 and, therefore, does not enter into the discussion here.) An audio mixing arrangement associated with the common channel amplifier distributes the two signals at the proper levels to the three channels as follows: a portion of each of the two signals is routed to the Set 2 + Interphone channel, is amplified there, and appears at the output terminals of that channel; another portion of each of the two signals is routed through the Set 1 + Set 2 + Interphone channel and, after amplification, is made available at the output terminals of that channel. The arrangement of the audio mixer circuit is such that the Set 2 signal is blocked from entering the Set 1 + Interphone channel. However, the microphone signal, appearing at the output of the common channel amplifier, is permitted to enter the Set 1 + Interphone channel, is amplified there, and is made available at the output terminals of that channel. The signals appearing at the output terminals of the three channels may be monitored at any one of the control stations associated with the installation. The three-position switch, shown connected to the three-channel output circuits, is a simplified representation of a control box, which provides connecting facilities for the audio devices used (a chest set with headset and microphone), and switching facilities for monitoring the output of any one of the amplifier channels.

(2) Power supply circuits. The power supply circuits within the amplifier unit, in conjunction with a plug-in vibrator unit, convert the storage battery voltage into the d-c (direct-current) potentials required for the operation of the amplifier and Receiver-Transmitter RT-70/GRC.The high-voltage supply circuit includes one of the plug-in type vibrator units, Power Supply PP-448/GR, PP-281/ GRC, or PP-282/GRC, depending on whether the storage battery is 6, 12, or 24 volts, respectively. The vibrator unit converts the storage battery into the screen and plate potentials for the amplifier and the receiver-transmitter. A lowvoltage circuit provides the filament potentials for the amplifier and the receiver-transmitter. Another low-voltage circuit supplies the control and microphone energizing potentials for both units.

d. RADIO SETS AN/GRC-3 THROUGH AN/GRC-8. These radio sets include all the components mentioned in c above and, in addition, one Receiver-Transmitter RT-66/GRC, RT-67/GRC, or RT-68/GRC. Also they may include one auxiliary Radio Receiver R-108/GRC, R-109/ GRC, or R-11O/GRC. By connecting either one of the receiver-transmitters or one of the receivers listed above to the Set 1 receiver output lead (fig.2), the block diagram of figure 2 becomes representative of Radio Sets AN/GRC-3 through AN/GRC-8.

(1) Signal circuits. Speech signals from the microphone and from Set 2 enter the amplifier and are routed through the three channels (fig. 2), as described in c (1) above. Signals from Set 1 are applied to the common channel amplifier over a separate connection. After amplification, these signals are routed (together with the microphone signals) to both the Set 1+Interphone and the Set 1+Set 2+ Interphone channels. The Set I signals are blocked from the Set 2+Interphone

channel, while the Set 2 signals are blocked from the Set 1+Interphone channel. Al three signals may appear at the output of the Set 1+Set 2+Interphone channel. For other features of Radio Sets AN/GRC-3 through AN/ GRC-8, refer to, the applicable technical manual.

(2) Power supply circuits. The power supply circuits in the amplifier provide operating potentials to the amplifier and to Receiver-Transmitter RT-70/GRC as described in c (2) above. The circuits of Receiver-Transmitter RT-66/GRC, RT67/GRC, or RT-68/GRC are powered by a separate power supply.

5. Technical Characteristics

	Set I+ Interphone channel	Set 2+ Interphone channel	Set I+ Set 2+ Interphone channel
Signal input levels (volts maximum)	_5	5	0. 25
Signal output levels (milli watts minimum):			
For 5-volt signal at ter minal B of J-2 (Set 1 input)	350		800
For 5-volt signal at ter minal A of J-3 (Set 2 input)		350	800
For .25-volt signal at terminal C of J-1 In terphone input)	350	350	1, 1800
Input impedance	1, 500 ohms	1, 500 ohms	150 ohms
Output impedance	600 ohms	600 ohms	600 ohms (adjustable) and 150 ohms
A-f response	Flat to within 4 db (decibels) for frequencies between 400 and 2,500 cycles, sharp cut-off beyond these limits		
Distortion --	10% maximum each path.		
Crosstalk between Set 1+ interphone and Set 2+ Interphone channels.	50 db down minimum.		

Amplifier power requirements (stand-by):

Plates	135 volts, 35 ma (milliam peres).
Filaments:	
6-volt operation	6.3 volts, 1.2 amperes.
12or 24-volt oper ation.	12.6 volts, .6 ampere.
Relay	6.3 volts, 161 ma.
Microphone	6.3 volts, 30 ma

Input voltage requirements for operation with vibrator power supply:

Power Supply PP-448/ GR.	6 volts, 6.1 amperes
Power Supply PP-281/ GRC.	12 volts, 3.85 amperes.
Power Supply PP-282/ GRC.	24 volts, 2.4 amperes.

Input voltage requirements for operation with ext ernal supply:

Filament, relay, and microphone supply.	6.3 volts.
Plate supply	135 volts.

Voltages made available to Receiver-Transmitter RT-70/GRC:

Plates	90 to 95 volts, 78 ma.
Filaments	6.3 volts, 360 ma.
Relay	6.3 volts, 161 ma.

Operating temperature From -40° F. (-40^0 C.) to range. $+131^0$ F. ($+55^0$ C).

6. Description

(figs. 1, 3, and 4)

a. GENERAL. AF Amplifier AM-65/GRC (fig. 1) consists of a metal panel-and-chassis assembly enclosed in a waterproof metal case.

b. CASE. The case is finished in wrinkled, olive drab enamel, and it is arranged to permit installing the amplifier on a mounting such as Mounting MT-297/GR, MT-300/GR, or MT-673/UR.

Runners are provided at .the bottom of the case to secure it on Mountings MT-297/GR and MT-300/GR. Snap catches at the bottom edges serve to secure the case on Mounting MT-673/UR.

The hooks at the sides of the case are used to secure Receiver-Transmitter RT-70/GRC on top of the amplifier. The unit is approximately 4Y4 inches high by 12% inches deep by 7’ inches wide.

The total weight of the unit, including the vibrator power supply, is 15.5 pounds.

C. PANEL. The cast-aluminum panel mounts a fuse, five cable connectors, a switch, a volume control, and Dzus fasteners for securing the panel to the case. The functions of these items are described in paragraph 7.

d. CHASSIS. Figure 3 is a top view of the panel and-chassis assembly removed from the case. Large components, such as transformers, electrolytic capacitors, tubes, etc., are mounted on top of the chassis. The screw-driver adjustable 6V-12V-24V switch, S-l, is also accessible from the top of the chassis. This switch adapts the

amplifier filament circuits for utilization of the 6-, 12-, or 24-volt storage battery used to power the amplifier. The small compartment at the rear of the chassis contains regulator tubes and associated resistors. A ballast tube and a thermal relay K-1 are mounted horizontally at the rear of the chassis. The large metal box, also mounted at the rear of the chassis, houses the plug-in vibrator type power supply unit. Figure 4 is a bottom view of the chassis. The small circuit components, such as capacitors and resistors, and most of the wiring are shown in this view.

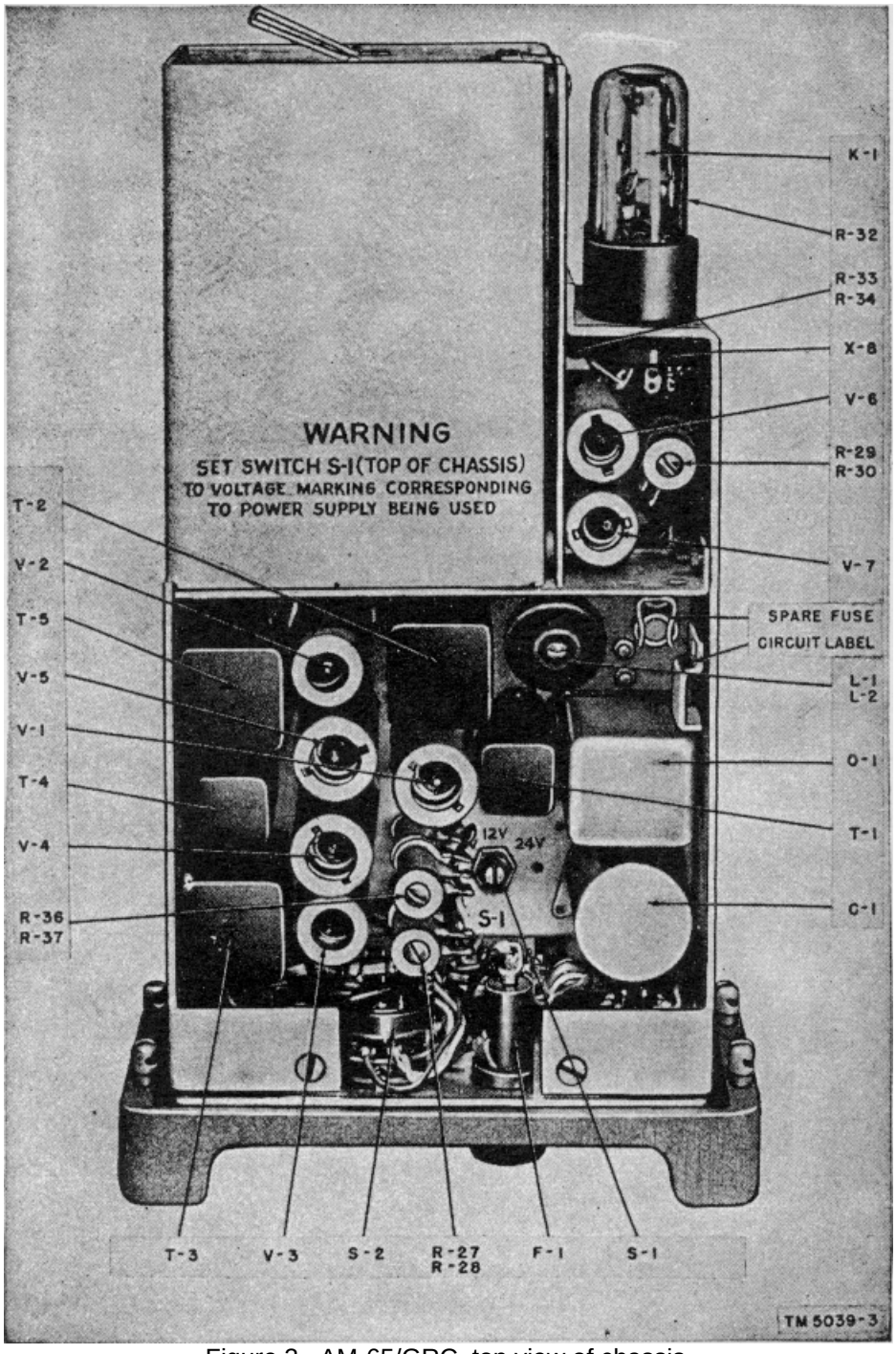


Figure 3. AM-65/GRC, top view of chassis.

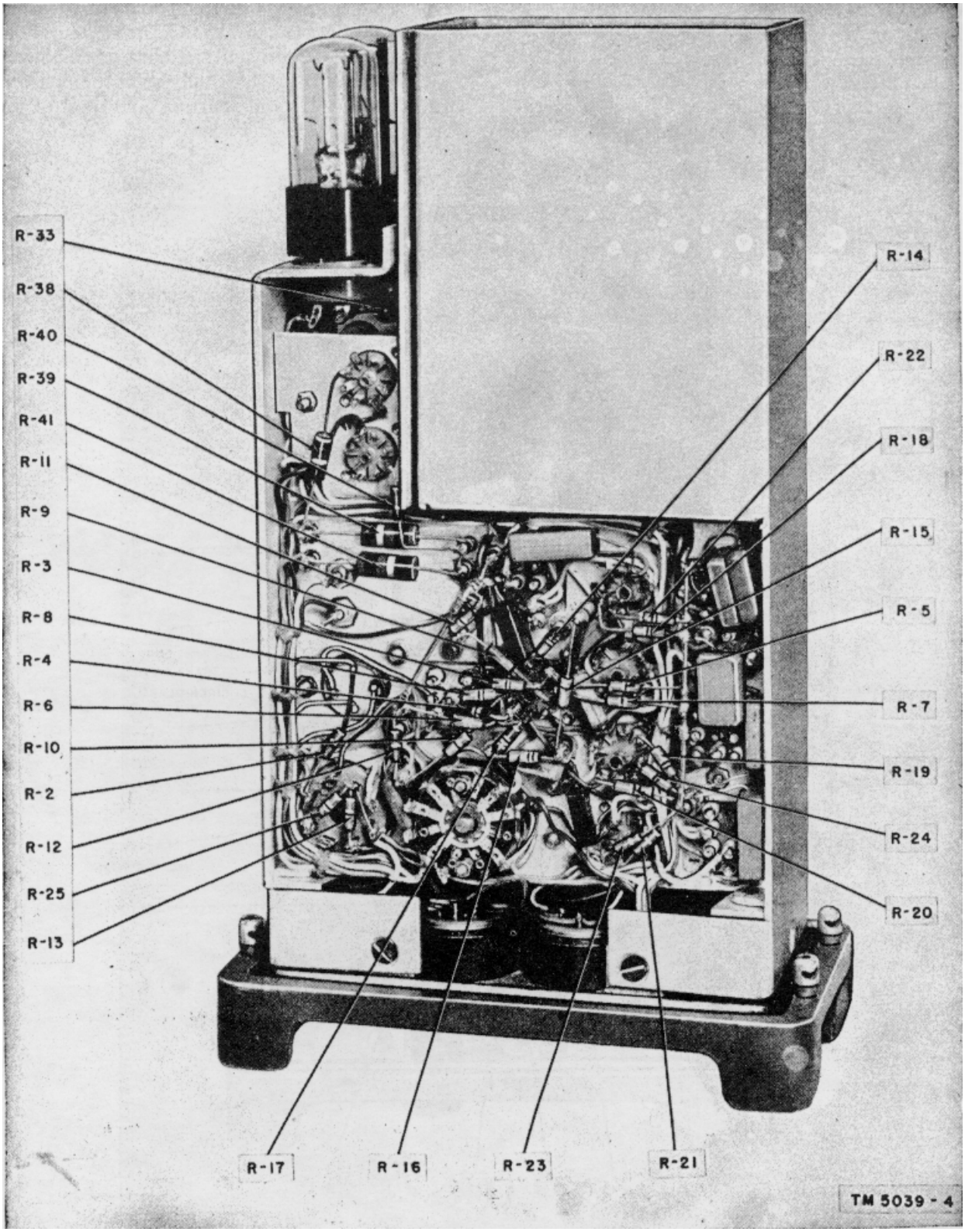


Figure 4. AF Amplifier AM-65/GRC, bottom view of chassis.

7. Front Panel Controls and Connectors

(figs. 1 and 5)

The following table lists the controls, connectors, fuse, and other facilities located on the front panel of the amplifier and indicates their functions.

Control or connector	Function
VOLUME (R-26)	The potentiometer serves to adjust the level of the 600-ohm output of the set 1+Set 2+ Interphone channel.
OFF-INT-RT-70	This three-pole, three-position switch (S-2) switch serves as the power on-off switch for the amplifier and for Receiver-Transmitter RT-70/GRC. OFF position: Disconnects all power from the amplifier and receiver-transmitter. INT position: Applies plate, screen, filament, and control voltages to the amplifier. RT-70 position: Applies plate,screen,filament and control voltages to the amplifier and to Receiver-Transmitter RT-70/GRC.
AUDIO connector (J-1)	Provides means for connecting a chest set (with microphone and headset), for monitoring, and talking over the Set 1+Set 2+ Interphone channel.
INT CONT connector (J-2)	(1) Provides for connection of audio and control facilities to permit monitoring the output of Set 1 and Set 2, and for monitoring and talking over the interphone system from a control station.
INT CONT connector (J-2)-Con for	(2) Connects the receiver output of Set 1 to the amplifier minitoring.
RT-70 POWER connector (J-3)	(1) Provides for connection of the power supply circuits to Receiver-Transmitter RT-70/GRC (Set 2). (2) Serves as a junction point for microphone and control circuits between Set 2 and the control boxes. (3) Connects the receiver output of Set 2 to the amplifier for monitoring and, throughJ-4, to the mounting for retransmission.
REC-TR CONT (J-4)	(1) Serves as a junction point between control boxes and the Set 2 microphone circuit. (2) Serves as a junction point between Set 2 and the circuits which control retrans mission of the Set 2 receiver output.
POWER IN connector (J-6)	Provides d-c power input connections.
FUSE	In fuse holder, protects battery circuit from overloads or short circuits. Caution: The rating of the fuse inserted into the fuse holder must correspond with the voltage of the storage battery used as indicated by the voltage and fuse rating marker.
Supply voltage and rating marker 6 V 10 A 12 V 10 A 24 V 4 A 12V- 24V	A small marker plate for fuse indicating operating voltage Serves as a reminder that the plug-in power supply unit, fuse F-1 and the setting of internal 6V-switch S-1 (par. 8) should correspond with the storage battery being used.

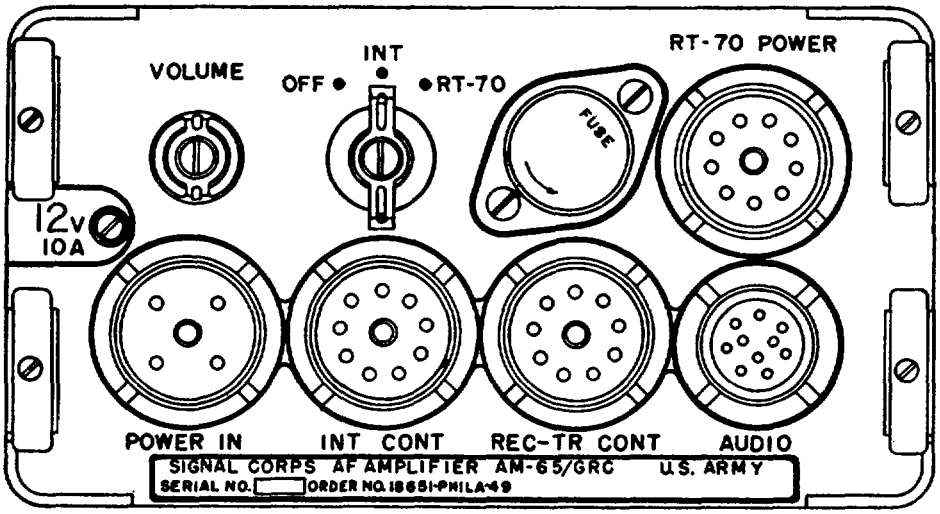


Figure 5. AF Amplifier AM-65/GRC, panel controls and connectors.

8. Internal Switch and Connector

In addition to the controls, connectors, and other items mounted on the panel (par. 7), the following internal switch and connector are provided:

Control	Function
6V-12V-24V switch (S1) (fig. 3).	Serves to arrange the circuits in amplifier for operation with a 6-, 12-, or 24-volt power supply, Power Supply PP-448/GR, PP-281/GRC, orPP-282/GRC, respectively. Note. This switch is set in the 6V position when an external 135-volt and 6-volt supply is used. The plug-in power supply unit must be removed when an external supply is used.
Power supply connector (J-5) (fig. 11).	This male eight-prong connector, located in the power supply compartment, provides-connection between the amplifier and the plug-in power supply unit.

9. Additional Equipment Required

To operate AF Amplifier AM-65/GRC, the following components are required:

a. POWER SUPPLY. This may be Power Supply PP-448/GR and a 6-volt storage battery, Power Supply PP-281/GRC and a 12-volt storage battery, or Power Supply PP-282/GRC and a 24-volt storage battery. Alternatively, any source providing 135 volts d-c and 6 volts d-c may be used.

b. AUDIO TRANSMITTING AND RECEIVING DEVICES. Chest Set Group AN/GSA-6 may be connected to AUDIO connector J-1 on the panel of the amplifier. The chest set will accommodate Headset-Microphone H-63/U. For listening only, Headset Navy type CW-49507 or Dynamic Loudspeaker LS-166/U may be connected. For talking only, Microphone M-29/U may be connected.

10. Running Spare Parts Supplied

Running spares for normally expendable items, such as tubes and fuses, are provided with each amplifier. These parts are listed below1 fuse, cartridge, 4 amperes (F-1) (table 1, fig. 17).

1 fuse, cartridge, 10 amperes (F-I) (table 1, fig. 17).
1 tube, ballast (thermal resistor R-32).
1 relay, thermal (K-1).
2 tubes type 6AK6, electron (V-2, V-3).
3 tubes type 12AU7, electron (V-1, V-4, V-5).
2 tubes type OB2, electron (V-6, V-7).

Note. This list is for general information only. See appropriate supply publications for information pertaining to requisition of new parts.

11. Block Diagram

(fig. 6)

Figure 6 is a functional block diagram of AF Amplifier AM-65/GRC. The diagram shows in simplified form the signal and power supply circuits provided by the amplifier.

a. GENERAL. The signal circuits include three input circuits (identified as Set 1 Rec Output, Interphone Mic, and Set 2 Rec Output), a common channel amplifier V-1, and three amplifying paths or channels (identified as the Set 1+Interphone, Set 1+Set 2+Interphone, and Set 2+ Interphone channels). The input circuits of the Set 1 + Interphone and Set 2 +Interphone channels are arranged to accept signals from the output of a radio receiver, while that of the Set 1+Set 2+Interphone channel accepts signals from a microphone.

b. COMMON CHANNEL AMPLIFIER. Signals from the receiver output circuits of Set 1 or 2 are routed over separate paths to the common channel amplifier, are amplified there, and appear in the output circuits of that stage. Before the operator can talk over the interphone channel, the push-to talk button must be pressed. This operation causes system circuits to connect a ground return to relay 0-1, and causes this relay to become energized. Contacts of the relay close, complete the circuit to the external microphone, and apply energizing potential to it from the internal power supply circuits. Speech signals from the microphone enter the amplifier over the closed contacts of relay 0-1, are amplified by V-1, and appear in the output circuits of that stage. An audio mixing arrangement in stage V-1 distributes the signals appearing at its output to the three channels, as described in subparagraph c below.

c. SIGNAL DISTRIBUTION. Signals from Set 1 and from the microphone are applied at the required levels to Set 1 +Interphone and Set 1+Set 2+Interphone channels. In a similar manner, signals from set 2 and from the microphone are applied at the proper levels to Set 2+ 922960°-518 Interphone and Set 1 +Set 2+Interphone Channels. Signals from Set 1 do not enter the Set 2+Interphone channel nor do signals from Set 2 enter the Set 1+Interphone channel. The Set 1 + Set 2 + Interphone channel carries signals from all three sources.

d. OUTPUT CIRCUITS. Signals passing through the Set+Interphone channel are amplified in output amplifier V-2, and appear at the output terminal for that channel. Similarly, signals passing through the Set 2+Interphone channel are amplified in output amplifier V-3 and appear at the output terminals for that channel. Signals entering the Set 1+Set 2+Interphone channel are amplified in driver amplifier V-4 and output amplifier V-5 and are applied through a VOLUME control to a 600-ohm output connection for application to Control C-435/GRC (if used) and to the front panel AUDIO connector, J-1. These signals also are applied to a 150-ohm output connection for application to Control Box C-375/VRC.

e. POWER SUPPLY CIRCUITS. The storage battery is connected through terminals of a panel mounted POWER IN connector (J-6), through a fuse (F-I), and through contacts of the panel mounted OFF-INT-RT-70 switch (S-2) to a high voltage and a low-voltage supply circuit. The switch serves as the power on-off switch for the amplifier and for Receiver-Transmitter RT70/GRC. The high-voltage supply circuit includes the plug-in vibrator type power supply unit, which converts the battery voltage into the plate and screen voltages for the tubes of the amplifier and of Receiver-Transmitter RT-70/GRC. The plate and screen voltages for the amplifier tubes are taken directly at the output of the power supply unit. The voltages for the receiver-transmitter are routed through the contacts of switch S-2, and through a voltage regulator circuit to terminals of panel-mounted connectors. The low-voltage supply circuit provides the filament, relay, microphone, and bias voltages for the amplifier. In addition, control and filament voltages are brought to terminals on a panel-mounted connector RT-70 9

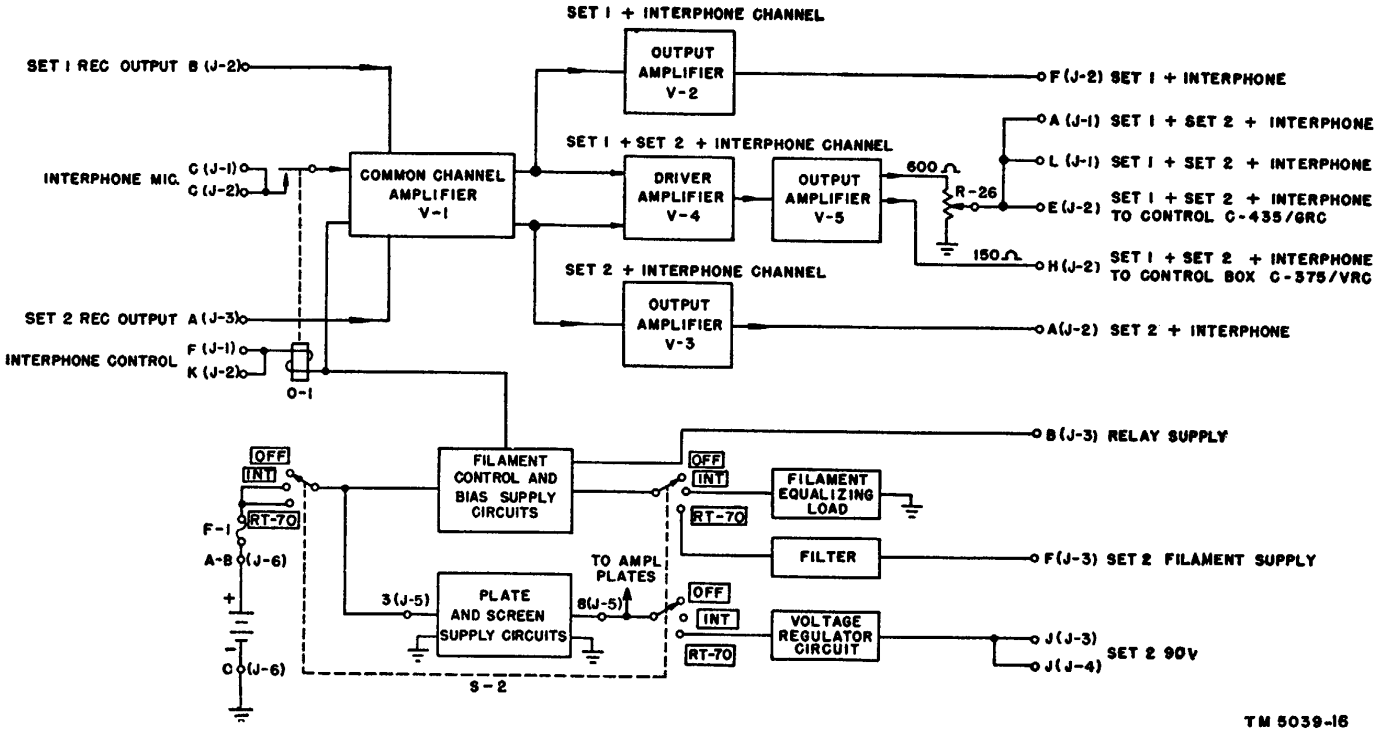


Figure 6. AF Amplifier AM-65/GRC, block diagram

POWER (J-3) for application to the relays and filaments, respectively, of Receiver-Transmitter RT-70/GRC. The filament supply circuit includes contacts of the OFF-INT-RT-70 switch (RT-70 position) and an a-f filter. When Receiver Transmitter RT-70/GRC is not used, contacts of the switch (INT position) substitute a load equivalent to the filaments of that unit across the filament supply circuit. This prevents overloading the filament supply circuit.

12. Signal Input and Common Channel Amplifier Circuits (fig. 7)

a. INTERPHONE CHANNEL INPUT CIRCUIT. The carbon element of the microphone used for talking through the interphone channel may be connected directly between terminals C and B (ground) of AUDIO connector J-1 or through a control box and a mounting to terminals C and D (ground) of INT CONT connector J-2. The microphone push-to-talk button is connected directly between terminals F and H (ground) of J-1 or through the mounting and control box between terminals K and D (ground) of J-2. In either case, operation of the microphone push-to-talk button applies external ground return for relay 0-1.

(1) D-c circuit. When a ground return is completed for relay 0-1, that relay becomes energized. Contacts 2 and 3 of the relay close, completing the circuit for the carbon element of the microphone and causing a d-c energizingpotential to be applied to it. The d-c circuit for the microphone extends through normally open contacts 2 and 3 of relay 0-1, primary winding 6-7 of microphone transformer T-l, choke -2, and current-limiting resistor R-2 to the microphone supply circuit. This includes resistors R-27 and R-28, strapped as shown in figure 17 for 6-, 12-, or 24-volt operation; section 2C of the OFF-INT-RT-70 switch S-2; fuse F-I; and the storage battery connected between terminals A-B and C (ground) of POWER IN connector J-6.Power supply circuit details are described in paragraphs 16 through 19.

(2) Signal circuit. Audio signals from the microphone are developed across the primary winding terminals 6 and 7) of T-1. The lower end of T-1 is returned to ground through capacitor OC1A which bypasses the d-c supply for the microphone circuit. The secondary voltage between terminals 1 and 2 of T-1 is applied to the voltage-divider network, R-3 and R-5, in the grid circuit of V-1A; the secondary voltage between terminals 3 and 2 of T-1 is applied to the voltage-divider network, R-4 and R-6, in the grid circuit of V-lB. The voltages across R-5 and R-6, 1800 out of phase with each other, are applied to the grids of V-1A and V-lB respectively.

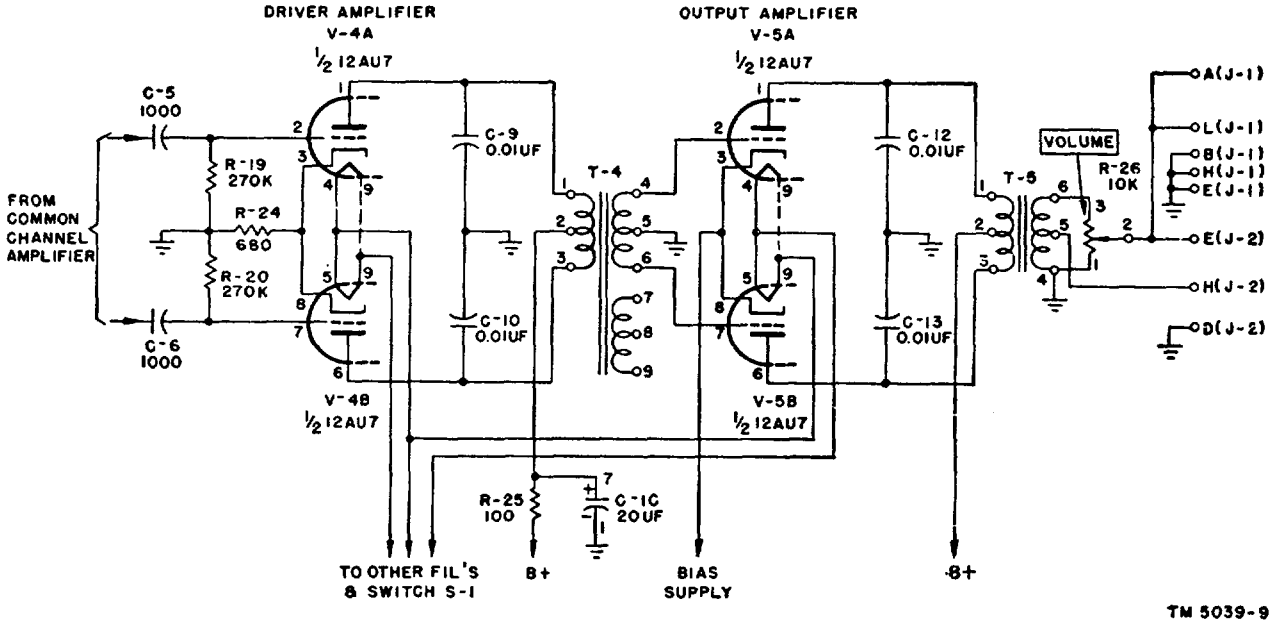


Figure 7. Signal input and common. channel amplifier circuits.

b. SET 1 INPUT CIRCUIT. Audio signals from the receiver output of Set 1 (normally Receiver Transmitter RT-66/GRC, RT-67/GRC, or RT68/GRC) enter the amplifier between terminal B of INT CONT connector J-2 and ground, and are developed across load resistor R-1 1. These signals are applied to the cathode of V-1A from the junction of resistors R--9 (A and B) and R-7, which form a voltage divider across R-1l.

c. SET 2 INPUT CIRCUIT. Audio signals from the receiver output of Set 2 (normally Receiver Transmitter RT-70/GRC) enter the amplifier between terminal A of RT-70 POWER connector J-3 and ground and are developed across load resistor R-12. These signals are applied to the cathode of tube V-lB from the junction of resistors R-10 (A and B) and R-8, which form a voltage divider across R-12. A strap connection between terminal A of J-3 and terminal B of connector J-4 routes these signals to Control C-435/ GRC for retransmission through another receiver transmitter (if used).

d. COMMON CHANNEL AMPLIFIER V-1. The common channel amplifier uses the two triode sections, V-1A and V-lB, of tube type 12AU7.

The twin triode is connected in push-pull for signals from the microphone; triode section V-1A serves as a single-ended amplifier for signals from Set 1, while V-lB serves as a single-ended amplifier for signals from Set 2.

(1) Cathode bias for V-1A and V-lB is provided by the voltage drop across cathode resistors R-7 and R-8, respectively. These resistors are unbypassed to allow cathode injection of the Set 1 and Set 2 signals. Resistors R-3 and R-5 in the grid circuit of V-1A and resistors R-4 and R-6 in the grid circuit of V-lB act as voltage dividers for the signals applied t, the grids of the two tubes from the microphone. These resistors have the additional functions of limiting grid current for strong signals and of reflecting the proper impedance into the primary winding of T-1. Plate voltages for V-1A and V-lB are supplied through plate supply filter resistor R-13, which is bypassed by filter capacitor C-lB, and through plate load resistors R-14 through R-17.

(2) Signals from the microphone, applied in push-pull to the grids of V-1A and V-lB, are amplified by these tubes, and are developed across the series arrangement of resistors R-14 and R-15 in the plate circuit of V-1A and across the series arrangement of resistors R-17 and R-16 in the plate circuit of V-lB. Signals from Set 1, applied to the cathode of V-1A, are amplified in that tube and appear across load resistors R-14 and R-15 but not across R-17 and R-16.

Similarly, signals from Set 2 are amplified in V-lB and appear across load resistors R-17 and R-16 but not across R-14 and R-15. Capacitors C-2 and C-3 bypass h-f (high-frequency) noises to ground and shape the h-f response of the amplifier.

13. Set I +Interphone Channel (fig. 8)

Signals from the interphone microphone and from Set 1, appearing across load resistors R-14 and R-15, are coupled through capacitor C-4 to the grid (pin 1) of output amplifier tube V-2. This stage uses a tube type 6AK6 power pentode as a class A amplifier. Resistors R-18 and R-22 are the grid return and cathode resistors, respectively.

a. Cathode bias is developed across R-22, which is unbypassed to allow cathode degeneration. This provides uniform operation of the amplifier even though characteristics of tubes may vary. Plate and screen voltages are filtered by resistor R-25 and capacitor C-IC; the screen voltage is supplied directly and the plate voltage is supplied through the primary of transformer T-2.

b. The amplified signal is developed across the primary winding (terminals 1, 2, and 3) of output transformer T-2. Capacitor C-8 in the plate circuit serves to bypass h-f noises to ground and to shape the frequency response of the amplifier. The signal voltages induced in the secondary winding (terminals 4, 5, and 6) of T-2 are applied from the 600-ohm connection (terminal 6) of T-2 to terminal F of INT CONT connector J-2. The 150-ohm tap (terminal 5) of T-2 is not used.

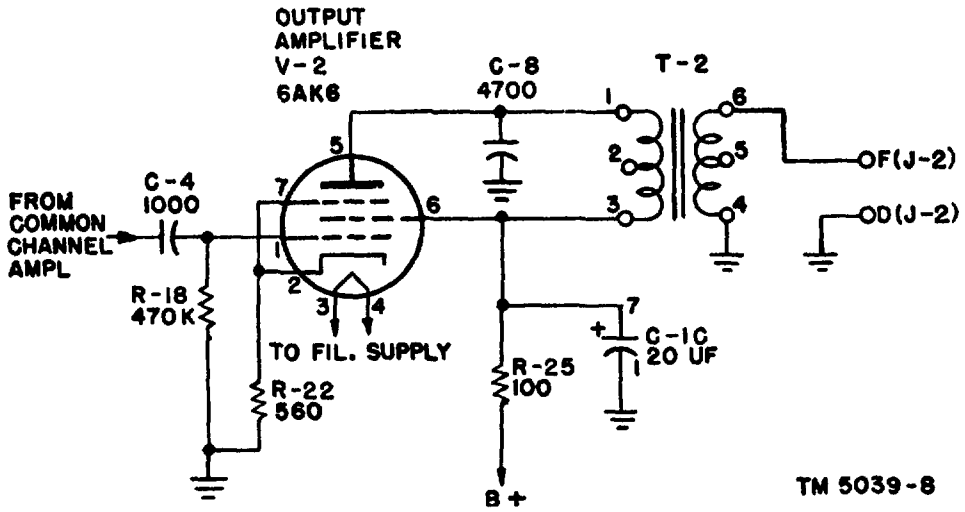


Figure 8. Set I + Interphone channel circuits.

14. Set 2+Interphone Channel (fig. 17)
The Set 2+Interphone channel is similar to the Set 1 +Interphone channel (par. 13). Signals from the interphone microphone and from Set 2, appearing across V-lB plate load resistors R-17 and R-16, are coupled through capacitor C-7 to the grid (pin 1) of output amplifier V-3 also a tube type 6AK6 pentode. Resistors R-21 and R-23 are the grid return and cathode bias resistors, respectively. Plate and screen voltages are filtered by resistor R-25 and capacitor C-lC; the screen voltage is supplied directly and the plate voltage is supplied through primary transformer T-3. The amplified signal appears across the plate winding of output transformer T-3. H-f noises are eliminated by capacitor C-1 11. The signal voltages developed across the secondary winding (terminals 4, 5, and 6) of T-3 are applied from the 600-ohm connection (terminal 6) of T-3 to terminal A of INT CONT connector J-2. The 150-ohm tap (terminal 5) of T-3 is not used.

15. Set 1 +Set 2+Interphone Channel (fig. 9)

The Set 1 +Set 2+Interphone channel includes a driver stage V-4 and a power output stage V-5. The driver stage functions as a conventional pushpull amplifier for the interphone microphone signals and as both amplifier and phase inverter for each of the signals from Sets 1 and 2.

a,. DRIVER STAGE V4. The driver stage uses the two triode sections, V-4A and V-4B, of type 12AU6 tube in a push-pull class A amplifier circuit.

(1) Microphone signals appearing across load resistor R-15 (in the plate circuit of V-1A) and across R-16 (in the plate circuit of V-lB) are coupled in push-pull through capacitors C-5 and C-6 to the grids (pins 2 and 7) of V-4A and V-4B, respectively. The grid circuits are returned to ground through resistors R-19 and R-20, respectively. Cathode bias is provided by the voltage drop across the common cathode resistor, R-24. This resistor provides current degeneration to balance the push-pull circuit against variations in component and tube values. The plates (pins 1 and 6) are connected by the center-tapped primary winding (terminals 1, 2, and 3) of push-pull output transformer T-4. Capacitors C-9 and C-10 bypass high a-f noises and shape the response of the amplifier at the higher frequencies. Plate voltage is applied to the center tap (terminal 2) of T-4 through filter resistor R-25, which is bypassed to ground through electrolytic capacitor C-IC.

(2) The portion of the signal from Set 1, developed across R-15 in the plate circuit of V-1A, is coupled through capacitor C-5 to the grid (pin 2) of V-4A.No signal from Set 1 is coupled to the grid (pin 7) of V-4B, since none appears across resistor R-16. Thus, the Set 1

signal is applied to the driver stage in a single-ended manner. The resultant plate current flowing through common cathode resistor R-24 develops a voltage drop across it. The voltage at the cathode is in phase with the signal voltage coupled to the grid (pin 2) of V-4A.

The net cathode-to-grid voltage of V-4A is the difference between these two voltages. Since the grid signal voltage is always larger than the cathode voltage, the net cathode-to-grid voltage is in phase with the original signal voltage applied to the grid. Since no signal is applied to the grid (pin 7) of V-4B, that grid is effectively at a-c (alternating current) ground potential, and the net cathode-to-grid potential of V-4B is 1800 out of phase with respect to the net cathode-to-grid potential of V-4A. Thus, since the signal voltages appearing in the cathode-to-grid circuits of V-4A and V-4B are inverted in phase with respect to each other, a push-pull relationship is established between the amplified signal voltages appearing in the plate circuits (winding 1-2-3 of T-4) of the stage.

(3) In a manner similar to that described in (2) above, signals from Set 2 appearing across resistor R-16 in the plate circuit of V-lB are coupled through capacitorC-6 to the grid (pin 7) of V-4B. As in the case of signals fronl Set 1, the resultant plate current flowing through common cathode resistor R-24 causes a voltage drop across that resistor. By phase inverter action this voltage is applied to tube V-4A. There the signal is amplified also, and is applied across winding 1-2 of T-4 in push-pull with the output of V-4B developed across winding 3-2 of T-4.

b. POWER OUTPUT STAGE V-5. The amplified signals appearing across the primary winding (terminals 1, 2, and 3) of push-pull output transformer T-4 are developed across the secondary winding (terminals 4, 5, and 6) and are applied directly to the grids (pins 2 and 7) of V-5A and V-5B. These two triode sections of the type 12AU7 tube are arranged in push-pull for class B operation. Each grid is returned to ground (terminal 5) on T-4 through one half of the secondary winding of T-4. Fixed bias is obtained by connection of the two cathodes (pins 3 and 8) to the filament supply circuit. (The bias supply arrangement is described in paragraphs 16 through 19.) The plate circuits include the primary winding (terminals 1, 2, and 3) of center-tapped push-pull output transformer T-5. Bypass capacitors C-12 and C: 3 serve to bypass h-f noises to ground and to shape the h-f response of the

Figure 9. Set l +Set 2+ Interphone channel.

amplifier. Plate voltage for the operation of the stage is applied at the center tap (terminal 2) of T-5. The signals developed across the primary winding of T-5 are induced into the secondary winding (terminals 4, 5, and 6). This winding provides a 600-ohm connection (terminal 6) which extends through VOLUME control potentiometer R-26 to terminals A and L of AUDIO connector J-1 and to terminal E of INT CONT connector J-2. A 150-ohm tap (terminal 5) on the secondary winding of T-5 is brought out to terminal H of connector J-2.

16. Power Supply Circuits Arranged for 24Volt Operation (fig. 10)

a. BATTERY CIRCUIT. The 24-volt storage battery is connected between terminals A-B (+) (strapped) and C (-) of POWER IN connector J-6. The battery circuit extends through a 4-ampere fuse, F-I, and through contacts of section 2C of the OFF-INT-RT-70 switch, S-2 (in either the INT or RT-70 position), to terminal 3 of connector J-5 and contacts of the 6V-12V-24V switch, S-1. The branch circuits which are supplied from these points are described in b through d below.

b. FILAMENT AND BIAS SUPPLY CIRCUITS. For 24-volt operation, the series-parallel amplifier filaments are connected across the battery in series with the receiver-transmitter filament-supply and overvoltage protection circuit. The receiver-transmitter filament supply is utilized also as a bias supply for power output tube V-5 in the amplifier.

(1) With switch S-2 in either the INT or RT-70 position, the amplifier filaments are connected through 24-volt contacts of switch S-1 (section lB) to one side (pin 2) of ballast tube R-32. Ballast tube R-32, resistor R-33, the heater element of thermal relay K-i, and additional contacts of S-1 (section 1A) complete a circuit to the ground side of the line. A normally closed contact of K-1 connects resistor R-34 in parallel with R-33; connects resistor R-35 in parallel with the series-parallel combination of R-33, R-34, and the heater element of K-1; and connects the potential at pin 7 of ballast tube R-32 to the cathode of power output tube V-5 and to section 1A of the OFFINT-RT-70 switch S-2. The RT-70 contacts of S-2 connect the receiver transmitter filaments in parallel with the resistance and thermal relay network through choke L-1 and contact F of jack J-3. ChokeL-1 and capacitorsC-15 and C-16 form an audio filter for the receiver transmitter filament circuit. Alternately, INT contacts of switch S-2 may connect resistor R-36 as a dummy load in place of the receiver-transmitter filaments.

(2) The drop across the amplifier filaments (V-1 through V-5) is normally 12 volts. An additional drop of 5.7 volts occurs across ballast tube R-32, leaving 6.7 volts available at pin 7 of K-1 for the filaments of the receiver-transmitter and for bias on power output tube V-5. The ballast tube is essentially a variable resistor the resistance of which (over its normal operating range) depends on the voltage supplied to it. If the battery voltage decreases, the voltage applied across R-32 decreases and the resistance consequently decreases. The net result is an essentially constant current through the circuit and an essentially constant voltage available for the receiver-transmitter filament circuit and the amplifier bias circuit, provided the resistance of the load circuit is constant. If the load varies, R-32 tends to maintain a constant current, so that the load voltage (filament and bias) will vary also.

(3) Thermal relay K-1 and the network associated with it protect the filament circuit against an overvoltage condition such as might occur when a filament in the series-parallel filament circuit of the receiver-transmitter breaks down. As long as the voltage across the heater element does not exceed a certain predetermined value, the shorting contacts remain closed and the circuit arrangement is as described in (1) above. The values of R-33, R-34, and R-35 are selected so that the required voltage is obtained across the relay heater. When the voltage to the receiver-transmitter filaments (at pin 7 of K-1) exceeds 7.5 volts, the voltage across the heater element of K-1 increases and causes the relay to operate. Contacts of K-1 then open, placing resistors R-33 and R-34 in series with the receiver-transmitter fila

ments. The increased resistance drops the filament voltage to a safe value, but maintains it high enough to allow circuit checking. When the contacts of K-1 open, the resistance in series with the heater element of K-1 is also increased, since R-33 and R-34 are no longer in parallel. This increased resistance protects the thermal relay by reducing the voltage drop across the heater element. The relay remains in an operated condition until power is removed from the amplifier unit.

(4) When an overvoltage condition occurs, the bias on power output tube V-5 rises simultaneously with the filament voltage of the receiver-transmitter. When the thermal relay operates, the bias is reduced simultaneously with the filament voltage.

c. PLATE SUPPLY CIRCUIT. The battery potential is supplied through terminal 3 of J-5 to terminal 3 of X-1 in the vibrator power supply unit. The vibrator unit converts the storage battery voltage to a high-voltage plate and screen supply. The output voltage, approximately 150 volts when S-2 is in the INT position and approximately 130 volts when S-2 is in the RT-70 position, is developed across terminals 8 (+) and 7 (-) of J-5. The voltage is applied through T-5 to the plates of V-5 (fig. 17), through R-13 to the plates of V-1, and through R-25 to the plates of V-4 and the plates and screens of V-2 and V-3. When S-2 is in the RT-70 position, the d-c output voltage of the power supply unit is applied also through contacts of S-2 (section 1B) and through voltage dropping resistors R-37, R-39, and R-41 to terminals J of connectors J-3 and J-4. The 90-volt potential appearing at these terminals is used to supply the plate and screen voltages for Receiver-Transmitter RT-70/GRO, which may be used with the amplifier. Voltage regulator tube V-6, tube type OB2, is connected in series with current limiting resistor R-38 from the junction of R-37 and R-39 to terminal E of J-3.

Voltage regulator V-7, also a type OB2 tube, is connected in series with current limiting resistor R-40 from the junction of resistors R-39 and R-41 to terminal E of J-3. These tubes limit the maximum output voltage when terminal E is grounded by external system wiring. When the external ground connection is broken, the tubes draw no current. The arrangement serves to prevent the tubes from drawing excessive current if the receiver-transmitter (load) is disconnected with switch S-2 in the RT-70 position.

d. RELAY, MICROPHONE, AND CONTROL VOLTAGE SUPPLIES. Socket connector X-1 or Power Supply PP-282/GRC provides a strap connection between terminals 3 and 6 of connector J-5 in the power supply compartment of the amplifier. (See the lower left-hand corner of figure 10.) This connection arranges a group of voltage-dropping resistors (R-27 through R-30) to drop the 24 volts from the storage battery to the 6 volts required by relay O-1, the microphone circuit, and external control circuits.

(1) Relay circuit. The strap connection between terminals 3 and 6 or J-5 connects the battery circuit through voltage dropping resistors R-28 and R-27 to the 6-volt coil of relay 0-1 (terminal 4).The relay circuit extends through the relay coil (terminal 1) to terminals F of J-1 and K of J-2. The relay is energized when ground return is connected to either one of these terminals. In a typical installation, ground is connected to these terminals when the interphone microphone push-to-talk button is operated.

(2) Microphone circuit. The strap connection between terminals 3 and 6 of J-5 also connects the battery circuit through R-28 and R-27 to the microphone circuit. The circuit continues through voltage dropping resistor R-2, choke -2, and the primary winding of microphone transformer T-1 over the normally open contacts of relay O-1 to terminals C of connectors J-1 and J-2. In a typical installation, the carbon element of the microphone is connected between terminal C of J-1 or J-2 and ground through the microphone push-to-talk switch. When the push-to-talk switch is closed, relay 0-1 in the amplifier is energized. Its contacts close, complete the talking circuit, and apply the excitation voltage to the carbon element of the microphone. Capacitor C-1A, one section of a three section electrolytic capacitor, filters the d-c microphone supply and also completes the a-c path of the microphone circuit.

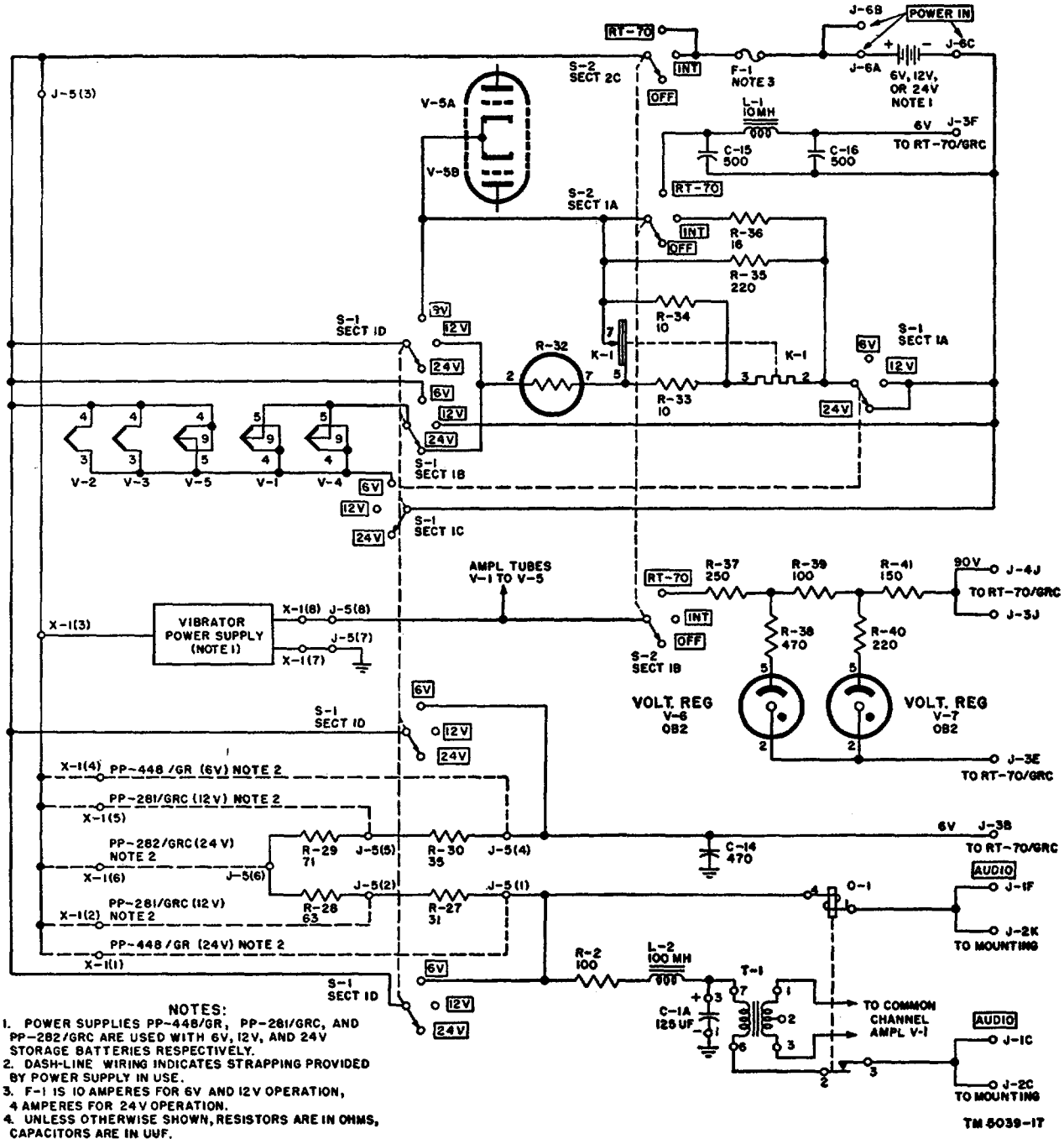


Figure 10. Power supply circuits.

(3) Control supply. The strap between terminals 3 and 6 of J-5 extends the battery circuit through voltage-dropping resistors R-29 and R-30 to terminal B of J-3.

The 6-volt potential available at this terminal is used to energize a relay in Receiver-Transmitter RT-70/GRC. Capacitor C-14 filters h-f voltages from the d-c control supply.

17. Power Supply Circuits Arranged for 12Volt Operation

(fig. 10)

For operation with a 12-volt storage battery, Power Supply PP-281/GRC is used, the rating of fuse F-1 is 10 amperes, and switch S-1 is set in the 12V position. The circuit as arranged for 12-volt operation differs from that described in paragraph 16 in the following respects: a. The 12-volt series-parallel arrangement of the filaments of tubes V-1 through V-5 in the amplifier (par. 16b) is connected directly across the battery circuit, since ground return is completed through the 12V contacts of section 1B of switch S-1. The filament supply circuit for Receiver-Transmitter RT-70/GRC extends directly from the battery circuit (contacts of section 2C of S-2), through the 12V contacts of section ID of S-, to ballast tube R-32. From this point, the circuit continues as described in paragraph 16b, except that the heater element of K-1 and load equalizer resistor R-36 are connected to ground through the 12V contacts of section 1A of S-1.

b. The strapping provided by connector X-1 of Power Supply PP-281/GRC connects terminals 2 and 5, of J-5, directly to the battery potential at terminal 3 of X-1, thereby short-circuiting resistors R-28 and R-29. Since a lower battery voltage is involved, resistors R-27 and R-30 are sufficient to drop the battery voltage to the 6 volts required by the relay, microphone, and control supply circuits. In all other respects these circuits remain as described in paragraph 16d.

18. Power Supply Circuits Arranged for 6-Volt Operation (fig. 10)

For operation from a 6-volt storage battery.
Power Supply PP-448/GR is used, the rating of fuse F-I is 10 amperes, and switch S-1 is set in the 6V position. The circuit as arranged for 6-volt operation differs from the arrangement described in paragraph 16 in the following respects:

a. The filaments of tubes V-1 through V-5 are arranged into two 6-volt groups, each of which is connected directly across the battery circuit through the 6V contacts of sections lB and 1C of switch S-1. One group (the filaments of V-2, V-3, and V-5 in parallel) connects to the positive side of the battery circuit through contacts of section 2C of S-2 and is returned to ground through the 6V contacts of sections IC of S-1. The other group (the filaments of V-1 and V-4 in parallel) connects to the positive side of the battery circuit through the 6V contacts of S-1B and is returned to ground through the 6V contacts of S-1C. The filament supply circuit for Receiver Transmitter RT-70/GRC extends through the 6V contacts of S-1D, over the RT-70 contacts of S-2A, and through filter choke L1 to terminal F of J-3. The ballast tube, the thermal relay, and resistors R-33, R-34, and R-36 are not in the circuit.

b. Fixed bias is derived directly from the battery circuit. When S-2 is in the INT position, the cathode circuit for tubes V-5A and V-5B extends through the 6V contacts of S-aD, the INT contacts of S-2C, fuse F-1, and through the battery to ground. When S-2 is in the RT-70 position, this path is paralleled by the series arrangement of L-1 and the filaments of the receiver-transmitter connected to terminal F of J-3.

c. The strapping provided by socket connector X-1 of Power Supply PP-448/GR connects terminals 4 and 1 of J-5, directly to the battery potential at terminal 3 of X-1, thereby short-circuiting resistors R-27 through R-30. The relay, microphone, and control supply circuits are thus connected directly to the battery circuit.

19. Operation with External 6.3-Volt and 135Volt Supplies (fig. 17)

Caution: The plug-in power supply must be removed when an external supply is used.

a. For this type of operation, a power supply capable of providing 6.3 and 135 volts d-c is used.
The external 135-volt supply i, connected between terminals D (+) and C (-) of J-6. The 6.3-volt supply is connected between terminals A-B (+) and C (-) of J-6. Since the vibrator power

supply unit is not in its compartment, the strap connections provided by that unit are not there.It is necessary to set S-1 in the 6V position to establish continuity between the 6.3-volt source and the relay, microphone, and control supply circuits. A 4-ampere fuse is used for F-1.

b. The 135-volt supply is connected from terminal D of J-6 directly to the plates and screens of tubes V-1 through V-5. This voltage is also applied through the RT-70 contacts of S-2 and through the voltage regulator circuit (R-37 through R-41, V-6 and V-7) to terminals J of J-3 and J-4.This portion of the plate supply circuit remains as described in paragraph 16.

c. The filament, relay, microphone, control, and bias supply circuits remain substantially as described for 6-volt operation (par. 18). The 6V contacts of S-1D connect these circuits directly to the battery circuit and short out resistors R-27 through R-30.

20. System of Wiring

In addition to the amplifier and power supply circuits described in paragraphs 16 through 19, AF Amplifier AM-65/GRC provides junction wiring which serves to interconnect the signal, power, and control circuits of the units associated with it in a system installation. See the schematic diagram, figure 17.

a. The wiring between terminals J, C, H, and K of J-3 and J-4 interconnects the B+, microphone, relay, and control circuits of Receiver Transmitter RT-70/GRC with corresponding wiring in associated mountings and control boxes to permit control from a local or remote control station.

b. The wire between A of J-3 and B of J-4 routes the signal output of the receiver in Receiver Transmitter RT-70/GRC to system circuits for retransmission through a transmitter of another receiver-transmitter.

c. The jumpers between F of J-1 and K of J-2 and the jumpers between C of J-l and C of J-2 provide for alternate control of the interphone channel from two distinct control points, that is, from local and remote control positions.

CHAPTER 3
FIELD MAINTENANCE INSTRUCTIONS

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

Section I. PREREPAIR PROCEDURES

21. Tools, Materials, and Test Equipment

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

Tool Equipment TE-113.
Tube Puller TLI201.
Cleaning fluid: Solvent, dry-cleaning, (SD);
Federal specification P-661a.
Tube Tester I-177, or equivalent tube tester capable of checking the tubes in the amplifier.
Electronic Multimeter TS-505/U: d-c volt
ohmmeter.
Test Lead Set CX-1331/U.

22. Removal of Pluck-out Parts

a. To remove any of the pluck-out parts except the fuse, the immersion proof cover must be removed. Proceed as follows:

(1) Loosen the four Dzus fasteners located on the right and left edges of the front panel.
(2) Stand the unit on the front panel and lift off the cover. Take care not to damage any wiring or components while removing the cover or at any time while the panel-and-chassis assembly is being handled without the cover on.

b. The fuse is accessible from the front panel (fig. 1). Unscrew the fuse cap at the top of the panel. Removal of the cap also will cause the fuse to come out of its holder, since the cap is also a fuse extractor.

Note. A spare fuse is mounted on the rear wall of the chassis assembly (fig. 3). A small compartment adjacent to the fuse holds the circuit label.

c. Remove the plug-in power supply unit as follows:

(1) Loosen the clamp bracket at the rear of the power supply compartment (fig. 11).
(2) Pull the power supply unit out of the compartment. A handle is provided on the power supply unit for this purpose.
(3) Check that the voltage marking on the power supply unit and the voltage indicated by the market -on the front panel (fig. 1) agree.

d. Remove the tubes as follows:

(1) Place the unit in its normal operating position, and remove the tube shields.
(2) Remove tubes V-1 through V-7 from their sockets (fig. 3) with a tube puller. If a tube puller is not available, pull up the tubes with the fingers, using a straight upward pull. Do not rock or jiggle the tube in its socket; the socket prongs may become damaged.

e. Ballast tube R-32 and thermal relay K-1 are mounted horizontally in the rear of the chassis (fig. 3). Remove these parts with a straight horizontal pull, following the precaution indicated in d above.

f. Remove electrolytic capacitor C-1 (fig. 3).

23. Inspecting and Cleaning Pluck-out Parts

a. Inspect the electrolytic capacitor for discoloration, corrosion, bulging, or leakage of liquid. If these conditions are observed, substitute a new electrolytic capacitor known to be in good condition.

b. Inspect glass envelopes of tubes, thermal relay, and ballast tube. Replace them if the envelope is loose or cracked. Wipe off dirt or dust.

c. Inspect the bases of pluck-out parts for evidences of damage. Clean dirty or corroded pins by rubbing them lightly with fine emery cloth. Dust them with a small, clean brush. Clean the base and shell of the capacitor with a clean lint free cloth moistened with solvent (SD). Dry in an air draft.

d. Clean the fuse ends and clips with emery cloth. Wipe with a clean cloth. Throw away blown fuses.

24. Testing Pluck-out Parts

a. TUBES V-1 THROUGH V-5. Check vacuum tubes V-1 through V-5 with Tube Tester 1-177 (or equivalent). If a tube checker is not available, the most reliable test is to substitute the tube in a unit known to be operating properly.

b. THERMAL RELAY K-i. Using Electronic Multimeter TS-505/U as an ohmmeter, check the continuity as follows:

Pins	Meter reading (ohms)
5 and7 ----------	0
2and3----------	27.7

C. BALLAST TUBE R-32. The ohmmeter connected between pins 2 and 7 of the ballast tube should read about 3 ohms.

d. ELECTROLYTIC CAPACITOR C-1. The triple section electrolytic capacitor C-l may be tested by substituting one from an amplifier known to be in good operating condition and observing whether the unit continues to operate unsatisfactorily when the capacitor is installed. The capacitor may be tested also by using an ohmmeter. For testing sections C-lB and C-1C of the capacitor, which have high-voltage ratings, use the high-resistance scale (at least 5 megohms) of the ohmmeter. For testing low-voltage section C-1A, use the 50,000-ohm range of the meter. Test each section of the capacitor separately. Proceed as follows:

(1) Before making any measurements, discharge the capacitor by shorting the positive and negative terminals. This applies also if a measurement is to be repeated. Note that the negative terminal is common to all three sections of the capacitor.

(2) Connect the positive lead of the ohmmeter to the positive terminal of the capacitor section under test. Connect the negative lead of the meter to the common negative terminal of the capacitor.

(3) Observe the meter pointer. The ohmmeter first should indicate a very low value of resistance. The pointer should then creep up slowly in the high-resistance direction on the scale. The final resistance reading should be at least 1 megohm for each of the high-voltage sections, C-lB and C-1C, and about 15,000 ohms for the low-voltage section, C-1A.

(4) If the final resistance reading is less than 250,000 ohms for C-IB or C-IC or less than 3,000 ohms for C-lA, the capacitor should be replaced.

e. VOLTAGE REGULATOR TUBES V-6 AND V-7. Check the emission of the tubes with a tube checker. Using the ohmmeter, make the measurements indicated below:

Point of measurement	Meter reading (ohms)
Pins 1 to 5 ----------	0
Pins 2 to 4----------	0
Pins 2 to 7 ----------	0
Pins 2 to 5 ----------	infinity

f. FUSE F-1. Using an ohmeter, check the fuse for continuity. Discard the fuse if the check shows it to be open.

25. Disassembly for Inspection and Cleaning (Fig. 11)

Note. Save screws and washers which will be removed during the disassembly procedure that follows. They will be needed for reassembly of the unit.

a. PANEL.

(1) Remove the six screws which hold the panel to the chassis assembly. Two screws are located at the top, two on the bottom, and one on each side of the assembly.

(2) Carefully pull the panel away from the chassis as far as the cable wiring will permit. Take care not to loosen any soldered connections. Do not place undue strain on the cable. Handleswitch assemblies only when necessary.

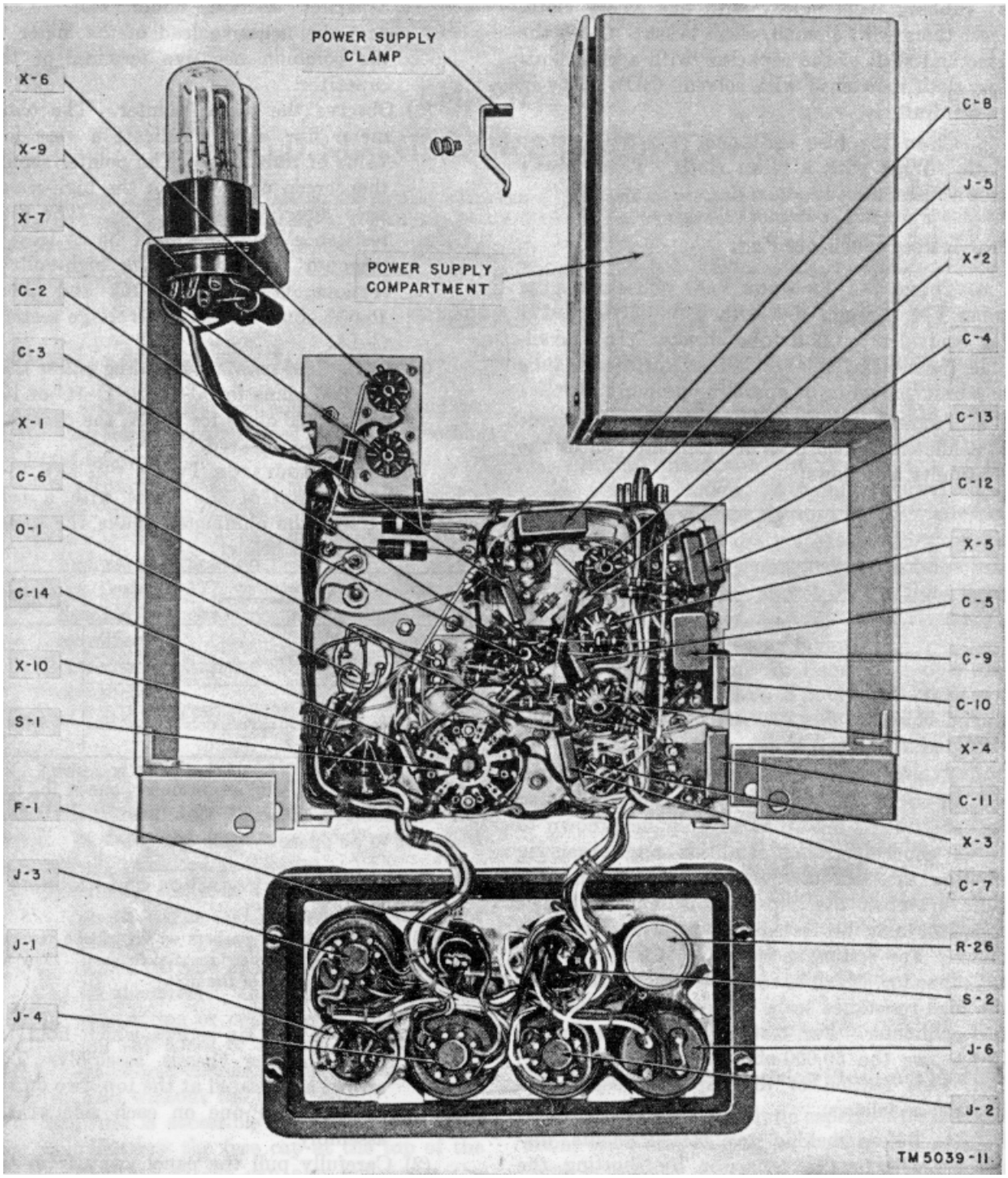


Figure 11. AF Amplifier AAI-65/GRC, disassembled view.

b. SIDE BRACKET. To gain access to the components located within the small compartment in the rear of the chassis, remove the right side wall as follows:

(1) Remove the five screws which hold the side wall of the assembly. Two screws are located at one end of the wall, two toward the middle of the wall, and one at the front of the assembly.

(2) Carefully disengage the side wall from the tabs on the bottom portion of the chassis, being careful not to damage the wiring to sockets X-8 and X-9.

26. General Inspection

After the unit has been disassembled (pars. 22 and 25), it is possible to inspect all parts and wiring. Thoroughly inspect the unit for any abnormal conditions. If any are found, the cause of such conditions should be determined and the defects remedied before proceeding with the trouble-shooting and other tests described in paragraphs 29 through 38 and 45 through 49. Repair instructions are given in paragraphs 39 through 41.

a. CHASSIS. Examine the chassis for mechanical defects, dirt, and corrosion.

b. WIRING. Examine for charred, loose, defective, or broken wiring and insulation. Examine lugs on capacitors, transformers, chokes, switches, and connectors, and on tube and relay sockets.

c. MOUNTING HARDWARE. Examine all nuts, bolts, and other mounting hardware on the chassis to make sure that they are not loose. Loose mounting hardware may cause intermittent noises in the amplifier and in the set associated with it.

d. SOCKETS. Inspect tube and other sockets for broken or excessively spread or corroded and dirty contacts. Check mounting rivets to determine that sockets are held firmly to the chassis.
See that the tube shields hold firmly to their bases.

e. CONNECTORS. Examine connectors for corrosion of contacts, breaks or damage to insulation, and defective wiring.

f CAPACITORS. Examine capacitors for signs of discoloration, leaks, bulging, dirt, loose mountings, or loose connections. Melted or oozing wax or other dielectric is a sure sign of damage to the part. Such capacitors must be removed for electrical check and replaced with good ones.

g. RESISTORS. Examine bodies of resistors for blistering, discoloration, or other signs of over heating. Inspect connecting leads for corrosion, dirt, dust, looseness, and broken or trailing strands in the connecting wires. Discoloration of the resistor may indicate that the component has been operated under overload and overheating, and may be taken as a sign of a defect in another part. (Power resistors may show discoloration as a result of burning of the fungicidal lacquer; hence the discoloration does not always indicate a defective resistor.) Be careful when examining or removing resistors which have pigtail connections. These connections may break at the point of entry into the body of the resistor and render it useless.

h. TRANSFORMERS. Leakage of potting compound from transformers is evidence of a short circuit in a winding of that part or of overloading because of associated faulty resistors or capacitors.

i. Fuse HOLDER. Check the fuse holder for signs of burning, charring, corrosion, or poor contact with the fuse.

Note. A burned-out fuse is usually a sign of failure in another part of the circuit. When a fuse is found to be burned out, the trouble is automatically localized to the filament, relay, or plate supply circuits in the amplifier.

j. Switch. Operate the switch on the front panel to each of its operating positions to determine that it works easily with no searching for contacts. Examine switch contacts for evidences of corrosion, improper contact, or dirt. Do not place excessive strain on the solder connections of the switch.

27. Cleaning

a. Dirt or corrosion will interfere with electrical continuity and mechanical efficiency of the parts and the unit by causing circuits to be shorted or insulated, or by causing switches to be jammed. For these reasons, it is important to clean all parts of the chassis and panel carefully and thoroughly.

b. No set method can be given for removal of dirt because of the many ways and places in which it can be collected. Cleaning should be done with a lintless cloth, fine (#000) sandpaper, crocus cloth, a soft brush, or, in more difficult cases, with the sharp edge of a screw driver. Dust and grease usually can be removed with a cloth or brush moistened in solvent (SD). Never use gasoline for cleaning. Be extremely careful in cleaning spots which are difficult to reach or parts which are delicate in order to avoid damage to wiring or parts. When it is necessary to remove portions

of the moisture-fungiproofing from a part, retropicalization is essential (par. 43b).

c. If available, use an air hose to blow out dust and lint from the chassis. Make sure, however, that no oil or water is carried along with the air stream and that the stream is controlled so that damage to small resistors and capacitors does not result.

d. Clean the cases of fixed capacitors, the relay, and other components. Remove all dirt and corrosion. In most cases, a dry cloth will do the job. If deposits of dirt are hard to remove, moisten the cloth with solvent (SD). Dry carefully.

e. Clean small components, such as resistors, with a small brush.

f. Clean dirty or corroded socket and switch contacts carefully. Use crocus cloth to remove corrosion. The wafer of switch S-1 is fragile; handle it with care.

28. Reassembly

The arrangement of AF Amplifier AM-65/GRC is such that, even though the unit is disassembled as described in the preceding paragraphs, electrical continuity exists between all parts of the unit. It is suggested that the unit be left unassembled for the test and repairs to be described in the following section. The trouble-shooting procedures given in section II of this chapter and the repair procedures given in section III of this chapter are based on the assumption that the unit is diassembled. Replace pluck-out parts as directed in the procedure for the particular test. When the required results are obtained for the checks of paragraphs 32 and 34, and any necessary repairs have been made, reassemble the unit in accordance with the procedure given in paragraph 41.

Section II. FIELD TROUBLE-SHOOTING

Warning: Never turn the OFF-INT-RT-70 switch to the RT-70 position when power is applied to the unit, unless suitable loads are connected across the power supply circuit output terminals which feed Receiver-Transmitter RT-70/GRC.Without proper loads, thermal relay K-1 will be severely overloaded.

29. Trouble-shooting Procedures

The test procedures for sectionalizing and localizing trouble in the amplifier are outlined in the following steps.

a. SHORT-CIRCUIT CHECKs. These checks consist of resistance measurements. They are intended to locate short circuits which might damage the battery or power supply, or cause additional damage to the equipment when power is applied (par. 31). Repair all short circuits before applying power to the unit.

b. OPERATIONAL CHECKS. The operational checks (pars. 32 and 34) are made to determine whether or not the amplifier functions properly. The trouble symptoms obtained will point to a faulty condition within a specific circuit section, and in some cases to a specific wire or part. It is recommended that each trouble be cleared as it is found before proceeding with the next operational check. Accordingly, the operational checks are divided into two parts, as follows:

(1) Power supply circuit output voltage measurements (par. 32) are made to determine that the proper voltages are delivered to the amplifier and are made available for connection to Receiver-Transmitter RT70/GRC. If the correct voltages are present at the output terminals, proceed with the signal transmission measurements (par. 34). Otherwise, localize the trouble within the power supply circuits (par. 33) and remedy the defect before making the signal transmission checks.

(2) Signal transmission checks (par. 34) through the three channels of the amplifier are made to determine whether the signal paths are in proper operating condition and provide the proper gain.

c. SIGNAL SUBSTITUTION. Once the trouble within the signal paths of the amplifier is sectionalized by means of the operational checks to a particular channel, a signal substitution or signal tracing procedure (par. 35) is used to localize the trouble to a particular stage within the channel.

d. RESISTANCE MEASUREMENTS. These tests are made to locate faulty or defective components and wiring within the circuit or stage shown to be faulty by the signal tracing procedure (pars. 35 and 37).

e. VOLTAGE MEASUREMENTS. Voltage measurements (par. 36) are made to determine whether the

correct d-c voltages are present at significant points of the circuit. They are made for the purpose of disclosing faults not observable during the preceding tests.

f. ADDITIONAL CHECKS. The interconnector strapping in the amplifier is important in the application of the unit in a system. Continuity checks (par. 38) are made to determine whether these strap connections are made as required.

30. Test Equipment

The following equipment is required for making the trouble-shooting tests described in this section.

a. Any one of the following power supply combinations:
- (1) A 6-volt storage battery and Power Supply PP-448/GR.
- (2) A 12-volt storage battery and Power Supply PP-281/GRC.
- (3) A 24-volt storage battery and Power Supply PP-282/GRC.
- (4) A 6-volt filament supply and a 135-volt plate and screen supply.

b. Electronic Multimeter TS-505/U, d-c volt ohmmeter.

c. Electronic Multimeter ME-68U, vacuum tube voltmeter.

d. Audio Oscillator TS-382A/U.

e. Any one of the following combinations of audio devices:
- (1) Chest Set Group AN/GSA with Headset-Microphone H-63/U.
- (2) Microphone M-29/U and Headset Navy type CW-49507.

i. Dynamic Loudspeaker LS-166/U.

g. Switch, single-pole, single-throw.

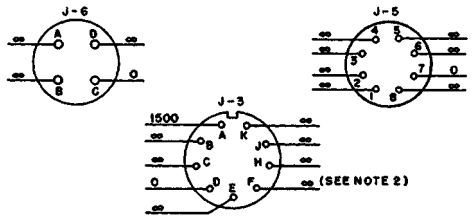
h. Capacitor paper dielectric; 2 uf (microfarad), 600 vdcw.

i. Dummy load resistors, as follows:
- (1) One resistor, 150 ohms, 5 watts.
- (2) Two resistors, 600 ohms, 5 watts.
- (3) One resistor, 100 ohms, 5 watts.
- (4) One resistor, 1,200 ohms, 10 watts.
- (5) One resistor, 39 ohms, 5 watts.
- (6) One resistor, 17.5 ohms, 5 watts.

31. Short-circuit Checks

(fig. 12)

a. Restore a good fuse in the fuse holder on the panel and replace the fuse cap. Do not reinsert any of the other pluck-out parts. Use Electronic Multimeter TS-505/U, or an equivalent meter, to check the resistance between each of the points on connectors J-3, J-5, and J-6 and chassis. The points of measurement and the required readings are summarized in figure 12. First turn internal



NOTE 1: ALL EXTERNAL B INTERNAL PLUG-IN COMPONENTS MUST BE REMOVED.
NOTE 2: 220 OHMS WITH S-1 IN EITHER ieV OR 24V POSITION B S-2 IN RT-70?O POSITION.

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Figure 12. AF Amplifier AM-65/GRC, short-circuit checks on power supply circuits.

switch S-1 to the 24V position, and obtain readings for each of the three positions of S-2. Repeat this procedure for the 12V and 6V positions of S-1. The readings shown in figure 12 should be obtained for all switch positions, except as indicated by the notes, on the figure.

b. If a required reading is not obtained, refer to figure 10, functional diagram of the power supply circuits, and to the over-all schematic for the amplifier (fig. 17), to determine which part or parts may be responsible for the trouble. Incorrect readings may be due to a shorted or leaky capacitor (C-14), or to a wire or a lug on one of the parts shorted to the chassis. Check each capacitor in the affected circuit section for leakage or short and replace, if necessary. Check the wires, lugs on components, and contacts on switches, and repair as necessary. Do. not apply power to the unit until the trouble has been cleared, and the readings indicated by figure 12 are obtained for all switch positions.

32. Trouble Sectionalization in Power Supply Circuits

(fig. 13)

To check whether the power supply circuits within AF Amplifier AM-65/GRC are functioning properly, and whether the correct voltages are made available for the receiver-transmitter, proceed as follows: a. Install Power Supply PP-281/GRC, PP282/GRC, or PP-448/GR in the power supply compartment and fasten the clamp. Check the input voltage rating of the unit used against the voltage rating of the storage battery available for these tests.

b. Check that the fuse installed in the holder on the front panel has the proper rating as follows:

Power supply	Storage battery voltage (volts)	Fuse rating (amp)
PP-281/GRC	12	10
PP-282/GRC	24	4
PP-448/GR	6	10

c. Set the 6fV-12V-24V switch (mounted on the chassis, screw driver control) to the position corresponding to the input voltage used.

d. Insert all pluck-out parts, including tubes V-1 through V-5, voltage regulator tubes V-6 and V-7, ballast tube R-32, thermal relay K-l, and capacitor C-1. Make sure that they are firmly seated in their sockets.

e. Make sure that the OFF-INT-RT-70 switch S-2 is in the OFF position at this time.

f. Connect a set of dummy load resistors between the output terminals and ground (terminal D of J-3). The values of the load resistors and the connection points are listed in the following chart.

Terminal	Connector	Resistance or connection
B ------ -	J-3 -------	39 ohms, 5 watts.
E---------	J-3 -------	Ground.
F----------	J-3 -------	17.5 ohms, 5 watts.
J---------	J-3 --------	1,200 ohms, 10 watts.
K ---------	J-2 -------	On-off switch to ground.*
C ---------	J-2-------	100 ohms, 5 watts.
F ---------	J-2 -------	600 ohms, 5 watts.
H ---------	J-2 -------	150 ohms, 5 watts.
A ---------	J-2 -------	600 ohms, 5 watts.

*Keep this switch open unless otherwise directed in the test procedure.

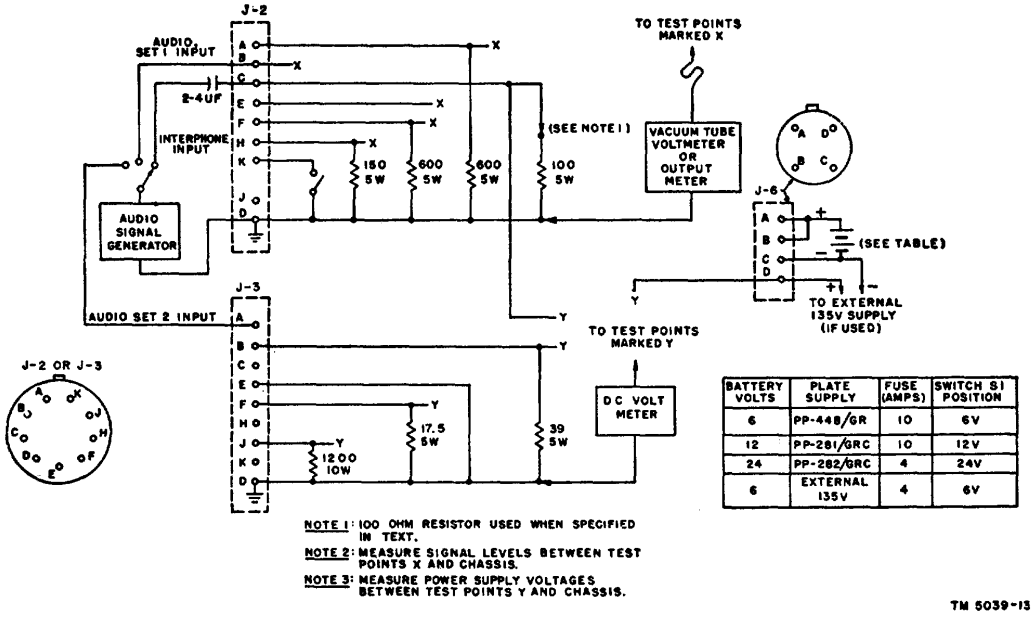
g. Connect the (+) terminal on the storage battery to terminals B-A (strapped internally) on connector J-6. Connect the (-) terminal of the battery to terminal C of J-6.

h. Turn the OFF-INT-RT-70 switch S-2 to the RT-70 position. Measure the voltages between the chassis and each of the terminals listed in the following chart.

Test point	Nominal reading (volts)	Probable trouble
Term D on J-6	130	Defective plug-in power supply, S-2, or plate supply circuit wiring or components (par. 33).
Term C on J-2*	3	Defective microphone circuit or relay 0-1 (par. 33).
Term B on J-3	6	Defective relay supply lead (par. 33).
Term F on J-3	6.3	Relay K-1 operated or defective filament supply circuit for the receiver-transmitter (par. 33).
Term J on J-3	90	Defective 90-volt supply circuit for receiver-transmitter (par. 33).

*Close external switch connected to K of J-2.

*'Slightly less for 6V position of S-1.



BATTERY VOLTS	PLATE SUPPLY	FUSE (AMPS)	SWITCH S1 POSITION
6	PP-448/GR	10	6V
12	PP-281/GRC	10	12V
24	PP-282/GRC	4	24V
6	EXTERNAL 135V	4	6V

Figure 13. AF Amplifier AM-65/GRC, operational test set-up for voltage and signal transmission checks.

i. The filaments of amplifier tubes V-1 through V-5 are not accessible at any of the connector points. Check whether filament voltage is applied to these tubes by noting whether they are lit.

j. Turn S-2 to the OFF position.

k. If any of the readings indicated in the preceding table are not obtained, check the circuit components in the particular power supply circuit (par. 33) and repair as needed.

33. Trouble Localization in Power Supply Circuits

If incorrect readings are obtained as a result of the checks outlined in paragraph 32h, it may be assumed that the power supply circuit associated with a particular measuring point is defective. Refer to the schematic diagram (fig. 17) and to the. functional diagram (fig. 10) to identify the point of measurement with the circuit section involved. Using Electronic Multimeter TS-505/U, or an equivalent ohmmeter, make point-to-point resistance measurements for the defective circuit section as indicated in the chart below. These measurements will aid in locating the trouble in the defective power supply circuit to a particular component or wire. For the purpose of these measurements, disconnect the battery and the load resistors; pull out the ballast tube, the thermal relay, all vacuum tubes, electrolytic capacitor, and the plug-in power supply. Leave the fuse in its holder. Use the data given in the table merely as a guide. Other measurements for localizing the trouble to a defective part of wire should suggest themselves. Clear troubles in the power supply circuits before proceeding with the signal transmission tests.

Item of check	Point of measurement	Required reading (ohms)	Probable trouble
Plate supply circuit	From term J on J-3 to term 5 on X-7	370	R-41 and R-40
	From term 5 on X-7 to term 5 on X-6	790	R-38, R-39, R-40.
	From term 2 on X-6 to term 2 on X-7	0	Broken connection.
	From term 2 on X-7 to term E on J-3	0	Broken connection.
	From term 5 on X-6 to term 8 on J-5 with S-2 in RT-70 position	720	Defective R-37 or R-38, S-2, or wiring.
	From term D on J-6 to term 8 on J-5	0	Defective wiring.
Filament supply circuits.	From term F on J-3 to term 7 on X-8 with 8-2 in RT-70 position	Approxi mately 1.	-Defective L-1 or S-2.
	From term 5 to term 7 on X-8	20	Defective R-33 or R-34.
	From term 7 on X-9 to term 5 on X-8	0	Open wire.
	From term 7 to term 2 on X-8 S-2 in INT position	15	Defective S-2 or R-36.
External relay circuits	From term B on J-3 to term 1 on J-5		
	S-1 in 24V position	200	Defective R-27, R-28, R-29, R-30.
	S-1 in 12V position	200	Defective S-1.
	S-1 in 6V position	0	Defective S-1.
Internal relay circuit	From term K on .T-2 to term 1 on JT-5	39	Defective coil of relay 0-1

34. Trouble Sectionalization in Signal Circuits

The purpose of the following checks is to determine whether each of the amplifier channels is continuous for transmission of signal, whether it provides the required gain, and whether the proper paths are taken by the signals applied to each of the input terminals. In the checks summarized in the following chart, it is assumed that the connections made in paragraph 32 are retained. The test circuit arrangement is shown in figure 13. In addition, the oscillator connections, oscillator output levels, points of measurement, and required readings are indicated in the chart. Adjust the oscillator frequency to 1,000 cycles, set the VOLUME control to its maximum clockwise position, and set OFF-INT-RT-70 switch S-2 to the RT—70 position. Allow a warm-up period of a few minutes. The oscillator output level should be measured across the terminals to which the oscillator is connected. Use a high impedance a-c voltmeter or a vacuum-tube voltmeter (par. 30) to make all measurements. Failure to meet any of the required reading points to the fault or faults indicated in the probable trouble column of the chart for that particular item.

Oscillator		Measuring point	Required reading (volts)	Probable trouble
Connection	Output level (volts)			
C on J-2 (interphone signal) Close external switch connected to K of J-2.	0 25	E on J- 2 -----	30	Defective, amplifier V--l, V- 4, or V- 5.
		H on J-2	15. 5	Defective transformer T-5 or wiring from 150-ohm tap on T-5 to terminal H on J-2.
		F on J-2 ----	15	Defective amplifier V-1 or V-2 and associated circuits.
		A on J-2 ----	15	Defective amplifier V-1 or V-3 and associated circuits.
B of J-2 (Set 1 signal)	5	F on J-2 -----	15	Defective input circuit or aniplifier V-2 in Set 1 + INT channel.
		H on J-2-----	12. 5	Defective amplifier V-1, V-4, or V-5 and associated circuits.
	3. 5	A on J-2-----	02*	Defective C-1.
A of J-3 (Set 2 signal)	5	A on J-2 -----	15	Defective input circuit or amplifier V-3 in Set 2 + INT channel.
		H on J-2 ----	12.5	Defective amplifier V-1 or interphone channel circuits.
	3. 5	F on J-2---	02**	Defective C-1.

*At least 50 db below signal level at F of J-2. " *At least 50 db below signal level at A of J-2.
Note. All connections and measurements made between terminals indicated and ground.

35. Signal Substitution

a. GENERAL. The purpose of the signal substitution or signal tracing checks described in this paragraph is to localize the trouble to a particular stage or part within the channel which has been shown to be defective by the signal transmission checks of paragraph 34.

b. TEST EQUIPMENT. The test equipments required for these checks are listed in paragraph 30. A source of audio signals, a vacuum-tube voltmeter, a set of dummy load resistors, power supply and storage battery or external plate and filament supply, test probes, and connecting cables are required.

Note. If a vacuum-tube voltmeter is not available, a loudspeaker, or a headset with a 10,000-ohm volume control shunted across it, may be used to obtain audible indications of the presence, volume, and quality of the signal at the various test points.

C. TEST PROCEDURE.

(1) Connect the power supply and all dummy load resistors as described in paragraph 32, including the load resistor to terminal C of J-2.

(2) Connect the ungrounded side of the audio signal generator through a 2-uf capacitor to the channel input terminals specified in d below. Connect the ground side of the signal generator to the amplifier chassis or to any one of the grounded terminals on one of the multiconnectors on the panel.

(3) Connect the vacuum-tube voltmeter between each of the test points shown in the chart and ground.

(4) Adjust the frequency of the signal generator to 1,000 cycles and adjust its output level so that the voltage, as measured with a vacuum-tube voltmeter across the channel input terminals, is as specified in d below.

(5) Turn the OFF-INT-RT-70 switch to the RT-70 position and allow a warmup period of about 1 minute.

(6) Using a vacuum-tube voltmeter, measure the signal voltages at the points indicated in d below. Follow the order given in the chart.

d. MEASUREMENT DATA.

(1) With the 1,000-cycle signal supplied at a level of 0.14 volt between terminal C of J-2 and ground, measure the levels at the test points indicated in the following chart. Close the external test switch (connected to K of J-2) while taking these measurements.

Test point	Reading (volts, rms)
H of J-2	12.2
1 of V-5	54.0
6 of V-5	54.0
2 of V-5	12
7 of -5	2
1 of V	28
6 of V-4	28
2 of V-4	2.5
7 of V-4	2.5
1 of V-1	4.9
6 of V-1	4.9
2 of V-1	5
7 of V-1	5
F of J-2	10
5 of V-2	58
1 of V-2	4
A of J-2	10
5 of V-3	58
1 of V-3	4

(2) With the 1,000-cycle signal supplied at a level of 3.3 volts between terminal B of J-2 and ground, measure the levels at the test points indicated in the following chart.

Test point	Reading (volts, rms)
H of J-2	11. 5
1 of V-5	49
6 of V-5	49
2 of V-5	11. 5
7 of V-5	11. 5
1 of V-4	25
6 of V-4	25
2 of V--4	5
7 of V-4	
1 of V-1	9
6 of V-1	
2 of V-1	
7 of V-1	
F of J-2	13. 4
5 of V-2	84
1 of V-2	7.6
A of J-2	
5 of V-3	
1 of V-3	

(3) With the 1,000-cycle signal supplied at a level of 3.3 volts between terminal A of J-3 and ground, measure the levels at the test points indicated in the following chart.

Test point	Reading (volts, rms)
H of J-2	11
1 of V-5	49
6 of V-5	49
2 of V-5	11. 5
7 of V-5	11. 5
1 of V-4	25
6 of V-4	25
2 of V-4	
7 of V-4	5
1 of V-1	
6 of V-1	9
2 of V-1	
7 of V-1	
F of J-2	
5 of V-2	
1 of V-2	
A of J-2	13. 4
5 of V-3	84
1 of V-3	7.6

e. ANALYSIS. Compare the readings obtained with the value given in the chart. The tabulated data are nominal values. Nonuniformity in tubes, tolerances of components, etc., may be responsible for reading variations between amplifiers of as much as 10 percent. Interpret the test results with this fact in mind. In general, the fault in the channel lies between the point at which a normal reading is first obtained and the preceding test point. A fault may be indicated by the absence of a reading, or by a drastic reduction or increase in a reading. In the case of the push-pull stages of the Set 1+Set 2+Interphone channel, a fault is indicated if the readings for one-half of the stage do not agree (approximately) with readings taken at corresponding points in the other half of the stage. Again note that such correspondence is nominal only, and depends upon tolerance in tubes and components. Unbalance in a push-pull stage may be due to a defect in one of the components which serve to maintain balance; for example, a leaky bypass capacitor C-9, a partially shorted transformer T-4 winding (1-2), or an aging resistor R-19. Refer to the schematic diagram (fig. 17), to identify the circuit section to which the trouble has been localized. Note also, that a similar correspondence of readings applies to comparable points in the Set 1+Interphone and Set 2+Interphone channels.

f. FURTHER TROUBLE LOCALIZATION CHECKS When trouble has been localized to a given stage or a portion of a stage, do the following:

(1) Turn the OFF-INT-RT-70 switch to the OFF position, and pull the tube out of its socket.

(2) Test the tube by means of a tube checker and, if defective, replace with a good one .If a tube checker is not available, substitute a tube known to be good for the suspected defective tube.

(3) To isolate trouble in the defective stage measure the voltages and resistances at the tube socket (fig. 14) and other pertinent points (pars. 36 and 37). Note that the information given is merely a guide and should suggest other tests, measurements, and procedures for localizing the trouble to a defective part or wire.

(4) When a defective part is found, replace it. Repair a defective or broken wire. Isolate and clear the trouble before proceeding with the succeeding step, since each step presupposes the satisfactory completion of all previous steps. Refer to paragraphs 39 through 41 for repair procedures.

36. Voltage Measurements

Make the pertinent d-c voltage measurements indicated in figure 14. These measurements serve to locate defects which are not readily determined by the resistance measurements of paragraphs 33 and 37, that is, defective capacitors, partially shorted transformer windings, etc. For these measurements, insert all plug-in parts, and connect the battery and load resistors (par. 32). All voltage measurements shown in figure 14, except filament voltages, are made to ground. Filament voltages are measured between the filament terminals of the socket. Refer to the schematic diagram (fig. 17), to identify the circuit components involved in a particular measurement. Note especially the arrangement of amplifier filament wiring for each position of the 6V-12V-24V switchS-1. Required readings are shown above the guide lines from the socket terminals. Use Electronic Multimeter TS-505/U as a voltmeter. Repair any part found by the voltage measurements to be defective.

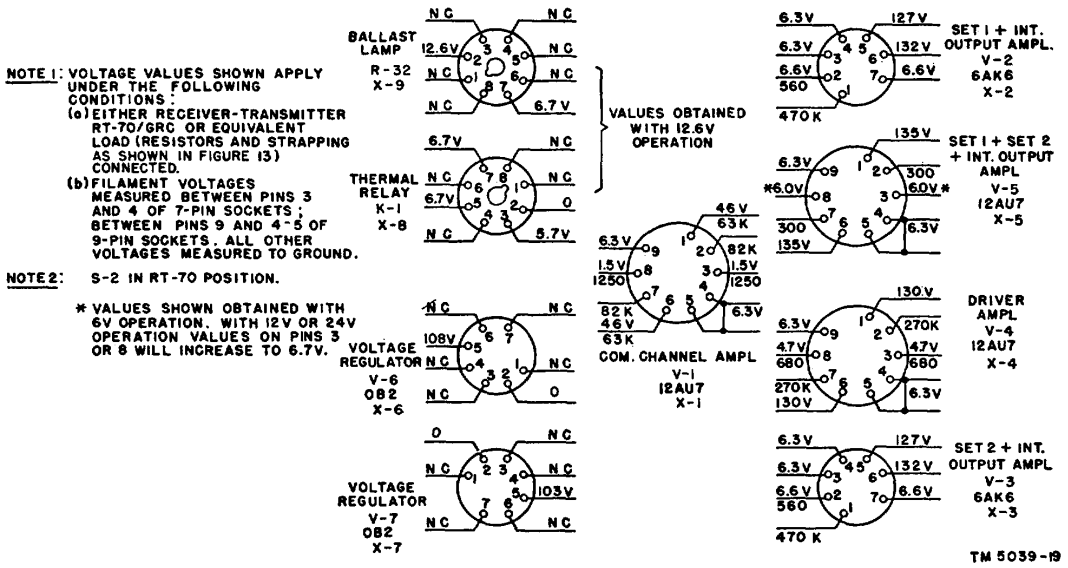


Figure 14. AF Amplifier AM-65/GRC, tube socket voltage and resistance diagram.

37. Resistance Measurements

(fig. 14.)

These checks are intended to serve as a guide for locating defective components or wiring in the amplifier stage found to be defective by the signal substitution checks of paragraph 35. For these checks, disconnect the batteries, remove the power supply unit, the ballast tube, thermal relay and all vacuum tubes; leave the fuse in its holder. Use Electronic MTS-505/U for taking the measurements. Replace any component or repair any wire found to be defective.

a. lake the pertinent measurements indicated in figure 14. These measurements all are made from the socket terminal to ground. The required resistance readings are shown below the guide line from the socket terminal. It is not necessary to make all of the measurements shown figure 14, but only those that are indicated at, the tube socket associated with the stage found to be defective by the signal substitution checks of paragraph 35.

b. Make the pertinent measurements listed in the following table. The data given in the table supplements the data given in figure 14.

Point of measurement	Normal reading (ohms)	Probable trouble
From term C on J-2 to term 7 on T-1	Infinity	Defective 0-1 con. tacts.
From term 1 to term 2 on T-1	800	Defective T-l, R-3 or R-5.
From term 3 to term 2 on T-1	800	Defective T-l, R-4, or R-6.
From term B on J-2 to chassis	1, 560	Defective R-7, R-9, or R-11.
From term A on J-3 to chassis	1, 560	Defective R-8, R-10, or R-12.
From term 1 to term 6 on X-1	114, 000	Defective R-14, R-15, R-16, or R-17.
From term 1 of X-1 to term 8 on J-5	62, 600	Defective R-14, R-15, or R-13.
From term 1 to term 6 on X-4.	1, 550	Defective T-4.
From term 6 on X-2 to term 1 on X-4.	800	Defective T-4.
From term 6 on X-3 to term 6 on X-4.	750	Defective T-4.
From term 2 to term7 on X-5.	650	Defective T-4.
From term 1 to term 6 on X-5.	200	Defective T-5.
From term 2 on T-4 to term 8 on J-5.	100	Defective R--25.

Point of measurement	Normal reading (ohms)	Probable trouble
From term 1 on X-5 to term 8 on J-5	80	Defective T-5 or wiring.
From term E on J-2 to chassis. VOLUME control in maximum clockwise position.	35	Defective R-26 or T-5.
From term H on J-2 to chassis.	16	Defective T-5.
From term 8 on X-5 to term 7 on X-8.	0	Defective wiring.
From term 8 on X-5 to term 3 on J-5. S-1 in 6V position.	0	Defective S-1.
From term 5 to term 6 on X-2.	625	Defective T-2.
From term F on J-2 to chassis.	24	Defective T-2.
From term 5 to term 6 on X-3.	625	Defective T-3.
From term A on J-2 to chassis.	24	Defective T-3.

38. Check of Interunit Strapping Connections

a. The continuity checks, outlined below, should be made to determine whether the strapping connections between the multiconnectors in the amplifier are properly made. The strapping connections are used to tie in the amplifier with other units of the system in which it is used.

b. Using an ohmmeter (Electronic Multimeter TS-505/U, or equivalent), check for continuity between the points listed below. In each case a reading of zero ohms should be obtained. Otherwise, the wire between the two terminals in question is broken, or the connector pin is defective. Make repairs as needed.

From term F of J-1 to term K of J-2.
From term H of J-1 to term D of J-3.
From term E of J-1 to term H of J-1.
From term B of J-1 to term E of J-1.
From term L of J-1 to term E of J-2.
From term H of J-3 to term H of J-4.
From term C of J-3 to term C of J-4.
From term K of J-3 to term K of J-4.
From term C of J-6 to term 1 of R-26.
From term A of J-1 to term L of J-1.
From term C of J-1 to term C of J-2.
From term D of J-2 to term 1 of R-26.
From term D of J-2 to term D of J-4.
From term A of J-3 to term B of J-4.
From term J of J-3 to term J of J-4.
From term D of J-2 to term D of J-3.
From term 7 of J-5 to ground bus.
From term D of J-4 to term B of J-1.
From term C of J-6 to ground bus.
From ground bus to chassis.

Section III REPAIRS

39. Replacement of Parts

When replacing parts in AF Amplifier AM-65/GRO, observe the precautions given below. a. TAGGING LEADS. Tagging leads is essential to assure that correct rewiring will be made when a part is replaced. Before unsoldering leads from transformers, tube sockets, panel connectors, or other parts, tie together the leads that are attached to each of these parts. Use small tags or short pieces of adhesive tape to identify all wires in accordance with their numbered connections. Identify every lead that is to be removed.

b. PARTS AND SUBSTITUTION. When damaged parts must be replaced, use identical parts. If identical parts are not available and the damaged component is beyond repair, a substitution must be made. The part substituted must have identical electrical properties and must be of equal or higher voltage and current rating.

c. LOCATION. Relocation of substituted parts may develop certain difficulties, such as hum or noise, and is not recommended.

d. MOUNTING. Mount the new or replaced part in the same mounting as that formerly occupied by the damaged part. Fasten all mountings securely.

e. SOLDERING. Before soldering any connection, carefully scrape all parts that will be touched by the solder until all traces of rust, corrosion, paint, or varnish are removed. Dust the scraped parts with a small clean brush. Tin all parts to be soldered. Wrap the wire around the lug to be soldered to obtain mechanical support. Solder the connections with a very little solder and use sufficient heat to make the solder flow evenly around the tinned surfaces.

f. RETROPICALIZATION. If the parts being re, placed require special treatment, such as retrop,

lcalization, follow the instructions given in TB SIG 13 and TB SIG 72.

40. Special Repair Procedures

Most of the parts in this unit are readily accessible and can be replaced easily without special procedure instructions. Special procedures required for repairing or replacing sockets and connectors are given in a through c below.

a. SOCKETS. All sockets are attached to the chassis with rivets. To change a socket-

(1) Remove the part plugged into the socket.
(2) Unsolder the wires connected to the socket.
(3) Drill out the two rivets fastening it to the chassis.
(4) Substitute a new socket and fasten it with machine screws, lockwashers, and nuts or, if feasible, with rivets.
(5) Resolder the wires to the socket.
(6) Clean the unit thoroughly to remove solder drops or metal chips.
(7) Check the new connections with those shown in the schematic diagram, figure 17.

b. PANEL CONNECTORS. To remove panel connectors, it is necessary to use a spanner wrench (or long-nose pliers).

(1) Insert the teeth on the spanner wrench into the notches in the rim of the connector on the front panel.
(2) Turn the spanner wrench in the counter-clockwise direction until the rim is removed. Remove the lockwasher.
(3) Remove the connector from the rear of the panel.
(4) Unsolder all wires.
(5) In selecting a new connector, make sure that the new part has a rubber gasket.
(6) Resolder all wires to the new connector. Clean thoroughly to remove solder drops.
(7) Recheck the new connections with those shown in the schematic diagram (fig. 17).
(8) Reinsert the connector from the rear of the panel.
(9) Reinsert the lockwasher and the rim by use of the spanner wrench. Screw the rim back onto the connector. Check the assembly for tightness.

C. POWER SUPPLY CONNECTOR J-5. The procedure outlined in a above for sockets applies in general to connector J-5 in the plug-in power supply compartment. Unless the body of the drill is long enough to fit into the power supply compartment, it is advisable to remove the compartment before attempting to remove the connector. To do that, remove the screws which hold the left side bracket to the chassis. The power supply compartment is formed from this bracket. Remove the screws which hold the bracket to the rear of the chassis. Now connector J-5 is accessible. Drill out the three rivets which hold the connector in place. Remove the connector and proceed as described in a above to replace the part.

41. Reassembly

After the inspection tests and repairs described in the preceding paragraphs have been made, the unit is ready for reassembly. To reassemble the unit follow the reverse of the procedure described in paragraph 25. Proceed as follows: Reattach the side brackets, if they have been removed. Reassemble the left side bracket first. Line it up so that the slits in the bracket slide over the notches on the side of the chassis. Restore the mounting screws. Follow a similar procedure to reassemble the right side bracket. Reattach the front panel by means of the six mounting screws, taking care to tuck the connecting cable carefully in place and not to damage the wiring. Tighten all mounting screws. Check that all plug-in parts are firmly seated in their sockets. Replace the outer case and tighten the Dzus fasteners.

Section IV. LUBRICATION AND WEATHERPROOFING

42. Lubrication

AF Amplifier AMN-65/GRC described in this manual does not require lubrication; do not apply oil or grease to any part of this unit.

43. Weatherproofing and Rustproofing

a. GENERAL. Signal Corps equipment, when operated under severe climatic conditions, such as prevail in tropical, arctic, and desert regions,

requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

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

c. WINTER MAINTENANCE. Special precautions necessary to prevent poor performance or total operational failure of equipment in extremely low temperatures are explained in TB SIG 66.

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

e. RUSTPROOFING. Rust and corrosion can be prevented by touching up bared surfaces. Clean, where necessary, with fine sandpaper. Never use steel wool.

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

44. Refinishing

a. When the finish on the case or on the panel has been badly scarred or damaged, rust and corrosion can be prevented by touching up bared surfaces. Use #00 or #000 sandpaper to clean the surface down to the bare metal; obtain a bright smooth finish. Instructions for refinishing badly marred panels and cases are given in TM 9-2851.

Caution: Do not use steel wool. Minute particles frequently enter the case and cause harmful internal shorting or grounding of circuits.

b. When a touch-up job is necessary, apply paint with a small brush. Remove rust from the case by cleaning corroded metal with solvent (SD). In severe cases, it may be necessary to use solvent (SD) to soften the rust and to use sandpaper to complete the preparation for painting. Paint used will be authorized and consistent with existing regulations.

Section V. FINAL TESTING

45. General

If the unit fails to meet the requirements of paragraphs 32 and 34, repeat the trouble-shooting procedures given in paragraphs 33 and 35 to 37 to locate other faults. Make repairs as found necessary. If the unit operates as required in paragraphs 32 and 34, perform the tests outlined in the following paragraphs before returning the unit to service.

46. Speech Transmission Tests

The purpose of the tests described in this paragraph is to determine the volume and quality of speech signals at each of the channel output terminals, when speech signals are applied to the input of the interphone channel. Proceed as follows:

a. Connect the load resistors and apply power to the unit as shown in figure 13. Omit the load resistor between terminals C and D of J-2.

b. Connect Chest Set Group AN/GSA-6 with Headset-Microphone H-63/U to AUDIO connector J-1.

c. Connect a loudspeaker or a headset between terminals E and D of J-2. Set the VOLUME control to its extreme counterclockwise position.

d. Operate the push-to-talk button and talk into the microphone. Listen to the loudspeaker or headset and gradually advance the VOLUME control until the desired volume of sound is heard. e. Note the quality of the received speech signals. Clear, distortion-free speech should be heard.

f. Shift the loudspeaker or headset connection to terminal F of J-2, and perform the operations indicated in the preceding steps. The requirements stated in e above should be met.

g. Shift the loudspeaker or headset connection to terminal A of J-2. The results should be approximately the same as those for e, above.

47. Frequency Response

a. To prevent high- and low-frequency noises from being amplified and transmitted through the system, frequencies above 3,500 cycles and below 400 cycles are sharply attenuated. Capacitors C-2, C-3, and C,8 through C-12 contribute to the shaping of the amplifier frequency response characteristic. The following tests are made to determine whether these requirements are met and whether or not these capacitors are defective.

b. The procedure is as follows:
(1) Connect a variable frequency audio signal generator, in series with a 2- to 4-uf capacitor across the channel input terminals as shown in figure 13 and listed in the chart below. Also connect the load resistors indicated in figure 13.
(2) Connect a vacuum tube voltmeter or an output meter across the channel output terminals, as indicated in the chart.
(3) Adjust the frequency of the signal generator to 1,000 cycles and its output level to the voltage shown in the chart for the particular channel input.
(4) Measure the level at the channel output terminals. Record this 1,000-cycle output level. This value is the reference level.
(5) Now, change the frequency of the signal generator to 400 cycles, but keep the input level to the amplifier channel at the same value as for 1,000 cycles.
(6) Measure the level at the channel output terminals, and compare it with the 1,000-cycle value, obtained in (4) above.

Requirement: The output level at 400 cycles should be within 2 db of that at 1,000 cycles.

(7) Change the frequency of the signal generator to 5,000 cycles, again keeping the input level to the channel at the same value as at 1,000 cycles.
(8) Measure the channel output level, and compare with the level at 1,000 cycles obtained in step (4) above.

Requirement: The output level at 5,000 cycles should be at least 10 db below the 1,000-cycle output level (a voltage ratio of 3.16).

c. The oscillator connections, channel input levels, and the output meter connections are summarized in the following chart. All connections are made between the points shown and chassis.

Oscillator		Output meter		
Channel input	Connection	Signal input (volts)	Channel output	Connection
Interphone	Term C of J-2 (Close test switch connected to K of J-2)	0.2	Set 1 +Set 2+ Interphone	Term H of J-2.
			Set 1 +Interphone	Term F of J-2.
			Set 2+Interphone	Term A of J-2.
			Set 1 amplifier	Term B of J-2
Set 1 amplifier		2. 5	Set 1+Interphone	Term F of J-2.
			Set 1+Set 2+Interphone	Term H of J-2.
Set 2 amplifier	Term A of J-3	2. 5	Set 2+Interphone	Term A of J-2.
			Set 1+Set 2+Interphone	Term H of J-2.

48. Crosstalk

a. The purpose of the checks outlined in this paragraph is to determine whether proper separation is maintained between the Set 1 and Set 2 amplifier channels, that is, whether a signal applied to the input of one of these channels is kept out, as required, from the output of the other channel.
b. A satisfactory qualitative check may be made as follows:
(1) Connect a signal generator to the input terminals of the Set 1 channel (terminals B and D of J-2). Connect the load resistors indicated in figure 13.
(2) Connect a headset to the output of that channel (terminals F and D of J-2).
(3) Adjust the signal generator to apply 1,000-cycle signal at 3.5 volts to the channel input terminals.
(4) Note the level of the signal at the channel output terminals.
(5) Transfer the headset connections to the output terminals of the Set 2 amplifier channel (terminals A and D of J-2); any signal heard should be weak.
(6) Shift the signal generator connections to the Set 2 amplifier channel input terminals (terminals A and D of J-3), adjust the frequency and level as before, and listen for the signal at the output terminals of each of the two channels.

No signal should be heard at the Set 1 channel amplifier output terminals (terminals F and D of J-2).

c. A quantitative check may be made by following the procedure outlined above, but using an output meter or vacuum tube voltmeter in place of the headset. When the signal is applied to the Set 1 amplifier input terminals, the level of the signal at the Set 2 amplifier output terminals should be at least 50 db below the level at the Set 1 amplifier output terminals. This level difference corresponds to a voltage ratio of 316. Similarly, when the signal is applied to the Set 2 amplifier input terminals, the level of the signal at the Set 1 amplifier output terminals should be 50 db below the level at the Set 2 amplifier output terminals, a voltage ratio of 316.

49. Noise

The purpose of the test described in this paragraph is to determine whether the amplifier provides noise-free operation. Proceed as follows: Apply power and connect the load resistors as shown in figure 13. With no signal applied to the amplifier input terminals, measure the voltages at each pair of output terminals, namely, between terminals H and D of J-2 (Set 1+ Set 2+ Interphone), F and D of J-2 (Set 1+ Interphone), and A and D of J-2 (Set 2+ Interphone). The voltages measured represent noise contributed by the amplifier. The voltage across each pair of output terminals should be less than .5 volt.

CHAPTER 4
SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

50. Repacking for Shipment or Limited Storage

Wrap and pack securely according to directions given in Packaging Specifications JAN-P-100, or as directed by the Officer in Charge.

51. Demolition of Materiel to Prevent Enemy Use

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

a. Smash. Smash capacitors, transformers, resistors, sockets, plugs, and other components, using sledges, axes, handaxes, pickaxes, hammers, crowbars, or heavy tools.

b. Cut. Cut wiring, using axes, handaxes, or machetes.

c. Bum. Burn technical manuals, records and forms, resistors, capacitors, and transformers, using gasoline, kerosene, oil, flame throwers, or incendiary grenades.

d. Bend. Bend chassis, panels, and covers, use

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

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

g. Destroy. Destroy everything.

APPENDIX I
REFERENCES

Note. For availability of items listed, check SR 310-20-3 and SR 31u-20- 4. Check Department of the Army Supply Catalog SIG 1 for Signal Corps supply catalog pamphlets.

1. Army Regulations

AR 380-5	Safeguarding Military Information.

2. Supply Publications

SIG 1	Introduction and Index.
SIG 5	Stock List of All Items.
SIG 6	Sets of Equipment.
SIG 7 & 8	Organizational Maintenance Allowances and Field and Base Maintenance Stockage Guide.
SB 11-47	Preparation and Submission of Requisitions for Signal Corps Supplies.
SB 11-76	Signal Corps Kit and Materials for Moisture- and Fungi-Resistant Treatment.

3. Publications on Test Equipment

NAVSHIPS 91269	Instruction Book for Electronic Multimeter ME-6A/U.
TM 11-2627	Tube Tester I-177.

4. Painting and Preserving

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TM 9-2851	Painting Instructions for Field Use.

5. Demolition

FM 5-25	Explosives and Demolitions.

6. Military (JAN) Specifications

JAN-D-169	Desiccants (Activated).
JAN-P-100	Packaging and Packing for Overseas Shipment-General Specifications.
JAN-P-106A	Packaging and Packing for Overseas Shipment-Boxes; Wood, Nailed.
JAN-P-116	Packaging and Packing for Overseas Shipment-Preservation, Methods of.
JAN-P-125	Packaging and Packing for Overseas Shipment-Barrier Materials, Waterproof, Flexible.
JAN-P-131	Packaging and Packing for Overseas Shipment-Barrier Material; Moisture-Vaporproof, Flexible.

7. Other Publications

FM 24-18	Field Radio Techniques.
SR 310-20-3	Index of Training Publications (Field Manuals, Training Circulars, Firing Tables and Charts, Army Training Programs, Mobilization Training Programs, Graphic Training Aids, Joint Army-Navy-Air Force Publications, and Combined Communications Board Publications).
SR 310-20-4	Index of Technical Manuals. Technical Regulations, Technical Bulletins, Sup-

	ply Bulletins, Lubrication Orders, Modification Work Orders, Tables of Organization and Equipment, Reduction Tables, Tables of Allowances, Tables of Organization, Tables of Equipment, and Tables of Basic Allowances.
TB SIG 66	Winter Maintenance of Signal Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 123	Preventive Maintenance Practices for Ground Signal Equipment.
TB SIG 178	Preventive Maintenance Guide for Radio Communication Equipment.
TM 1-455	Electrical Fundamentals.
TM 9-2857	Storage Batteries Lead-Acid Type.
M 11-430	Batteries for Signal Communication. Except those perting to Aircraft.
TM 11-453	Shop Work.
TM 11-455	Radio Fundamentals.
TM 11-483	Suppression of Radio Noises.
TM 11-486	Electrical Communication Systems Engineering.
TM 11-60	Introduction to Electronics.
TM 11-4000	Trouble-Shooting and Repair of Radio Equipment.
TM 38-650	Basic Maintenance Manual.

8. Abbreviations

a-c	alternating current
a-f	audio frequency
amp	ampere(s)
C	centigrade
db	decibel(s)
d - c	direct current
F	Fahrenheit
h-f	high frequency
ma	milliampere
r-f	radio frequency
rms	root mean square
uf, uuf	microfarad, micromicrofarad

APPENDIX II
IDENTIFICATION TABLE OF PARTS

1. Requisitioning Parts

The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as a specific pamphlet in each series of 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 another authorized supply basis. The Department of the Army Supply Catalog applicable to the equipment covered in this manual is SIG 7 & 8 AM-65/GRC. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1, Introduction and Index.

2. Identification Table of Parts for AF Amplifier AM45/GRC

Ref Symbol	Name of part and description	Function of part	Signal Corps stock No.
	ARMY-NAVY AF AMPLIFIER AM-65/GRC: power output: 1800 mw for Set 1+Set 2+Int channel, 350 mw for Set 1 +Int, and Set 2+Int channels with.25 v interphone input signal; 350 mw at Set 1+Int and Set 2+Int, and 800 mw at Set 1+Set 2+Int with 5 v signal applied to Set 1 or Set 2 input. -2db or lower at 250 eye, +2 to -2db at 400 cyc, 0 db at 1000 cyc, 0 to --5 db at 2500 eye, - 10 db or lower at 5000 eye; 7%" wd x 4Y," h x 12%" d o/a; nom input 6.3, 12.6, or 25.2 v DC vehicular, or 6 and 135 v DC external supply; three input channels, one for 150 ohms low-impedance mic; two 5 v audio channels; output impedance 600 ohms w/150 ohm tap, metal case; has voltage regulating ckt; moisture and fungus resistant; contains compartment to accept vibrator plate power supply; Fed Tele & Rad part/dwg #GA-2436-14; U. S. Army Spec #71-3324.	Interphone and monitor amplifier	2C449-&6
C-1A, C-1B, C-1C.	CAPACITOR, fixed: electrolytic; 3 sect; cap between pins 1 and 5 and pins 1 and 7 ea 20 uf, between pins 1 and 3 125 uf, tolerance all sect--10% +150%; 20 uf sect ea 250 vdcw, 125 uf sect 50 vdcw; working temp range --400 C. to +850 C.; I%" diam x 2wJ2" ig excluding cont and locating pins; HS metal can; four pin type term; all term insulated from can; mts in std octal socket by means of plug-in base; Fed Tele & Rad part/dwg #GH-1771-2.	O-1A: Microphone circuit filter..... C-IB: Plate circuit decoupling, C-1C: B+ decouplers, V-2, V-3,	3DB125-5. V-1. and V-4.
C-14	CAPACITOR, fixed: mica; JAN type CM20D471M; 470 uuf +20%; 500 vdcw.	Relay supply circuit decoupling	3K2047144.
C-8, C-11.	CAPACITOR, fixed: mica; JAN type CM40A472K; 4700 uuf +-10%; 500 vdcw.	C-8: V-2 plate h-f bypass ..... C-11: V-3 plate h-f bypass.	3K4047211.
C-4 thru C-7.	CAPACITOR, fixed: paper dielectric; JAN type CN-20A102M; 1000 uuf ±20%; 400 vdcw.	C-4: V-2 input coupling ..... C-5: V-4A input coupling. C-6: V-4B input coupling. C-7: V-3 input coupling.	3DA1-215.

Ref Symbol	Name of part and description	Function of part	Signal Corps stock No.
C-2, C-&	CAPACITOR, fixed: paper dielectric; JAN type CN-20A302M; 3000 uuf +20%; 200 vdcw.	C-2: V-1A plate h-f bypass C-3: V-1B plate h-f bypass.	3DA3-116.
C-9, C-10, C-12, C-13.	CAPACITOR, fixed: paper dielectric; JAN type CN-22A103M; 10,000 uuf ±20%; 300 vdcw.	C-9: V-4A plate h-f bypass C-10: V-4B plate h-f bypass. C-12: V-5A plate h-f bypass. C-13: V-5B plate h-f bypass.	3DA10-447.
CG15, C-16.	CAPACITOR, fixed: ceramic dielectric; 500 uuf + 20 %; variable temp coef; 500 vdcw; case %" lg x %i6" wd across flats of mtg flange; axial wire leads; single hole mtg, bushing #12-28 x %2" lg w/hex mtg flange; ceramic insulation; rosin lacquer coated and wax impregnated, feed-thru type capacitor; Erie type #321 or Centralab style #DA-817; Fed Tele & Rad part/dwg #GH-2051-2-1.	Filament supply h-f filters	3D9500-226.
H-1 thru H-4.	CATCH, fastener: p/o Fed Tele and Rad #GA-1716-14 case assem; c/o back plate lever, 2 ea outside and inside links, 2 pins and 2 springs; steel zinc pl and olive drab iridited; 2%s" lg x 17s" wd x %" d in locked position; two .144" diam mtg holes on back plate; .437" c to c; Sig C dwg #SC-D-20648.	Mounting catches	6Z3810-97.
0-2, 0-3.	CLIP: fuse; for holding spare fuse; phosphor bronze, burnished nickel pl; '16" lg x 'Y52" wd x Y4" d o/a; ea clip has pair of fuse stop ears used for type 5AG fuses; Littlefuse type #105001.	Spare fuse holder clips	3Z1013.
L1	REACTOR: audio reactor; 10 mh min, 360 ma DC; 1.1 ohms +5% DC resistance; not cased; 252 turns #25 formvar wire; 1%" OD x Y4" ID x %" thk; mts by means of ctr hole; 2 pigtail wire leads protruding from side of coil; tropicalized; p/o Army-Navy AF Amplifier AM-65/GRC; Fed Tele & Rad part/dwg #GH-3104-2.	Filament supply h-f filter	3C315-156.
L2	REACTOR: audio reactor; 100 mh min, 30 ma DC; 13.5 ohms +5% DC resistance; not cased; 800 turns #31 formvar wire; 1I" OD x Y4" ID x %" thk; mts by means of ctr hole; 2 solder lug term on side of coil; tropicalized; p/o Army-Navy AF Amplifier AM-65/GRC; Fed Tele & Rad part/dwg #GH-85-2.	Microphone circuit filter	3C315-14.
J-5	CONNECTOR, receptacle: 8 round male cont; Straight; ly4" diam x %a" lg o/a; round phenolic body w/brass locating pin; mts on chassis by means of retainer plate not supplied as part of connector; cont silver pl, notch on outside edge of body to prevent rotation when mtd; Fed Tele & Rad part/dwg W3GA-1611-2.	Plug-in power supply connection	2Z3028-55.
J-1	CONNECTOR, receptacle: 10 round button-type coent straight; 1.286" max diam x 1.197" max d o/a; cylindrical as body, sand blast finish, locking; molded phenolic insert; single hole mtg, #1-32 N82 x Me" lg thd; has "O" ring wp seal on mtg collar; supplied w/spanner-type mtg nut; immersion and salt spray resistant; index flat on mtg portion; Ainphenol dwg #164-7 or Cannon elec dwg #1.7651-1; Fed Tele & Rad part/dwg #GH-2079-12.	AUDIO connector	2Z3030-27.

Ref Symbol	Name of part and description	Function of part	Signal Corps stock No.
J-6	CONNECTOR, receptacle: 4 round female cont; straight; 1s%2" diam x 1%" max lg o/a; cont rated 20 amp at 800 v AC; cylindrical brass body, electro tin pl finish, locking; molded phenolic insert; single hole mtg, 14"-18.NEF-2 x %" lg mtg bushing; has "O" ring wp seal in mtg fi; supplied w/spannei-type mtg nut and lockwasher; immersion and salt spray resistant; two index flats on mtg bushing, Y4". -20 double thd tapped metal insert in ctr of phenolic insert provide locking action w/mating plug, locating key in outer shell, groove in insert; Amphenol dwg #164-1; Fed Tele & Rad part/dwg #GH-2081-12.	POWER IN connector	2Z3696
J-2, J-3, J-4.	CONNECTOR, receptacle:9 round, female cont; straight; 1'%2" diam x1max lg o/a; cont rated 10 amp at 800 v AC; cylindrical brass body electro tin pl finish, locking; molded phenolic insert; single hole mtg, 1Y4"-18 NEF-2 x Y% lig mtg bushing; has "O" ring wp seal in mtg fi; supplied w/spanner type mtg nut andlockwasher; immersion and salt spray resistant; two index flats on mtg bushing, -Y" -20 double thd tapped metal insert in ctr of phenolic insert provides locking action w/mating plug, locating key in outer shell, groove in insert; Amphenol dwg #164-3; Fed Tele & Rad part/dwg #GH-2082-12.	J-2: INT CONT connector ..... J-3: RT-70POWER connector. J-4: REC-TR CONT connector.	2Z3070-49.
H-5 thru H-8.	FASTENER, Dzus: panel to case fastener; die cast zinc and steel, olive drab finish; 1%" lg x lA6" wd x 5/6" thk o/a; mts by shaft thru Y" diam clearance hole; preloaded spring pressure, unlocked approx 32 lb, locked 45 lb; Dzus dwg #X-486; Fed Tele & Rad part/dwg #GA-2178-2.	Panel-to-case fasteners	6Z3809-27.
F-1	FUSE, cartridge: 10 amp; opens in 1 hr at 135% load, 2 min at 200% load, rated continuous at 110% load; 32 v max; one time; glass body; ferrule term; 1I" lg x 1%2" diam; term '%2" diam x %8" lg; antivibration aircraft type; Buss catalog #AGU-10.	Fuse for use with 6- and 12-volt power supply.	3Z2610.1.
	or	or	
F-1	FUSE, cartridge: 4 amp; open in 1 hr at 135% load, 2 min at 200% load, rated continuous at 110% load; 250 v max; one time; glass body; ferrule term; 1I" lg x '%52" diam; term 1%2" diam x %" lg; antivibration aircraft type; Buss catalog #AGU-4.	Fuse for use with 24-volt power supply.	3Z2632.
0-21	GASKET: neoprene or Buna N; single hole; rectangular, 6.6" lg x 3.506" wd x .187" thk o/a; hole 6.12"' g x 3.026" wd; durometer hardness 35-40; Fed Tele & Rad part/dwg #GR-1443-12-3.	Panel-to-case waterproof seal gas ket.	2Z4868.784.
E-8	HOLDER, fuse: extractor post type; single 5AG cartridge fuse; phenolic wimetal ceont and term; 50 v, 22 amp; 2%" lg x 1.775" wd x 1.2" h o/a; two .173" max diam mtg holes on 1.312" mtg/c; 2 solder lug term; wp seal between cap and body and wp mtg seal; Bussman type #HPC-D; Fed Tele & Rad part/dwg #GA-2365-2.	Fuse holder	3Z3282-42.3.
H-34 thru H-37.	INSERT', threaded; p/o Fed Tele & Rad GA--1716-14 case assem; steel cad pl and olive drab iridited; generally rectangular w/two rounded corners; 2%2" lg x 1a2" wd x .1196" thk; two #632 NO-2 tapped holes on .531" ctr; Fed Tele & Rad part/dwg #GB-1171-2.	Retaining inserts (nuts) for strike mounting screws.	2Z5400-52

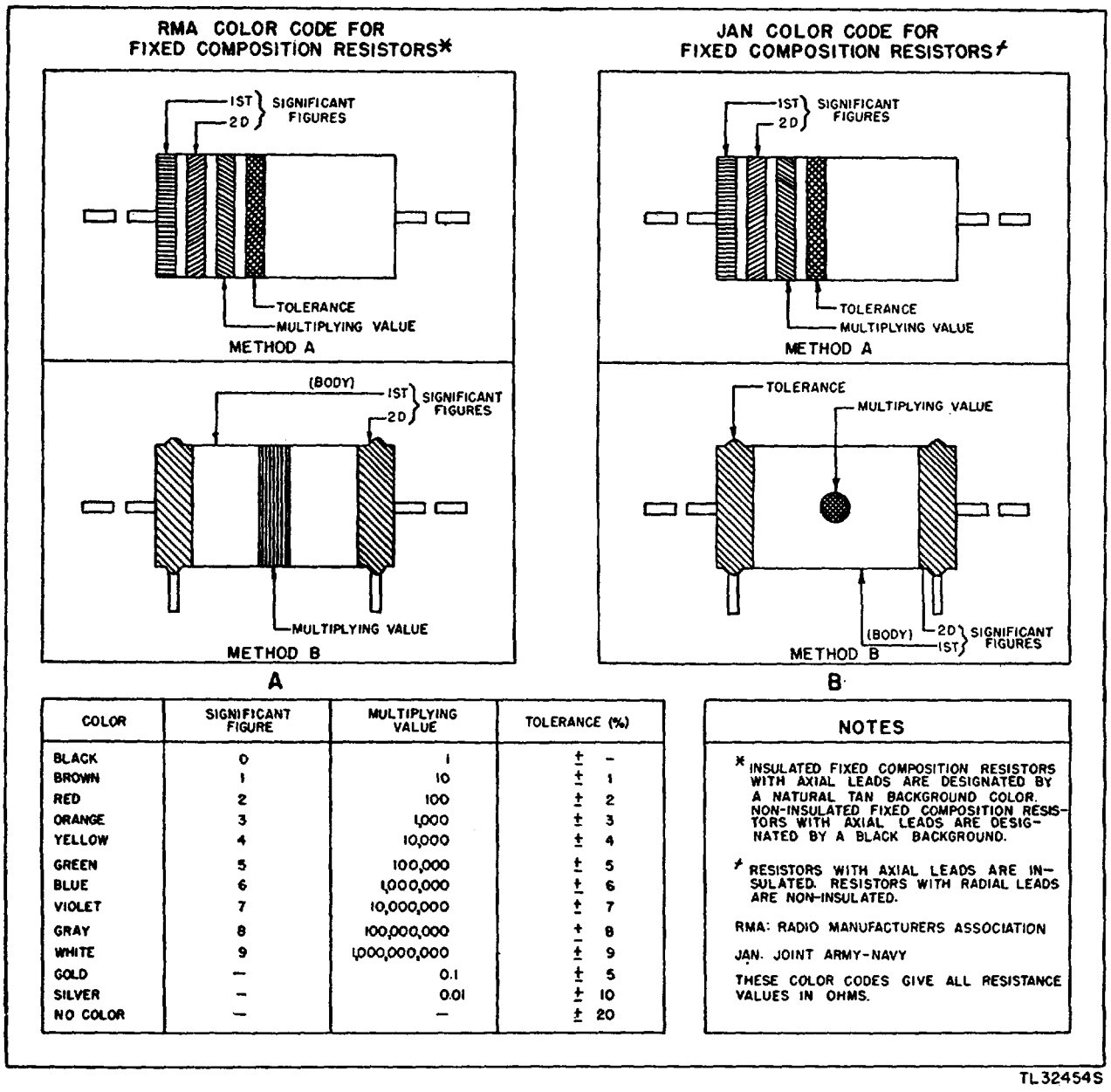
Ref Symbol	Name of part and description	Function of part	Signal Corps stock No.
H-38 thru H-41.	INSERT, threaded: p/o Fed Tele & Rad GA-1716-14 case assem; steel cad pl and olive drab iridited; generally rectangular w/l rounded end; Is%" lg x %" wd x .1196" thk; two #6-32 NC-2 tapped holes on .437" ctr; Fed Tele & Rad part/dwg #GB1172-2.	Retaining inserts (nuts) for catch mounting screws.	2Z5400-5a
E-18, E-2L	INSULATOR, bushing: tubular shape; type LTS-E4 phenolic; %e" lg o/a; Y4" OD x Me" ID; mts by means of outer diam and ctr hole; Fed Tele & Rad part/dwg #GP-2028-2.	Toroid coil mounting insulator	3G100-1b&
E-1 thru E-7, E-9, E-10.	INSULATOR, standoff: round post shape; white unglazed ceramic w/metal end caps; .7875" lg o/a; .209" diam; ceramic silicone treated, rivet type mtg stud on 1 end cap .094" diam x .1" lg solder type stud term on other end cap; Fed Tele & Rad partldwg #GG1743-2-1.	Stand-off insulators	SG3850-&11
E-19	KNOB: round; olive drab zinc alloy; for Y4" diam double flatted shaft; single #6-32 screw thru hole in face of knob, screws into axially tapped hole in end of shaft; two white luminous lines; 2%2" max diam at bottom tapers to 2,2" max diam at top, ,%2" h ola; shaft hole .359" d from bottom surface; luminous markings; Fed Tele & Rad part/dwg #GC-1245-2.	Control knob	2Z82240
E-20	KNOB: round w/bar; olive drab zinc alloy; for Y" diam double flatted shaft; single #6-32 screw thru hole in face of knob, screws into axially tapped hole in end of shaft; two white luminous lines on barportion; 1!46 lg x /%" wd x '%2" h o/a; shaft hole .359" d from bottom surface; luminous markings; Fed Tele & Rad part/dwg #GC-1246-2.	Switch knob	2Z5822-40
N-1	LABEL: aluminum; .968" lg x .562" wd x .032" thk o/a; inscribed 6V1OA on one side, 12V1OA other side; white print on olive drab background; mtg slot one end .265" lg x .218" max wd; individually packed; Fed Tele & Rad part/dwg #GT-2426-2.	Voltage designation label	6D16839-
N-2	LABEL: aluminum; .968" lg x .562" wd x .032" thk o/a; inscribed 24V4A on one side, 135V 4A other side; white print on olive drab background; mtg slot on one end .265" lg x .218" max wd; individually packed; Fed Tele & Rad part/dwg #GT-24382.	Voltage designation label	D16889.
N-3	LABEL: white nylon tafetta, 120 x 88 mesh; 6%" wd x 13'4" lg x .004" thk w/4Y" wd tape stitched to one end, extends 17%" beyond label; black print on white background; edges heat-treated to prevent fraying; individually packed; Fed Tele & Rad part/dwg #GD-1105-14; Sig C dwg #SC-C40597A.	Circuit label	6D16778-&
H-9, H-10.	NUT, castellated: steel cad pl and olive drab iridited; finished per dwg; %"-32 NS-2;]" thk; %a" OD; 4 slots %2' wd x %4" d, spaced 90 deg apart; Fed Tele & Raa part/dwg #GB-1106-2.	H-9: Control mounting nut H-10: Switch mounting nut.	6L3006-32&
H-11	NUT, hexagon: brass, chamfered corners on bearing surface; %"-32 NS-2; %2" thk; %" across flats; Fed Tele & Rad part/dwg #GB-2437-2.	Control mounting	6Z350-3 8-.
H-12	NUT, thumb: steel, olive drab enamel; machined bearing surface; #6-32 NC-2; %" thk; 4s" OD, counterbored Y4" diam x %4" d; fine knurl on outside edge; Fed Tele & Rad'part/dwg #GB-2440-2.	Voltage designation plate retaining nut.	6Z38932-&

Ref Symbol	Name of part and description	Function of part	Signal Corps stock No.
012	PLATE, retainer: p/o Army-Navy AF Amplifier AM-65/GRC and Radio Receivers R-108/GRC, R-109/GRC, and R-110/GRC; steel, tin pl; D shaped plate w/hole in ctr; 2" OD x 1" ID x .108" thk o/a; three .152" diam mtg holes on "' rad, two 90 deg. apart, third hole 135 deg from other two; flat edge on 1 side %" from ctr; Fed Tele & Rad part/dwg #GB-1609-2.	Power pack receptacle retainer ring.	2Z7091-342
0-1	RELAY, armature: 1A; 100 ma, 150 v; %6" diam palladium cont; single wnd 6 v nom; pull-in voltage 4 v DC, max operating 8 v DC, 39+3 ohms DC resistance, ins coil; solder lug term on coil and cont; max dimen 1%" ig x ly1" wd x 2%" h o/a; three #6-32 x Me" lg mtg studs on I's" x 1l6" mtg/c; fast acting; HS metal case; term #1 marked w/brown dot, circuit diagram on top of can; Dunco #181AXX102 or Adv Elec #A8774-1Y; Fed Tele & Rad partldwg #GH-1670-2.	Microphone control ----------__	2Z7599A-25&
K-1	RELAY, thermal: SPST normally closed; cont rating 2 amp max; silver cont; single wnd heat coil, operates at 6.9 v DC w/l amp cont load, release at 2 to 3.5 v, heater current 250 ma w/6.9 v applied, ins; coil and cont leads terminate in octal base; 1.275" diam x 2%" lg excluding base cont and locating pin; mts by means of octal base; operates within 10 see; inct in type T-9 bulb w/std octal base; Raytheon #CK-118; Fed Tele & Rad part /dwg #GH-2392-12.	Overvoltage protection ----------	2Z7598-129.
R-13	RESISTOR, fixed: comp; JAN type RC20BF562K; 5600 ohms + 10%; } w.	V-1 plate circuit decoupling ------	3RC20BF562K.
R-9A, R-10A.	RESISTOR, fixed: comp; JAN type RC20BF622J; 6200 ohms + 5%; % w.	R-9A: Set 1 input voltage divider R-1OA: Set 2 input voltage	3RC20BF622J.
R-9B, R-10B.	RESISTOR, fixed: comp; JAN type RC20BF103K; 10,000 ohms + 10%; } w.	R-9B: Set 1 input voltage divider. R-1OB: Set 2 input voltage divider.	3RC20BF103K.
R14, R-17.	RESISTOR, fixed: comp; JAN type RC20BF183K; 18,000 ohms + 10%; is w.	R-14: V-1A plate load R-17: V-lB plate load.	3RC20BF183K.
R-15, R-16.	RESISTOR, fixed: comp; JAN type RC20BF393K; 39,000 ohms + 10%; % w.	R-15: V-1A plate load. R-16 V-lB plate load.	3RC20BF393K.
R-5, R-6.	RESISTOR, fixed: comp; JAN type RC20BF823K; 82,000 ohms + 10%; % w.	Interphone input voltage dividers	3RC20BF823K.
R-3, R-4.	RESISTOR, fixed: comp; JAN type RC20BF154K 150,000 ohms :+10%; % w.	Interphone input voltage dividers	3RC20BF154K.
R-19, R-20.	RESISTOR, fixed: comp; JAN type RC20BF274K; 270,000 ohms +10%; % w.	R-19; V-4A grid return. R-20 V-4B grid return.	3RC20BF274K.
R-18, R-21.	RESISTOR, fixed: comp; JAN type RC20BF474K; 470,000 ohms 410%; X4 w.	R-18: V-2 grid return. R-21 V-3 grid return.	3RC20BF474K.
R-34	RESISTOR, fixed: comp; JAN type RC20BF10 ; 10 ohms +10%; % w.	Overvoltage circuit current limiter	3RC20BF100K.
R-33	RESISTOR, fixed: comp; JAN type RC40BFIOO1 ; 10 ohms + 10%; 2 w.	Overvoltage circuit current limiter	3RC40BF1IOOK.
R-2, R-25.	RESISTOR, fixed: comp; JAN type RC20BF101K; 100 ohms + 10%; % w.	R-2: Microphone current limiting. R-25: B+ decoupling.	3RC20BF101K.
R-39	RESISTOR, fixed: comp; JAN type RC40BFI01K; 100 ohms +:10%; 2 w.	Set 2 B+ dropping	3RC40BF1OLK.
R-41	RESISTOR, fixed: comp; JAN type RC40BF151K; 150 ohms + 10%; 2 w.	Set 2 B+ dropping	3RC40BF151K
R-35, R-40.	RESISTOR, fixed: comp; JAN type RC20BF221K; 220 ohms + 10%; X4 w.	R-35: Relay K-1 shunt R-40: V-7 current limiting.	3RC20BF221K.
R-38	RESISTOR, fixed: comp; JAN type RC30BF471K; 470 ohms +10%; 1 w.	V-o current limiting	3RC30BF471K.

Ref Symbol	Name of part and description	Signal Corps Function of part	stock No.
R-22, R-23.	RESISTOR, fixed: comp; JAN type RC20BF561K; 560 ohms + 10%; % w.	R-22: YV-2 cathode bias R-23: V-3 cathode bias.	3RC20BF561K.
R24	RESISTOR, fixed: comp; JAN type RC20BF681K; 680 ohms + 10%; % w.	V-4A and V-4B cathode phase inverter load.	3RC20BF681K.
R-7, R-8.	RESISTOR, fixed: comp; JAN type RC20BF152K; 1500 ohms + 10%; 34 w.	R-7: V-1A cathode bias R-8: V-lB cathode bias.	3RC20BF152K
R-11, R12.	RESISTOR, fixed: comp; JAN type RC20BF222K; 2200 ohms + 10%; y w.	R-11: Set 1 input load R-12: Set 2 input load.	3RC20BF222K.
R-36	RESISTOR, fixed: WW; JAN type RW30G160; 16 ohms +5%; 8 w.	Dummy load to replace Set 2 fila ments.	3RW13503.
R-27	RESISTOR, fixed: WW; JAN type RW30G310; 31 ohms + 5%; 8 w.	Relay and microphone supply voltage dropping.	3RW15307.
R-30	RESISTOR, fixed: WW; JAN type RW30G350; 35 ohms 45%; 8 w.	Relay supply voltage dropping	3RW15606.
R-28	RESISTOR, fixed: WW; JAN type RW30G630; 63 ohms +5%; 8 w.	Relay and microphone supply voltage dropping.	3RW17103
R-29	RESISTOR, fixed: WW; JAN type RW30G710; 71 ohms +5%; 8 w.	Relay supply voltage dropping	3RW17413.
R-37	RESISTOR, fixed: WW; JAN type RW30G251; 250 ohms +5%; 8 w.	Set 2 B+ dropping	3RW20705.
R-32	RESISTOR, thermal: current thru lamp greater than .58 amp w/4.3 v measured across lamp and less than .625 amp w/9.7 v measured across lamp; designed for DC; T-9 bulb, 2%" lg o/a; intermediate octal base; Amperite type #6-4; Fed Tele & Rad part/dwg #GH-2677-2.	Current regulator	3Z6925-3.19.
R-26	RESISTOR, variable: comp; 10,000 ohms 4-20%; 2 w; 700 C max continuous operating temp; 3 solder lugs; metal case, 113e" diam x 25'2" d, encl; double flatted metal shaft Y," diam x 2%2" lg w/axially tapped #6-32 hole y%" d in end; AB type B taper, 100% resistance at 0% rotation, 88% at 10%, 65% at 20%, 44% at 30%, 23% at 40%; 10% at 50%, 5% at 60%, 2% at 70%, 1% at 80%; ins cont arm, w/o off position; normal torque; %2" lg x %"-32 bushing, nonturn device on '%2" rad at 9 o'clock; tropicalized and salt water resistant, wp seal in bushing and mtg collar; Fed Tele & Rad part/dwg #GH-1811-2.	VOLUME control	3Z7410-179.
H-13	SCREW, captive: slot drive; cheese head, finished per dwg; steel, normal hardness, cad pl and olive drab iridite; w/olive drab enamel head; #6-32 NC-2; Ae" lg; thd portion 1%4" lg; head .235" diam x %2" thk, slot %4" wd x 5%" d; Fed Tele & Rad part/dwg #GB-2427-2.	Voltage designation plate mount-ing screw.	6L4776-32.86.
E-12, E-13.	SHIELD, tube: JAN type S086; cad pl brass; round w/hole in top; bayonet push on mtg; .81" ID x 1," lg; pressure coil spring inside.	Tube shields	2Z8304.154.
E-11, E-14, E15.	SHIELD, tube: JAN type TSFOT105; copper or brass, nickel pl; round w/hole in top, bayonet push on mtd; .95" ID x 1 'i" lg; pressure coil spring inside.	do	2Z8304.183.
E-16, E-17.	SHIELD, tube: JAN type TSFOT103; copper or brass, nickel pl; round w/hole in top; bayonet push on mtd; .81" ID x 2%" lg; pressure coil spring inside.	do	2Z8304.172.
X-2, X-3, X-6, X-7.	SOCKET, tube: 7 cont miniature; JAN type 801OM; one piece saddle mtg; two %" diam mtg holes on %" mtg/c; round plastic body, wlmetal shell, 15" lg x .8" wd x 2'%2" d excluding term; beryllium copper silver pl eont; marked S01OM; w/metal shock shield and ctr shield .18" OD.	X-2: V-2 tube socket X-3: V-3 tube socket. X-6: V-6 tube socket. X-7: YV-7 tube socket.	2Z8677.94.

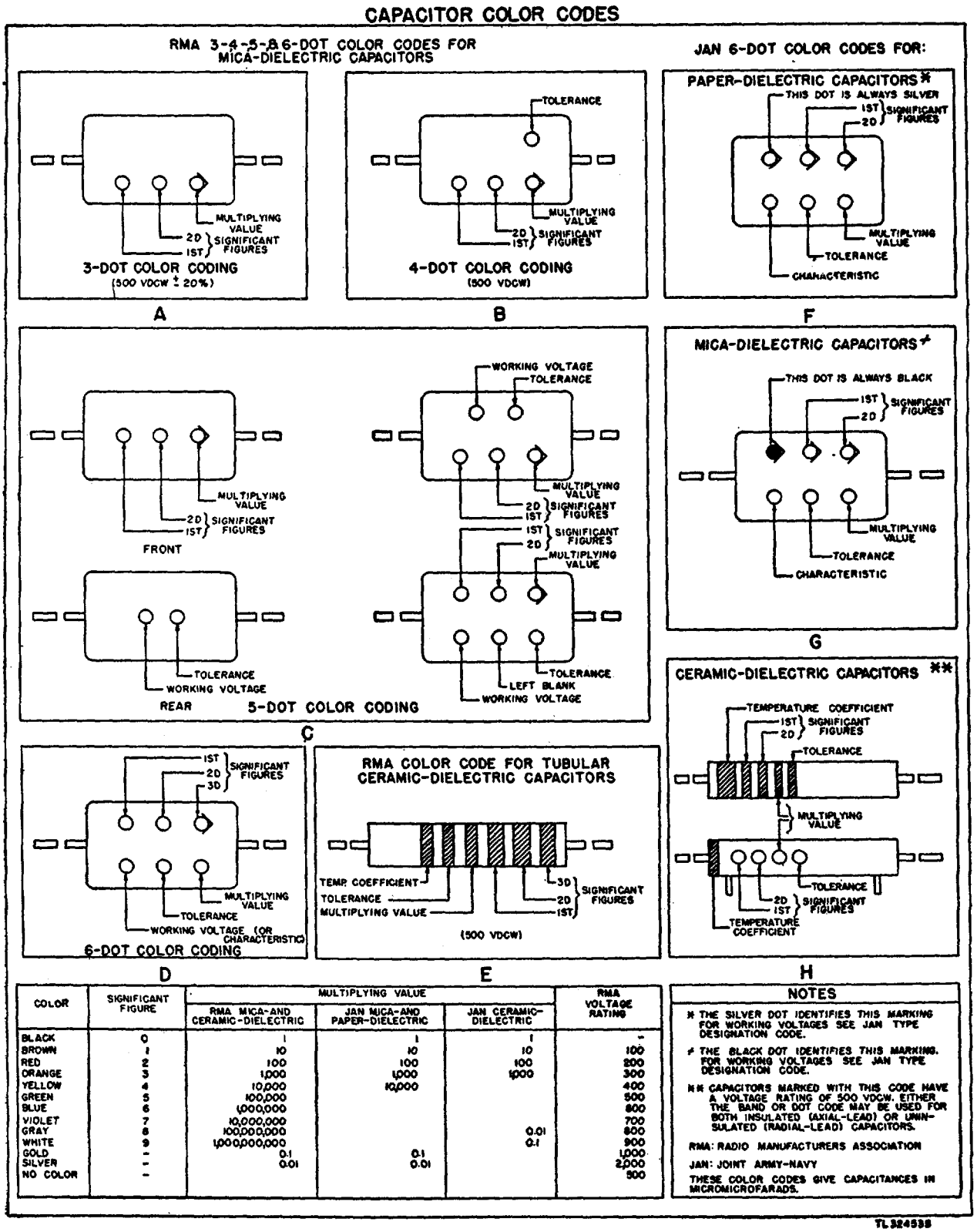
Ref Symbol	Name of part and description	Function of part	Signal Corps stock No.
X-1, X-4, X-5.	SOCKET, tube: 9 cont minature; JAN type TSE9T101; one piece saddle mtg; two 3" diam mtg holes on 1%" mtg/c; round plastic body w/metal shell, 1%" lg x .94" wd x 2%2" d excluding term; beryllium copper, silver pl cont; marked w/type number and mfr code; w/metal shock shield and ctr shield .18" OD.	X-1: V-1 tube socket X-4: V-4 tube socket. X-5: V-5 tube socket.	2Z8679.30.
X-8, X-9, X-10.	SOCKET, tube: octal; one piece molded in mtg plate; two %2" diam mtg holes on ll%" mtg/c; round plastic body 1.11" diam x .49" h excluding term; beryllium copper silver pl cont; Amphenol type #59-103; Fed Tele & Rad part/dwg #GE-2039-2.	X-8: K-1 relay socket X-9: R-32 ballast tube socket. X-10: C-1 capacitor socket.	2Z8678.337.
0-17 thru 0-20.	SPRING: flat type; fastener catch spring; #23 ga spring steel, cad pl and olive drab iridite; l1lo" lg x lye" wd x %" h o/a; two %" diam mtg holes on .437" mtg/c; Corbin Cabinet catalog #15822.	Fastener catch springs	2Z8877.380.
0-13 thru 0-16.	SPRING: loop type; strike for Dzus fastener; .08" diam olive drab iridited music wire; 1%" lg x %2" wd x .08" thk o/a; two end turned perpendicular at 90 deg angle to straight portion on fye" rad; Dzus dwg #X-487; Fed Tele & Rad part/dwg #GB2414-2.	Fastener strikes	6Z8377-10.
H-14 thru H-17.	STRIKE, fastener: steel, cad pl and olive drab iridite; %" lg x ,56" wd x '12" h o/a; two .169" diam mtg holes, .531" c to c; one edge shaped into hook on H 6" inside rad x %h2" wd to provide catch action; Fed Tele and Rad part/dwg #G13-30352.	Mounting fastener strikes	6Z85694
S1	SWITCH, rotary: 4 pole, 3 position; single sect; silver pl brass cont; plastic wafer; max dimen 1'%2" lg x ly4" wd x y4" d; nonshorting cont; locking action; solder lug termh; single hole mtg; bushing %"-32 x Y4" lg, shaft Y%" diam x %" lg from mtg surface, w/ screwdriver slot, flush mtg; has nonturn device on 1%2" rad; Grisby-Allison type #4M; Fed Tele & Rad part/dwg #GH-1602-2.	6V-12V-24V switch	3Z9825-36.&
S2	SWITCH, rotary: 3 pole, 3 position; double sect, 1 wafer and 1 vol control type switch, rated 12 amp at 8 v; silver cont, plastic body; max dimen 1'9h2" lg x lyL" wd x l1e" d; nonshorting cont; locking action; solder lug term; single hole mtg, bushing %"-32 x {se" lg, shaft Yi" diam x 1'6%" lg from mtg surface, has double flats and #6-32 axially tapped hole in end y4" d, flush mtg; has nonturn device on 1%/2" rad, wp seal in bushing and mtg fl; Grigsby-Allison type #4M; Fed Tele & Rad part/dwg #GH-1601-2.	OFF-INT-RT-70 switch	3Z9825-36.2.
T-1	TRANSFORMER, AF: input type; pri #1 30 ohms impedance, pri #2 190 ohms impedance, seed 19,000 ohms impedance CT, 500 v RMS test; HS steel case; silicon steel core; l%f" lg x %" wd x 24s" h o/a; turns ratio pri #1 to seed 1:22.8, pri #2 to seed 1:10; freq response 250 to 2500 cyc, +2 to --2 db; 7 solder type stud term on bottom of case; two .128" diam mtg holes on ll" mtg/c; part number marked on top of case; Fed Tele & Rad part/dwg #GH-1205-2.	Microphone transformer	2Z9631.39&

Ref Symbol	Name of part and description	Function of part	Signal Corps stock No.
T-2, T-3.	TRANSFORMER, AF: plate couplingtype;pri 19,000 ohms impedance CT, .005 amp DC, seed 600 ohms impedance CT, 500 v RMS test; HS steel case; sill-con steel core; lye" sq x 24" h o/a; turns ratio of pri to seed 5.54:1; freq response 250 to 2500 cyu, +2 to --2 db; six solder. type stud term on botton of case; two #6-32 x 1%4" lg mtg studs on diagonally opposite corers on 'MG" x 1%6" mtg/c; part number marked on top of case; Fed Tele & Rad part/dwg #GH-1202-2.	T-2: Set 1+Interphone channel output transformer. T-3: Set 2+Interphone channel output transformer.	2Z9632.58&
T-4	TRANSFORMER, AF: plate coupling type; pri 22,000 ohms impedance CT, .006 amp DC, seed #1 600 ohms impedance CT, seed #2 5200 ohms impedance CT; 500 v RMS test; HS steel case, silicon steel core; 1%" lg x %" wd x 2H6" h o/a; 160 mw output; turns ratio pri to seed #1 6.28:1, pri to seed #2 2.03:1; freq re-sponse +2 to -2 db between 250 and 2500 eye; 9 solder type stud term on bottom of case; two .128" diam mtg holes on 1%" mtg/c; part number marked on top of case; Fed Tele & Rad part/dwg #GH-1203-2.	V-4, V-5 interstage transformer	2Z9632.52.
T-5	TRANSFORMER, AF: plate coupling type; pri 7600 ohms impedance CT, .001 amp DC, seed 600 ohms impedance CT; 500 v RMS test; HS steel case; silicon steel core; 13A6" sq x 24" lg o/a; output 2 w min at 1000 cps across 600 ohms; turns ratio of pri to seed 3.46:1; freq response 250 to 2500 eye, -1 to +3 db; 6 solder type stud term on bottom of case; two #6-32 x t%4'" lg mtg studs on diagonally opposite corners on 13" ft x '1/1e'" mtg/c; part number marked on top of case; Fed Tele & Rad part/dwg #GH-1655-2.	Set 1+Set 2+Interphone channel output transformer.	2Z9632.589
V-6, V-7.	TUBE, electron: type OB2; voltage regulator	Voltage regulators	2JOB2.
V-2, V-3.	TUBE, electron: type 6AK6; power amplr pentode	V-2: Set 1+Interphone channel output amplifier.	2J6AK.
V-3:	Set 2+Interphone channel	output amplifier.	
V-1, V-4, V-5.	TUBE, electron: type 12AU7; twin triode	V-1: Common channel amplifier ..... V-4: Set 1+Set 2+Interchannel driver amplifier.	2J12AU7.
V-5:	Set l+Set 2+Interphone channel output amplifier.		
H-22 thru H-33.	WASHER, cup: steel cad pi and olive drab iridited; round cup shaped, %" OD x .140" ID x %2" thk o/a; material .0209" thk, cup portion .23 OD; Fed Tele & Rad part/dwg #GB-2378-2.	Resistor mounting washers	6L5840&
H-18, H-19, H-42.	WASHER, fiat: type LTSE4 phenolic; round, H" OD x .152" ID x Ha" thk; Fed Tele & Rad part/dwg #GP-2027-2.	Toroid coil insulating washer	6L5525.
H-20	WASHER, flat: aluminum; round, %" OD x %," ID x .025" thk; Fed Tele & Rad part/dwg#GB-2340-2.	Toroid coil mounting washer.....	6L3400-69.



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

Figure 15. Resistor 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	1000	300
YELLOW	4	10,000	10,000		400
GREEN	5	100,000			500
BLUE	6	1,000,000			600
VIOLET	7	10,000,000			700
GRAY	8	100,000,000		0.01	800
WHITE	9	1,000,000,000		0.1	900
GOLD	-	0.1	0.1		1,000
SILVER	-	0.01	0.01		2,000
NO COLOR	-				500

NOTES

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

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

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

RMA: RADIO MANUFACTURERS ASSOCIATION

JAN: JOINT ARMY-NAVY

THESE COLOR CODES GIVE CAPACITANCES IN MICROMICROFARADS.

TL 324538

Figure 16. Capacitor color codes.

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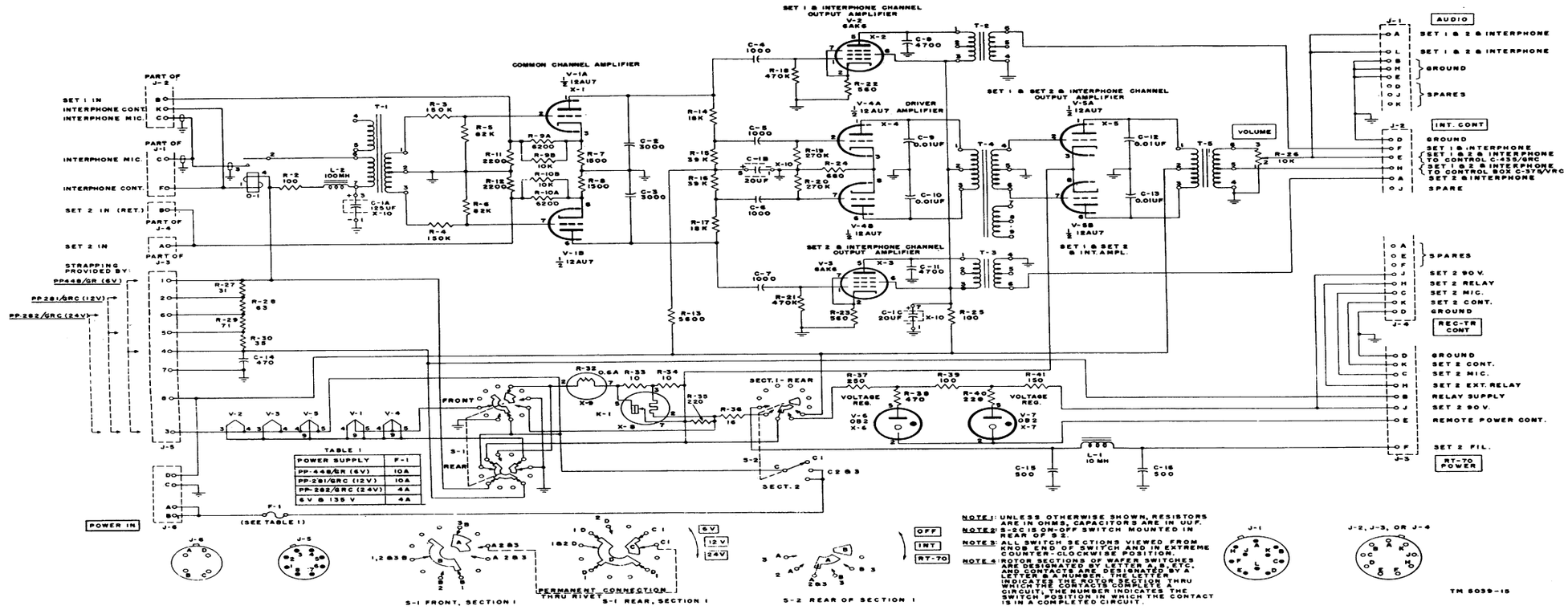

Figure 17. AF Amplifier AM 65/GRC, schematic diagram.

Figure 17. AF Amplifier AM 65/'GRC, schematic diagram.

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