

101.11:  
11-2140-20

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TM 11-2140-20

DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER

TO 31W1-2TCC-144

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GOVERNMENT DOCUMENTS

**TELEPHONE REPEATER  
AN/TCC-8 AND  
TELEPHONE REPEATER  
AN/TCC-21  
ORGANIZATIONAL MAINTENANCE**

This copy is a reprint which includes current  
pages from Changes 6 through 10

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*DEPARTMENTS OF THE ARMY AND THE AIR FORCE  
MARCH 1958*

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## **WARNING**

### **HIGH VOLTAGE**

is used in this equipment.

### **DEATH ON CONTACT**

may result if safety  
precautions  
are not observed.

All operating adjustments of this equipment are made with the power on. Be careful when working on the inside of the equipment. Be careful not to contact the high-voltage connections or the 115-volt input connections.

The spiral-four cable in a system using unattended repeaters normally carries 100 milliamperes of current at high voltage. Do not disconnect or handle cable connectors unless power has been removed from the cable.

### **EXTREMELY DANGEROUS POTENTIALS**

#### **EXIST IN THE FOLLOWING UNITS:**

Power Supply PP-826/U (600 volts)

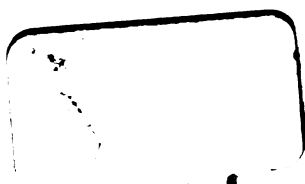
Power Supply PP-826A/U (600 volts)

and

Power Supply PP-827/U (200 volts)

**DON'T TAKE CHANCES!**

GPO 828-088-1



TELEPHONE REPEATER AN/TCC-8 AND TELEPHONE REPEATER AN/TCC-21  
ORGANIZATIONAL MAINTENANCE, SECOND ECHELON

TM 11-2140-20  
TO 31W1-2TCC-144  
CHANGES No. 6 }  
)

DEPARTMENTS OF THE ARMY  
AND THE AIR FORCE  
WASHINGTON 25, D.C., 27 August 1962

TM 11-2140-20/TO 31W1-2TCC-144, 31 March 1958, is changed as follows:

*Note.* The parenthetical reference to previous changes (example: page 1 of C 5) indicates that pertinent material was published in that changes.

*Page 33*, appendix II (pages 8-13 of C 5). Delete sections IV, V, VI, and VII and substitute the following:

Section IV. MAINTENANCE ALLOCATION CHART (PP-826/U, PP-826A/U)

(i)	(g)	(h)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)	(s)	(t)	(u)	(v)	(w)	(x)	(y)	(z)	
PART OR COMPONENT	MAINTENANCE FUNCTION	1ST ECH	2ND ECH	3RD ECH	4TH ECH	5TH ECH	TOOLS REQUIRED	REMARKS												
POWER SUPPLY PP-826/U; PP-826A/U	service adjust inspect test repair overhaul	X X X X	X X X X	X X X X	X X X X	X X X X	14 14 14 5, 13 5, 13, 14 11 14	Exterior 600v adjustments only All adjustments Exterior Load current DC output using built-in facilities Resistance, voltage and continuity All tests use tool code 12 in place of 13 for fifth Ech												

Section V. ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS (PP-826/U, PP-826A/U)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	1ST ECH	2ND ECH	3RD ECH	4TH ECH	5TH ECH	TOOL CODE	REMARKS
PP-826/U; PP-826A/U (continued)							
ATTENUATOR TS-402/U							
FREQUENCY METER AN/TSM-16						1	
GENERATOR, SIGNAL SG-71/FCC						2	
METER, AUDIO LEVEL ME-71/FCC						3	
MULTIMETER AN/UJM-105						4	
MULTIMETER TS-352/U						5	
MULTIMETER, METER ME-26/U						6	
OSCILLOSCOPE OS-8/U						7	
POWER SUPPLY PP-827/U						8	
TEST FACILITIES KIT, TELEPHONE CARRIER MK-155/TCC						9	
TEST SET TS-190/U						10	
TEST SET, ELECTRON TUBE TV-2/U						11	
TEST SET, ELECTRON TUBE TV-7/U						12	
TOOL EQUIPMENT TE-123						13	
TRANSFORMER, VARIABLE CN-16/U						14	
TRANSMISSION MEASURING SET TS-559/FT						15	
TUBE SOCKET ADAPTER KIT WX-1258/U						16	
VOLTMETER, METER ME-30/U						17	
						18	

**Section VI. MAINTENANCE ALLOCATION CHART**

(i) PART OR COMPONENT	(j) MAINTENANCE FUNCTION	(k) 1ST ECH	(l) 2ND ECH	(m) 3RD ECH	(n) 4TH ECH	(o) 5TH ECH	(p) TOOLS REQUIRED	(q) REMARKS
POWER SUPPLY PP-827/U	service	X	X				14	Exterior 200v adjustment only All adjustments Exterior  200v output by using built-in facilities Resistance voltage and continuity All tests use tool code 12 in place of 13 for fifth Ech
	adjust	X	X				14	
	inspect	X	X				14	
	test	X	X	X	X		5, 13 5, 13, 14	
	repair overhaul			X	X	X	14 14	

**Section VII ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS (PP-827/U)**

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	1ST ECH	2ND ECH	3RD ECH	4TH ECH	5TH ECH	TOOL CODE	REMARKS
PP-827/U (continued)							
ATTENUATOR TS-402/U		+		+		1	
FREQUENCY METER AN/TSM-16				+		2	
GENERATOR, SIGNAL SG-71/FCC				+		3	
METER, AUDIO LEVEL ME-71/FCC				+		4	
MULTIMETER AN/URM-105		+				5	
MULTIMETER TS-352/U				+		6	
MULTIMETER, METER ME-26/U				+		7	
OSCILLOSCOPE OS-8/U				+		8	
POWER SUPPLY PP-827/U				+		9	
TEST FACILITIES KIT, TELEPHONE CARRIER MK-155/TCC				+		10	
TEST SET TS-190/U		+		+		11	
TEST SET, ELECTRON TUBE TV-2/U				+		12	
TEST SET, ELECTRON TUBE TV-7/U		+		+		13	
TOOL EQUIPMENT TE-123				+		14	
TRANSFORMER, VARIABLE CN-16/U				+		15	
TRANSMISSION MEASURING SET TS-559/FT				+		16	
TUBE SOCKET ADAPTER KIT MK-1256/U				+		17	
VOLTMETER, METER ME-30/U		+		+		13	

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Armies (2)	each except as indicated)
Corps (2)	11-7
Instl (2)	11-15
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USATC Armor (2)	11-98
USAOMC (2)	11-117
Svc Colleges (2)	11-155
Br Svc Sch (2)	11-157
GENDEP (2) except	11-500 (AA-AE) (4)
Atlanta GENDEP (none)	11-557
Sig Sec, GENDEP (5)	11-587
Sig Dep (12) except Sacramento Sig Dep (17)	11-592
WRAMC (1)	11-597

NG: State AG (3); TOE: 11-15, 11-22, 11-32, 11-85, 11-117, 11-155 (1).

USAR: None.

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



**Organizational Maintenance**  
**TELEPHONE REPEATER AN/TCC-8 AND**  
**TELEPHONE REPEATER AN/TCC-21**

CHANGE }  
No. 8 }

**HEADQUARTERS**  
**DEPARTMENT OF THE ARMY**  
WASHINGTON, D. C., 27 November 1963

TM 11-2140-20, 31 March 1958, is changed as follows:

Page 2, paragraph 1.

Delete subparagraph *d* (deleted by C7, 23 May 1963).

Delete subparagraph *e* (page 1 of C5, as changed by C7, 23 May 1963).

Paragraphs 1.1 and 1.2 (as added by C7, 23 May 1963).

Delete paragraphs 1.1 and 1.2 and substitute:

**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 an index of current technical manuals, technical bulletins, supply manuals (types 4, 6, 7, 8, and 9), 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 publication.

**1.2. 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), NAVSANDA

Publication 378 (Navy), and AFR 71-4 (Air Force).

*c. Reporting of Equipment Manual Improvements.* The direct reporting, by the individual user, of errors, omissions, and recommendations for improving this manual is authorized and encouraged. DA Form 2028 (Recommended changes to DA technical manual parts lists or supply manual 7, 8, or 9) will be used for reporting these improvements. This form will be completed in triplicate using pencil, pen, or typewriter. The original and one copy will be forwarded direct to Commanding Officer, U. S. Army Electronics Materiel Support Agency, ATTN: SELMS-MP, Fort Monmouth, N. J. 07703. One information copy will be furnished to the individual's immediate supervisor (officer, noncommissioned officer, supervisor, etc.).

Page 3, paragraph 3b. Delete subparagraph (1) and substitute:

- (1) Preventive maintenance checks and services (pars. 5 through 6.4).

Paragraph 4. Delete subparagraph *c* and substitute:

*c. Test Equipment:*

- (1) Multimeter AN/URM-105.
- (2) Test Set TS-190/U.
- (3) Test Set, Electron Tube TV-7/U.
- (4) Tube Socket Adapter Kit MX-1258/U.

\*This change supersedes C 7, 23 May 1963.

Delete paragraph 5 and substitute:

### 5. Organizational Preventive Maintenance

a. Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational capability. Preventive maintenance is the responsibility of all echelons concerned with the equipment and includes the inspection, testing, and repair or replacement of parts, subassemblies, or units that inspection and tests indicate would probably fail before the next scheduled periodic service. Preventive maintenance checks and services of the equipment at the second echelon level are made at monthly and quarterly intervals unless otherwise directed by the commanding officer. The preventive maintenance checks and services should be scheduled concurrently with the periodic service schedule of the carrying vehicle for all vehicular installations.

b. Maintenance forms and records to be

Add paragraphs 6-1 through 6.4 after paragraph 6.

used and maintained on this equipment are specified in TM 38-750.

Page 4. Delete paragraph 6 and substitute:

### 6. Monthly Maintenance

Perform the maintenance functions indicated in the monthly preventive maintenance checks and services chart (par. 6.1) once each month. A month is defined as approximately 30 calendar days of 8-hour-per-day operation. If the equipment is operated 16 hours a day, the monthly preventive maintenance checks and services should be performed at 15-day intervals. Adjustment of the maintenance interval must be made to compensate for any unusual operating conditions. Equipment maintained in a standby (ready for immediate operation) condition must have monthly preventive maintenance checks and services performed on it. Equipment in limited storage requires service before operation; it does not require monthly preventive maintenance.

### 6.1. Monthly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Pluckout items ---	Inspect seating of pluckout items. Make certain that tube clamps grip tube bases tightly.	Figs. 6 through 15
2	Jacks -----	Inspect jacks for snug fit and good contact.	
3	Transformer terminals.	Inspect terminals on power transformer. All nuts must be tight. There should be no evidence of dirt or corrosion.	
4	Terminal blocks ---	Inspect terminal blocks for loose connections and cracked or broken insulation.	
5	Resistors and capacitors.	Inspect resistors and capacitors for cracks, blistering, or other detrimental defects.	
6	Interior -----	<i>Warning: Compressed air is dangerous and can cause serious bodily harm. It can also cause mechanical damage to the equipment. Be careful to direct compressed air away from the body. Do not use compressed air that exceeds the permissible pressure. Do not use compressed air to dry parts where cleaning compound has been applied.</i> Use dry compressed air, not to exceed 60 pounds per square inch, to blow out dirt and dust.	
7	PE-75-( ) motors	Inspect the generator for brush wear, spring tension, and arcing.	Fig. 7, TM 11-2140-10.

## 6.2. Quarterly Maintenance

Quarterly preventive maintenance checks and services on the equipment are required. Periodic weekly and monthly services constitute a part of the quarterly preventive maintenance checks and services and must be

performed concurrently. All deficiencies or shortcomings will be recorded in accordance with the requirements of TM 38-750. Perform all the checks and services listed in the quarterly preventive maintenance checks and services chart (par. 6.3) in the sequence listed.

## 6.3. Quarterly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Publications	See that all publications are complete, serviceable, and current.	DA Pam 310-4.
2	Modifications	Check DA Pam 310-4 to determine if new applicable MWO's have been published. All URGENT MWO's must be applied immediately. All normal MWO's must be scheduled.	TM 38-750 and DA Pam 310-4.
3	Spare parts	Check all spare parts (operator and organizational) for general condition and method of storage. There should be no evidence of overstock, and all shortages must be on valid requisitions.	App. II, and TM 11-2140-10.
4	Installation	See that equipment is properly installed.	Par. 22, TM 11-2140-10.
5	Preservation	Check all surfaces for evidence of fungus. Remove rust and corrosion and spot-paint bare spots.	Par. 6.4.
6	Fuses	See that all operating fuses are of correct value. Check spare fuses for proper value and quantity.	Par. 25, TM 11-2140-10.
7	Mounting	See that all bolts, nuts, and washers are correctly positioned and properly tightened. Check for cracked, bent, or broken brackets.	

## 6.4. Cleaning and Touchup Painting Instructions

Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TM 9-213.

Page 5. Delete figure 1.

Page 6. Delete figure 2.

Page 33, appendix (page 1 of C5, as changed by C7, 23 May 1963).

Change APPENDIX to APPENDIX I.

Appendix I, paragraph 1. Delete all references to TM 11-2139 and TM 11-2148.

Add the following references:

TM 11-2139-20	Organizational Maintenance Manual: Terminals, Telephone AN/TCC-7 and AN/TCC-50.
TM 11-5805-240-12	Operator's and Organizational Maintenance Manual: Repeater, Telephone AN/TCC-11.
DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 4, 6, 7, 8 and 9), Supply Bulletins, Lubrication Orders, and Modification Work Orders.
TM 9-213	Painting Instructions for Field Use.
TM 38-750	The Army Equipment Record System and Procedures.

## APPENDIX II

### MAINTENANCE ALLOCATION

#### Section 1. INTRODUCTION

##### 1. General

a. This section assigns maintenance functions to be performed on components, assemblies, and subassemblies by the lowest appropriate maintenance echelon.

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

- (1) *Component*. This column shows only the nomenclature or standard item name. Additional descriptive data is 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 the subassemblies which are part of an assembly are listed immediately below that assembly. Each generation break-down (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 echelons.
  - (a) *Service*. To clean, to preserve, and to replenish lubricants.
  - (b) *Adjust*. To regulate periodically to prevent malfunction.
  - (c) *Inspect*. To verify serviceability and to 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 a 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) *1st, 2d, 3d, 4th, 5th echelons.* The symbol **X** placed in Columns 3 through 7 indicates the echelon responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Echelons higher than the echelon 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 column.

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) *1st, 2d, 3d, 4th, 5th echelon.* The dagger (†) symbol in these columns indicates the echelons 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 fourth echelon are authorized to the organization operating this equipment.

SECTION II. MAINTENANCE ALLOCATION CHART (AN/TCC-21 & AN/TCC-8)

PART OR COMPONENT	MAINTENANCE FUNCTION	ECHOLON					TOOLS REQUIRED	REMARKS
		1	2	3	4	5		
TELEPHONE REPEATER AN/TCC-21	service	X	X				13	Exterior Line-up and operating adjustments-using built-in facilities All adjustments
	adjust	X			X		2,3,5,8,9,10,13,14,16	
	inspect	X	X				13	Exteriors
	test	X	X				4,10,12,13	Test for normal operation-using built-in facilities Continuity, voltage and resistance tests Test Electron tubes
			X				2,3,5,6,8,10,13,15,16	Test carrier and signal frequencies and levels.
				X			1,2,3,5,6,8,9,10,12,13,14,15,16	All testing (Tool code 11 replaces tool code 12 for the 5th echolon testing)
	repair calibrate			X			13 1,3,5,6,8,9,10,13,16	Built-in metering and test network circuits
					X		13	
	service	X	X					Exterior
	adjust	X			X		13	Line-up & operating adj-using built-in facilities All adjustments
TELEPHONE REPEATER AN/TCC-8	inspect	X	X				13	Exterior
	test	X	X				4,10,12,13	Test for normal operation-using Built-in facilities Continuity, voltage, and Resistance tests Test Electron tube
			X				2,3,5,6,8,10,13,15,16	Test carrier and signal frequency and levels
	repair calibrate	X			X		13 1,2,3,5,6,8,9,10,12,13,14,15,16	All testing-Tool code 11 replaces tool code 12 for 5th echolon testing
	overhaul		X				13 1,3,5,6,8,9,10,13,16	Built-in metering and test network circuits
				X			13	
					X			
						X		

PART OR COMPONENT	MAINTENANCE FUNCTION	EPOCH					TOOLS REQUIRED	REMARKS
		1	2	3	4	5		
AN/TCC-8 & AN/TCC-21 (continued) AMPLIFIER-PILOT REGULATOR AM-708/TCC-8	service	X	X				13	Exterior
	adjust	X	X		X		1,2,5,7,8,9,13,16	Initial adjustments All adjustments Exterior
	inspect	X	X				13	
	test	X	X		X		4,10,12,13	Continuity, voltage and Resistance tests Test Electron tubes
	replace	X	X		X		1,2,3,5,6,7,8,9,10,12,13,15,16	All testing (Tool code 11 replaces tool code 12 for 5th echelon testing)
	repair	X	X		X		13	Replacement of subassemblies only
	overhaul	X	X		X		13	
	service	X	X				13	
	inspect	X	X				13	
	test	X	X				4,10,12,13	Test by substitution-Test Electron tube Continuity, voltage and Resistance tests All testing
AMPLIFIER, AUDIO FREQUENCY-RADIO FREQUENCY  AMPLIFIER-PILOT REGULATOR SUB-ASSEMBLIES	replace	X			X		1,2,5,7,8,9,10,12,13,16	
	repair	X			X		13	
	service	X					13	
	inspect	X					13	
	test	X					4,10,12,13	Test by substitution-Test Electron tubes, Continuity, voltage and resistance tests All testing
	replace	X			X		1,5,7,8,9,10,12,13,16	
	repair	X			X		13	
	service	X					13	
	inspect	X					13	
	replace	X					13	Replacement of components
repair	X					13	Exterior Exterior	
POWER SUPPLY PP-826A/U POWER SUPPLY PP-827/U RECEIVER-TRANSMITTER TEST SET GROUP OA-446/TCC	service	X						
	inspect	X						
	replace	X						
repair	X							

7  
 1 Jun 43  
 HELMS 604 TP  
 AN/TCC-8 & AN/TCC-21  
 Army-PT. Memorandum, N7-4008 2150-43





PART OR COMPONENT	MAINTENANCE FUNCTION	SECTION					TOOLS REQUIRED	REMARKS
		1	2	3	4	5		
AN/TCC-8 & AN/TCC-21 (continued) TEST SET, TELEPHONE TS-761/FCC-8	service	X	X				13	Exterior
	adjust	X	X		X		1,2,5,7,8,9,13,16	Initial adjustments & Tests All adjustments Exterior
	inspect	X	X		X		13	Test Electron tubes, continuity, voltage & resistance tests
	test	X	X		X		4,10,12,13	All testing
	replace repair	X	X		X		1,2,3,5,7,8,9,10,12,13, 15,16	Replacement of subassemblies only
	calibrate overhaul	X	X		X		13	
	service	X	X		X		1,3,5,7,8,9,13,16	
	inspect	X	X		X		13	
	test	X	X		X		4,10,12,13	Test by substitution, Test electron tube continuity, voltage & Resistance tests
	replace repair	X	X		X		1,2,3,5,7,8,9,10,12,13, 16	All testing
JUNCTION BOX J-85/G	repair	X					13	See TM 11-5820-308-12P for mainten- ance for allocations.
	repair	X					13	See TM 11-6150-200-12P for mainten- ance allocations
JUNCTION BOX JB-110	repair	X					13	See TM 11-900 and TM 11-900A for maintenance allocations
	repair	X					13	
POWER UNIT PE-75C,D,J,K,Q,T,U,AA,AB,AC,AD,AE,AF	repair	X					13	

REPLACEMENT OF TUBES  
1 Jun 53

AN/TCC-8 & AN/TCC-21

SECTION III ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS

PART OR COMPONENT	EQUIPMENT					TOOL CODE	REMARKS
	1	2	3	4	5		
AN/TCC-8 & AN/TCC-21 (continued)							
ATTENUATOR TS-402/U				†	†	1	
AUDIO LEVEL METER ME-71/FCC				†	†	2	
FREQUENCY METER AN/TSM-16				†	†	3	
MULTIMETER AN/URM-105			†			4	
MULTIMETER TS-352/U				†	†	5	
MULTIMETER METER ME-26/U				†	†	6	
POWER SUPPLY PP-827/U				†	†	7	
SIGNAL GENERATOR SG-71/FCC				†	†	8	
TEST FACILITIES KIT, TELEPHONE CARRIER MK-155/TCC				†	†	9	
TEST SET TS-190/U				†	†	10	
TEST SET, ELECTRON TUBE TV-2/U					†	11	
TEST SET, ELECTRON TUBE TB-7/U				†	†	12	
TOOL EQUIPMENT TE-123				†	†	13	
TRANSFORMER, VARIABLE CN-16/U					†	14	
TUBE SOCKET, ADAPTER KIT MX-1258/U				†	†	15	
VOLTMETER, METER ME-30/U				†	†	16	

**Appendix II, section IV (page 2 of C6, as changed by C7, 23 May 1963).**

**Column 8, line 4. After "5, 13," add 17.**

**Column 9, line 7. After "continuity" add:  
Tube socket voltage test.**

**Section V (page 3 of C6, as changed by C7, 23 May 1963). TUBE SOCKET ADAPTER KIT MX-1258/U.**

**Column 3. Add: dagger (†).**

**Section VI (page 4 of C6).**

**Column 8, line 4. After "5, 13" add 17.**

**Column 9, line 6. After "continuity" add:  
Tube socket voltage test.**

**Section VII (page 5 of C6, as changed by C7, 23 May 1963).**

**TUBE SOCKET ADAPTER KIT MX-1258/U.**

**Column 3. Add dagger (†).**

By Order of the Secretary of the Army:

**EARLE G. WHEELER,**  
*General, United States Army,*  
*Chief of Staff.*

Official:

**J. C. LAMBERT,**  
*Major General, United States Army,*  
*The Adjutant General.*

Distribution:

*Active Army:*

DASA (6)	Svc Colleges (2)
USASA (2)	Br Svc Sch (2) except
CNGB (1)	USASESCS (100)
CSigO (7)	USMA (2)
CofT (1)	WRAMC (2)
CofEngrs (1)	AFIP (1)
CofSptS (1)	USASTC (5)
TSG (1)	USA Trans Tml Comd (1)
USA CD Agcy (2)	Army Tml (1)
USAMC (5)	USAOSA (1)
USCONARC (5)	POE (1)
ARADCOM (2)	AMS (1)
ARADCOM Rgn (2)	Army Pic Cen (2)
OS Maj Comd (3)	USA Mbl Spt Cen (1)
Base Comd (2)	USA Elct Mat Agcy (12)
LOGCOMD (2)	Chicago Proc Dist (1)
USAECOM (7)	Sig Fld Maint Shops (3)
USAMICOM (4)	USA Elct RD Actv
USASCC (4)	Ft Huachuca (2)
MDW (1)	White Sands (13)
Armies (2)	WSMR (5)
Corps (2)	Yuma PG (2)
USATC AD (2)	USA Corps (3)
USATC Armor (2)	Units org under fol TOE:
USATC Engr (2)	(2 ea. except as indicated)
USATC Inf (2)	11-7
USASTC (2)	11-16
Instl (2) except	11-57
Ft Monmouth (63)	11-95
Ft Hancock (4)	11-97
GENDEP (OS) (2)	11-117
Sig Sec, GENDEP (5)	11-155
Sig Dep (OS) (12)	11-157
A Dep (2) except	11-500 (AA-AE) (4)
Lexington (12)	11-557
Sacramento (28)	11-587
Tobyhanna (12)	11-592
Ft Worth (8)	11-597

NG: State AG (3); Units same as Active Army except allowance is one (1) copy to each unit.

USAR: None.

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

## Organizational Maintenance

## TELEPHONE REPEATER AN/TCC-8 AND TELEPHONE REPEATER AN/TCC-21

CHANGE  
No. 9HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 20 August 1964

TM 11-2140-20, 31 March 1958, is changed as follows:

*Note.* The parenthetical reference to a previous change (example: "page 1 of C 8") indicates that pertinent material was published in that change.

Page 2 (page 1 of C 8), paragraph 1.2, subparagraph c, lines 12, 13, and 14. Change Commanding Officer, U.S. Army Electronics Material Support Agency, ATTN: SELMS-MP to Com-

manding General, U.S. Army Electronics Command, ATTN: AMSEL-MR-MP-P,

Page 33, appendix I (page 1 of C 5 and page 3 of C 8). Delete appendix I and substitute:

APPENDIX I  
REFERENCES

- DA Pam 310-4 Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 4, 6, 7, 8, and 9), Supply Bulletins, Lubrication Orders, and Modification Work Orders.
- TM 9-213 Painting Instructions for Field Use.
- TM 11-381 Cable Assembly CX-1065/G, Telephone Cable Assemblies CX-1606/G and CX-1512/U, and Telephone Loading Coil Assembly CU-260/G, and Electrical Connector Plug U-176/G.
- TM 11-900 Power units PE-75-C, -D, -J, -K, -P, -S, -T, -U, -W, -AA, -AB, -AC, -AD, and -AE.
- TM 11-900A Power Unit PE-75-AF.
- TM 11-2139-10 Operator's Manual: Terminals, Telephone AN/TCC-7 and AN/TCC-50.
- TM 11-2139-20 Organizational Maintenance Manual: Telephone AN/TCC-7 and AN/TCC-50.
- TM 11-2140-10 Operator's Manual: Telephone Repeater AN/TCC-8 and Telephone Repeater AN/TCC-21.
- TM 11-2143 Telephone Test Sets TS-712/TCC-11 and TS-712A/TCC-11
- TM 11-2150 Telephone Carrier Systems using Terminals, Telephone AN/TCC-7 and AN/TCC-50, Repeater, Telephone AN/TCC-8 (AN/TCC-21), Repeater, Telephone AN/TCC-11 and Telephone Test Set TS-712/TCC-11.
- TM 11-5805-240-12 Operator's and Organizational Maintenance Manual: Repeater, Telephone AN/TCC-11.
- TM 11-5805-245-20P Organizational Maintenance Repair Parts and Special Tools List: Power Supply PP-827/U.
- TM 11-5805-248-20P Organizational Maintenance Repair Parts and Special Tool Lists: Power Supplies PP-826/U and PP-826A/U.
- TM 11-5805-282-20P Organizational Maintenance Repair Parts and Special Tool Lists: Repeaters, Telephone AN/TCC-8 and AN/TCC-21.
- TM 11-5805-317-20P Organizational Maintenance Repair Parts and Special Tool Lists: Terminals, Telephone AN/TCC-7 and AN/TCC-50.

- TM 11-5820-287-10 Operator's Manual: Radio Sets AN/TRC-24, AN/GRC-75, AN/GRC-78, AN/GRC-81, and AN/GRC-81A; Radio Terminal Sets AN/TRC-35, AN/GRC-76, AN/GRC-79, and AN/GRC-82; Radio Relay Set AN/TRC-36, Radio Repeater Sets AN/GRC-77, AN/GRC-80, and AN/GRC-83; and Radio Set Groups AN/TRA-25, AN/TRA-25A, and OA-3668A/TRC-24.
- TM 11-5820-287-20 Organizational Maintenance Manual: Radio Sets AN/TRC-24, AN/GRC-75, AN/GRC-78, AN/GRC-81, and AN/GRC-81A; Radio Terminal Sets AN/TRC-35, AN/GRC-76, AN/GRC-79, and AN/GRC-82; Radio Relay Set AN/TRC-36; Radio Repeater Sets AN/GRC-77, AN/GRC-80 and AN/GRC-83; and Radio Set Groups AN/TRA-25, AN/TRA-25A and OA-3668A/TRC-24.
- TM 11-5820-308-12P Operators and Organizational Maintenance Repair Parts and Special Tools List and Maintenance Allocation Chart: Junction Box J-85/G.
- TM 11-5965-216-15P Operator, Organizational, Field and Depot Maintenance Repair Parts and Special Tool Lists and Maintenance Allocation Chart: Handset TS-9-F.
- TM 11-6115-206-20P Organizational Maintenance Repair Parts and Special Tool Lists: Power Units PE-75-C, -D, -J, -K, -T, -U, -W, -AA, -AB, -AC, -AD, -AE, and -AF.
- TM 11-6150-200-12P Operator's and Organizational Maintenance Repair Parts and Special Tools List and Maintenance Allocation Chart: Junction Box JB-110.
- TM 11-6625-274-12 Operator's and Organizational Maintenance Manual: Test Sets, Electron Tube TV-7/U, TV-7A/U, TV-7B/U, and TV-7D/U.
- TM 38-750 Army Equipment Record Procedures.

Page 33, appendix II, section II change 8. Make the following additions (underscored) in the columns indicated below:

Page	PART OR COMPONENT	MAINTENANCE FUNCTION	ECHELON					TOOLS RE-REQUIRED	REMARKS
			1	2	3	4	5		
6	TELEPHONE REPEATER AN/TCC-21	repair		X					
8	HANDSET TS-9	replace		X				13	
		repair							See TM 11-5965-216-15P for maintenance for allocation.
9	JUNCTION BOX J-85/G	replace		X				13	
	JUNCTION BOX JB-110	replace		X				13	
	POWER UNIT PE-75C, D, J, K, Q, T, U, AA, AB, AC, AD, AE, AF.	replace		X				13	

(Page 7 of C 8). Reference PART OR COMPONENT column, RECEIVER-TRANSMITTER TEST SET GROUP OA-446/TCC and MAINTENANCE FUNCTION column, "replace" and "repair". Delete X in 1st echelon column, add X in second echelon column.

By Order of the Secretary of the Army:

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

Official:

J. C. LAMBERT,  
Major General, United States Army,  
The Adjutant General.

Distribution:

Active Army:

CNGB (1)	USA Trans Tml Comd, Arctic (1)	GENDEP (OS) (2)
CofT (1)	1st Fld Sta, USASA (5)	Sig Sec, GENDEP (OS) (5)
CofEngrs (1)	USARSOUTHCOM Sig Agy (1)	Sig Dep (OS) (12)
TSG (1)	USAARMBD (2)	USA Elct R&D Agy:
CofSptS (1)	USAARTYBD (2)	Yuma PG (2)
C/COMMEL (7)	USATC AD (2)	WSMR (13)
USASA (2)	USATC Armor (2)	Ft Gordon (5)
USCONARC (5)	USATC Engr (2)	Ft Huachuca (10)
USAMC (5)	USATC Inf (2)	USATCA (1)
ARADCOM (2)	USASTC (3)	USATCP (1)
ARADCOM Rgn (2)	USA Pic Cen (2)	USATCG (1)
OS Maj Comd (3)	WRAMC (1)	Units organized under following
OS Base Comd (2)	AMS (1)	TOE's (2 each unless other-
LOGCOMD (2)	11th Air Assault Div (3)	wise indicated):
USAMICOM (4)	US Army Tml (1) except Oakland	11-16
USAECOM (32)	(5)	11-57
USA Avn Mat Comd (1)	POE (1)	11-97
USASCC (4)	Sig Fld Maint Shops (3)	11-98
USASMCOM (2)	USAERDL (2)	11-117
USACDCCEA (1)	USA Cold Rgns R&E Lab (2)	11-155
USACDCCEA, Ft Monmouth (1)	Svc Colleges (2)	11-157
MDW (1)	Br Svc Sch (2)	11-158
Armies (2)	Army Dep (2) except Tobyhanna,	11-500 AA-AE (4)
Corps (2)	Lexington (12) Sacramento (28)	11-557
USA Corps (3)	Ft Worth (8) Letterkenny, Nav-	11-587
Chicago Proc Dist (1)	aho, Savanna (5) Charleston,	11-592
Instl (2) except Ft Monmouth (63)	Sharpe (3)	11-597

NG: State AG (3) units same as active Army except allowance is one copy to each unit.

USAR: None.

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





CHANGE }  
NO. 10 }HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, DC 10 August 1983**ORGANIZATIONAL MAINTENANCE  
TELEPHONE REPEATER AN/TCC-8  
(NSN 5805-00-333-9796) AND TELEPHONE  
REPEATER AN/TCC-21 (NSN 5805-00-692-6778)**

TM 11-2140-20/TO 31W1-2TCC-144, 31 March 1958, is changed as follows:

*Cover.* The title is superseded as shown above.

**NOTE**

The parenthetical reference to a previous change (page 1 of C8) indicates that pertinent material was published in that change.

*Page 2.* Paragraph 1.2 (page 1 of C8) delete and substitute:

**1.2 Maintenance Forms, Records, and Reports**

*a. Reports of Maintenance and Unsatisfactory Equipment.* Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750. The Army Maintenance Management System.

*b. Report of Packaging and Handling Deficiencies.* Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73/AFR 400-54/MCO 4430.3E.

*c. Discrepancy in Shipment Report (DISREP) (SF 361).* Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38, NAVSUPINST 4610.33B/AFR 75-18/MCO P4610.19C/DLAR 4500.15.

*Page 2.* Paragraph 1.3 is added.

**1.3 Reporting Errors and Recommending Improvements**

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703. In either case, a reply will be furnished direct to you.

*Page 2.* Paragraph 1.4 is added.

**1.4 Reporting Equipment Improvement Recommendations (EIR)**

If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us

what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703. We'll send you a reply.

*Page 2.* Paragraph 1.5 is added.

**1.5 Administrative Storage**

Administrative Storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage the PMCS should be performed to assure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in paragraphs 19 through 22.

*Page 2.* Paragraph 1.6 is added.

**1.6 Destruction of Army Electronics Materiel**

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

*Page 3.* Paragraph 5 (page 2 of C8). Delete and substitute the following:

**5. Preventive Maintenance Checks and Services.****NOTE**

Refer to TM 750-244-2 for proper procedures for destruction of this equipment to prevent enemy use.

*a.* Organizational preventive maintenance procedures are designed to help maintain equipment in serviceable condition. They include items to be checked and how to check them. These checks and services, described in paragraph 6 outline inspections that are to be made at specific monthly (M) intervals.

*b.* Routine checks like CLEANING, LUBRICATION, DUSTING, WASHING, CHECKING FOR FRAYED CABLES, STOWING ITEMS NOT IN USE, COVERING UNUSED RECEPTACLES, CHECKING FOR LOOSE

NUTS AND BOLTS AND CHECKING FOR COMPLETENESS are not listed as PMCS checks. They are things that you should do any time you see they must be done. If you find a routine check like one of those listed in your PMCS,

it is because other operators reported problems with this item.

**NOTE**

When you are doing any PMCS or routine checks, keep in mind the warnings and cautions.

Page 4. Paragraph 6 through 6.3 (page 2 of C8). Delete and substitute the following:

**6. Organizational Preventive Maintenance Checks and Services**

M – Monthly

Item No.	Interval	Item to be Inspected	Procedures
	M		
1	●	Completeness	Check for completeness and satisfactory condition of the equipment. Report missing items.

**By Order of the Secretary of the Army:**

**JOHN A. WICKHAM, JR.**  
*General, United States Army*  
*Chief of Staff*

**Official:**

**ROBERT M. JOYCE**  
*Major General, United States Army*  
*The Adjutant General*

**DISTRIBUTION:**

**To be distributed in accordance with Special List.**



TECHNICAL MANUAL  
 No. 11-2140-20  
 TECHNICAL ORDER  
 No. 31W1-2TCC-144

DEPARTMENTS OF THE ARMY  
 AND THE AIR FORCE  
 WASHINGTON 25, D. C., 31 March 1958

**TELEPHONE REPEATER AN/TCC-8 AND TELEPHONE REPEATER AN/TCC-21  
 ORGANIZATIONAL MAINTENANCE**

	Paragraph	Page
<b>CHAPTER 1. INTRODUCTION</b>		
Scope.....	1	2
Internal differences in models.....	2	2
<b>2. MAINTENANCE INSTRUCTIONS</b>		
<b>Section I. Preventive maintenance</b>		
Scope of organizational maintenance.....	3	3
Tools, materials, and test equipment.....	4	3
Preventive maintenance.....	5	3
Lubrication.....	6	4
<b>II. Troubleshooting</b>		
General.....	7	4
Visual inspection.....	8	4
Troubleshooting checklist.....	9	7
Cable continuity chart.....	10	14
Tube socket voltage and resistance measurements.....	11	14
Tube testing and replacement.....	12	15
Removal and replacement of plug-in subassembly.....	13	15
<b>CHAPTER 3. BLOCK DIAGRAM THEORY OF TELEPHONE REPEATER AN/TCC-8</b>		
General.....	14	26
Amplifier-Pilot Regulator AM-708/TCC-8.....	15	26
Order Wire Receiver-Transmitter RT-281/TCC-8.....	16	27
Telephone Test Set TS-761/TCC-8.....	17	28
Power supplies.....	18	29
<b>4. SHIPMENT AND LIMITED STORAGE</b>		
Repacking for shipment or limited storage.....	19	31
Material requirements.....	20	31
Packaging.....	21	31
Packing.....	22	32
<b>APPENDIX REFERENCES.....</b>		33

\* This manual supersedes those portions of TM 11-2140, 7 December 1953, including C 1, 28 December 1953, C 2, 25 February 1954, C 3, 29 September 1955, C 4, 1 August 1956, and C 5, 9 September 1957, pertaining to organizational maintenance of this equipment.

# CHAPTER 1

## INTRODUCTION

---

### 1. Scope

a. These instructions are published for the use of personnel responsible for organizational (second echelon) maintenance of Telephone Repeater AN/TCC-8 and Telephone Repeater AN/TCC-21. Telephone Repeater AN/TCC-21 is Telephone Repeater AN/TCC-8 plus a Power Unit PE-75-( ), grounding accessories, and power distribution accessories. Instructions given in this manual for the AN/TCC-8 are applicable to the AN/TCC-21, unless otherwise stated. This manual is used in conjunction with TM 11-2140-10, Telephone Repeater AN/TCC-8 and Telephone Repeater AN/TCC-21, Operator's Manual.

b. An appendix containing a list of current references is included.

c. Official nomenclature followed by (\*) is used to indicate all models of the equipment covered in this manual. Thus Power Supply PP-826(\*)/U represents Power Supply PP-826/U and Power Supply PP-826A/U. Whenever official nomenclature is followed by parentheses with no number or symbol in the parentheses ( ), reference is made to all models of the equipment. Thus Power Unit PE-75-( ) refers to every model of Power Unit PE-75.

d. Forward all comments on this publication direct to: Commanding Officer, United States Army Signal Publications Agency, Fort Monmouth, N. J.

*Note.* For applicable forms and records, see paragraph 2, TM 11-2140-10.

### 2. Internal Differences in Models

a. Power Supply PP-826/U and Power Supply PP-826A/U are similar in purpose and appearance and may be used interchangeably. Refer to the *differences in models* paragraph in TM 11-2140-10 for exterior differences and general functional differences.

b. In Power Supply PP-826/U, the plug-in subassembly is designated as low-voltage rectifier and alarm Z1; in Power Supply PP-826A/U, the plug-in subassembly is designated as low-voltage rectifier and alarm Z2.

c. Refer to TM 11-900 or TM 11-900A for differences in Power Unit PE-75-( ).

d. Differences of interest to higher echelon maintenance are covered in the technical manual for field and depot maintenance.

## CHAPTER 2

### MAINTENANCE INSTRUCTIONS

#### Section I. PREVENTIVE MAINTENANCE

#### 3. Scope of Organizational Maintenance

a. Following is a list of the maintenance duties normally performed by the organizational maintenance man. These duties are limited by the available spare parts, tools, materials, and test equipment.

b. Organizational maintenance for Telephone Repeaters AN/TCC-8 and AN/TCC-21 consist of the following:

- (1) Preventive maintenance (par. 5).
- (2) Visual inspection (par. 8).
- (3) Performing systematic equipment performance check (TM 11-2140-10).
- (4) Troubleshooting (par. 9).
- (5) Checking cable continuity (par. 10).
- (6) Checking of vacuum tube element, and circuit resistances and voltages (par. 11).
- (7) Testing and replacement of defective vacuum tubes (par. 12).
- (8) Replacement of defective lamps, fuses, and lightning arresters (TM 11-2140-10).
- (9) Replacement of plug-in subassemblies (par. 13).
- (10) Refer to TM 11-900 or TM 11-900A for preventive maintenance on Power Unit PE-75-( ) (part of the AN/TCC-21).

#### 4. Tools, Materials, and Test Equipment

The tools, materials, and test equipment required for organizational maintenance are listed below:

##### a. Tools.

- (1) The following special tools and cables are supplied with Telephone Repeaters AN/TCC-8 and AN/TCC-21:

Hexagonal wrench,  $\frac{1}{8}$  inch (located in rear of storage drawer).

Hexagonal wrench,  $\frac{1}{16}$  inch (located in rear of storage drawer).

Measure cord adapter (located in storage drawer).

Extension cable, 21-conductor (located in storage drawer).

Extension cable, seven-conductor (located in rear of test panel).

- (2) Tools necessary for organizational maintenance are contained in Tool Equipment TE-123.

##### b. Materials.

- (1) Cleaning Compound (Federal stock No. 7930-395-9542).

**Warning:** Prolonged breathing of Cleaning Compound fumes is dangerous. Make sure that adequate ventilation is provided. Cleaning Compound is flammable; do not use near a flame.

- (2) Lint-free cloth.
- (3) Fine sandpaper.

##### c. Test Equipment.

- (1) Multimeter ME-77/U, or equivalent.
- (2) Electron Tube Test Set TV-7/U (TM 11-5083), or equivalent.
- (3) Tube Socket Adapter Kit MX-1258/U.

#### 5. Preventive Maintenance

a. *DA Form 11-238.* DA Form 11-238 (figs. 1 and 2) is a preventive maintenance checklist to be used by organizational maintenance personnel. Items not applicable to the equipment are lined out. References in the ITEM block in the figures are to paragraphs which contain additional information pertinent to the particular item. Instructions for the use of the form appear on page 1 of the form. Additional preventive maintenance information concerning items 1 through 7 on DA Form 11-238 is given in the preventive maintenance portion of TM 11-2140-10.

b. *Items.* The information in this subparagraph is supplementary to DA Form 11-238. The item numbers correspond to the ITEM numbers on the form.

Item	Maintenance procedure
6	Use fine sandpaper to remove rust or corrosion.
10	Inspect drawer slide assemblies and cable connector retaining screws for proper operation.
14	Inspect Junction Boxes J-85/G and JB-110 for tightness of cable clamps and loose cover screws. Inspect for broken guard on J-85/G. Use Cleaning Compound* to loosen and remove grease and grime.
15	Inspect the seating of all tube shields. Inspect tightness of tube clamps in the power supplies. Inspect the seating of all plug-in subassemblies to see that the mounting screws (usually circled by a black ring) of each subassembly are tight. Inspect reference voltage regulator tube V9 on the 200-volt Power Supply and voltage regulator tubes V1, V3, and V4 and voltage standard tubes V2 and V5 in the low-voltage rectifier and alarm sub-assembly of the 600-volt Power Supply for a steady purple glow. If a tube appears defective, replace it (par. 12). Inspect the panels and storage drawer for spare fuses, lamps, tubes, lightning arresters, hexagonal wrenches, and extension cables (par. 4a).

Item	Maintenance procedure
19	Use camel's-hair brush and/or lint-free cloth to clean these components. If necessary, wet a cloth with Cleaning Compound* and wipe the parts with the cloth.
20	Remove each plug-in subassembly and inspect for straightness of pins, and dirt and cracks in insulator.
27	Perform a systematic equipment performance check (TM 11-2140-10).

\*Cleaning Compound is flammable and its fumes are toxic. Do not use near a flame; provide adequate ventilation.

## 6. Lubrication

No lubrication of Telephone Repeater AN/TCC-8 is required. Refer to TM 11-900 or TM 11-900A for lubrication requirements of Power Unit PE-75-( ) (part of Telephone Repeater AN/TCC-21).

## Section II. TROUBLESHOOTING

### 7. General

a. The paragraphs which follow in this section help in determining which of the components of the AN/TCC-8 is at fault and in localizing the fault in that component to a panel, subassembly, or part. Troubleshooting is based on the performance of the equipment at the time of failure and the use of the senses in determining such troubles as burned-out fuses, loose wiring, etc.

b. The definitions of terms used in referring to all or any part of this equipment are given below:

- (1) *Equipment.* Telephone Repeater AN/TCC-8.
- (2) *Component.* An integral nomenclatured part of the AN/TCC-8.
- (3) *Panel.* A section of a component; may or may not have its own nomenclature.
- (4) *Subassembly.* Unitized section of a component or panel; for example, *plug-in subassembly.*
- (5) *Stage.* Associated group of parts which perform a circuit function.
- (6) *Part.* Tube, fuse, capacitor, resistor, etc.

### 8. Visual Inspection

a. Before inspecting the equipment, inspect the

operator's tag to determine the area of failure. When the equipment fails to operate properly, inspect it for—

- (1) Improper settings of controls or switches (TM 11-2140-10).
- (2) Worn, broken, or disconnected cables, handset cords, or connectors.
- (3) Defective lightning arresters.
- (4) Defective fuses.
- (5) Faulty ground connections.
- (6) Improperly seated pluck-out parts or subassemblies.
- (7) Low current output from 600-VOLT POWER SUPPLY (normally 100 milliamperes (ma)).
- (8) Loose or faulty soldered connections.
- (9) Loose or faulty binding post connections.

**Caution:** If trouble is indicated by visual inspection, obtain permission from the control terminal to turn off the power before performing the necessary corrective action. Do not perform any corrective action with the power on.

b. After the visual checks have been completed, proceed to the troubleshooting checklist (par. 9).





NO. DAILY ITEM		DAILY CONDITION FOR MONTH OF <b>DECEMBER, 1957</b>												CONDITION						
		1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16		
<p><b>LEGEND for marking conditions:</b> Satisfactory, ✓ Adjustment, Repair or Replacement required, X Defect corrected, ⊗</p>																				
1 COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT (Transmitters, receivers, carrying cases, wire, cables, microphones, tubes, spare parts, technical manuals).		/																✓		
2 CLEAN DIRT AND MOISTURE FROM SWITCHES, MICRO-PHONES, HEADSETS, KEYS, JACKS, PLUGS, COMPONENT PANELS		/																✓		
3 INSPECT CONTROLS FOR NORMAL OPERATION TAP CONTROLS LIGHTLY FOR EVIDENCE OF CUT-OUT FROM LOOSE CONTACTS		/																✓		
4 CHECK FOR UNUSUAL OPERATION OR CONDITION BE ALERT FOR UNUSUAL OPERATION OR CONDITION		/																✓		
		WEEKLY												CONDITION EACH WEEK		2D 3D ECH				
5 CLEAN AND TIGHTEN EXTERIORS OF CASES, RACKS MOUNTS, <del>AND EXPOSED METAL SURFACES FOR RUST CORROSION.</del>		1ST	2D	3D	4TH	5TH											2D	3D	ECH	
6 INSPECT CASES MOUNTS <del>AND EXPOSED METAL SURFACES FOR RUST CORROSION.</del> PAR. 5b																		✓	✓	✓
7 INSPECT CORDS, CABLE, WIRE SHOCK MOUNTS FOR CUTS, KINKS, BREAKS, FRAYING, UNDUE STRAIN																		✓	✓	✓
8. <del>SHOCK MOUNTS AND METER WINDOWS.</del>																				
9 INSPECT CANVAS AND LEATHER ITEMS FOR MILDew TEARS, FRAYING																				
10 INSPECT ACCESSIBLE ITEMS FOR LOOSE NUTS, SCREWS, KNOBS, JACKS, CONNECTORS, TRANSFORMERS, BLOWERS, PILOT LIGHTS BLOWERS, ETC PAR. 5b																		✓	✓	✓
11 CLEAN AND/OR INSPECT <del>AND METER WINDOWS.</del> NAME PLATES <del>AND METER WINDOWS.</del>																		⊗	✓	✓
12 <del>INSPECT AND CLEAN METER WINDOWS.</del>																				
ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS																				
13 <del>INSPECT AND CLEAN METER WINDOWS.</del>																		✓		
14 CHECK TERMINAL BOX COVERS FOR CRACKS, DIRT LEAKS DAMAGED GASKETS, GREASE		PAR 5b																✓		

CONTINUED ON PAGE 4

Figure 2. DA Form 11-638, pages 3 and 5.

## 9. Troubleshooting Checklist

The checklist in *b* below is furnished to help localize trouble in the AN/TCC-8 or the AN/TCC-21 to a panel, subassembly or part. Only those corrective measures which organizational maintenance personnel can accomplish are given. If the corrective measure given does not restore normal equipment performance, troubleshooting is required at the field maintenance level. Note on the repair tag what corrective measures were taken.

*a. General.* Before using the troubleshooting checklist, examine the operator's repair tag to determine whether the trouble has been sectionalized. If the trouble has not been sectionalized, perform the procedures outlined in the equipment performance checklist and the troubleshooting checklist of TM 11-2140-10 before performing any of the corrective measures given in *b* below.

*b. Troubleshooting Checklist.* The organizational maintenance troubleshooting checklist is divided into four parts: alarms ((1) below), transmission faults or failures ((2) below), frequency faults or failures ((3) below), and power supply faults or failures ((4) below). Each part lists the symptoms which may be observed, test points and normal indications to aid in localizing the trouble, the probable trouble that caused the fault or failure, and the corrective measures to be taken. A chart listing the actions or conditions for making equipment performance measurements is provided in TM 11-2140-10. To replace subassemblies listed in the *Corrective measure* column, refer to paragraph 13. To check tube socket voltages and resistances listed in the *Corrective measure* column, refer to paragraph 11.

### (1) Alarms.

Symptom (alarm indication)	Test point (jack)	Normal indication	Probable trouble	Corrective measure
1. AB ALARM LOW or AB ALARM HIGH.	68 kc at AB AMP 1 OUT.	0 db	Defective AB amplifier 1, AR1.	Replace AB amplifier 1, AR1 on REPEATER PANEL (fig. 5).
	68 kc at AB AMP 2 OUT.	0 db	a. Defective AB amplifier 2, AR2. b. Defective AB regulator and alarm Z11. c. Defective interconnecting cable (LOW ALARM only).	a. Replace AB amplifier 2 AR2 on REPEATER PANEL (fig. 5). b. Replace AB regulator and alarm Z11 on REPEATER PANEL (fig. 5). c. Check cable continuity (par. 10, item 20).
2. BA ALARM LOW or BA ALARM HIGH.	68 kc at BA AMP 1 OUT.	0 db	Defective BA amplifier 1, AR3.	Replace BA amplifier 1 AR3 on REPEATER PANEL (fig. 5).
	68 kc at BA AMP 2 OUT.	0 db	a. Defective BA amplifier 2, AR4. b. Defective BA regulator and alarm Z12. c. Defective interconnecting cable.	a. Replace BA amplifier 2 AR4 on REPEATER PANEL (fig. 5). b. Replace BA regulator and alarm Z12 on REPEATER PANEL (fig. 5). c. Check cable continuity (par. 10, items 21 and 22).
3. AB ALARM LOW and BA ALARM LOW or AB ALARM HIGH and BA ALARM HIGH.	-----	-----	Fault or failure in power from 200-VOLT POWER SUPPLY.	Check +200 volts and 6.3 volts ac from 200-VOLT POWER SUPPLY to REPEATER PANEL (fig. 19).
4. LOAD ALARM or LOAD ALARM and LOW VOLTAGE or LOAD ALARM and HIGH VOLTAGE.	-----	-----	<b>600-Volt Power Supply</b>	
			a. Absence of input voltage from 200-VOLT POWER SUPPLY.	a. Check for proper ac voltages (115 or 230 volts ac) at TO 600-VOLT POWER SUPPLY connector J2 and J3 on 200-VOLT POWER SUPPLY (fig. 19).

Symptom (alarm indication)	Test point (jack)	Normal indication	Probable trouble	Corrective measure
			b. Defective rectifier, regulator, or control circuits on main chassis. c. Defective regulator or control circuits on low-voltage rectifier and alarm Z1 or Z2.	b. Check tube socket voltages or resistances of tubes V1 through V6 on main chassis of 600-VOLT POWER SUPPLY (fig. 15). c. Check tube socket voltages or resistances of tubes V1 through V6 on low voltage and rectifier and alarm Z1 (or Z2) on 600-VOLT POWER SUPPLY (fig. 15).

(2) *Transmission faults or failures.*

Symptom (fault or failure)	Test point (jack)	Normal indication	Probable trouble	Corrective measure
<i>Repeater Panel</i>				
1. Cannot measure signal output in AB and in BA direction and no alarm indications.	68 kc at: AB AMP 1 OUT, AB AMP 2 OUT, BA AMP 1 OUT, BA AMP 2 OUT.	0 db	Absence of B+ or filament voltages.	Check 200 volts and 6.3 volts ac from 200-VOLT POWER SUPPLY to REPEATER PANEL (fig. 19).
2. No signal output in AB direction.	68 kc at AB AMP 1 OUT.	0 db	Defective AB amplifier 1, AR1.	Replace AB amplifier 1 AR1 on REPEATER PANEL (fig. 5).
	68 kc at AB AMP 2 OUT.	0 db	Defective AB amplifier 2, AR2.	Replace AB amplifier 2 AR2 on REPEATER PANEL (fig. 5).
3. No signal output in BA direction.	68 kc at BA AMP 1 OUT.	0 db	Defective BA amplifier 1, AR3.	Replace BA amplifier 1 AR3 on REPEATER PANEL (fig. 5).
	68 kc at BA AMP 2 OUT.	0 db	Defective BA amplifier 2, AR4.	Replace BA amplifier 2 AR4 on REPEATER PANEL (fig. 5).
<i>Order Wire Panel</i>				
4. No signal output in AB and in BA directions and no alarm indications.	1 kc at AB REC AMP IN or BA REC AMP IN.	0 db	a. Defective interconnecting cable.	a. Check cable continuity (par. 10, item 7 for AB direction; item 6, for BA, direction).
			b. Defective measuring circuit.	b. Check 1-kc output in ORDER WIRE PANEL ((3) below, item 5).
5. No signal output in AB direction.	1 kc at AB REC AMP OUT.	0 db	a. Defective AB receiving amplifier, AR101.	a. Replace AB receiving amplifier, AR101 on ORDER WIRE PANEL (fig. 4).
	1 kc at AB TR AMP OUT.	0 db	b. Defective interconnecting cable.	b. Check cable continuity (par. 10, item 7).
			c. Defective AB transmitting amplifier AR102.	c. Replace AB transmitting amplifier, AR102 on ORDER WIRE PANEL (fig.4).
6. No signal output in BA direction.	1 kc at BA REC AMP OUT.	0 db	a. Defective BA receiving amplifier, AR103.	a. Replace BA receiving amplifier, AR103 on ORDER WIRE PANEL (fig. 4).
	1 kc at BA TR AMP OUT.	0 db	b. Defective BA transmitting amplifier, AR104.	b. Replace BA transmitting amplifier, AR104 on ORDER WIRE PANEL (fig. 4).
			c. Defective interconnecting cable.	c. Check cable continuity (par. 10, item 6).

(3) Frequency faults or failures.

Symptom (fault or failure)	Test point (jack)	Normal indication	Probable trouble	Corrective measure
1. Unable to make frequency measurements on TEST PANEL.	-----	-----	<ul style="list-style-type: none"> <li>a. Defective flat amplifier AR2.</li> <li>b. Defective rectifier circuit V3.</li> <li>c. Absence of B+ and filament voltages.</li> <li>d. Defective IF amplifier AR1.</li> <li>e. Defective carrier oscillator circuit V2.</li> </ul>	<ul style="list-style-type: none"> <li>a. Replace flat amplifier AR2 on TEST PANEL (fig. 3).</li> <li>b. Check tube socket voltages and resistances of tube V3 on TEST PANEL (fig. 6).</li> <li>c. Check 200 volts and 6.3 volts ac from 200 VOLT POWER SUPPLY to TEST PANEL (fig. 19).</li> <li>d. Replace if amplifier AR1 on TEST PANEL (fig. 3).</li> <li>e. Check tube socket voltages and resistances of tube V2 on TEST PANEL (fig. 6).</li> </ul>
2. Unable to make selective measurements on TEST PANEL.	-----	-----	<ul style="list-style-type: none"> <li>a. Defective IF amplifier AR1.</li> <li>b. Defective carrier oscillator circuit V2.</li> </ul>	<ul style="list-style-type: none"> <li>a. Replace if amplifier AR1 on TEST PANEL (fig. 3).</li> <li>b. Check tube socket voltages and resistances of tube V2 on TEST PANEL (fig. 6).</li> </ul>
3. 65-kc oscillator output on TEST PANEL.	CHECK OSC. ....	0 db	Defective test oscillator circuit V1.	Check tube socket voltages and resistances of tube V1 on TEST PANEL (fig. 6).
4. 68-kc oscillator output on TEST PANEL.	CHECK OSC. ....	0 db	<ul style="list-style-type: none"> <li>a. Defective test oscillator circuit V1.</li> <li>b. Absence of B+ and filament voltages.</li> </ul>	<ul style="list-style-type: none"> <li>a. Check tube socket voltages and resistances of tube V1 on TEST PANEL (fig. 6).</li> <li>b. Check 200 volts and 6.3 volts ac from 200-VOLT POWER SUPPLY to TEST PANEL (fig. 19).</li> </ul>
5. 1 - kc output in ORDER WIRE PANEL.	AB REC AMP IN.	0 db	Defective interconnecting cable.	Check cable continuity (par. 10, item 7).
	AB REC AMP OUT.	0 db	<ul style="list-style-type: none"> <li>a. Defective AB receiving amplifier, AR101.</li> <li>b. Absence of B+ and filament voltages.</li> </ul>	<ul style="list-style-type: none"> <li>a. Replace AB receiving amplifier, AR101 on ORDER WIRE PANEL (fig. 4).</li> <li>b. Check 200 volts and 6.3 volts ac from 200-VOLT POWER SUPPLY to ORDER WIRE PANEL (fig. 19).</li> </ul>
	AB TR AMP OUT.	0 db	<ul style="list-style-type: none"> <li>a. Defective AB transmitting amplifier, AR102.</li> <li>b. Absence of B+ and filament voltages.</li> </ul>	<ul style="list-style-type: none"> <li>a. Replace AB transmitting amplifier, AR102 on ORDER WIRE PANEL (fig. 4).</li> <li>b. Check 200 volts and 6.3 volts ac from 200-VOLT POWER SUPPLY to ORDER WIRE PANEL (fig. 19).</li> </ul>
6. 1,600-cps output of ORDER WIRE PANEL.	AB REC AMP IN or BA REC AMP IN	-3 to +7 db.	<ul style="list-style-type: none"> <li>a. Defective Ringer-Oscillator Y101.</li> <li>b. Absence of B+ and filament voltages.</li> </ul>	<ul style="list-style-type: none"> <li>a. Replace Ringer-Oscillator Y101 on ORDER WIRE PANEL (fig. 4).</li> <li>b. Check 200 volts and 6.3 volts ac from 200-VOLT POWER SUPPLY to ORDER WIRE PANEL (fig. 19).</li> </ul>
7. 12-kc output of REPEATER PANEL (test in item 3 above satisfactory).	AB AMP 2 OUT	0 ± .8 db	<ul style="list-style-type: none"> <li>a. Defective AB amplifier 1, AR1.</li> <li>b. Defective AB amplifier 2, AR2.</li> <li>c. Absence of B+ and filament voltages.</li> </ul>	<ul style="list-style-type: none"> <li>a. Replace AB amplifier 1, AR1 on REPEATER PANEL (fig. 5).</li> <li>b. Replace AB amplifier 2, AR2 on REPEATER PANEL (fig. 5).</li> <li>c. Check 200 volts and 6.3 volts ac from 200-VOLT POWER SUPPLY to REPEATER PANEL (fig. 19).</li> </ul>

Symptom (fault or failure)	Test point (jack)	Normal indication	Probable trouble	Corrective measure
8. 28-kc output of REPEATER PANEL (test in item 3 above satisfactory).	BA AMP 2 OUT	0 ±.8 db	a. Defective BA amplifier 1, AR3. b. Defective BA amplifier 2, AR4. c. Absence of B+ and filament voltages.	a. Replace BA amplifier 1, AR3 on REPEATER PANEL (fig. 5). b. Replace BA amplifier 2, AR4 on REPEATER PANEL (fig. 5). c. Check 200 volts and 6.3 volt ac from 200-VOLT POWER SUPPLY to REPEATER PANEL (fig. 19).
	AB AMP 2 OUT	0 ±.4 db	a. Defective AB amplifier 1, AR1. b. Defective AB amplifier 2, AR2.	a. Replace AB amplifier 1, AR1 on REPEATER PANEL (fig. 5). b. Replace AB amplifier 2, AR2 on REPEATER PANEL (fig. 5).
9. 37-kc output of REPEATER PANEL (test in item 3 above satisfactory).	BA AMP 2 OUT	0 ±.4 db	a. Defective BA amplifier 1, AR3. b. Defective BA amplifier 2, AR4.	a. Replace BA amplifier 1, AR3 on REPEATER PANEL (fig. 5). b. Replace BA amplifier 2, AR4 on REPEATER PANEL (fig. 5).
	AB AMP 2 OUT	0 db	a. Defective AB amplifier 1, AR1. b. Defective AB amplifier 2, AR2.	a. Replace AB amplifier 1, AR1 on REPEATER PANEL (fig. 5). b. Replace AB amplifier 2, AR2 on REPEATER PANEL (fig. 5).
10. 62-kc output of REPEATER PANEL.	BA AMP 2 OUT	0 db	a. Defective BA amplifier 1, AR3. b. Defective BA amplifier 1, AR4.	a. Replace BA amplifier 1, AR3 on REPEATER PANEL (fig. 5). b. Replace BA amplifier 2, AR4 on REPEATER PANEL (fig. 5).
	AB 62 KC.....	To left of -5 db	a. Defective AB amplifier 2, AR1. b. Defective AB amplifier 2, AR2.	a. Replace AB amplifier 1, AR1 on REPEATER PANEL (fig. 5). b. Replace AB amplifier 2, AR2 on REPEATER PANEL (fig. 5).
11. 65-kc output of REPEATER PANEL (signal sent from test PANEL, test in item 3 above satisfactory).	BA 62 KC.....	To left of -5 db.	a. Defective BA amplifier 1, AR3. b. Defective BA amplifier 2, AR4.	a. Replace BA amplifier 1, AR3 on REPEATER PANEL (fig. 5). b. Replace BA amplifier 2, AR4 on REPEATER PANEL (fig. 5).
	AB AMP 1 OUT	0 db	a. Defective AB amplifier 1, AR1. b. Defective interconnecting cable.	a. Replace AB amplifier 1, AR1 on REPEATER PANEL (fig. 5). b. Check cable continuity (par. 10, item 11).
	AB AMP 2 OUT	0 db	a. Defective AB amplifier 2, AR2. b. Absence of B+ and filament voltages.	a. Replace AB amplifier 2, AR2, on REPEATER PANEL (fig. 5). b. Check 200 volts and 6.3 volts ac from 200-VOLT POWER SUPPLY (fig. 19).
	BA AMP 1 OUT	0 db	a. Defective BA amplifier 1, AR3. b. Defective interconnecting cable.	a. Replace BA amplifier 1, AR3 on REPEATER PANEL (fig. 5). b. Check cable continuity (par. 10, item 10).
12. 65-kc output of REPEATER PANEL (signal sent from distant terminal or repeater).	BA AMP 2 OUT	0 db	a. Defective BA amplifier 2, AR4. b. Absence of B+ and filament voltages.	a. Replace BA amplifier 2, AR4 on REPEATER PANEL (fig. 5). b. Check 200 volts and 6.3 volt ac from 200-VOLT POWER SUPPLY (fig. 19).
	AB AMP 1 OUT	0 db	Defective AB amplifier 1, AR1.	Replace AB amplifier 1, AR1 on REPEATER PANEL (fig. 5).
	AB AMP 2 OUT	0 db	a. Defective AB amplifier 2, AR2. b. Absence of B+ and filament voltages.	a. Replace AB amplifier 2, AR2 on REPEATER PANEL (fig. 5). b. Check 200 volts and 6.3 volts ac from 200-VOLT POWER SUPPLY to REPEATER PANEL (fig. 19).
	BA AMP 1 OUT	0 db	Defective BA amplifier 1, AR3.	Replace BA amplifier 1, AR3 on REPEATER PANEL (fig. 5).

Symptom (fault or failure)	Test point (jack)	Normal indication	Probable trouble	Corrective measure
13. 68-kc output of REPEATER PANEL (signal sent from TEST PANEL, test in item 4 above satisfactory).	BA AMP 2 OUT	0 db	a. Defective BA amplifier 2, AR4. b. Absence of B+ and filament voltage.	a. Replace BA amplifier 2, AR4 on REPEATER PANEL (fig. 5). b. Check 200 volts and 6.3 volts ac from 200-VOLT POWER SUPPLY to REPEATER PANEL (fig. 19).
	AB AMP 1 OUT	0 db	a. Defective AB amplifier 1, AR1. b. Defective interconnecting cable.	a. Replace AB amplifier 1, AR1 on REPEATER PANEL (fig. 5). b. Check cable continuity (par. 10, item 11).
	AB AMP 2 OUT	0 db	a. Defective AB amplifier 2, AR2. b. Defective interconnecting cable. c. Absence of B+ and filament voltages.	a. Replace AB amplifier 2, AR2 on REPEATER PANEL (fig. 5). b. Check cable continuity (par. 10, item 11). c. Check 200 volts and 6.3 volts ac from 200-VOLT POWER SUPPLY to REPEATER PANEL (fig. 19).
	BA AMP 1 OUT	0 db	a. Defective BA amplifier 1, AR3. b. Defective interconnecting cable.	a. Replace BA amplifier 1, AR3 on REPEATER PANEL (fig. 5). b. Check cable continuity (par. 10, item 10).
	BA AMP 2 OUT	0 db	a. Defective BA amplifier 2, AR4. b. Defective interconnecting cable. c. Absence of B+ and filament voltages.	a. Replace BA amplifier 2, AR4 on REPEATER PANEL (fig. 5). b. Check cable continuity (par. 10, item 10). c. Check 200 volts and 6.3 volts ac from 200-VOLT POWER SUPPLY to REPEATER PANEL (fig. 19).
14. 83-kc, 91-kc, and 99-kc output from REPEATER PANEL (test in item 3 above satisfactory).	AB AMP 2 OUT	0 db	a. Defective AB amplifier 1, AR1. b. Defective AB amplifier 2, AR2. c. Defective interconnecting cable. d. Absence of B+ and filament voltages.	a. Replace AB amplifier 1, AR1 on REPEATER PANEL (fig. 5). b. Replace AB amplifier 2, AR2 on REPEATER PANEL (fig. 5). c. Check cable continuity (par. 10, item 11). d. Check 200 volts and 6.3 volts ac from 200-VOLT POWER SUPPLY to REPEATER PANEL (fig. 19).
	BA AMP 2 OUT	0 db	a. Defective BA amplifier 1, AR3. b. Defective BA amplifier 2, AR4. c. Defective interconnecting cable. d. Absence of B+ and filament voltages.	a. Replace BA amplifier 1, AR3 on REPEATER PANEL (fig. 5). b. Replace BA amplifier 2, AR4 on REPEATER PANEL (fig. 5). c. Check cable continuity (par. 10, item 10). d. Check 200 volts and 6.3 volts ac from 200-VOLT POWER SUPPLY to REPEATER PANEL (fig. 19).

(4) Power supply faults or failures.

Symptom (fault or failure)	Test point (jack)	Normal indication	Probable trouble	Corrective measure
1. 200-VOLT POWER SUPPLY.	-----	0 db on TEST PANEL meter.	a. Absence of 115- or 230-volt ac input. b. Defective rectifier or regulator circuits V1 through V9.	a. Check 115- or 230-volt ac input to 200-VOLT POWER SUPPLY (fig. 19). b. Check tube socket voltages and resistances of tubes V1 through V9 on 200-VOLT POWER SUPPLY (fig. 14).

Symptom (fault or failure)	Test point (jack)	Normal indication	Probable trouble	Corrective measure
2. 600-VOLT POWER SUPPLY.	-----	100 ma on CURRENT meter.	<p>a. Absence of 115- or 230-volt ac input.</p> <p>b. Defective rectifier or regulator circuits V1 through V6.</p> <p>c. Defective low voltage rectifier and alarm Z1 or Z2.</p>	<p>a. Check for 115- or 230-volt ac input at connector J marked TO 600-VOLT POWER SUPPLY J2 or J3 (fig. 19).</p> <p>b. Check tube socket voltages and resistances of tubes V1 through V6 on main chassis of 600-VOLT POWER SUPPLY (fig. 15).</p> <p>c. Check tube socket voltages and resistances of tubes V1 through V6 of low voltage rectifier and alarm Z1 or Z2 on 600-VOLT POWER SUPPLY (fig. 15).</p>

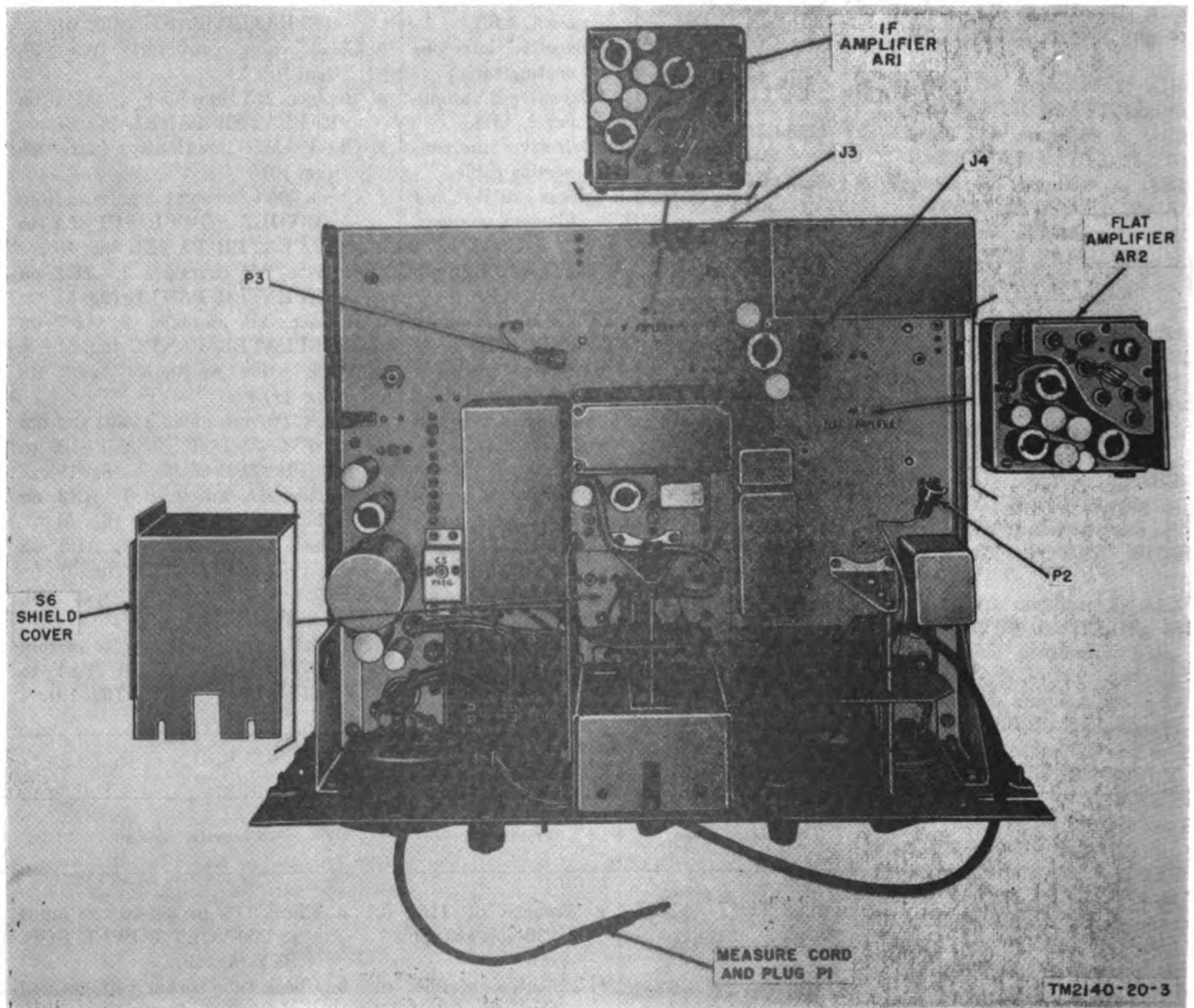


Figure 3. Telephone Test Set TS-761/TCC-8, TEST PANEL, top view of chassis, location of plug-in subassemblies.



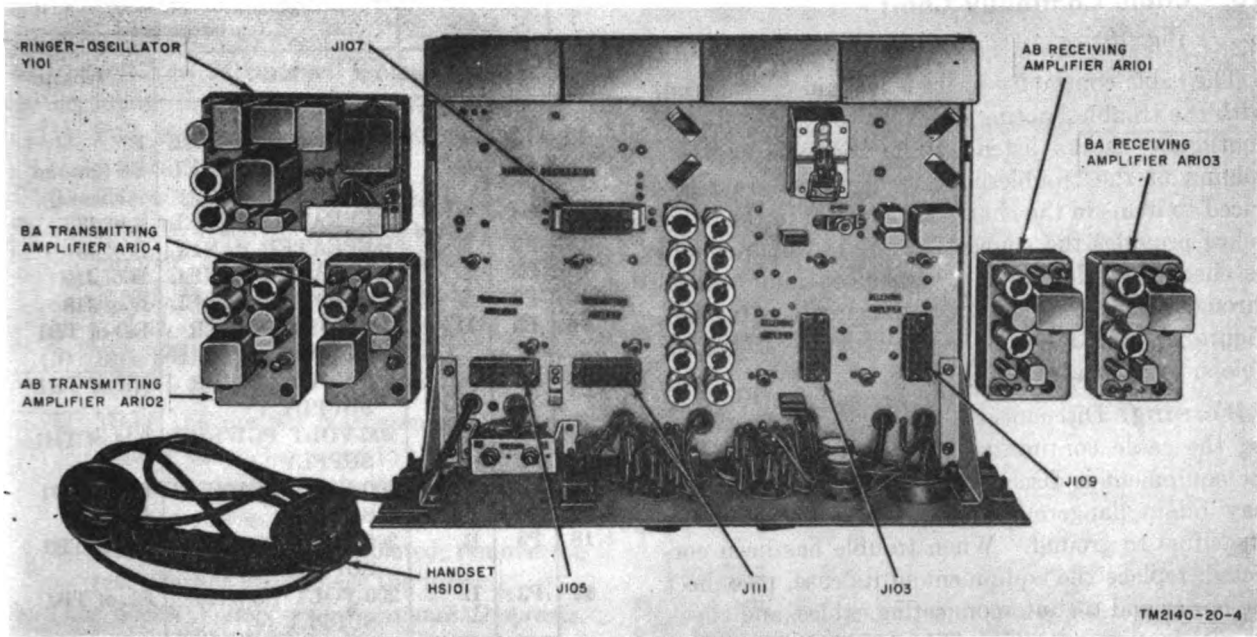


Figure 4. Order Wire Receiver-Transmitter RT-281/TCC-8, ORDER WIRE PANEL, top view of chassis, location of plug-in subassemblies.

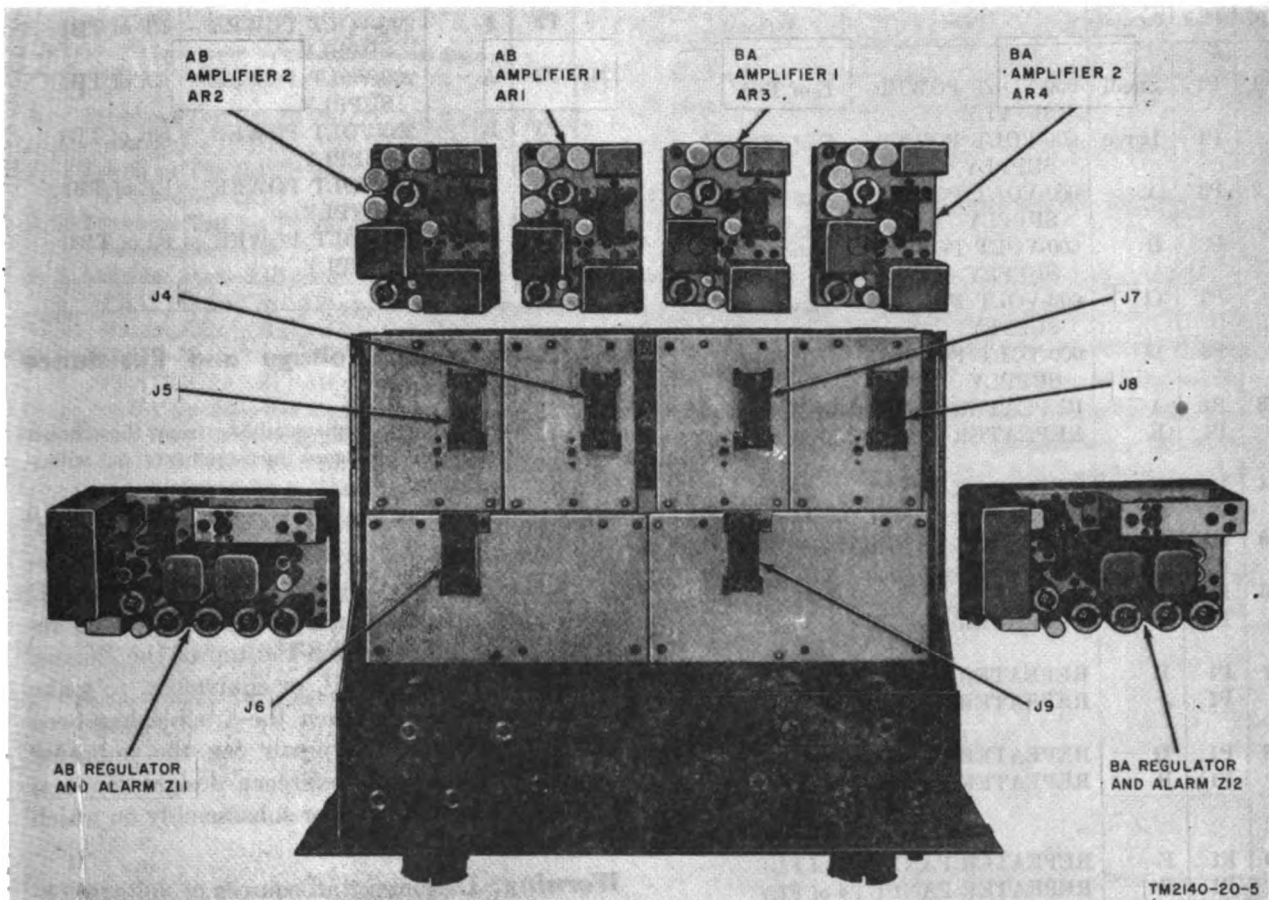


Figure 5. Amplifier-Pilot Regulator AM-708/TCC-8, REPEATER PANEL, top view of chassis, location of plug-in subassemblies.

## 10. Cable Continuity Chart

(fig. 19)

The cable continuity chart is used in conjunction with the troubleshooting checklist (par. 9b). Cable continuity checks listed in the *corrective measure* column of the troubleshooting checklist are referenced to items in the chart. Each item in the chart below provides the connecting points which should be checked to determine whether continuity exists through the cable or cables of the circuit in trouble. Figure 19 provides complete interpanel cabling for Telephone Repeater AN/TCC-8.

**Warning:** Disconnect all power before performing the cable continuity checks. When power to the equipment is disconnected some capacitors still may retain dangerous voltages. Short-circuit the capacitors to ground. When trouble has been corrected, replace the equipment in its case, reconnect the power and the interconnecting cables, and check for satisfactory operation (TM 11-2140-10).

Item No.	Cable		Terminating point	
	Plug	Terminal	Panel	Terminal
1	P1	Small	600-VOLT POWER SUPPLY	E of TB1
	P1	Large	600-VOLT POWER SUPPLY	F of TB1
2	P3	A	600-VOLT POWER SUPPLY	A of TB1
	P3	B	600-VOLT POWER SUPPLY	B and C of TB1
	P3	C	600-VOLT POWER SUPPLY	C and B of TB1
	P3	D	600-VOLT POWER SUPPLY	D of TB1
3	P1	A	REPEATER PANEL	E7
	P1	K	REPEATER PANEL	E8 (ground, chassis)
4	P1	I	REPEATER PANEL	3 of FL2
	P1	C	REPEATER PANEL	4 of FL2
5	P1	M	REPEATER PANEL	M of J3
	P1	N	REPEATER PANEL	N of J3
6	P1	F	REPEATER PANEL	E45
	P1	R	REPEATER PANEL	Ground (chassis)
7	P1	H	REPEATER PANEL	E30
	P1	J	REPEATER PANEL	Ground (chassis)
8	P1	D	REPEATER PANEL	D of J3
	P1	B	REPEATER PANEL	H of J3 (ground, chassis)
9	P1	E	REPEATER PANEL	3 of FL4
	P1	P	REPEATER PANEL	4 of FL4
10	P2	J	REPEATER PANEL	E34
11	P2	K	REPEATER PANEL	E17

Item No.	Cable		Terminating point	
	Flag	Terminal	Panel	Terminal
12	P2	A	REPEATER PANEL	E7
	P2	C	REPEATER PANEL	E8 (ground, chassis)
13	P2	H	REPEATER PANEL	L of J3
	P2	F	REPEATER PANEL	B of J3
14	P2	D	REPEATER PANEL	D of J19
15	P2	E	REPEATER PANEL	D of J18
16	P3	D	200-VOLT POWER SUPPLY	ED of TB1
	P3	H	200-VOLT POWER SUPPLY	EH of TB1
17	P3	M	200-VOLT POWER SUPPLY	EM of TB1
	P3	N	200-VOLT POWER SUPPLY	EN of TB1
18	P3	R	200-VOLT POWER SUPPLY	ER of TB1
19	P3	L	200-VOLT POWER SUPPLY	EL of TB1
	P3	B	200-VOLT POWER SUPPLY	EB of TB1
20	P3	P	200-VOLT POWER SUPPLY	EP of TB1
	P3	F	200-VOLT POWER SUPPLY	EF of TB1
21	P3	A	200-VOLT POWER SUPPLY	EA of TB1
	P3	K	200-VOLT POWER SUPPLY	EK of TB1
22	P3	E	200-VOLT POWER SUPPLY	EE of TB1
	P3	J	200-VOLT POWER SUPPLY	EJ of TB1

## 11. Tube Socket Voltage and Resistance Measurements

**Note.** Remove plug-in subassemblies from the chassis (par. 13) to perform resistance measurements on subassemblies.

To localize trouble within a particular circuit, make tube socket voltage and resistance measurements. Tube Socket Adapter Kit MX-1258/U provides test adapters that permit voltage and resistance measurements from the top of the chassis. Use Multimeter ME-77/U, or equivalent, to make these measurements. When the trouble has been localized, record on the repair tag the improper measurement, the tube reference designation and pin number, and the panel or subassembly on which the tube is located.

**Warning:** Disconnect all sources of voltages before measuring the tube socket resistances. When the power is disconnected, some capacitors still may

retain dangerous voltages. Short-circuit the capacitors to ground.

a. *Use of Test Adapters.* When using a test adapter, follow the procedures outlined below.

- (1) Pull the tube straight out with a tube puller.
- (2) Select the test adapter from the MX-1258/U which corresponds to the size and number of pins of the tube removed. Insert this test adapter into the tube socket.
- (3) Insert the removed tube into the test adapter.
- (4) Make the desired measurements by connecting the meter probe to the terminal on the test adapter corresponding to the pin number on the tube.
- (5) When the tests are completed, remove the test adapter and replace the tube.

b. *Tube Socket Voltage and Resistance Diagrams.* The following chart lists the tube socket voltage and resistance diagrams for each panel or subassembly:

Fig. No.	Panel or subassembly (tube socket voltage and resistance diagram)
6	Telephone Test Set TS-761/TCC-8, TEST PANEL, chassis.
7	Telephone Test Set TS-761/TCC-8, TEST PANEL, IF amplifier AR1.
8	Telephone Test Set TS-761/TCC-8, TEST PANEL, flat amplifier AR2.
9	Amplifier-Pilot Regulator AM-708/TCC-8, REPEATER PANEL, AB amplifier, AR1 or AR2, or BA amplifier, AR3 or AR4.
10	Amplifier-Pilot Regulator AM-708/TCC-8, REPEATER PANEL, AB regulator and alarm Z11, or BA regulator and alarm Z12.
11	Order Wire Receiver-Transmitter RT-281/TCC-8, ORDER WIRE PANEL, AB transmitting amplifier, AR102 or BA transmitting amplifier, AR104.
12	Order Wire Receiver-Transmitter RT-281/TCC-8, ORDER WIRE PANEL, AB receiving amplifier, AR101 or BA receiving amplifier, AR103.
13	Order Wire Receiver-Transmitter RT-281/TCC-8, ORDER WIRE PANEL, Ringer-Oscillator Y101.
14	Power Supply PP-827/U, 200-VOLT POWER SUPPLY.
15	Power Supply PP-828(*)/U, 600-VOLT POWER SUPPLY.

## 12. Tube Testing and Replacement

When trouble is reported, check all control settings, cabling, and connections before testing any tubes. If tube failure is suspected, use Electron Tube Test Set TV-7/U, or equivalent, and check the tubes as follows:

*Note.* Preferred-type tubes for use in Telephone Repeater AN/TCC-8 and tube location diagrams are listed in TM 11-2140-10.

a. Prepare the tube tester for use in accordance with the instructions in TM 11-5083, Electron Tube Test Set TV-7/U, or equivalent, and the test data (TB 11-5083-1) on the inside cover of the tube tester.

b. Remove the tube shield or tube clamp; remove and test one tube at a time.

**Caution:** Never rock or rotate a tube when removing it from a socket; pull it straight out with a tube puller.

c. Discard a tube only if its defect is obvious or if the tube tester shows it to be defective. Do not discard a tube that tests at or slightly above its minimum test limits.

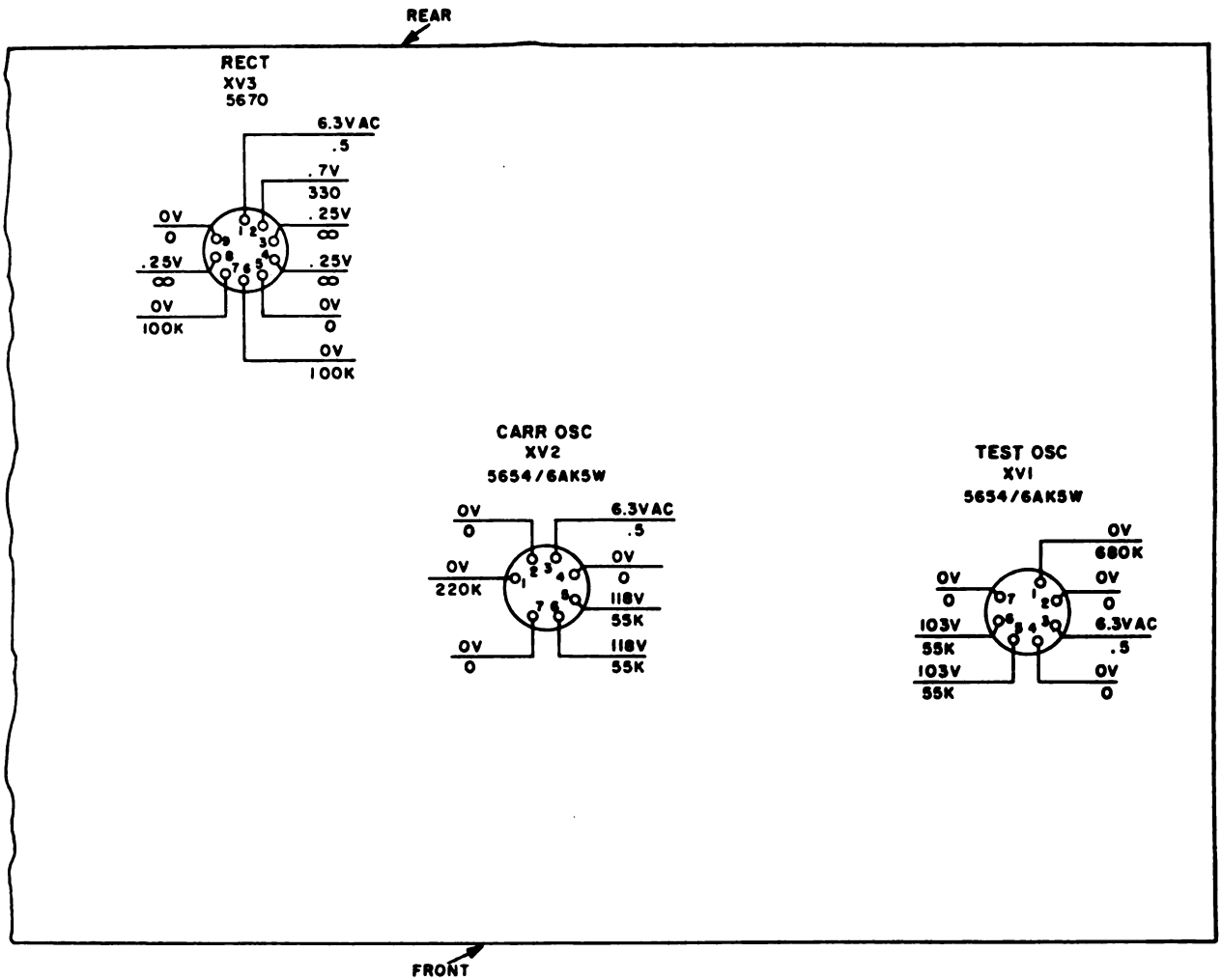
d. Replace the original tube, or install a new one if required, before testing the next one.

e. Replace the tube shield or tube clamp.

## 13. Removal and Replacement of Plug-In Subassembly

a. *Removal.* The plug-in subassemblies of Telephone Repeater AN/TCC-8 are secured to the chassis by captive screws that are usually circled by a black ring. To remove a plug-in subassembly, loosen the captive screws and carefully lift the subassembly partially out of its position. Remove any cables that connect the subassembly to the chassis. Be careful not to damage any parts that may be close to the unit.

b. *Replacement.* The sequence for replacing a plug-in subassembly is the reverse of the removal procedure (a above).

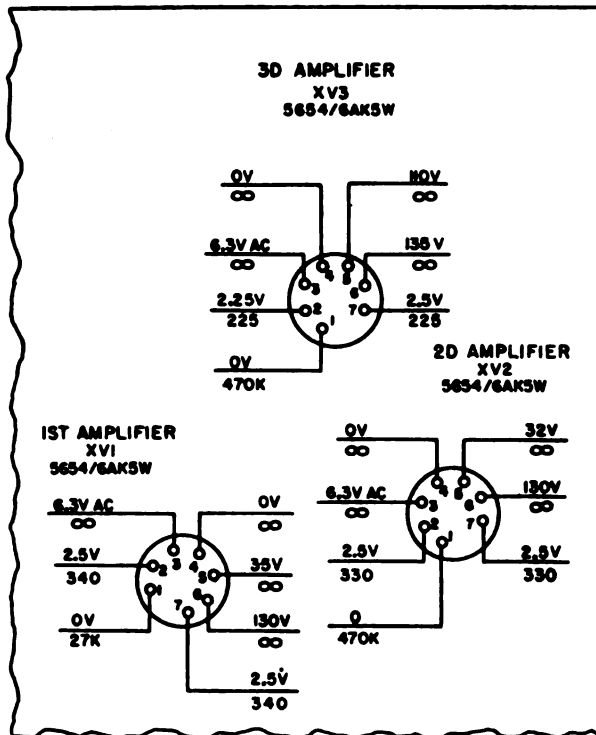


**NOTES:**

1. DO NOT ATTEMPT TO MAKE RESISTANCE MEASUREMENTS WITH POWER ON.
2. VOLTAGE MEASUREMENTS ARE SHOWN ABOVE LINE, RESISTANCE MEASUREMENTS BELOW.
3. DC VOLTAGE MEASUREMENTS ARE TAKEN WITH A 20,000 - OHMS - PER - VOLT METER.
4. ALL MEASUREMENTS ARE MADE FROM TEST POINT TO GROUND (CHASSIS).
5. UNLESS OTHERWISE SHOWN, VOLTAGES ARE DC.

TM2140-20-8

Figure 6. Telephone Test Set TS-761/TCC-8, TEST PANEL, chassis, tube socket voltage and resistance diagram.

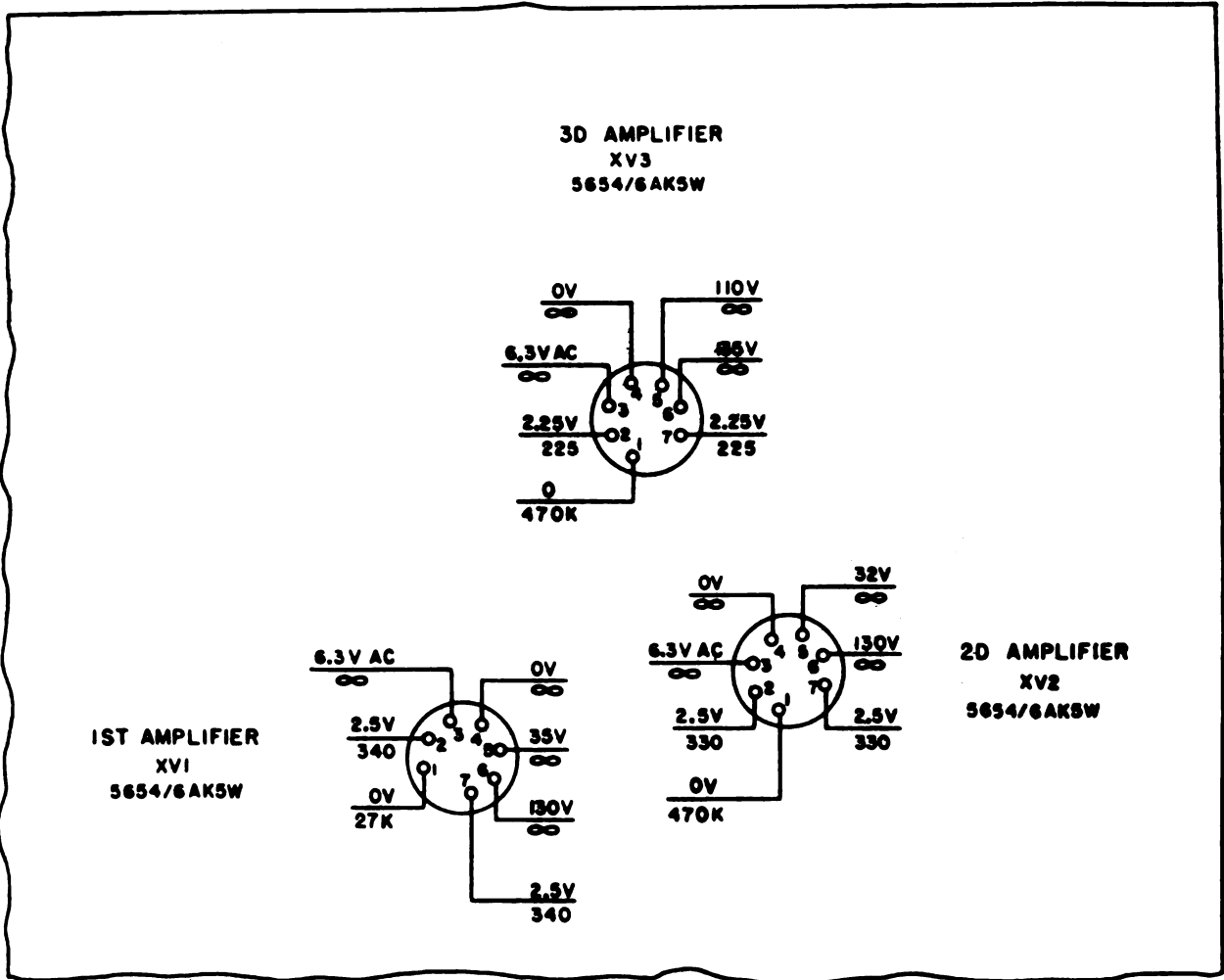


**NOTES:**

1. DO NOT ATTEMPT TO MAKE RESISTANCE MEASUREMENTS WITH POWER ON.
2. VOLTAGE MEASUREMENTS ARE SHOWN ABOVE LINE, RESISTANCE MEASUREMENTS BELOW.
3. DC VOLTAGE MEASUREMENTS ARE TAKEN WITH A 20,000-OHMS-PER-VOLT METER.
4. ALL MEASUREMENTS ARE MADE FROM TEST POINT TO GROUND (CHASSIS).
5. UNLESS OTHERWISE SHOWN, VOLTAGES ARE DC.
6. SUBASSEMBLY IS REMOVED FROM CHASSIS TO MAKE RESISTANCE MEASUREMENTS.

TME40-20-7

Figure 7. Telephone Test Set TS-761/TCC-8, TEST PANEL, 1D amplifier AR1, tube socket voltage and resistance diagram.

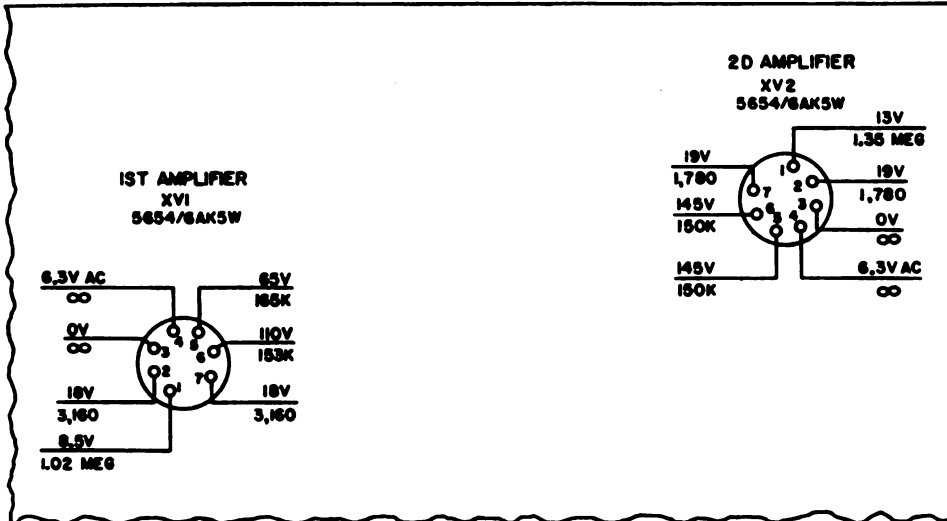


**NOTES:**

1. DO NOT ATTEMPT TO MAKE RESISTANCE MEASUREMENTS WITH POWER ON (SEE NOTE 6).
2. VOLTAGE MEASUREMENTS ARE SHOWN ABOVE LINE, RESISTANCE MEASUREMENTS BELOW.
3. DC VOLTAGE MEASUREMENTS ARE TAKEN WITH A 20,000-OHMS-PER-VOLT METER.
4. ALL MEASUREMENTS ARE MADE FROM TEST POINT TO GROUND (CHASSIS).
5. UNLESS OTHERWISE SHOWN, VOLTAGES ARE DC.
6. PLUG-IN SUBASSEMBLY IS REMOVED FROM CHASSIS TO MAKE RESISTANCE MEASUREMENTS.

TM2140-20-8

Figure 8. Telephone Test Set TS-761/TCC-8, TEST PANEL, flat amplifier AR2, tube socket voltage and resistance diagram.

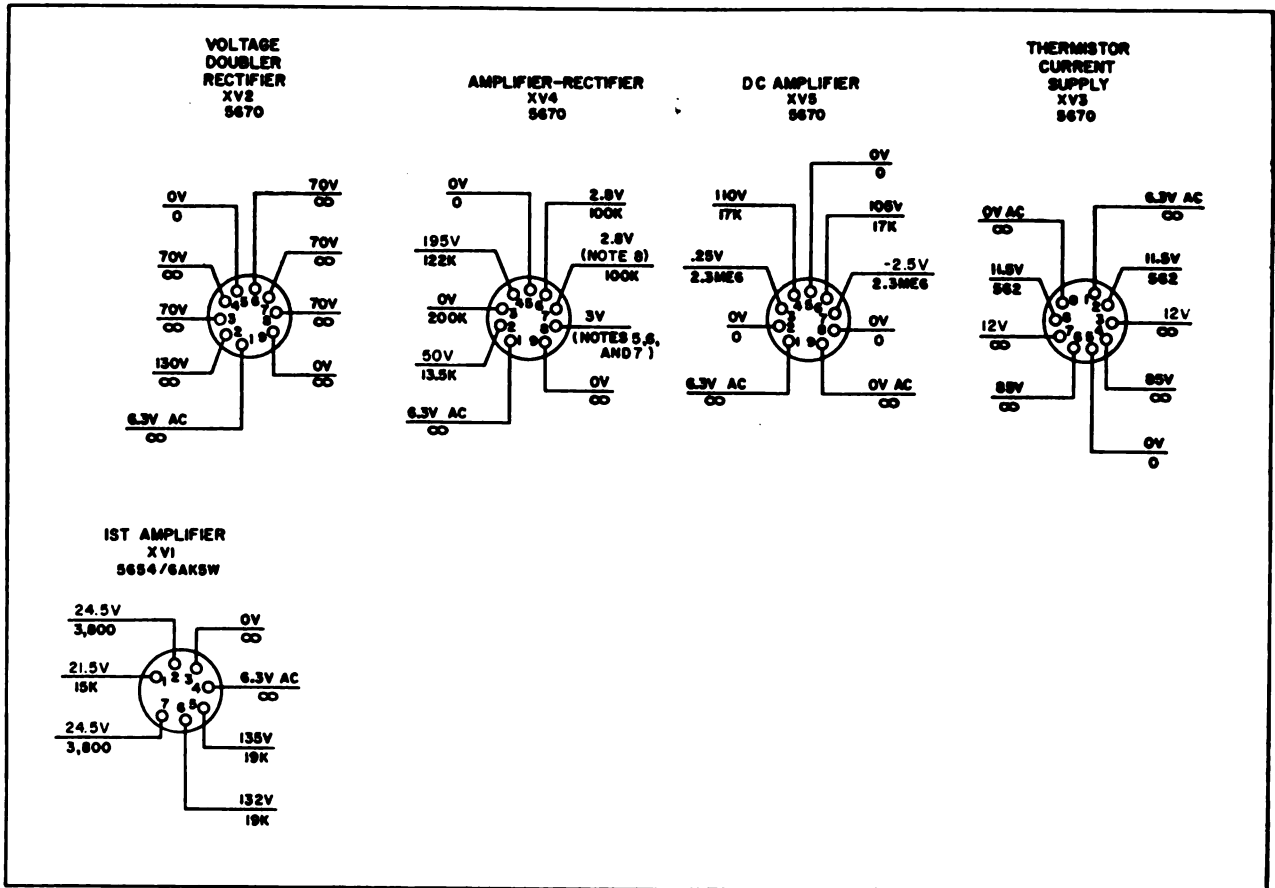


**NOTES:**

1. DO NOT ATTEMPT TO MAKE RESISTANCE MEASUREMENTS WITH POWER ON.
2. VOLTAGE MEASUREMENTS ARE SHOWN ABOVE LINE, RESISTANCE MEASUREMENTS BELOW.
3. DC VOLTAGE MEASUREMENTS ARE TAKEN WITH A 20,000-OHMS-PER-VOLT METER.
4. ALL MEASUREMENTS ARE MADE FROM TEST POINT TO GROUND (CHASSIS).
5. UNLESS OTHERWISE SHOWN, VOLTAGES ARE DC.
6. PLUG-IN SUBASSEMBLY IS REMOVED FROM CHASSIS TO MAKE RESISTANCE MEASUREMENTS.

TM2140-20-9

Figure 9. Amplifier-Pilot Regulator AM-708/TCC-8, REPEATER PANEL, AB amplifier, AR1 or AR2, or BA amplifier, AR3 or AR4, tube socket voltage and resistance diagram.



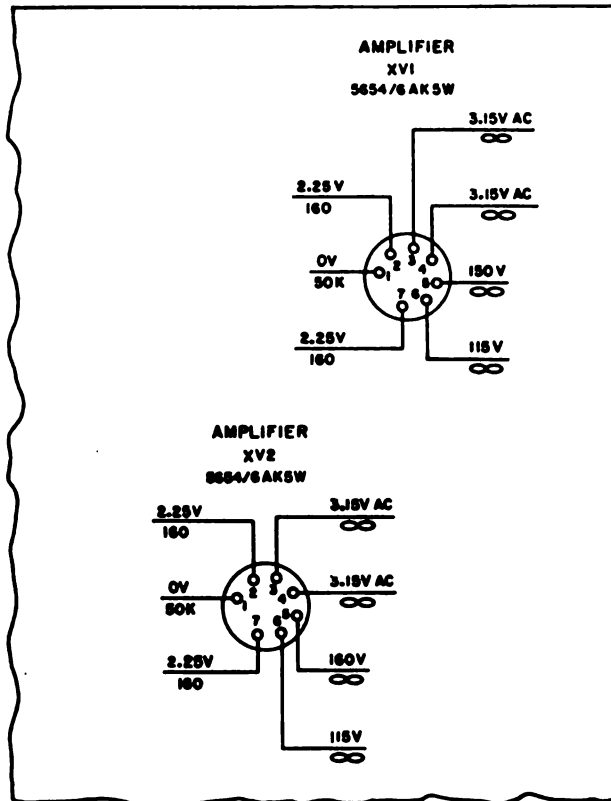
**NOTES:**

1. DO NOT ATTEMPT TO MAKE RESISTANCE MEASUREMENTS WITH POWER ON.
2. VOLTAGE MEASUREMENTS ARE SHOWN ABOVE LINE, RESISTANCE MEASUREMENTS BELOW.
3. DC VOLTAGE MEASUREMENTS ARE TAKEN WITH A 20,000-OHMS-PER-VOLT METER.
4. ALL MEASUREMENTS ARE MADE FROM TEST POINT TO GROUND (CHASSIS).
5. **ALARM TEST** SWITCH IN NORMAL POSITION FOR READING OF 240K.
6. **ALARM TEST** SWITCH IN **[1 HIGH]** POSITION FOR READING OF 10K.
7. **ALARM TEST** SWITCH IN **[2 LOW]** POSITION FOR READING OF 200K.
8. SHORT E16 TO GROUND FOR THIS MEASUREMENT.
9. UNLESS OTHERWISE SHOWN, VOLTAGES ARE DC.
10. SUBASSEMBLY IS REMOVED FROM CHASSIS TO MAKE RESISTANCE MEASUREMENTS.

TME140-20-10

Figure 10. Amplifier-Pilot Regulator AM-708/TCC-8, REPEATER PANEL, plug-in subassembly AB regulator and alarm Z11, or BA regulator and alarm Z12, tube socket voltage and resistance diagram.



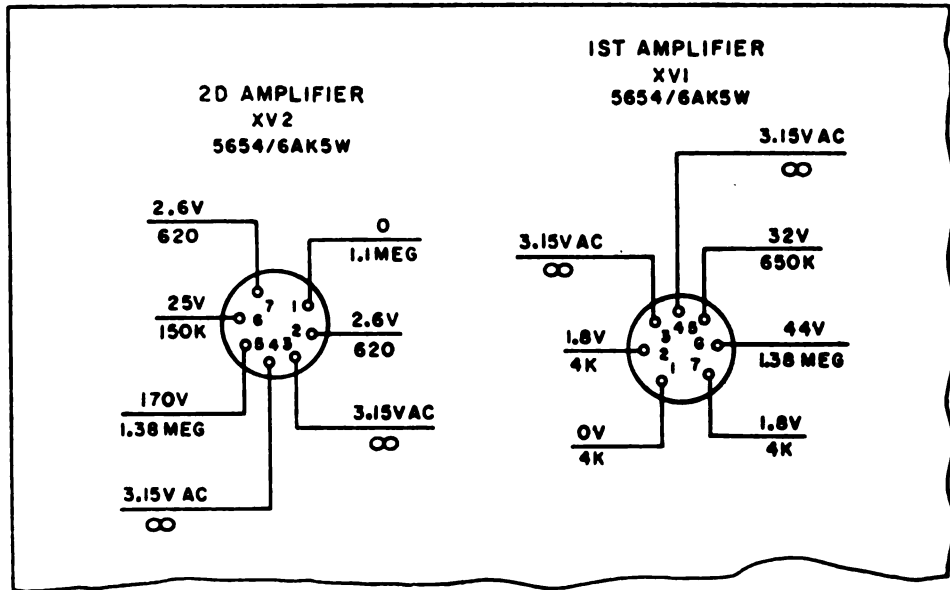


**NOTES:**

1. DO NOT ATTEMPT TO MAKE RESISTANCE MEASUREMENTS WITH POWER ON.
2. VOLTAGE MEASUREMENTS ARE SHOWN ABOVE LINE, RESISTANCE MEASUREMENTS BELOW.
3. DC VOLTAGE MEASUREMENTS ARE TAKEN WITH A 20,000-OHMS-PER-VOLT METER.
4. ALL MEASUREMENTS ARE MADE FROM TEST POINT TO GROUND (CHASSIS).
5. UNLESS OTHERWISE SHOWN, VOLTAGES ARE DC.
6. PLUG-IN SUBASSEMBLY IS REMOVED FROM CHASSIS TO MAKE RESISTANCE MEASUREMENTS.

TM2140-20-11

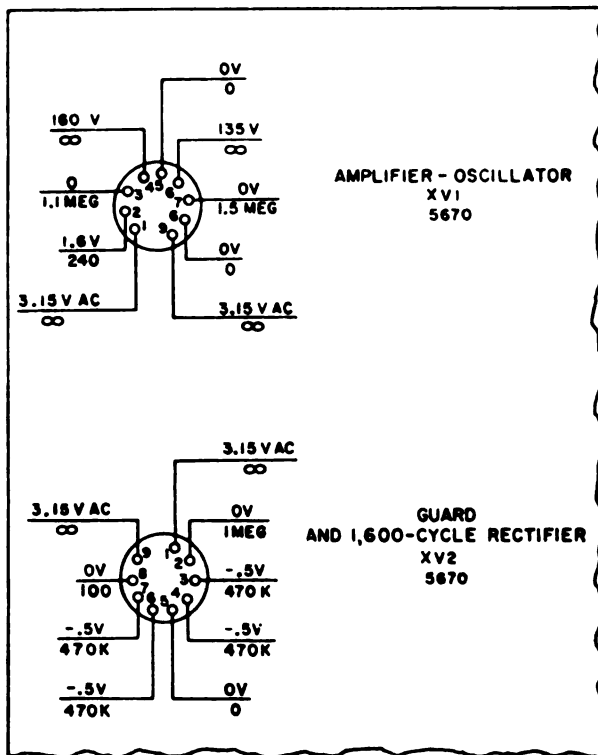
Figure 11. Order Wire Receiver-Transmitter RT-881/TCC-8, ORDER WIRE PANEL, AB transmitting amplifier, AR108 or BA transmitting amplifier, AR104, tube socket voltage and resistance diagram.



**NOTES:**

1. DO NOT ATTEMPT TO MAKE RESISTANCE MEASUREMENTS WITH POWER ON.
  2. VOLTAGE MEASUREMENTS ARE SHOWN ABOVE LINE, RESISTANCE MEASUREMENTS BELOW.
  3. DC VOLTAGE MEASUREMENTS ARE TAKEN WITH A 20,000 -OHMS-PER-VOLT METER.
  4. ALL MEASUREMENTS ARE MADE FROM TEST POINT TO GROUND (CHASSIS).
  5. UNLESS OTHERWISE SHOWN, VOLTAGES ARE DC.
  6. PLUG-IN SUBASSEMBLY IS REMOVED FROM CHASSIS TO MAKE RESISTANCE MEASUREMENTS.
- TM2140-20-12

*Figure 12. Order Wire Receiver-Transmitter RT-281/TCC-8, ORDER WIRE PANEL, AB receiving amplifier, AR101 BA receiving amplifier, or AR103, tube socket voltage and resistance diagram.*



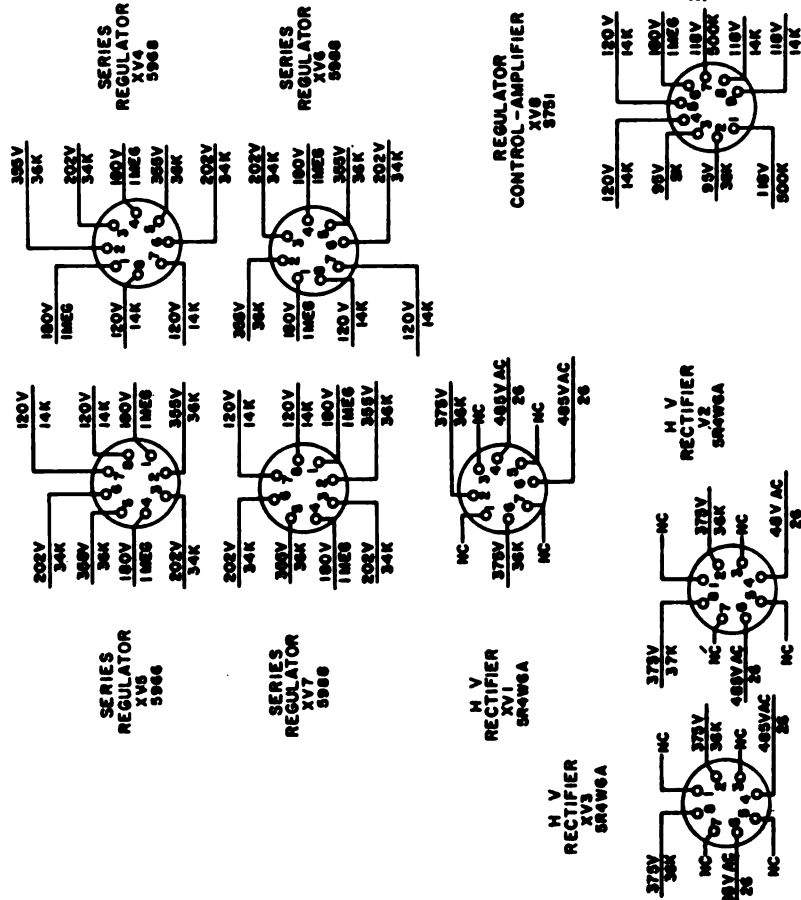
**NOTES:**

1. DO NOT ATTEMPT TO MAKE RESISTANCE MEASUREMENTS WITH POWER ON.
2. VOLTAGE MEASUREMENTS ARE SHOWN ABOVE LINE, RESISTANCE MEASUREMENTS BELOW.
3. DC VOLTAGE MEASUREMENTS ARE TAKEN WITH A 20,000-OHMS-PER-VOLT METER.
4. ALL MEASUREMENTS ARE MADE FROM TEST POINT TO GROUND (CHASSIS).
5. UNLESS OTHERWISE SHOWN, VOLTAGES ARE DC.
6. PLUG-IN SUBASSEMBLY IS REMOVED FROM CHASSIS TO MAKE RESISTANCE MEASUREMENTS.

TM2140-20-13

Figure 13. Order Wire Receiver-Transmitter RT-281/TCC-8, ORDER WIRE PANEL, Ringer-Oscillator Y101, tube socket voltage and resistance diagram.

REAR

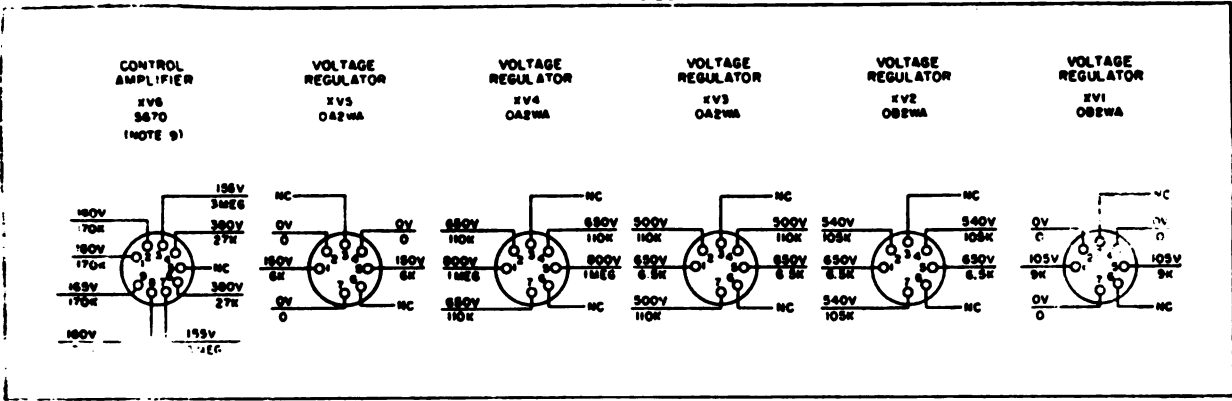


FRONT

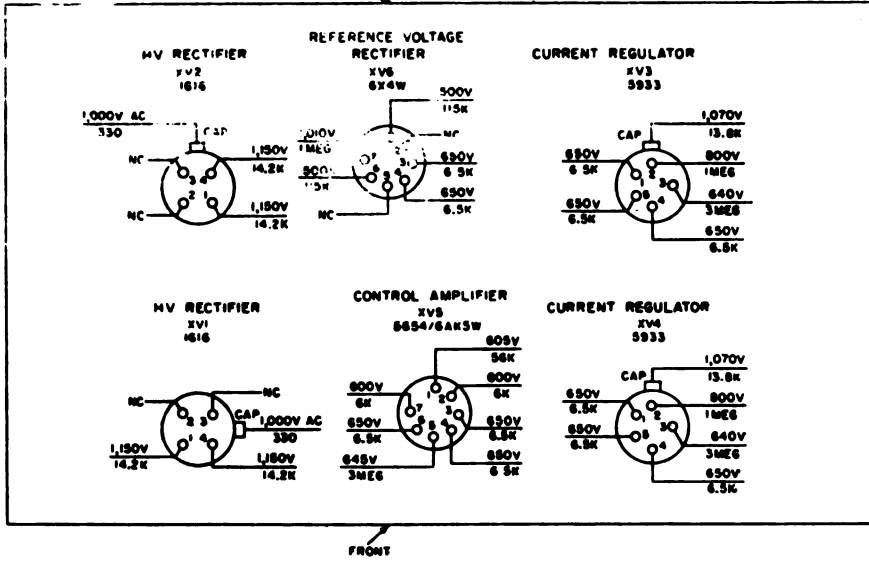
NOTES:

1. DO NOT ATTEMPT TO MAKE RESISTANCE MEASUREMENTS WITH POWER ON.
2. VOLTAGE MEASUREMENTS ARE SHOWN ABOVE LINE, RESISTANCE MEASUREMENTS BELOW.
3. FILAMENT VOLTAGES: 6.4V AC IS MEASURED ACROSS PINS 7 AND 8 OF XV4 THROUGH XV7, AND PINS 4 AND 5 OF XV8; 5V AC IS MEASURED ACROSS PINS 2 AND 6 OF XV1 THROUGH XV3.
4. DC VOLTAGE MEASUREMENTS ARE TAKEN WITH A 20,000-OHMS-PER-VOLT METER.
5. ALL MEASUREMENTS ARE MADE FROM TEST-POINT TO GROUND (CHASSIS).
6. NC INDICATES NO CONNECTION.
7. UNLESS OTHERWISE SHOWN, VOLTAGES ARE DC.
8. CONNECTOR [TO REPEATER PAN] IS CONNECTED TO [REPEATER PANEL] FOR ALL RESISTANCE MEASUREMENTS.

Figure 14. Power Supply PP-887/U, 500-VOLT POWER SUPPLY, tube socket voltages and resistance diagram. TMR140-80-14



600 VOLT POWER SUPPLY PANEL  
REAR (NOTE 8)



FRONT

NOTES

- 1 ALL VOLTAGES AND RESISTANCES ARE SAME FOR POWER SUPPLIES PP-826/U AND PP-826A/U
- 2 VOLTAGE AND RESISTANCE READINGS TAKEN WITH LOW VOLTAGE RECTIFIER AND ALARM PLUGGED INTO 600 VOLT POWER SUPPLY PANEL THE **REPAIR** SWITCH ON THE POWER SUPPLY PANEL IS IN **TEST** POSITION
- 3 DO NOT MAKE RESISTANCE MEASUREMENTS WITH POWER ON
- 4 VOLTAGE MEASUREMENTS ARE SHOWN ABOVE LINE, RESISTANCE MEASUREMENTS BELOW
- 5 UNLESS OTHERWISE SHOWN, VOLTAGES ARE DC
- 6 DC VOLTAGE MEASUREMENTS ARE TAKEN WITH A 20,000-OHMS-PER-VOLT METER
- 7 EXCEPT AS INDICATED IN NOTES 8 AND 9, ALL MEASUREMENTS ARE MADE FROM TEST POINT TO GROUND (CHASSIS)
- 8 FILAMENT VOLTAGES FOR TUBE SOCKETS OF 600 VOLT POWER SUPPLY PANEL ARE AS FOLLOWS 6.4V AC ACROSS PINS 1 AND 5 OF XV3 AND XV4, AND ACROSS PINS 3 AND 4 OF XV5 AND XV6, USE CAUTION WHEN MEASURING 2.5V AC ACROSS PINS 1 AND 4 OF XVI AND XV2 (A HIGH DC POTENTIAL EXISTS BETWEEN PIN 1 AND GROUND AND BETWEEN PIN 4 AND GROUND)
- 9 FILAMENT VOLTAGE MEASURE 6.4V AC ACROSS PINS 1 AND 9
- 10 NC DENOTES NO CONNECTION

TME40-20-15

Figure 15. Power Supply PP-826(\*)/U, 600-VOLT POWER SUPPLY, tube socket voltage and resistance diagram.

## BLOCK DIAGRAM THEORY OF TELEPHONE REPEATER AN/TCC-8

**14. General**

a. Telephone Repeater AN/TCC-8 is used as an attended intermediate equipment in a carrier communication system (TM 11-2150, Telephone Carrier System Using Telephone Terminal AN/TCC-7, Telephone Repeater AN/TCC-8 (AN/TCC-21), Telephone Repeater AN/TCC-11, and Telephone Test Set TS-712/TCC-11). The system provides facilities for two-way transmission of 12 carrier channels and an order-wire channel over nonloaded spiral-four cable and/or radio systems for distances up to approximately 200 miles. The terminal equipment (Telephone Terminal AN/TCC-7) translates 12 voice-frequency (vf) channels into carrier frequency channels for transmission over the spiral-four cable. At the repeater (fig. 16) the carrier channels and the order-wire channel are amplified and adjusted in the REPEATER PANEL (par. 15) before they are transmitted to the next station in the system. The ORDER WIRE PANEL (par. 16) contains circuits for ringing, talking, and listening to attended points in the carrier communication system. The TEST PANEL (par. 17) contains circuits for testing and for supplying test and pilot frequencies. The 200-VOLT POWER SUPPLY furnishes power to the components of the AN/TCC-8, and the 600-VOLT POWER SUPPLY furnishes power over the spiral-four cable to the unattended repeaters in the power loop (TM 11-2140-10).

b. Test jacks, for use during initial adjustments, tests, and system lineup (TM 11-2140-10), and for use by maintenance personnel in localizing troubles to a defective panel or subassembly, are located on the front panel of the following components:

ORDER WIRE PANEL.

TEST PANEL.

REPEATER PANEL.

600-VOLT POWER SUPPLY (chassis only).

200-VOLT POWER SUPPLY (chassis only).

**15. Amplifier-Pilot Regulator AM-708/TCC-8**

(fig. 16)

**a. Carrier Channels.**

(1) *AB direction.* The twelve carrier channels and order-wire channel, are applied to

spiral-four cable connector A, J1. From the spiral-four cable connector, the signals are applied to the AB input and equalizing circuits. The twelve carrier channels are separated from the order-wire channel (*b* below) by a low-pass filter. The carrier channels pass through a high-pass filter (located in the AB input and equalizer circuits) to AB amplifier 1, AR1. The amplified signals are then applied to AB regulating and equalizing circuits. The regulating circuits, in conjunction with AB regulator and alarm Z11, maintain the signal output level relatively constant, regardless of the input level variation. After the signals are amplified in AB amplifier 2 AR2, they pass to the AB output circuits. In the output circuits the order-wire channel (*b* below) joins the twelve carrier channels through a low-pass filter. The carrier channels, test signals (*c* below), order-wire channel, and power from 600-VOLT POWER SUPPLY (*d* below) are applied to the spiral-four cable connector B, J2; and then to the spiral-four cable to the next station.

(2) *BA direction.* The twelve carrier channels order-wire channel are applied to spiral-four cable connector B, J2. From the spiral-four cable connector, the signals are applied to the BA input and equalizing circuits. The twelve carrier channels are separated from the order-wire channel (*b* below) by a low-pass filter. The carrier channels pass through a high-pass filter (located in the BA input and equalizer circuits) to BA amplifier 1, AR3. The amplified signals are then applied to BA regulating and equalizing circuits. The regulating circuits, in conjunction with BA regulator and alarm Z12, maintain the signal output level relatively constant, regardless of the input level variation. After the signals are amplified in BA amplifier 2, AR4, they pass to the BA output circuits. In the output circuits the order-wire channel (*b* below) joins the twelve carrier

channels through a low-pass filter. The carrier channels, test signals (*c* below), order-wire channel, and power from 600-VOLT POWER SUPPLY (*d* below) are applied to the spiral-four cable connector A, J1; and then to the spiral-four cable to the next station.

*b. Order-Wire Channel.* By using Handset HS101, communication in both directions ((1) and (2) below) is possible over the order-wire channel.

(1) *AB direction.* The order-wire channel, separated from the carrier channels (*a*(1) above), is applied to the ORDER WIRE PANEL AB input circuit through a low-pass filter. From the ORDER WIRE PANEL AB output circuit the amplified, regulated, and equalized order-wire channel is applied to the AB output circuit in the REPEATER PANEL through a low-pass filter.

(2) *BA direction.* The order-wire channel, separated from the carrier channels (*a*(2) above) is applied to the ORDER WIRE PANEL BA input circuit through a low-pass filter. From the ORDER WIRE PANEL BA output circuit the amplified, regulated, and equalized order-wire channel is applied to the BA output circuit in the REPEATER PANEL through a low-pass filter.

*c. Test Frequencies.* Test frequencies from the TEST PANEL are applied to the input of AB amplifier 1, AR1, for transmission in AB direction and to the input of BA amplifier 1, AR3, for transmission in the BA direction. The amplified test frequencies are passed through the system. Test signal frequencies are measured by connecting the measure cord on plug to the test jacks (par. 14*b*).

*d. Power Supplies.* Power from one 600-VOLT POWER SUPPLY (par. 18) is applied through repeating coils to the spiral-four cable connector A, J1 for transmission in the BA direction; power from the other 600-VOLT POWER SUPPLY is applied through repeating coils to the spiral-four cable connector B, J2 for transmission in the AB direction. Power from the 200-VOLT POWER SUPPLY is applied to all panels.

## 16. Order Wire Receiver-Transmitter RT-281/TCC-8 (fig. 17)

The ORDER WIRE PANEL provides facilities for transmitting, receiving, and regulating signals

in a vf band from 300 cycles per second (cps) to 1,700 cps in the AB and BA directions. Handset HS101, supplied with the ORDER WIRE PANEL, provides for voice transmission communication in both directions at the same time over the order-wire circuit to terminals in the system, other attended repeaters and unattended repeaters. Ringer-Oscillator Y101 provides for ringing, in both directions at the same time, the terminals and other attended repeaters, and for receiving a ringing signal from the terminals, other attended and unattended repeaters.

### *a. Through Transmission Circuits.*

(1) *AB direction.* Vf ringing and speech signals from the REPEATER PANEL (AB input) pass through AB receiving amplifier, AR101, attenuator and equalizing circuits, AB transmitting amplifier, AR102, low-pass filter FL101, to the REPEATER PANEL (AB output). Incoming vf ringing signals (1,600 cps) pass to Ringer-Oscillator Y101 (*c* below). Incoming speech signals pass to Handset HS101 (*b* below).

(2) *BA direction.* Vf ringing and speech signals from the REPEATER PANEL (BA input) pass through BA receiving amplifier, AR103, attenuator and equalizing circuits, BA transmitting amplifier, AR104, low-pass filter FL102, to the REPEATER PANEL (BA output). Incoming vf ringing signals (1,600 cps) pass to Ringer-Oscillator Y101 (*c* below). Incoming speech signals pass to Handset HS101 (*b* below).

*b. Handset Circuit.* With the HS101 butterfly switch operated, transmitting by the repeater attendant is accomplished over the order-wire circuit in both the AB and the BA direction at the same time. Receiving is accomplished without the operation of the switch.

(1) *Transmitting.* Speech signals from the transmitter of Handset HS101 pass through RING switch S102 (nonoperated), and hybrid coil T101, to both AB receiving amplifier, AR101 and BA receiving amplifier, AR103. The signal is then amplified and applied to the REPEATER PANEL (par. 14*a*) in the AB and BA output direction (fig. 16).

(2) *Receiving.* Speech signals from the REPEATER PANEL in the AB direction are applied to AB receiving amplifier

AR101. The signal is then amplified and applied to the receiver of Handset HS101. Speech signals from the REPEATER PANEL in the BA direction are applied to BA receiving amplifier, AR103. The signal is then amplified and applied to the receiver of Handset HS101.

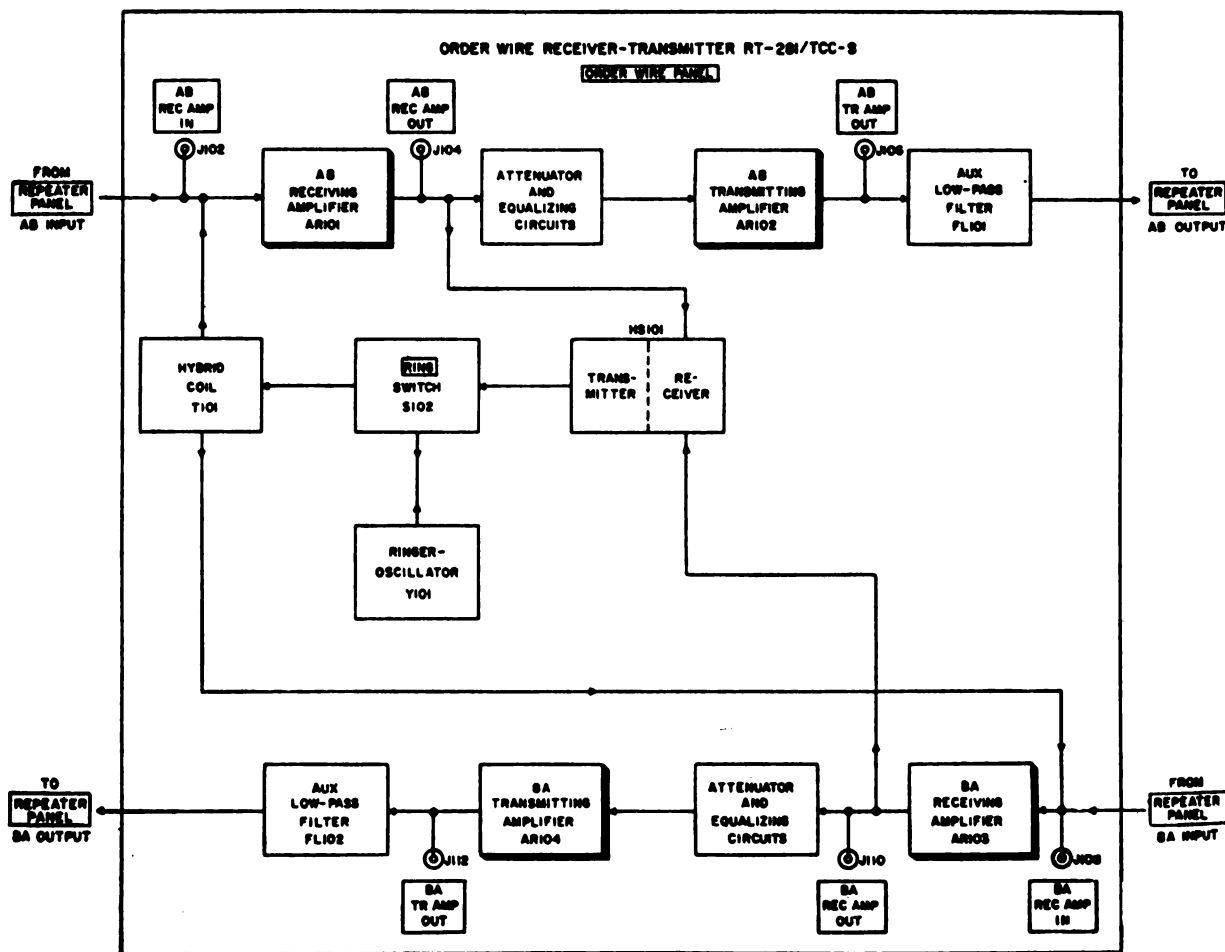
*c. Ringer-Oscillator Circuit.*

- (1) *Ringer circuit (receiving).* With RING switch S102 in the nonoperated position, Ringer-Oscillator Y101 is connected to amplify and rectify incoming (both AB and BA directions) ringing signal (1,600 cps). The incoming signal causes visual and audible signals. Guard circuits are provided in Ringer-Oscillator Y101 to reduce the probability of false operation from speech signals or from noise.
- (2) *Oscillator circuit (transmitting).* With RING switch S102 in the ON position, the

output (1,600 cps) of Ringer-Oscillator Y101 is applied through RING switch S102 to both AB receiving amplifier, AR101 and BA receiving amplifier, AR103. The signal is then amplified and applied to the REPEATER PANEL (par. 15).

**17. Telephone Test Set TS-761/TCC-8 (fig. 18)**

The TEST PANEL contains circuits for making direct-current (dc) voltage measurements and selective and nonselective signal frequency measurements at various points in the transmitting and receiving circuits of the repeater. A measure cord and plug is provided to connect the circuit to be tested to the TEST PANEL meter circuit. These measurements are made without disturbing the operation of the system. The test oscillator generates frequencies that are used for calibration of the selective measuring circuits, system lineup, system modula-



NOTE:  
SHADED BOXES INDICATE PLUG-IN SUBASSEMBLIES

1 MB-40-20-17

Figure 17. Order Wire Receiver-Transmitter RT-281/TCC-8, ORDER WIRE PANEL, simplified block diagram.



tion tests, and for locating troubles in the repeater and in the system.

*a. Selective Measurements.* Where a frequency must be chosen for test, and in an operating system where speech and other disturbances interfere with precise measurement, selective measurements are necessary. With MEASURE NON-SELECTIVE switch S7 in OFF position and MEASURE SELECTIVE switch S6 in an operated position (other than OFF), signals from the test jacks are applied through the measure plug and cord, MEASURE NON-SELECTIVE switch S7, MEASURE SELECTIVE switch S6, the modulator circuit and the carrier oscillator circuit to intermediate-frequency (IF) amplifier AR1. The signal under test is amplified by IF amplifier AR1 and applied to flat amplifier AR2. The test signal is further amplified by flat amplifier AR2 and, after being rectified, applied to meter M1.

*b. Nonselective Measurements.* When speech and other disturbances do not interfere with measurements, nonselective measurements are made. With MEASURE SELECTIVE switch S6 in OFF position, and MEASURE NON-SELECTIVE switch S7 in an operated position (other than OFF), signals

from the test jacks are applied through the measure plug and cord, MEASURE NON-SELECTIVE switch S7 to flat amplifier AR2. The signal under test is amplified by a fixed amount and, after being rectified, applied to meter M1.

*c. Test Frequencies.* The test oscillator supplies 65-, 68-, 83-, 91-, and 99-kc signals. These signals are sent through SEND DIRECTION switch S3 to the REPEATER PANEL (fig. 16) and then through the repeater in either the AB or the BA direction depending on the position of the SEND DIRECTION switch. The test frequencies can also be sent to Telephone Test Set TS-712/TCC-11.

## 18. Power Supplies

(fig. 16)

*a. Power Supply PP-827/U.* The 200-VOLT POWER SUPPLY panel provides regulated dc plate and screen voltages, and ac filament and indicator lamp voltages for the following components of the repeater: REPEATER PANEL, TEST PANEL, and ORDER WIRE PANEL. In addition, negative 10 volts is supplied to the ORDER WIRE PANEL for both Handset HS101 transmitter and bias in the Ringer-Oscillator Y101. The input

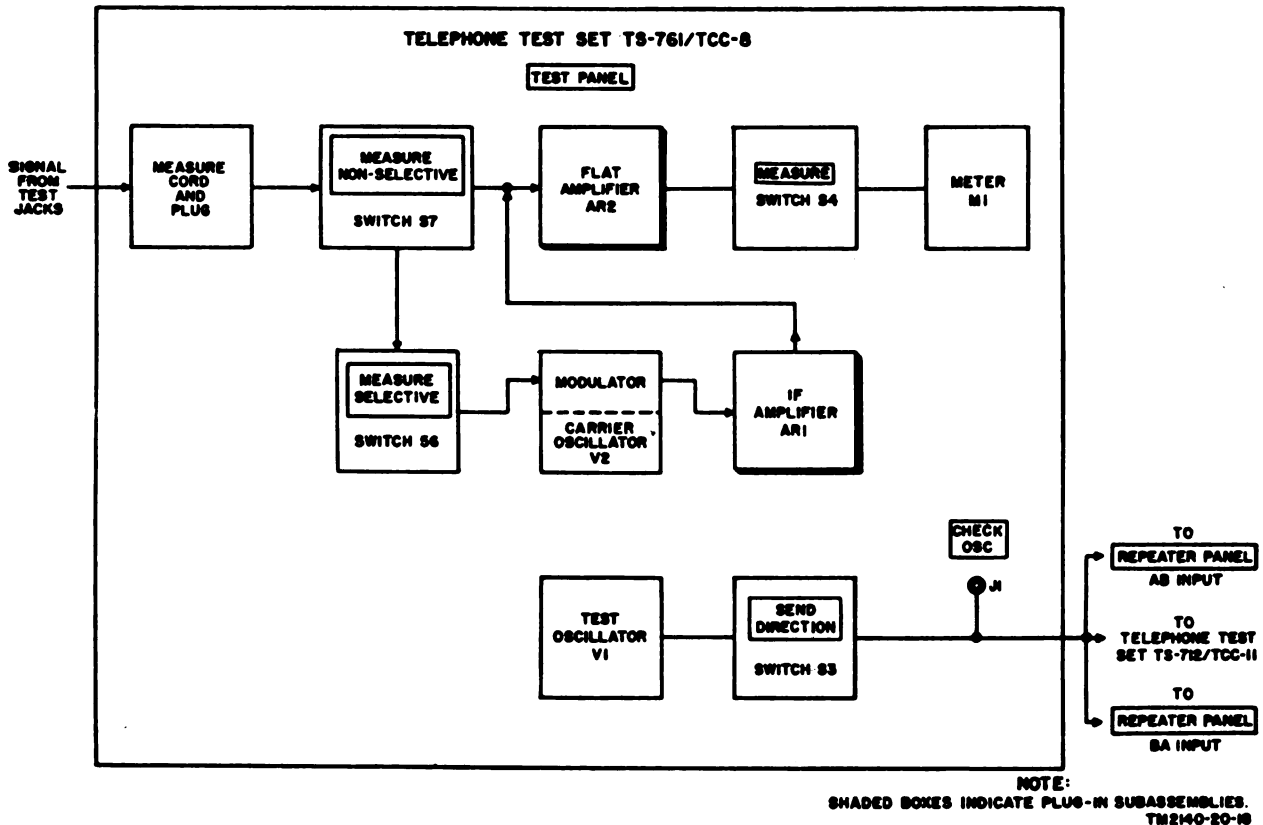


Figure 18. Telephone Test Set TS-761/TCC-8, TEST PANEL, simplified block diagram.

voltages for the 200-VOLT POWER SUPPLY may be 115 or 230 volts ac.

b. *Power Supply PP-826(\*)/U*. The 600-VOLT POWER SUPPLY provides a regulated current of .1 ampere dc at a nominal 600 volts for one, two, or three Telephone Repeaters AN/TCC-11. Provisions are made through the use of dummy load

resistors in the 600-VOLT POWER SUPPLY to compensate for a load when less than three repeaters are used. The output of the 600-VOLT POWER SUPPLY is applied through the REPEATER PANEL (par. 15d) to the nonloaded spiral-four cable.

## CHAPTER 4

### SHIPMENT AND LIMITED STORAGE

#### 19. Repacking for Shipment or Limited Storage

*Note.* For information pertaining to disassembly of Telephone Repeater AN/TCC-8 and Telephone Repeater AN/TCC-21, refer to TM 11-2140-10.

The exact procedure for repackaging depends on the material available and the conditions under which the equipment is to be shipped or stored. Adopt the procedure outlined below whenever possible. The information concerning the original packaging (TM 11-2140-10) will also be helpful.

#### 20. Material Requirements

The following materials are required for packaging Telephone Repeater AN/TCC-8 and Telephone Repeater AN/TCC-21. For stock numbers of materials, refer to SB 38-100, Preservation, Packaging and Packing Materials, Supplies, and Equipment Used in the Army.

Material	Quantity	
	AN/TCC-8	AN/TCC-21
Single-faced corrugated paper.....	200 sq ft	270 sq ft
Gummed paper tape.....	90 ft	110 ft
Pressure-sensitive tape.....	80 ft	90 ft
Steel strapping.....	65 ft	95 ft
Waterproof barrier material.....	185 sq ft	335 sq ft
Wooden shipping boxes.....	5 each	6 each
Modified shipping box with 2 x 10 skids (for PE-75-( )).		1 each

#### 21. Packaging

##### a. Telephone Repeater AN/TCC-8.

- (1) *Technical manuals.* Package each technical manual within a bag made from waterproof barrier material. Seal the seams of the bag with pressure-sensitive tape.
- (2) *Pluck-out items.* Check to see that all tubes with their tube shields and clamps are tight and in place; extension cables (par. 4a) and schematic diagrams are in place and clamped; all transit cases snap catches on the covers are locked.
- (3) *Spare parts.* Package loose spare parts individually within corrugated paper. Se-

cure the wrapping with gummed paper tape.

- (4) *Stowage within transit case.* Stow the items packaged in (3) above within the appropriate transit case.
- (5) *Transit cases.* Cushion each transit case on all surfaces with pads fabricated of corrugated paper. Secure the cushioning material with gummed paper tape.

b. *Telephone Repeater AN/TCC-21.* Package the PE-75-( ) and associated components as outlined in (1) through (6) below. Package the AN/TCC-8 components as outlined in a above. Refer to TM 11-900 or TM 11-900A for instructions on removal of oil, gasoline, rust prevention, etc., before proceeding to package the power unit.

- (1) *Technical manuals.* Package each technical manual (TM 11-900 or TM 11-900A) within a bag fabricated of waterproof barrier material. Seal the seams of the bag with pressure-sensitive tape.
- (2) *Spare parts and tools.* Package all electro-mechanical, combustion engine spare parts, and all hand tools individually within corrugated paper. Secure the wrapping with gummed paper tape.
- (3) *Stowage.* Stow the items packaged in (2) above within the power unit tool box to its maximum capacity. Fill all voids with corrugated paper to prevent shifting. Secure the tool box lid with its fasteners.
- (4) *Consolidated package.* Consolidate all items, that remain after filling the tool box, within a wrap of corrugated paper. Secure the wrapping with gummed paper tape.
- (5) *PE-75-( ).* The PE-75-( ) is bolted on the flat wooden base (reinforced with skids). After the mounting bolts are installed, the unit is covered with the waterproof barrier material. Packing is done by letting the shipping box down over the unit and nailing it to the base (par. 22b(2)).
  - (a) Secure the consolidated package ((4) above) to the power unit.
  - (b) Cushion all the sharp projections with

- pads of corrugated paper and secure with pressure-sensitive tape.
- (c) Drill mounting holes through the wooden base to match the mounting holes in the skids of the power unit.
  - (d) Put a layer of waterproof barrier material across the wooden base and leave enough overlap to be wrapped around the power unit base.
  - (e) Insert suitable size and style bolts through the mounting hole box skids, and power unit base.
  - (f) Mount the power unit on the wooden base and secure it by using lockwashers and nuts on the bolts.
  - (g) Secure the overlapping waterproof barrier material ((d) above) around the base of the power unit with pressure-sensitive tape.
  - (h) Cover the power unit with a shroud of waterproof barrier material. Secure the material around the base with pressure-sensitive tape.
- (6) *Miscellaneous items.* Package Junction Box JB-110, Junction Box J-85-G, Clamp TM-106, and Cord CO-711 separately within a wrap of corrugated paper. Secure the wrapping with gummed paper tape. Ground Rod MX-148G is not packaged.

## 22. Packing

### a. Telephone Repeater AN/TCC-8.

- (1) *Waterproof liner.* Line each wooden shipping box with waterproof barrier material. Seal all seams of the waterproof barrier material with pressure-sensitive tape.
- (2) *Shipping boxes.* Place each packaged transit case within its wooden shipping box (par. 21a(5)). Before sealing the top seam

of the waterproof liner with pressure-sensitive tape, fill all voids with corrugated paper to prevent movement. Secure the packaged technical manuals (par. 21a(1)) between the contents and the lid of the box before nailing down the lid.

- (3) *Strapping.* When packed for intertheater shipment, apply steel strapping girthwise to reinforce the shipping boxes.
- (4) *Marking.* Mark each shipping box in accordance with the requirements of Military Standard, Marking for Shipment and Storage, MIL-STD-129A.

b. *Telephone Repeater AN/TCC-21.* Pack the PE-75-( ) and power distribution accessories as outlined in (1) through (5) below. Pack the AN/TCC-8 components as outlined in a above.

- (1) *Waterproof liner.* Line the wooden shipping box for the miscellaneous items with waterproof barrier material. Seal all seams of the waterproof barrier material with pressure-sensitive tape.
- (2) *Shipping boxes.* Place the miscellaneous items (par. 21b(6)) within its wooden shipping box. Before sealing the top seam of the waterproof liner with pressure-sensitive tape, fill all voids with corrugated paper to prevent movement. Mount and nail down the box cover of the power unit on the base with the skids.
- (3) *Strapping.* When packed for intertheater shipment, apply steel strapping girthwise to reinforce the shipping boxes.
- (4) *Marking.* Mark each shipping box in accordance with the requirements of Military Standard Marking for Shipment and Storage, MIL-STD-129A.
- (5) *Ground rod.* Attach a tag to the ground rod to associate it with the AN/TCC-21.

# APPENDIX

## REFERENCES

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Following is a list of references applicable and available to the organizational maintenance man of Telephone Repeater AN/TCC-8 and Telephone Repeater AN/TCC-21:

- TM 11-381.....Cable Assembly CX-1065/G, Telephone Cable Assemblies CX-1606/G and CX-1512/U, and Telephone Loading Coil Assembly CV-260/G.
- TM 11-687.....Radio Set AN/TRC-24, Radio Terminal Set AN/TRC-35, and Radio Relay Set AN/TRC-36.
- TM 11-900.....Power Units PE-75-C, -D, -J, -K, -P, -S, -T, -U, -W, -AA, -AB, -AC, and -AE.
- TM 11-900A....Power Unit PE-75-AF.
- TM 11-2139....Telephone Terminal AN/TCC-7.
- TM 11-2140-10 Telephone Repeater AN/TCC-8 and Telephone Repeater AN/TCC-21, Operator's Manual.
- TM 11-2143....Telephone Test Set TS-712/TCC-11.
- TM 11-2148....Telephone Repeater AN/TCC-11.
- TM 11-2150....Telephone Carrier Systems Using Telephone Terminal AN/TCC-11, Telephone Repeater AN/TCC-8 (AN/TCC-21), Telephone Repeater AN/TCC-11, and Telephone Test Set TS-712/TCC-11.

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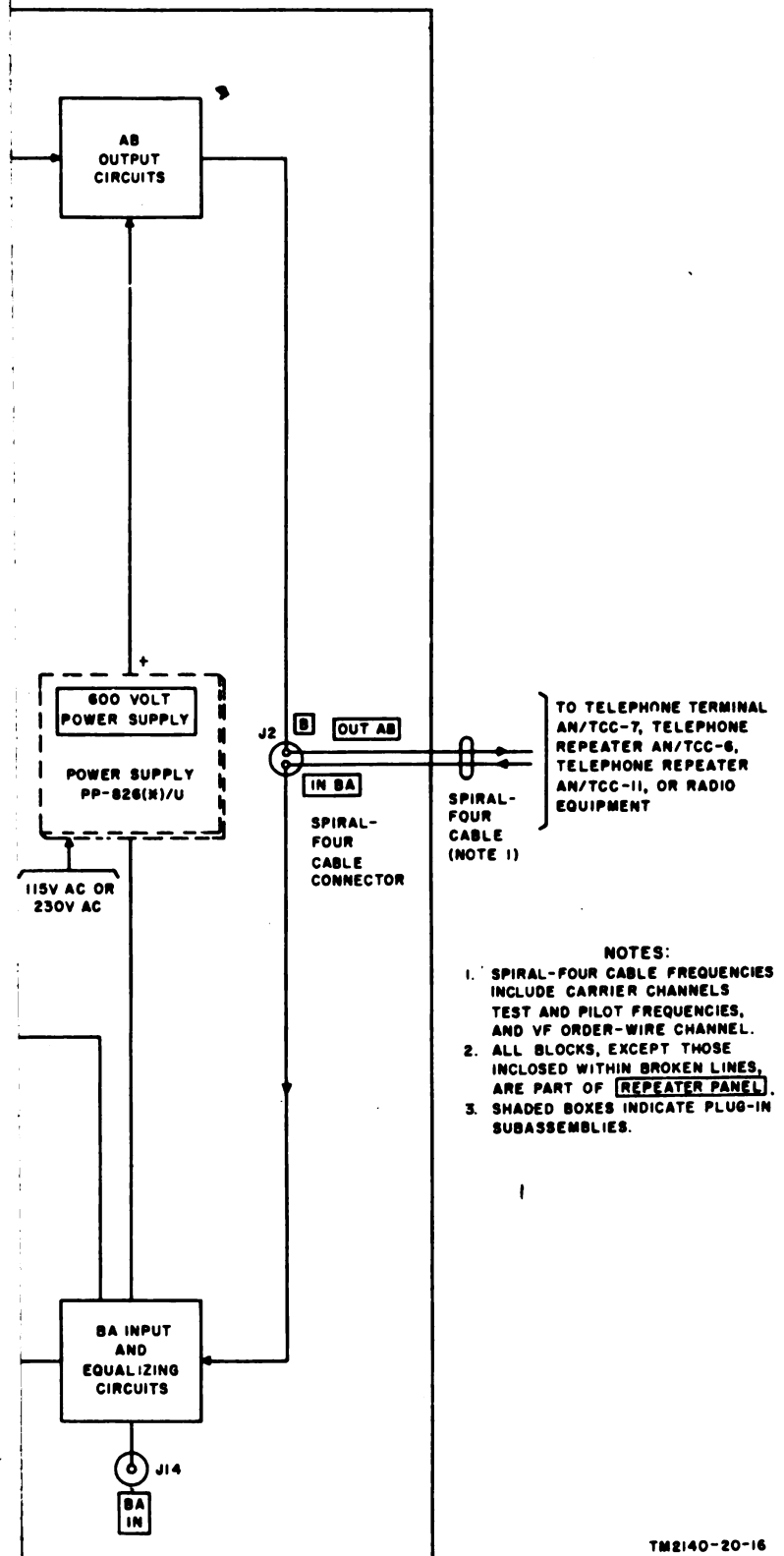
CNGB  
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USA Armor Bd  
USA Armor Bd Test Sec  
USA Inf Bd  
USA Air Def Bd  
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USA Sig Comm Engr Agcy  
USA Elct PG  
USA Sig Pub Agcy  
USA Sig Eqp Spt Agcy  
USA White Sands Sig Agcy  
Yuma Test Sta  
Ports of Emb (OS)  
Trans Terminal Comd  
Army Terminals  
OS Sup Agcy  
Sig Fld Maint Shops  
Sig Lab  
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NG: State AG; units—same as Active Army.

USAR: None.

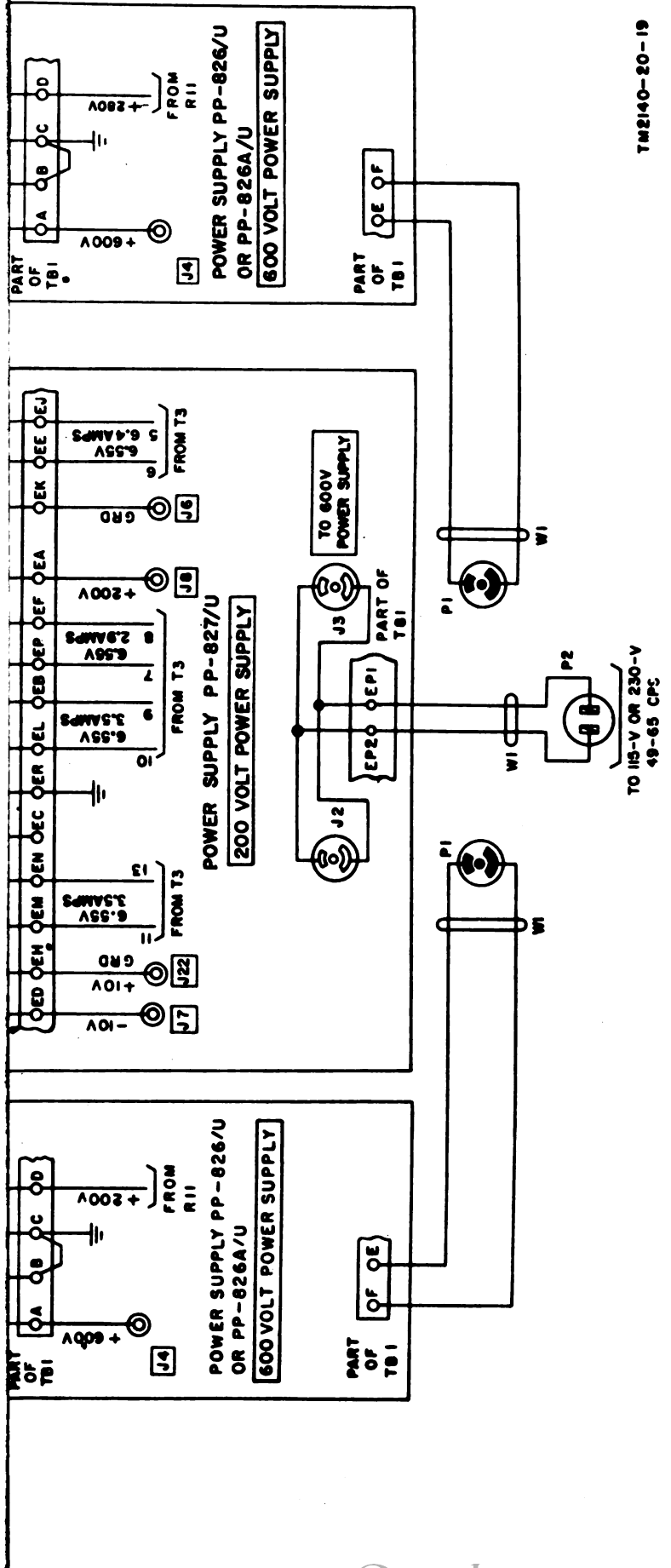
For explanation of abbreviations used, see AR 320-50.



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