TM 11-5090

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

MULTIMETER

AN/PRM-15

DEPARTMENT OF THE ARMY • SEPTEMBER 1955

TECHNICAL MANUAL

MULTIMETERS AN/PRM–15 AND AN/PRM–15X

TM 11–5090
CHANGES NO. 1

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *20 June 1957*

TM 11–5090, 27 September 1955, is changed as follows.

The manual is changed as indicated so that it also applies to all equipment procured on Orders No. 10654–Phila–55 and 30982–Phila–57.

The title is changed to: **MULTIMETERS AN/PRM–15 AND AN/PRM–15X.**

Add "or AN/PRM–15X" after "Multimeter AN/PRM–15" in the following places:

Page 3, paragraph 1, line 2.
Page 3, paragraph 3, line 1.
Page 4, paragraph 4, line 1.
Page 4, paragraph 5*b*, line 2.
Page 5, paragraph 6, line 1 in component column.
Page 5, figure 2, caption.
Page 5, paragraph 7, heading.
Page 5, paragraph 7*a*, line 1.
Page 6, figure 3, caption.
Page 7, paragraph 8, line 2.
Page 8, paragraph 10*a*, line 1.
Page 13, paragraph 18, line 2.
Page 15, paragraph 23*a*, line 2.
Page 16, paragraph 26*b*, line 2.
Page 17, figure 4, under "EQUIPMENT NOMENCLATURE".
Page 18, figure 5, under "EQUIPMENT NOMENCLATURE".
Page 19, paragraph 28, line 1.
Page 19, paragraph 29*a*, line 1.
Page 32, paragraph 40, line 2.
Page 33, paragraph 41, chart, line 1.
Page 33, paragraph 41, chart, line 3.
Page 33, paragraph 41, chart, line 4.
Page 39, paragraph 46, line 3.
Page 39, paragraph 47, line 1.

Page 40, paragraph 48, line 3.
Page 42, paragraph 49, line 2.

Add "or Power Supply PP–713/PRM–15X" after "Battery Power Supply PP–1247/PRM–15," in the following places:

Page 4, paragraph 4, line 3.
Page 5, paragraph 7*a*, line 4.

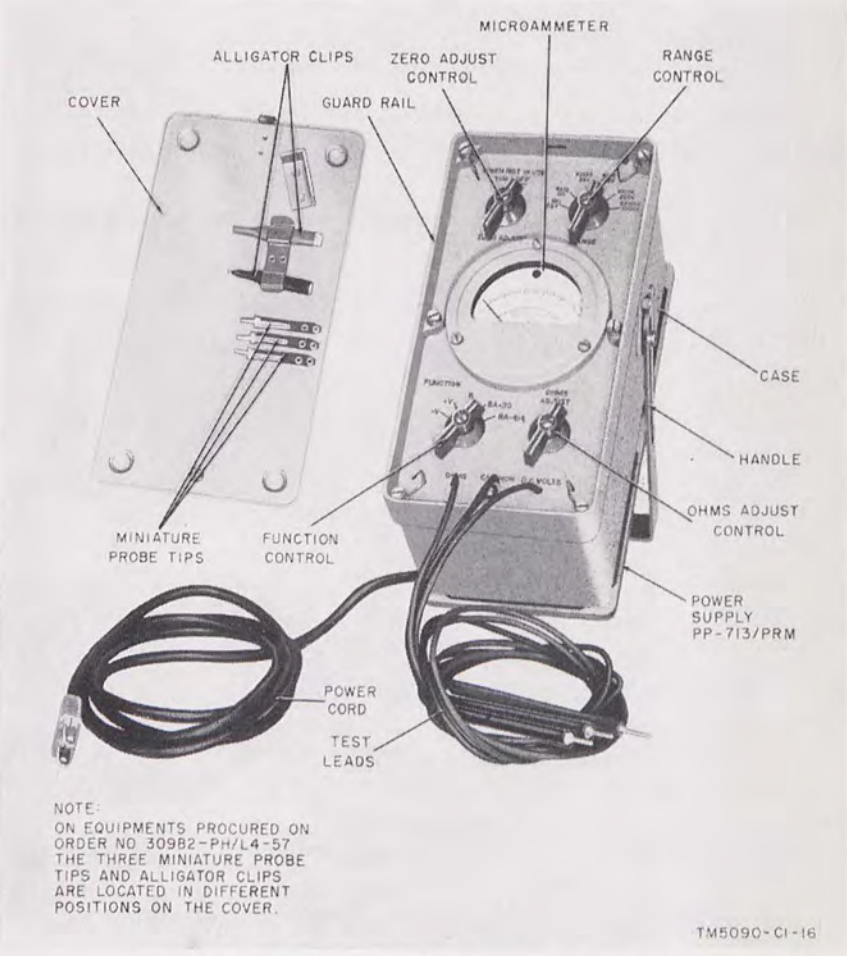

Figure 1.1. (Added) Multimeter AN/PRM–15X, with Power Supply PP–713/PRM–15X.

Page 4, paragraph 4.

c. (Added) Power Supply PP–173/PRM–15X.

Plate power ----------45 volts dc (+24 volts dc and −21 volts dc).
Filament power ----------1.3 volts ac.
Ohmmeter power ----------−3 volts dc.

Page 5, paragraph 6. In the component column after "Battery, Power Supply PP–1247/PRM–15," add the following:

Component	Reqd. No.	Length (in.)	Width (in.)	Height (in.)	Volume (cu ft)	Weight (lb)
or Power Supply PP–713/PRM–15X	1	9	4¾	2½	.06	3

6.1 Nomenclature and Common Name

(Added)

Nomenclature	Common name
Multimeter AN/PRM–15 or AN/PRM–15X	Test set
Multimeter TS–618/U	Multimeter
Battery Power Supply PP–1247/PRM–15	Battery power supply
Power Supply PP–713/PRM–15X	Ac power supply

Page 6, paragraph 7.

Subparagraph *b.* Delete line 1 and substitute: When the multimeter is to be battery operated, Battery Power Supply PP–1247/PRM–15 is required. It contains mountings.

c. (Added) When the multimeter is to be operated from an ac source, Power Supply PP–713/PRM–15X is mounted at the bottom of the common case and held by six captive screws. The power supply consists of a transformer, crystal rectifiers, and a filter circuit. It provides 45 volts dc plate voltage and 1.3 volts ac filament voltage for cathode follower tube V1. Minus three volts dc are provided for ohmmeter power.

Page 7, paragraph 8. Make the existing paragraph *a.*

b. (Added) When ac power supply is used two spare fuses are mounted alongside the fuses in use.

Page 7, paragraph 9.

In the heading, delete the word "Required." Delete the first three lines and substitute: When battery operation is desired the batteries listed below must be requisitioned.

11.1 Installation of Power Supply PP–713/PRM–15X in Multimeter AN/PRM–15X

(fig. 10.1)

(Added)

a. Remove the six screws and lockwashers at the rear of the test set.

b. Connect the power supply cable connector X1 to jack J1.

c. Place the ac power supply within the case and replace the

six screws and lockwashers. Tighten the screws to insure a watertight seal.

d. Connect the power cord to a 115-volt ac power source.

Page 10, paragraph 14.

In the chart function column, opposite "Position BA–30," add: If ac operated, switch position BA–30 is inoperative. Opposite "Position BA–414," after the word "condition" add: or, if ac operated, indicates the plate supply voltage.

Page 11, paragraph 15.

c. (Superseded) Check the filament and plate supply voltages by setting the FUNCTION switch to the BA–30 and BA–414 positions, respectively. If the meter indicates REPLACE while the switch is in either position, replace the batteries or, if ac operated, check the power source.

Note. When the ac power supply is used, position BA–30 is inoperative.

Page 13, paragraph 16*b*(5). After the last sentence, add: If ac operated, check the ac power supply.

Page 16, paragraph 25*b*.

(2) (Superseded) Clean electrical contacts with a cloth moistened with Cleaning Compound (Federal stock No. 7930–395–9542).

Caution: Provide adequate ventilation.

Delete subparagraph *c* and *d*.

Page 20, paragraph 32*b*.

(8) (Added) Blown fuses (ac operated).

Page 22, paragraph 33*c*.

Item No. 2, in the corrective measures column, add: If ac operated, check ac power supply. Item No. 3, in the corrective measures column, add: When the ac power supply is used, position BA–30 is inoperative. Item No. 4, in the corrective measures column, add: If ac operated, check ac power supply.

Page 24, paragraph 34.

Delete the first sentence and substitute: Multimeter AN/PRM–15 consists of a multimeter and a battery power supply. Multimeter AN/PRM–15X uses an ac power supply. Figure 6 shows the test set using battery power. Figure 6.1 shows the test set using ac power. For detailed circuit information, refer to the complete schematic and wiring diagrams (figs. 14, 15, and 15.1).

c. (Added) Ac Power Supply. Power Supply PP–713/PRM–15X supplies all the power required by the multimeter (fig. 6.1).

(1) *Ohmmeter supply.* The ohmmeter supply is —3 volts dc.

(2) *Plate Supply.* The plate supply is 45 volts dc.

(3) *Filament supply.* The filament supply is 1.3 volts ac.

Page 24, paragraph 35.

In the heading, change "(fig. 7)" to read: **(figs. 7 and 7.1).**

At the beginning of *b*, add: When the test set is battery operated.

c. (Added) When the ac power supply is used, plate voltage for tube V1 is supplied from the plate voltage section of the ac power supply (fig. 7.1). Filament voltage (1.3 volts ac) is supplied in series with the power OFF switch S3. When ZERO ADJUST control is rotated clockwise, switch S3 which is controlled by the same shaft, closes and power (115 volts ac) is applied to the ac power supply. The cathode circuit of V1 is returned to the negative side of the plate power section through cathode load resistors R14, R15, and R16. The plate power section is tapped to ground through meter M1. This provides +24 volts dc and —21 volts dc across the plate power output terminals. With the plate supply tapped to ground, a point in the external load circuit also must be at ground potential (0 volt). By rotating ZERO ADJUST control R15, ground potential can be obtained at the junction of R14 and R15 and meter M1 will indicate 0 volt.

Page 25, figure 6.

At the end of the caption, add: when used with battery power supply.

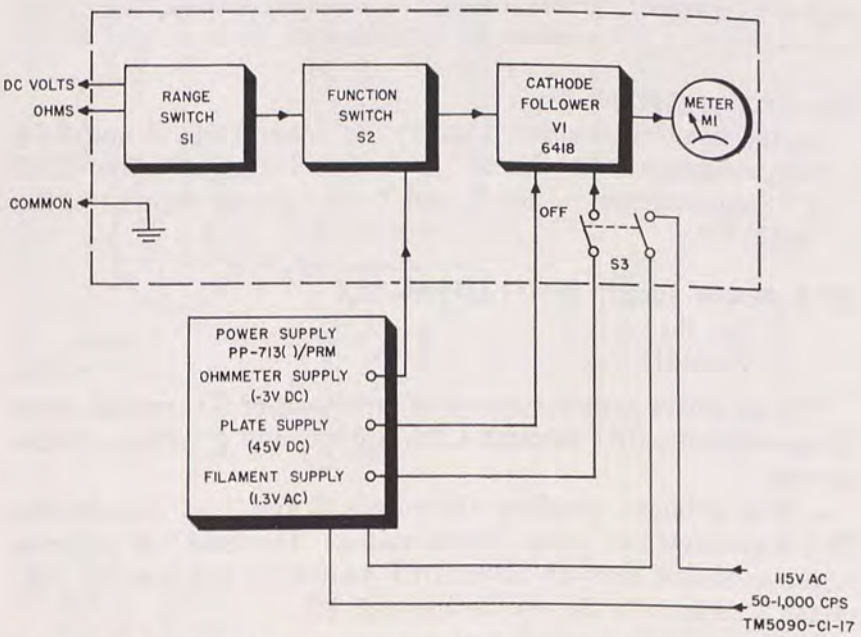

Figure 6.1 (Added) Multimeter AN/PRM–15X, block diagram, with Power Supply PP–713/PRM–15X.

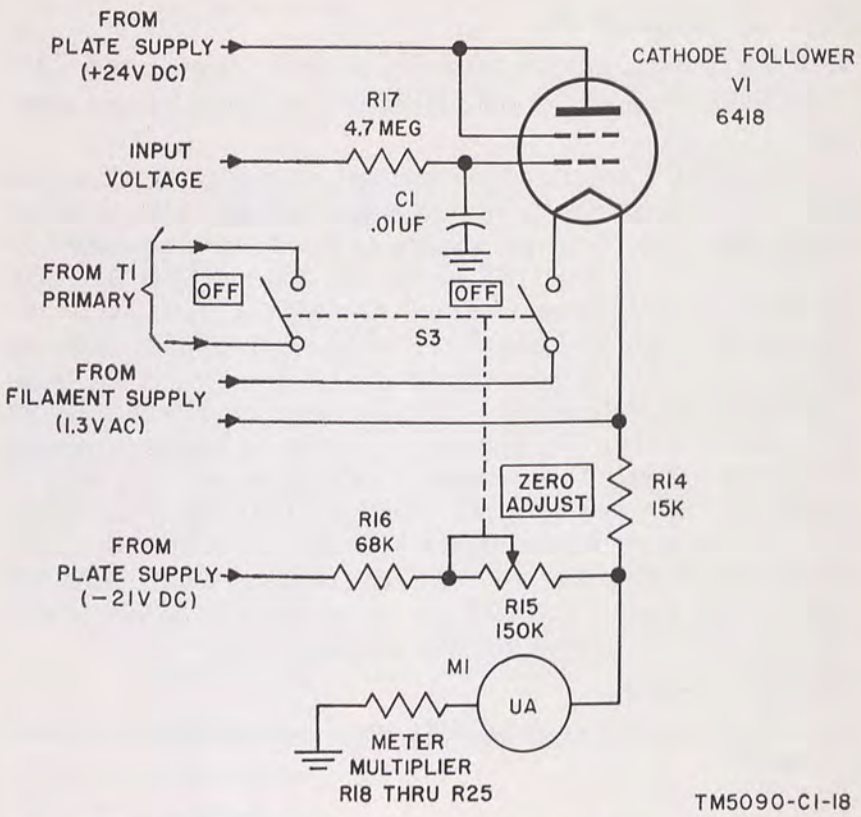

Figure 7.1 (Added) Cathode follower, V1 schematic diagram, using Power Supply PP–713/PRM–15X.

Page 28, paragraph 37.

In the heading change "(fig. 8)" to read: **(figs. 8 and 8.1).** Subparagraph *a*, line 7, add " (or —3-volt supply)" after "BAT 3." Subparagraph *b*, line 3, add " (or —3-volt supply)" after "BAT 3."

37.1 Power Supply PP–713/PRM–15X

(fig. 9.1)
(Added)

The ac power supply consists of transformer T1, crystal rectifying elements, CR1 through CR4, a filter, and a voltage divider circuit.

a. The primary winding (terminals 1 and 2 of transformer T1) is connected to the ac source voltage. Terminal 1 is returned to the ac source through power OFF switch S3 and fuse F1. Terminal 2 returns to the source through F2.

b. The secondary winding that connects to terminals 6, 7, and 8, together with crystal rectifiers CR3 and CR4, take the place

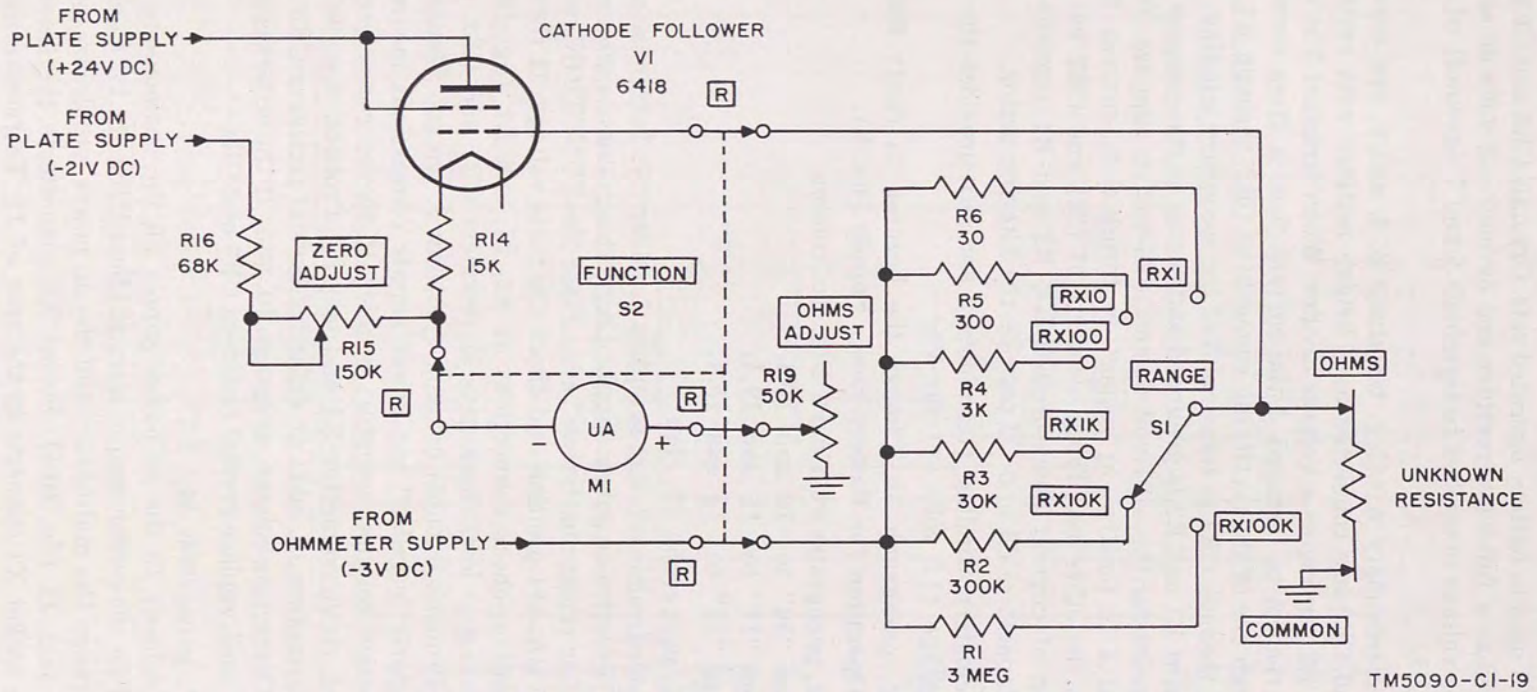

Figure 8.1. (Added) Ohmmeter circuit, schematic diagram, using Power Supply PP-713/PRM-15X.

of BAT 3 used in battery operated sets. Crystals CR3 and CR4 are connected as a full-wave rectifier and develop —3 volts dc across R3. This voltage is applied to terminals 6 and 7 (ground) of connector X1.

c. The secondary winding, terminals 3, 4, and 5, and crystals CR1 and CR2 are connected as a bridge rectifier with resistors R1 and R2 serving as a voltage divider. When terminal 3 is positive in respect to terminal 4 the current flow is from terminal 4, through one of the rectifying elements of CR2, through R4, R2, and R1, through CR1 to terminal 3 of the secondary winding. The junction of R1 and R2 is grounded and serves as the common reference point for the —21-volt dc and +24-volt dc supplies. When terminal 4 is positive in respect to terminal 3, current flows through the other rectifying elements of CR1 and CR2 but the direction of current flow through R4, R2 and R1 remains the same. Capacitors C1 and C2 provide the filtering action.

d. Secondary winding (terminals 9 and 10) provides the filament voltage (1.3 volts ac) for V1.

Page 31, paragraph 38. Change the heading to read: **Battery Test Operation for Battery Power Supply (fig. 9).**

Page 33, paragraph 41, Chart, Fig. No. column.
Change "10" to: **10 and 10.1.**
Change "11" to: **11 and 11.1.**
Change "15" to: **15 and 15.1.**

Page 34, paragraph 43, chart.
Probable trouble column, symptom 1, under "No battery power" add: Defective ac power supply. Correction column, symptom 1, after "or replace batteries." add: Place the FUNCTION switch in the BA–414 position and check the plate voltage. If there is no reading, check connections at X2, J1, and X1 (fig. 10.1). If reading is low, check crystal rectifiers CR1 and CR2 (fig. 9.1). Probable trouble column, symptom 9, change "Batteries improperly installed" to: **Power supply connections incorrect.** Correction column, symptom 9, add: If the ac power supply is used, check connector X1 and jack J1. Probable trouble column, symptom 10, add: or defective crystal rectifiers CR3 and CR4. Correction column, symptom 10, add: If the ac power supply is used, replace crystal rectifiers CR3 and CR4.

Page 37, paragraph 44.

d.1. (Added) In the ac power supply all the components are mounted on the power supply terminal board (fig. 11.1). Connections between the multimeter and the ac power supply are made through jack J1 (fig. 10.1). Socket X2 connects to the front of J1 while socket X1 connects to the rear of J1. To remove the ac

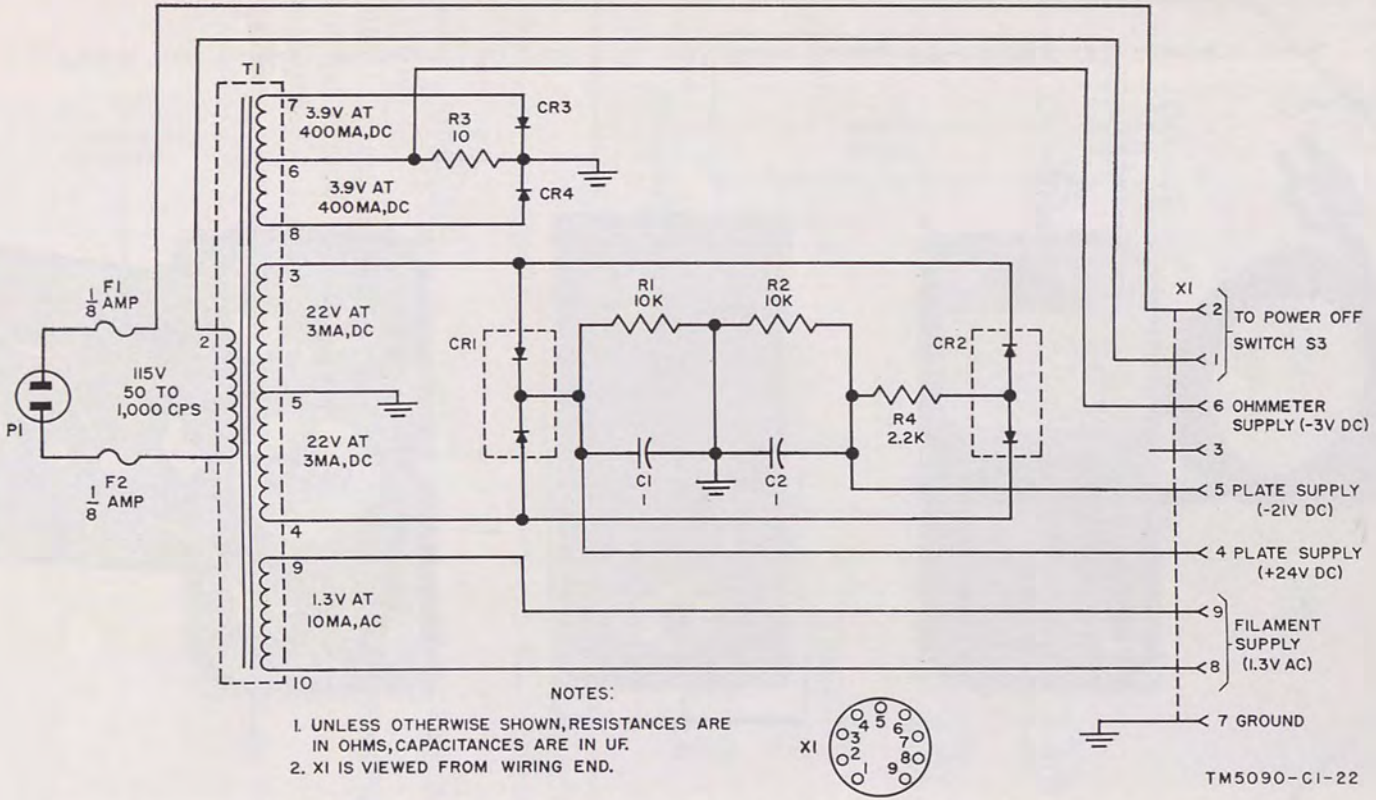

Figure 9.1. (Added) Power Supply PP–713/PRM–15X, schematic diagram.

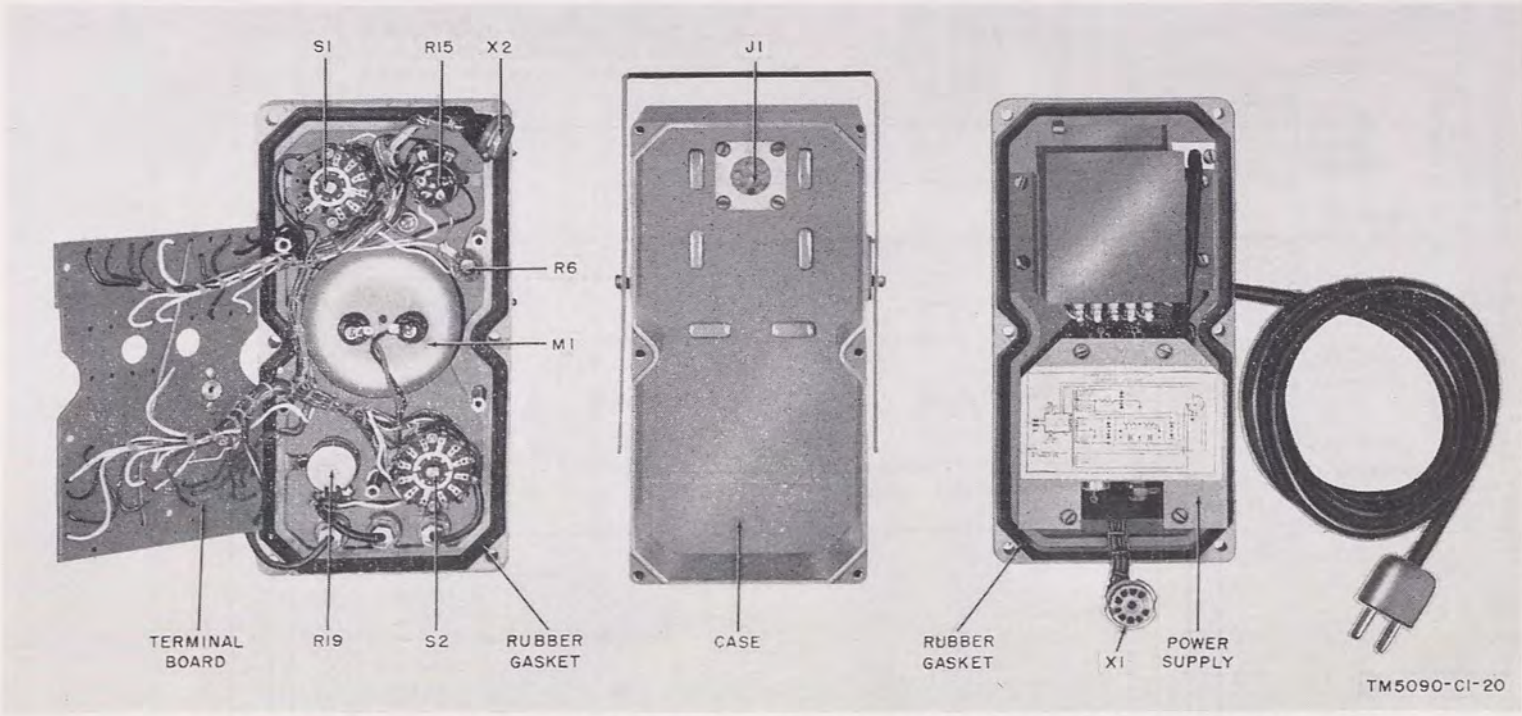

Figure 10.1. (Added) Multimeter AN/PRM–15X, with Power Supply PP–713/PRM–15X, location of parts.

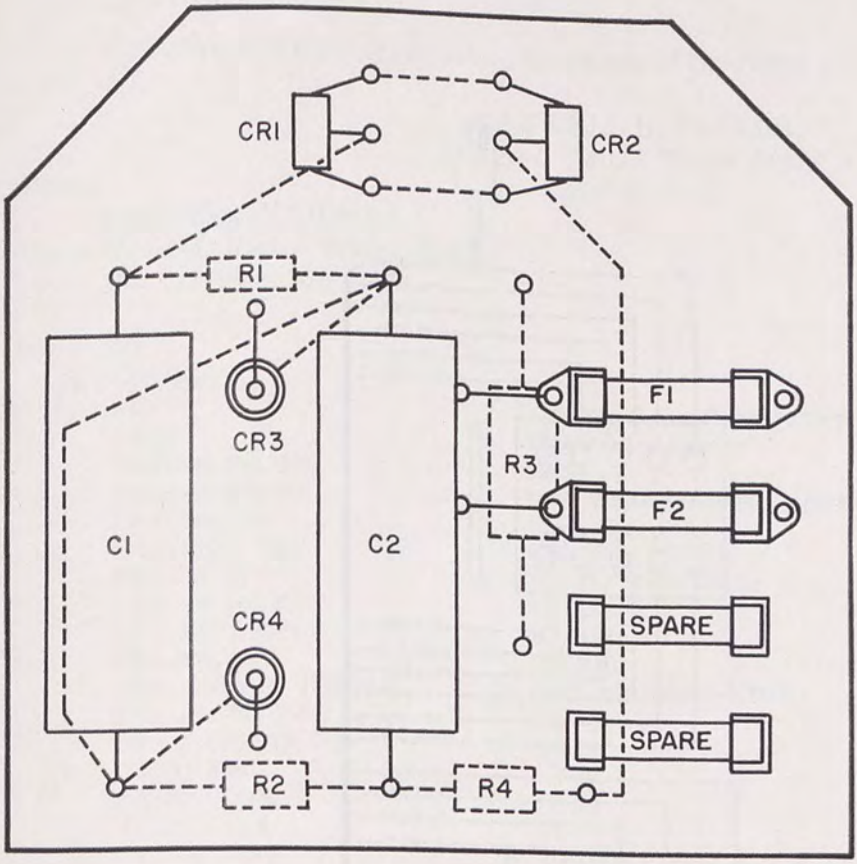

Figure 11.1. (Added) Power Supply PP–731/PRM–15X, terminal board.

power supply unscrew the six captive screws and unplug socket X1 from J1.

Page 42, paragraph 49. At the beginning of *a*, add: When battery power is used.

Facing page 44, figure 14, (fold-out).

5. (Added) X2 IS VIEWED FROM WIRING END; X3 IS VIEWED FROM MATING END.

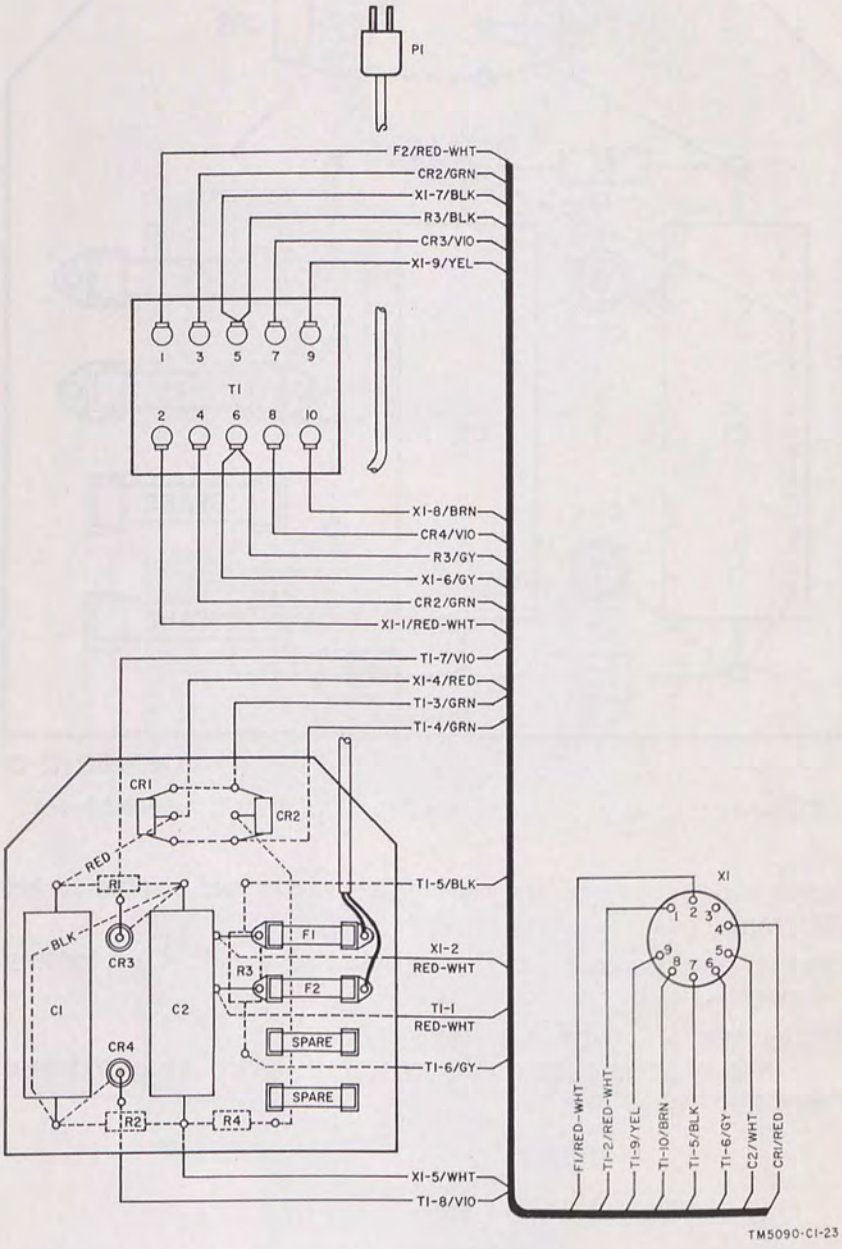

Figure 15.1 (Added) Power Supply PP–713/PRM–15X wiring diagram.

[AG 413.74 (17 Jun 57)]

By Order of *Wilber M. Brucker*, Secretary of the Army:

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Chief of Staff.

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55–116 57–57

NG: State AG; units—same as Active Army.

USAR: None.

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

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TECHNICAL MANUAL
MULTIMETERS AN/PRM-15 AND AN/PRM-15X

TM 11-5090
CHANGES No. 2

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *25 September 1961*

TM 11-5090, 27 September 1955, is changed as follows:

Page 3, paragraph 2. Add the following subparagraph:

f. Any comments concerning omissions and discrepancies in appendix I and appendix II will be prepared on DA Form 2028 and forwarded direct to Commanding Officer, U.S. Army Signal Materiel Support Agency, ATTN: SIGMS-ML, Fort Monmouth, N.J.

APPENDIX I (Added)
MAINTENANCE ALLOCATION POWER SUPPLY PP-713/PRM

Section I. MAINTENANCE ALLOCATION

1. General

a. The maintenance allocation chart 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 breakdown (components, assemblies, or subassemblies) are listed in disassembly order or alphabetical order.

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

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*These Changes supersede so much of DA Supply Manual SIG 7 & 8 AN/PRM-15, 24 September 1958, including C 1, 23 September 1960, as pertains to first echelon items for PP-713/PRM.

(*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 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*) *Aline.* 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 developed and published by heads of technical services. 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 echelon.* The symbol X 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 columns.

c. Columns in the allocation of tools for maintenance functions chart 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

(1) Part or component	(2) Maintenance function	(4) 2d ech.	(6) 4th ech.	(7) 5th ech.	(8) Tools required	(9) Remarks
POWER SUPPLY PP-713/PRM.	service	X	----	----	4	Visual only.
	inspect	X	----	----	-------	
	test	----	X	----	1	
	repair	----	X	----	2, 3	
	rebuild	----	----	X	2, 3	

Section III. ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS

(1) Tools required for maintenance functions	(2) 1st ech.	(3) 2d ech.	(5) 4th ech.	(6) 5th ech.	(7) Tool code
PP-713/PRM (continued)					
MULTIMETER TS-352/U	-----	-----	(†)	(†)	1
TOOL KIT TK-87/U	-----	-----	(†)	(†)	2
TOOL KIT TK-88/U	-----	-----	(†)	(†)	3
TOOLS AND TEST EQUIPMENT NORMALLY AVAILABLE TO THE REPAIRMAN USER BECAUSE OF HIS ASSIGNED MISSION	(†)	(†)	-----	-----	4

APPENDIX II (Added)

BASIC ISSUE ITEMS FOR POWER SUPPLY PP-713/PRM

Section I. INTRODUCTION

1. Scope

a. This appendix lists items supplied for initial operation and for running spares. The list includes tools, accessories, parts, and material issued as part of the major end item. The list includes all items authorized for basic operator maintenance of the equipment. End items of equipment are issued on the basis of allowances prescribed in equipment authorization tables and other documents that are a basis for requisitioning.

b. Columns are as follows:

(1) *Source, maintenance, and recoverability code.* Not used.

(2) *Federal stock number.* This column lists the 11-digit Federal stock number.

(3) *Designation by model.* Not used.

(4) *Description.* Nomenclature or the standard item name and brief identifying data for each item are listed in this column. When requisitioning, enter the nomenclature and description.

(5) *Unit of issue.* The unit of issue is the supply term by which the individual item is counted for procurement, storage, requisitioning, allowances, and issue purposes. If column is left blank, the unit of issue is each.

(6) *Expendability.* Nonexpendable items are indicated by NX. If column is left blank, items are considered expendable.

(7) *Quantity authorized.* Under "items comprising an operable equipment," the column lists the quantity of items supplied for the initial operation of the equipment. Under "running spares and accessory items," the quantities listed are those issued initially with the equipment as spare parts. The quantities are authorized to be kept on hand by the operator for maintenance of the equipment.

(8) *Illustrations.* Not used.

Section II. FUNCTIONAL PARTS LIST

(2) Federal stock No.	(4) Description	(6) Expendability	(7) Quantity authorized
6625-500-4463	POWER SUPPLY PP-713/PRM: metallic type rectification; output 24 v DC, 21 v DC, 3 v DC, 1.3 v AC; 117 put 115 v, 50 to 1000 cps		
	ITEMS COMPRISING AN OPERABLE EQUIPMENT		
	POWER SUPPLY PP-713/PRM (BASIC COMPONENT)	NX	1
Ord thru AGC	TECHNICAL MANUAL TM 11-5090 (Not installed) (Not mounted)		2
5920-189-0855	FUSE, CARTRIDGE: 0.125 amp, 125v; Littlefuse No. 313.125 (Mounted in equip)		2
	RUNNING SPARES AND ACCESSORY ITEMS		
5920-189-0855	FUSE, CARTRIDGE: 0.125 amp, 125v; Littlefuse No. 313.125 (Mounted in equip)		5

BY ORDER OF THE SECRETARY OF THE ARMY:

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Sig Dep (12)
Ft Monmouth (163)
USA Corps (3)
USAAMS (50)
Savanna Ord Dep (5)
Tooele Ord Dep (5)
Umatilla Ord Dep (5)
AFIP (1)
WRAMC (1)
AFSSC (1)
USAEPG (2)
EMC (1)
USACA (2)
USASEA (1)
USA Caribbean Sig Agcy (1)
USA Sig Msl Spt Agcy (12)
USASSA (20)
USASSAMRO (1)
Army Pictorial Cen (2)
USAOMC (3)
USA Trans Tml Comd (1)
Army Tml (1)
POE (1)
OSA (1)
AMS (1)
Sig Fld Maint Shops (2)
JBUSMC (2)
Units organized under following TOE's (2 copies each unless otherwise indicated):
5-5
5-7
5-8
5-15
5-16
5-17
5-35
5-37
5-78
5-215
5-216
6-100
6-101
6-115
6-116
6-125

Units organized under following TOE's (2 copies each unless otherwise indicated):—Con.

6–126
6–135
6–136
6–300
6–301
6–315
6–316
6–325
6–326
6–401
6–415
6–416
6–425
6–426
6–501
6–525
6–535
6–536
6–545
6–558
6–565
6–575
6–576
6–577
6–585
6–630
6–631
7
7–11
7–12
7–25
7–26
7–27
8–500 (AA–AH)
9–47
9–65
9–66
9–87
9–227
9–377
9–500 (AA–AC)
9–510 (EA–EB)
10–202
10–206
10–445
11–5
11–6
11–7
11–16
11–55
11–57
11–96
11–97
11–98
11–117
11–155
11–500 (AA–AE) (4)
11–555
11–557
11–587
11–592
11–597
17
17–2
17–17
17–22
17–25
17–26
17–27
17–32
17–45
17–51
17–52
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17–57
17–62
17–65
17–66
17–67
17–85
17–87
17–115
17–116
17–117
19–29
19–55
19–57
19–217
19–500 (AA–AE)
29–51
29–55
29–56
29–57
32–51
32–57
33–77
39–51
39–61
44–70
44–435

Units organized under following TOE's (2 copies each unless otherwise indicated):—Con.	44-536
	44-537
	44-544
44-436	44-545
44-437	44-546
44-445	44-547
44-446	44-548
44-447	55-16
44-448	55-28
44-535	57

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.

U.S. GOVERNMENT PRINTING OFFICE: 1961

TECHNICAL MANUAL
No. 11–5090

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 27 *September 1955*

MULTIMETER AN/PRM–15

	Paragraph	Page
CHAPTER 1. INTRODUCTION		
Section I. General	1, 2	1
II. Description and data	3–9	1
CHAPTER 2. INSTALLATION	10–12	8
3. OPERATION		
Section I. Controls and instruments	13, 14	10
II. Operation under usual conditions	15–17	11
III. Operation under unusual conditions	18–21	13
CHAPTER 4. ORGANIZATIONAL MAINTENANCE		
Section I. Organizational tools and equipment	22, 23	15
II. Preventive maintenance	24–27	15
III. Lubrication and weatherproofing	28–30	19
IV. Troubleshooting at organizational maintenance level	31–33	20
CHAPTER 5. THEORY	34–38	24
6. FIELD MAINTENANCE		
Section I. Troubleshooting at field maintenance level	39–43	32
II. Repairs	44, 45	37
III. Calibration and final testing	46–48	39
CHAPTER 7. SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE		
Section I. Shipment and limited storage	49, 50	42
II. Demolition of materiel to prevent enemy use	51, 52	42
INDEX		45

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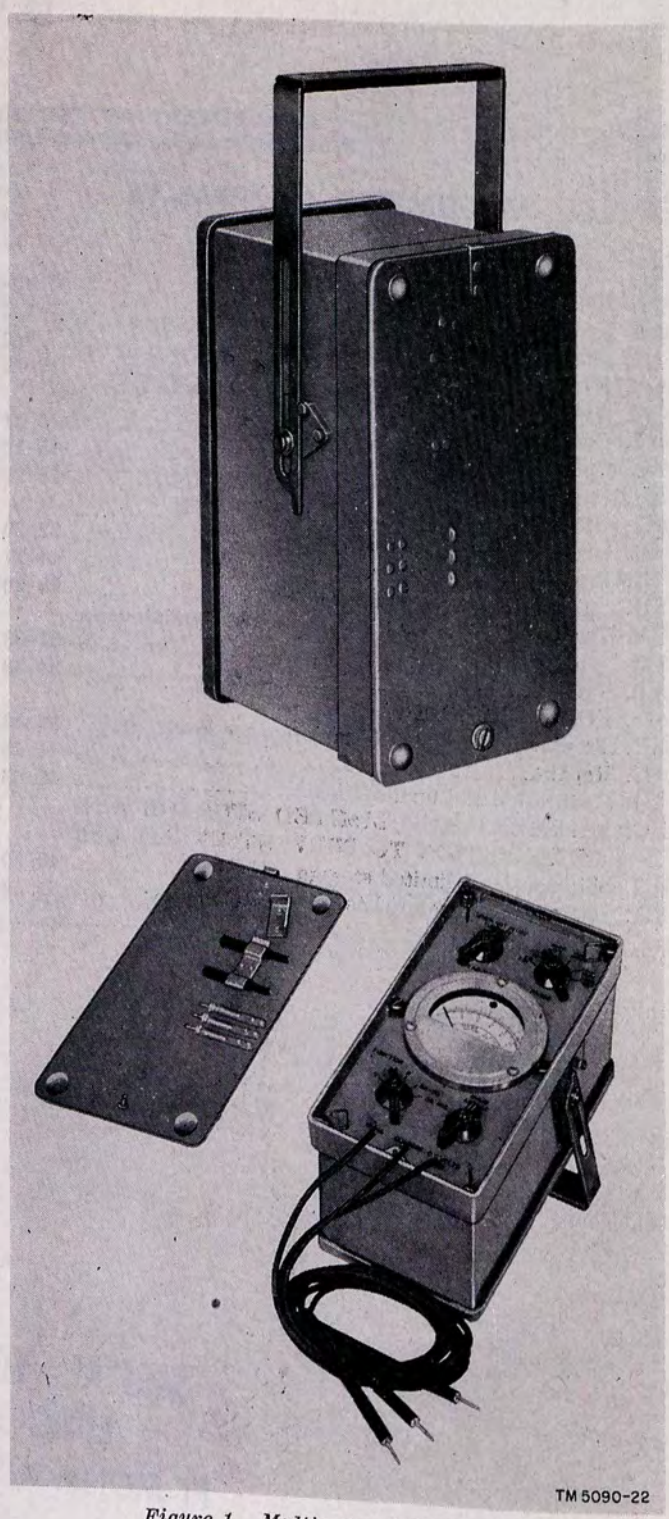


Figure 1. Multimeter AN/PRM–15.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

This manual contains instructions for the installation, operation, maintenance and repair of Multimeter AN/PRM–15 (fig. 1). The theory of operation and an analysis of the multimeter circuitry are also outlined in the manual.

2. Forms and Records

The following forms will be used for reporting unsatisfactory conditions of Army materiel and equipment and when performing preventive maintenance:

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

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

c. DD Form 535, Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700–45–5 and AF TO 00–35D–54.

d. DA Form 11–238, Operator First Echelon Maintenance Checklist for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar) will be prepared in accordance with instructions on the back of the form (fig. 4).

e. DA Form 11–239, Second and Third Echelon Maintenance Checklist for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar) will be prepared in accordance with instructions on the back of the form (fig. 5).

Section II. DESCRIPTION AND DATA

3. Purpose and Use

a. Multimeter AN/PRM–15 (fig. 1) is used for measuring direct-current (dc) voltages, resistances, and continuity of wiring, cording, and cabling.

b. Its purpose is to determine the unknown resistances and dc voltages employed in electronic equipment.

4. Technical Characteristics

The technical characteristics for Multimeter AN/PRM–15 which consists of Multimeter TS–618/U and Battery Power Supply PP–1247/PRM–15, are as follows:

a. Multimeter TS–618/U.

Voltage range	0 to 1,000 vdc.
Resistance range	0 to 100 megohms.
Accuracy	±3% of full scale at nominal ambient temperature of 25° C.
Meter ranges:	
Dc voltage	0 to 2.5, 0 to 10, 0 to 25, 0 to 100, 0 to 250, and 0 to 1,000 v.
Resistance	0 to 1,000 0 to 10,000, and 0 to 100,000 ohms, 0 to 1, 0 to 10, and 0 to 100 meg.
Battery test indications	REPLACE-GOOD
Input impedance	11 meg on all voltage ranges.
Meter sensitivity	50 μa
Number of tubes	1.

b. Battery Power Supply PP1247/PRM–15.

Plate power	Battery BA–414/U (45 v).
Filament power	Battery BA–30 (1.5 v).
For resistance measurements	Two batteries BA–30 (3 v) in series.

5. Packaging Data

a. When packaged, the multimeter is placed in a moisture-vaporproof container. The container measures 11 inches high by 9 inches deep, by 8 inches wide, and has a volume of .4 cubic foot. An exploded view of the packaging is shown in figure 2. The equipment may be packaged in a manner different from that shown, depending on the supply channel.

b. The following list indicates the contents of the case.

1 Multimeter AN/PRM–15 (with tube type 6418, and 3 attached test leads).
2 alligator clips.
3 miniature probe tips.
1 spare tube type 6418.
1 TM 11–5090.

c. The alligator clips and the miniature probe tips are stored inside the front cover. The spare tube is stored on the terminal board inside the meter case.

6. Table of Components

Component	Reqd No.	Length (in.)	Width (in.)	Height (in.)	Volume (cu ft)	Weight (lb)
Multimeter AN/PRM–15 consisting of:						
Multimeter TS–618/U	1	8¾	4¾	5⅝	0. 13	8. 5
Battery, Power Supply PP–1247/PRM–15	1	8¾	4¾	1⅝	. 04	2. 0
TM 11–5090	1	9¼	6			

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

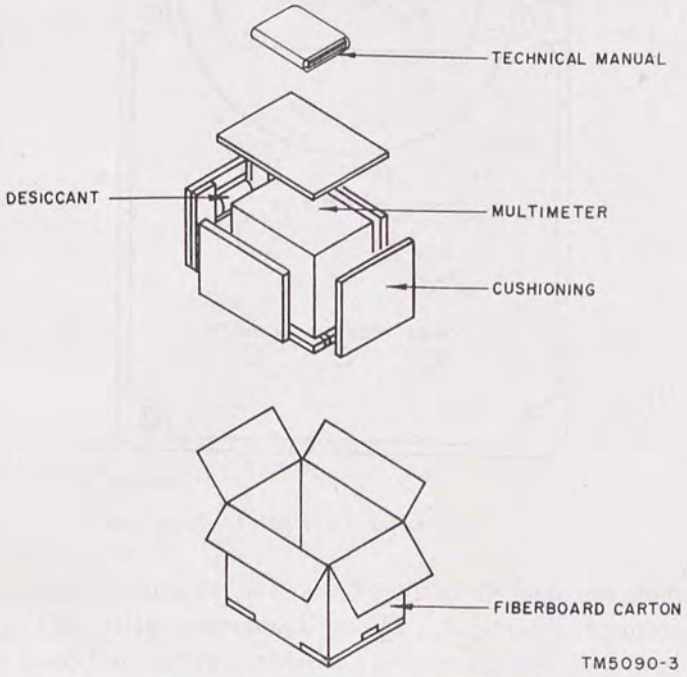


Figure 2. Packing and packaging Multimeter AN/PRM–15.

7. Description of Multimeter AN/PRM–15

a. Multimeter AN/PRM–15 (fig. 3) is a one tube vacuum-tube voltohmmeter for measuring dc voltages and resistances. The multimeter consists of Multimeter TS–618/U and Battery Power Supply PP–1247/PRM–15 mounted in a common case. The cover for the multimeter case is used to store the alligator clips and the miniature probe tips. The carrying handle attached to the case may be pivoted and locked into position to serve as a stand when the equipment is in use. This will give the operator a comfortable viewing angle. Rubber gaskets are located between the top of the multimeter unit and

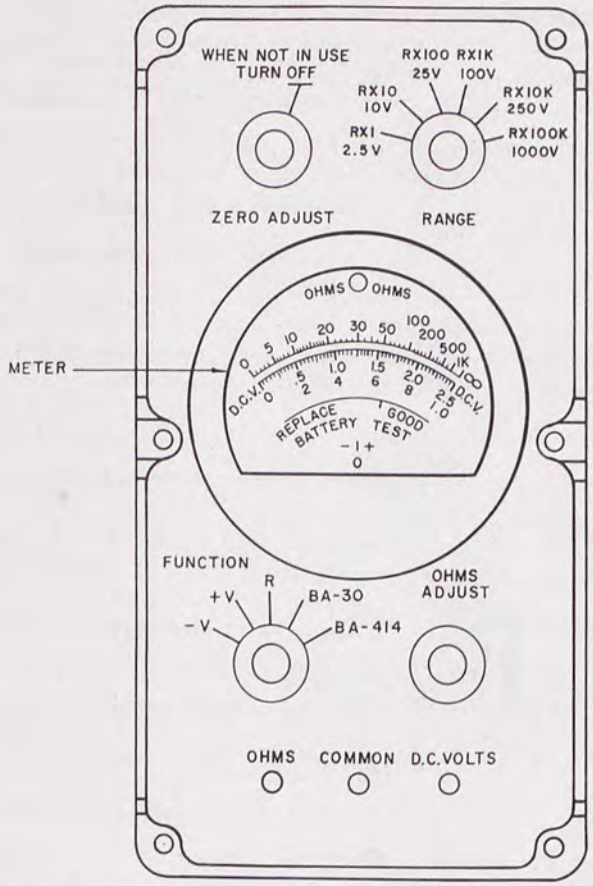


Figure 3. Multimeter AN/PRM–15, front panel.

the common case, and the battery holder and the common case, to make the instrument watertight. The milliammeter (Meter M1) is calibrated in two dc voltage ranges, a resistance range, and for a battery test indication. The multimeter has a ZERO ADJUST knob that is arranged so that the cover for the equipment cannot be replaced unless the control is set in the OFF position. Six screws hold the multimeter to its case and are accessible from the top. The test leads are attached to the multimeter.

b. Battery Power Supply PP–1247/PRM–15 contains mountings for one Battery BA–414/U (45 volts) for supplying plate power to the type 6418 vacuum tube (V1), one Battery BA–30 (1.5 volt) for filament power, and two Batteries BA–30 connected in series for supplying ohmmeter power. The power supply is fastened to the multimeter case by six screws.

8. Running Spares

One spare tube, type 6418, is supplied with Multimeter AN/PRM–15. This spare tube is mounted adjacent to the operating tube (fig. 11).

9. Additional Equipment Required

The required batteries for Battery Power Supply PP–1247/PRM–15 are not supplied with the multimeter. They must be requisitioned through regular supply channels.. The batteries required are:

1 Battery BA–414/U (45 volts).

3 Batteries BA–30 (1.5 volts).

CHAPTER 2

INSTALLATION

10. Unpacking and Checking New Equipment

a. General. Multimeter AN/PRM–15 may be shipped in domestic cartons (fig. 2), or in its own carrying case. Be careful when unpacking or handling the multimeter. It is a precision measuring instrument. Mishandling will make it inaccurate, or inoperative. Avoid thrusting tools into the interior of the container. This may damage the instrument. Unpack the instrument where it will not be exposed to dampness or excessive dust.

b. Step-By-Step Instructions for Unpacking the Multimeter.

(1) Do not attempt to pry the top open. Cut the tape which seals the fiberboard carton. Open the top.

(2) Remove the desiccant and cushioning from the carton.

(3) Remove the multimeter from the carton and place it on a table or work bench.

(4) Inspect the instrument for possible damage incurred during shipping.

(5) Check the contents of the packing case against the packing slip.

Note. Save the original packing container. It may be used again when repacking the instrument for storage or shipment.

11. Installation of Batteries in Multimeter AN/PRM–15

a. Remove the six screws and lockwashers from the battery power supply holder on the bottom of the multimeter. Remove the battery holder.

b. Install one Battery BA–414/U in its mounting (Bat 1 Holder) (fig. 10) and insert plug J2 into the receptacle on the battery.

c. Observe the battery polarity markings on the mountings for the three Batteries BA–30. Install the three batteries.

d. Connect battery power supply cable connector X3 (fig. 10) to adapter J1. Adapter J1 is located in the partition which separates the battery power supply compartment from the multimeter.

e. Replace the battery power supply holder. Fasten it securely to the case with the six lockwashers and screws to insure a watertight seal.

12. Service Upon Receipt of Used or Reconditioned Equipment

a. Follow the instructions outlined in paragraph 10 for unpacking and checking the contents.

b. Check the equipment for tags or other indications pertaining to wiring changes. If changes were made, note them in this manual preferably on the schematic diagram (fig. 14).

CHAPTER 3

OPERATION

Section I. CONTROLS AND INSTRUMENTS

13. General

Haphazard handling and operation, or improper setting of the controls can cause damage to the multimeter. For this reason, it is important to know the function of each control.

14. Controls and Their Uses

The following chart lists the controls and meter of the multimeter (fig. 3) and indicates the functions:

Control	Function
ZERO ADJUST control and power OFF switch.	For setting the needle of the meter to zero on the left or zero center, and for applying filament and plate voltage to V1.
FUNCTION switch	Places meter M1 in the desired circuit for measuring negative or positive dc voltages, resistances, and to indicate the condition of the filament and plate voltage batteries. The function of the five positions are as follows:

Position	*Function*
−V	Measures negative dc voltages.
+V	Measures positive dc voltages.
R	Measures resistance.
BA–30	Indicates filament voltage battery condition.
BA–414	Indicates plate voltage battery condition.

Control	Function
OHMS ADJUST control	Sets the meter needle to infinity (∞) on the resistance scale when the OHMS and COMMON test leads are open.
Meter	Indicates voltage, resistance, and battery conditions.
RANGE switch	Selects the desired ranges for measuring resistances and voltages. The functions of the six positions are as follows:

Position	*Voltmeter range*	*Ohmmeter range*
RX1		
2.5V	2.5 V	1,000 ohms
RX10		
10V	10 V	10,000 ohms
RX100		
25V	25V	100,000 ohms
RX1K		
100V	100V	1 megohm
RX10K		
250V	250V	10 megohms
RX100K		
1000V	1000V	100 megohms

Section II. OPERATION UNDER USUAL CONDITIONS

15. Preoperational Procedures

a. Remove the cover of the multimeter by disengaging the screw at one end of the cover, and sliding the cover out of the hook on the other end of the case.

b. Rotate the ZERO ADJUST control clockwise past the position where a click is heard.

c. Operate the FUNCTION switch control to BA–414 and BA–30 positions, respectively. If the meter needle indicates REPLACE while the switch is in either position, replace the batteries.

d. Operate the FUNCTION switch to position R. The meter needle should deflect full scale or over.

e. Rotate the OHMS ADJUST control to set the meter needle at the point marked infinity (∞).

f. Short the tips of the probes on the ends of the OHMS and COMMON test leads. The meter needle should deflect to the left on any RANGE setting.

g. Adjust the ZERO ADJUST control for a zero reading at the left of the meter scale.

h. Operate the FUNCTION switch to the +V position. The meter needle should be on zero. Use the ZERO ADJUST control to obtain zero reading on the meter.

i. Operate the FUNCTION switch to the −V position. The meter needle should continue to indicate zero.

Note. If the above results are not obtained, refer to the equipment performance checklist (par. 33).

16. Operating Procedure

a. Operation of Multimeter as Voltmeter.

(1) Operate the ZERO ADJUST control clockwise past the click and the FUNCTION switch to the +V position.

(2) To measure an unknown voltage, operate the RANGE switch control to the 1,000V position. Decrease the voltage range one step at a time until the meter needle remains on scale. This will prevent damaging the instrument. To measure 12 volts, set the RANGE control at 25V. To measure 300V, set the RANGE control at 1,000V. If the known voltage will not exceed 2.5 volts, set the RANGE control at 2.5V.

(3) The test leads are attached to the multimeter COMMON, D. C. VOLTS, and OHMS jacks. To measure voltage, touch the probe tip on the COMMON lead to chassis ground, and the lead coming from the D. C. VOLTS jack to the point where the voltage measurement is required. The meter will deflect and indicate on the black scale, the amount of voltage at that point. When making repeated measurements at the same point, attach an alligator clip to the probe tip on the common lead and attach the clip to chassis ground.

(4) To measure the voltage across a resistor, apply the COMMON lead to the ground or low voltage terminal of the resistor, and the D. C. VOLTS test lead to the higher voltage terminal of the resistor.

(5) To make negative voltage measurements, operate the FUNCTION switch control to the −V position. Use the same procedure used when measuring positive voltages.

(6) When negative and positive voltage measurements are to be made, rotate the ZERO ADJUST control until the meter needle indicates zero at the bottom center of the scale. The needle will deflect to the right of zero center when making positive voltage readings and to the left for negative readings. Accurate readings cannot be made but the meter provides polarity indication.

b. Operation of Multimeter as Ohmmeter.

(1) Operate the FUNCTION switch to the R position.

(2) Adjust the OHMS ADJUST control for full scale (∞) needle deflection.

(3) Use one test lead coming from the OHMS jack, and the other from the COMMON jack. Short the test lead probe tips

and adjust the ZERO ADJUST control for a zero reading on the left of the meter scale.

(4) With the test lead probe tips separated, repeat the procedure outlined in (2) above.

(5) If full scale deflection cannot be obtained, replace the two BA–30 batteries in BAT 3 HOLDERS (fig. 10). These batteries are in the ohmmeter circuit.

(6) Apply the tip of the COMMON test lead probe to one end of the resistance to be measured, and the OHMS test lead probe tip to the other end.

(7) Vary the position of the RANGE control until the resistance value is as close as possible to midscale.

(8) Note the position of the RANGE switch. Read the resistance on the green scale. Multiply the reading on the green scale by the RANGE switch indication. For example, if the meter needle indicates 30 and the RANGE switch position indicates RX10K, the resistance is 30 times 10,000 or 300,000 ohms.

c. Testing Batteries with Multimeter.

(1) To test the BA–30 filament battery, set the FUNCTION switch to the BA–30 position. Read the BATTERY TEST scale. If the meter needle indicates REPLACE, install a new BA–30 filament battery in BAT 2 HOLDER (fig. 10).

(2) To test the BA–414/U plate voltage battery, set the FUNCTION switch to BA–414 position. If the meter needle indicates REPLACE, install a new BA–414/U battery in BAT 1 HOLDER (fig. 10).

17. Stopping Procedure

a. Set the RANGE switch control at the 1,000 V position.

b. Set the FUNCTION switch to the +V or −V position.

c. Rotate the ZERO ADJUST control fully counterclockwise, past the click, to the OFF position.

d. If the multimeter is not to be used in the immediate future, place the test leads in the cover. Replace the cover.

Note. To extend the life of the batteries, set the ZERO ADJUST control to OFF when the multimeter is not in use constantly.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

18. General

Although every precaution has been taken in the design of Multimeter AN/PRM–15, its measurements may vary slightly in regions where extreme cold, heat, humidity, moisture, or sand conditions, prevail. Paragraphs 19, 20, and 21 outline precautions to take so that

erratic operation of the multimeter will be minimized in adverse climates.

19. Operation in Arctic Climates

a. Handle the multimeter carefully.

b. Keep the multimeter in a warm and dry compartment if possible.

c. When the multimeter has been exposed to cold and is returned to a warm room, it will sweat. When the multimeter case has reached room temperature, remove the moisture with a dry cloth.

d. When the multimeter is not in use, remove the batteries and protect them by any improvised means.

20. Operation in Tropical Climates

Protect the instrument from dampness, corrosion, and rust. Remove the batteries when the equipment is not in use. Store the batteries and the multimeter in a dry compartment. Remove moisture with a dry cloth at intervals. Keep the instrument free of dust and dirt.

21. Operation in Desert Climates

Sand, dirt, and dust present the greatest problem in desert climates. It is important that the multimeter be kept free of these items. When not in use, keep the cover on the instrument. Before and after using the multimeter, remove any dust particles that may be located within the case or cover with a dry cloth.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE

Section I. ORGANIZATIONAL TOOLS AND EQUIPMENT

22. General

No tools or materials for organizational maintenance of the multimeter are supplied with the instrument. The tools, parts, and supplies necessary to perform organizational maintenance are authorized by appropriate publications.

23. Tools, Materials, and Test Equipment

a. Tools and Materials.

The tools and materials needed for organizational maintenance of Multimeter AN/PRM–15 are listed below.

Tool Equipment TE–41
Screwdriver TL–459/U
Cheesecloth, bleached, lint-free*
Sandpaper (No. 000)*
Solvent, Dry Cleaning (SD)*

b. Test Equipment.

Electron Tube Test Set TV–7/U
Multimeter TS–297/U

Section II. PREVENTIVE MAINTENANCE

24. Definition of Preventive Maintenance

Preventive maintenance is work performed on equipment, usually when the equipment is not in use, to keep it in good working order and to minimize needless breakdowns and interruptions. Preventive maintenance differs from troubleshooting and repair in that its object is to prevent certain troubles from occurring.

25. General Preventive Maintenance Techniques

a. Use No. 000 sandpaper to remove corrosion.

b. Use a clean, dry, lint-free cloth or a dry brush for cleaning.

(1) If necessary, except for electrical contacts, moisten the cloth or brush with solvent (SD); then wipe the parts dry with a cloth.

*Part of Tool Equipment TE–41.

(2) Clean electrical contacts with a cloth moistened with carbon tetrachloride; then wipe them dry with a dry cloth.

Caution: Repeated contact of carbon tetrachloride with the skin or prolonged breathing of the fumes is dangerous. Make certain that adequate ventilation is provided.

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

d. For further information on preventive maintenance techniques, refer to TB SIG 178, Preventive Maintenance Guide for Radio Communication Equipment.

26. Use of Preventive Maintenance Forms

a. The decision concerning the items on DA Forms 11–238 and 11–239 that are to be applied to this equipment is to be made in the case of first echelon maintenance by the communication officer/chief or his designated representative, and in the case of second and third echelon maintenance, by the individual making the inspection. Instructions for the use of each form appear on the reverse side of the form.

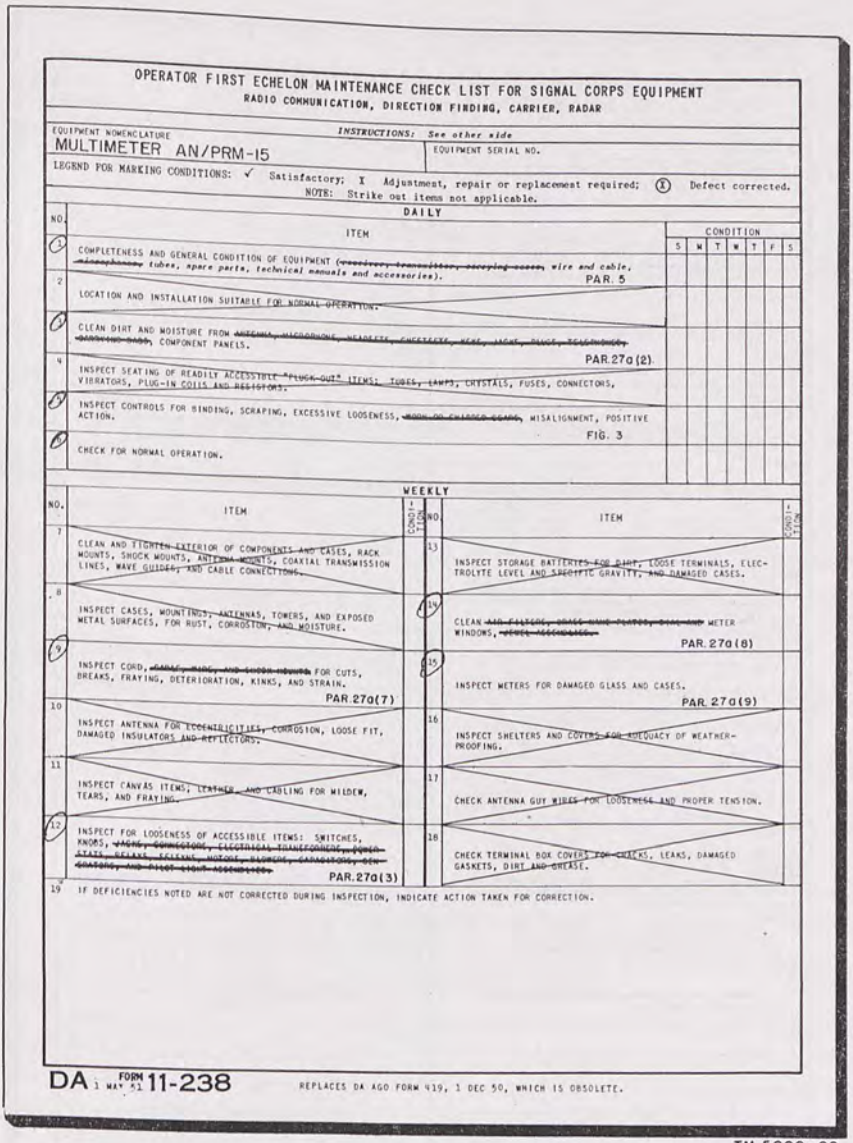
b. Circled items on figures 4 and 5 are partially or totally applicable to Multimeter AN/PRM–15. Items not applicable have been crossed out. References in the item column are to paragraphs that contain additional maintenance information.

27. Performing Preventive Maintenance

Caution: Tighten screws, bolts, and nuts carefully. Fittings tightened beyond the pressure for which they are designed may be damaged.

a. External Items.

(1) Check for completeness and general condition of the multimeter (par. 5).
(2) Remove dirt and moisture from the case (fig. 1).
(3) Inspect the controls for binding, scraping, excessive looseness, and positive action (fig. 3).
(4) Check the multimeter for normal operation.
(5) Tighten all screws.
(6) Inspect the case and handle for rust, scratches, and corrosion.
(7) Inspect the test leads for breaks, cracks, frayed insulation, loosened probes, moisture, and dirt (fig. 1).
(8) Inspect the panel for dirt and grease, scratches, and rust.
(9) Inspect the meter glass for moisture, cracks, and cleanliness.



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

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE: MULTIMETER AN/PRM-15
EQUIPMENT SERIAL NO.

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

DAILY

NO.	ITEM	CONDITION S	M	T	W	T	F	S
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT (~~receivers, transmitters, carrying cases~~, wire and cable, ~~microphones~~, tubes, spare parts, technical manuals and accessories). PAR. 5							
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION.							
3	CLEAN DIRT AND MOISTURE FROM ~~ANTENNA, MICROPHONE, HEADSET, CHESTSET, KEAF, JACKS, PLUGS, TELEPHONES, SWITCHBOARDS~~, COMPONENT PANELS. PAR. 27a(2)							
4	INSPECT SEATING OF READILY ACCESSIBLE ~~"PLUG-OUT" ITEMS~~: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS.							
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, ~~WORN OR CRACKED GEARS~~, MISALIGNMENT, POSITIVE ACTION. FIG. 3							
6	CHECK FOR NORMAL OPERATION.							

WEEKLY

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS.		13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.	
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE.		14	CLEAN ~~AIR FILTERS, GRAIN BINS, PANTOS, DIAL AND~~ METER WINDOWS, ~~FUSE ASSEMBLIES.~~ PAR. 27a(8)	
9	INSPECT CORD, ~~CABLE, RUBBER AND SHOCK MOUNTS~~ FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 27a(7)		15	INSPECT METERS FOR DAMAGED GLASS AND CASES. PAR. 27a(9)	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS.		16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHERPROOFING.	
11	INSPECT CANVAS ITEMS, LEATHER, AND LABELING FOR MILDEW, TEARS, AND FRAYING.		17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, ~~JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, FUSE-POSTS, RELAYS, RELIEVAL MOTORS, BLOWER, CAPACITORS, GEN-GASKETS, AND PILOT LIGHT ASSEMBLIES.~~ PAR. 27a(3)		18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE.	

19 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

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

TM 5090-20

Figure 4. DA Form 11–238.

b. Internal Items.

(1) Inspect the battery holders for dirt, grease, corrosion, and tightness (fig. 10).

(2) Inspect resistors for bulges, cracks, and discoloration (fig. 11).

(3) Inspect the capacitor for bulges and leaks.

(4) Inspect the gaskets for wear, proper fit, and cracks.

(5) Inspect J1 for tightness, grease, and dirt.

SECOND AND THIRD ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT

RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE: MULTIMETER AN/PRM-15

EQUIPMENT SERIAL NO.:

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

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT ~~(receivers, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories).~~ PAR.27b(10)		19	ELECTRON TUBES - ~~INSPECT~~ FOR LOOSE ENVELOPES, CAP CONNECTORS, CRACKED SOCKETS; ~~INSPECT~~ FOR SOCKET SPRING TENSION; CLEAN DUST AND DIRT CAREFULLY; CHECK EMISSION OF RECEIVER TYPE TUBES.	
2	LOCATION AND INSTALLATION ~~SUITABLE~~ FOR NORMAL OPERATION.		20	~~INSPECT~~ FILM CUT-OUTS ~~FOR LOOSE PARTS~~, DIRT, MISALIGNMENT AND CORROSION.	
3	CLEAN DIRT AND MOISTURE FROM ~~ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING CASES~~ COMPONENT PANELS. PAR.27b(8)		21	~~INSPECT~~ FIXED CAPACITORS FOR LEAKS, BULGES, AND DISCOLORATION. PAR.27b(3)	
4	~~INSPECT~~ SEATING OF READILY ACCESSIBLE "PLUG-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS.		22	~~INSPECT~~ RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR LOOSE MOUNTINGS; BURNED, PITTED, CORRODED CONTACTS; MISALIGNMENT OF CONTACTS AND SPRINGS; INSUFFICIENT SPRING TENSION; BINDING OF PLUNGERS AND HINGE PARTS.	
5	~~INSPECT~~ CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, ~~WORN OR CHIPPED GEARS~~, MISALIGNMENT, POSITIVE ACTION. PAR.27b(7)		23	~~INSPECT~~ VARIABLE CAPACITORS ~~FOR~~ DIRT, MOISTURE, MISALIGNMENT OF PLATES, AND LOOSE MOUNTINGS.	
6	CHECK FOR NORMAL OPERATION.		24	~~INSPECT~~ RESISTORS, BUSHINGS, AND INSULATORS, FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE. PAR.27b(2)	
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS ~~AND CASES, RACK-MOUNTS, LOCK-MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS~~. PAR.27b(5)		25	~~INSPECT~~ TERMINALS OF LARGE FIXED CAPACITORS AND RESISTORS FOR CORROSION, DIRT AND LOOSE CONTACTS.	
8	~~INSPECT~~ CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE.		26	CLEAN AND TIGHTEN SWITCHES, TERMINAL BLOCKS, BLOWERS, RELAY CASES, AND INTERIORS OF CHASSIS AND CABINETS NOT READILY ACCESSIBLE.	
9	~~INSPECT~~ CORD, ~~CABLE, WIRE, AND SHOCK MOUNTS~~ FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR.27b(6)		27	~~INSPECT~~ TERMINAL BLOCKS ~~FOR~~ LOOSE CONNECTIONS, CRACKS AND BREAKS.	
10	~~INSPECT~~ ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS.		28	CHECK SETTINGS OF ADJUSTABLE RELAYS.	
11	~~INSPECT~~ CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.		29	LUBRICATE EQUIPMENT IN ACCORDANCE WITH APPLICABLE DEPARTMENT OF THE ARMY LUBRICATION ORDER.	
12	~~INSPECT~~ FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, ~~JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, FUSEHOLDERS, RELAYS, CRYSTALS, METERS, BUSHINGS, CAPACITORS, CONDENSERS, AND PILOT LIGHT ASSEMBLIES~~.		30	~~INSPECT~~ GENERATORS, AMPLIDYNES, DYNAMOTORS, FOR BRUSH WEAR, SPRING TENSION, ARCING, AND FITTING OF COMMUTATOR.	
13	~~INSPECT~~ STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.		31	CLEAN AND TIGHTEN CONNECTIONS AND MOUNTINGS FOR ~~RHEOSTATS, CHOKES~~ POTENTIOMETERS, AND RHEOSTATS. PAR.27b(1)	
14	CLEAN ~~AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, DUST ACCUMULATIONS~~.		32	~~INSPECT~~ ~~RHEOSTATS, CHOKES~~, POTENTIOMETERS, AND RHEOSTATS FOR OVERHEATING ~~AND OIL LEAKAGE~~.	
15	~~INSPECT~~ METERS FOR DAMAGED GLASS AND CASES.		33	BEFORE SHIPPING OR STORING - REMOVE BATTERIES. PAR.27b(9)	
16	~~INSPECT~~ SHELTERS AND COVERS ~~FOR~~ ADEQUACY OF WEATHERPROOFING.		34	~~INSPECT~~ CATHODE RAY TUBES ~~FOR~~ BURNT SCREEN SPOTS.	
17	CHECK ANTENNA GUY WIRES ~~FOR~~ LOOSENESS AND PROPER TENSION.		35	~~INSPECT~~ BATTERIES FOR SHORTS AND DEAD CELLS.	
18	CHECK TERMINAL BOX COVERS ~~FOR~~ CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE.		36	~~INSPECT~~ FOR LEAKING WATERPROOF GASKETS, WORN OR LOOSE PARTS. PAR.27b(4)	
			37	MOISTURE AND FUNGIPROOF.	
38	IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.				

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TM 5090-21

Figure 5. DA Form 11-239.

(6) Inspect all wires for wear, breaks, connections, and dirt (fig. 10).
(7) Inspect the contacts of S1 and S2 for breaks, corrosion, and positive action.
(8) Inspect the terminal board for dirt and dust, loose connections, and tightness.
(9) Inspect the batteries for bulges, dirt, and grease (par. 11).
(10) Inspect all metal for corrosion, dirt, grease, and scratches.

Section III. LUBRICATION AND WEATHERPROOFING

28. Lubrication

No lubrication is required for Multimeter AN/PRM–15.

29. Weatherproofing Procedures and Precautions

a. General. When Multimeter AN/PRM–15 is operated under severe climatic conditions such as prevail in tropical, arctic, and desert regions, it requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

b. Tropical Maintenance. A special moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. This treatment is explained in TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment, and TB SIG 72, Tropical Maintenance of Ground Signal Equipment.

c. Arctic Maintenance. Special precautions necessary to prevent poor performance or total operational failure of equipment in extremely low temperatures are given in TB SIG 66, Winter Maintenance of Signal Equipment at Low Temperatures.

d. Desert Maintenance. Special precautions necessary to prevent equipment failure in areas subject to extremely high temperatures, low humidity, and excessive sand and dust are given in TB SIG 75, Desert Maintenance of Ground Signal Equipment.

30 Rustproofing and Painting

a. When the finish on the case has been badly scarred or damaged, rust and corrosion can be prevented by touching up bared surfaces. Use No. 000 sandpaper to clean the surface down to the bare metal.

b. When a touch-up job is necessary, remove the rust from the case with solvent (SD). In severe cases, solvent (SD) can be used to soften the rust, and sandpaper to complete the preparation for painting. Apply the paint with a brush of suitable size. Paint used will be authorized and consistent with existing regulations.

Caution: Do not use steel wool for cleaning. Very small particles frequently enter the cases of equipment and cause harmful internal shorts or grounds in electrical circuits.

Section IV. TROUBLESHOOTING AT ORGANIZATIONAL MAINTENANCE LEVEL

31. General

a. The troubleshooting and repairs that can be performed at the organizational maintenance level (operators and repairmen) are necessarily limited in scope by the tools, test equipment, and replaceable parts issued, and by the tactical situation. Accordingly, troubleshooting is based on the performance of the equipment, and the use of the senses in determining such troubles as broken test leads, defective wiring, bad batteries, and a defective tube.

b. Paragraphs 32 through 34 will help in determining which circuit is at fault, and in localizing the fault to a defective component.

32. Visual Inspection

a. When trouble develops within the multimeter, do not make a detailed examination of the component parts before first checking the possible faults outlined in *b* below. Obtain information from the previous user of the multimeter regarding the last performance of the unit.

b. Failure of the multimeter may be caused by one or more of the following faults:

(1) Improperly connected batteries.
(2) Weak or dead batteries.
(3) Faulty test leads.
(4) Defective tube.
(5) Defective switch or switches.
(6) Faulty connections to J1.
(7) Faulty wire connection.

33. Troubleshooting by Using Equipment Performance Checklist

a. Purpose and Use. The equipment performance checklist is the beginning of a systematic troubleshooting technique designed to isolate trouble with a minimum of wasted effort. Operate the multimeter as indicated in the checklist, check for the normal indications listed, and if abnormal indication is obtained, follow the corrective measure outlined in the final column of the checklist.

b. Corrective Measures. In some cases, the nature of the abnormal indications will permit immediate localization of the trouble to a particular part. The corrective measures column will indicate the spe-

cific action to take to repair or replace the part. In most cases, the possible abnormal indications provide only for sectionalization of the trouble to a particular part. The corrective measures call for the performance of additional testing procedures for localizing the trouble. When this procedure is beyond the scope of the organizational maintenance personnel, reference is made to specific paragraphs in this manual and troubleshooting at a field maintenance level is required.

c. Equipment Performance Checklist.

	Item No.	Item	Action or condition	Normal indications	Corrective measures
START	1	ZERO ADJUST control and power OFF switch.	Rotate clockwise past the click.	Meter needle deflects rapidly and settles on zero.	Adjust ZERO ADJUST control (par. 43).
EQUIPMENT PERFORMANCE	2	FUNCTION switch	Turn to BA–414	Meter needle points to GOOD	Replace BAT 1.
	3	FUNCTION switch	Turn to BA–30	Meter needle indicates GOOD	Replace BAT 2.
	4	FUNCTION switch	Turn to R	Meter needle deflects full scale to ∞ (infinity).	Adjust OHMS ADJUST control or replace BAT 3.
	5	OHMS and COMMON test leads.	Short the two probe tips together.	Meter needle indicates zero	Adjust ZERO ADJUST control.
	6	OHMS and COMMON test leads.	Apply probe tips to both ends of resistor.	Meter indicates resistance	Refer to paragraph 43.
	7	FUNCTION switch	Operate to +V	Meter indicates zero	Adjust ZERO ADJUST control.
	8	D. C. VOLTS and COMMON test leads.	RANGE switch at 1,000 V with test leads connected to a positive dc voltage and chassis ground.	Meter indicates voltage	Refer to paragraph 43.
	9	FUNCTION switch	Operate to −V	Meter needle points to zero	Adjust ZERO ADJUST control.
	10	D. C. VOLTS and COMMON test leads.	RANGE switch at 1,000 V with test leads applied to negative dc voltage and ground.	Meter indicates negative voltage.	Refer to paragraph 43.

	11	FUNCTION switch	Operate to +V	Meter needle points to zero	Adjust ZERO ADJUST control.
	12	ZERO ADJUST control	Rotate clockwise until meter indicates zero center.	Meter zero centered	Refer to paragraph 43.
	13	D. C. VOLTS and COMMON test leads.	Adjust RANGE switch for proper range. Apply test leads to a dc voltage and chassis ground.	Meter will indicate voltage polarity.	Refer to paragraph 43.
STOP	14	ZERO ADJUST control and power OFF switch.	Turn to OFF.		

CHAPTER 5

THEORY

34. Block Diagram

Multimeter AN/PRM–15 consists of a multimeter and a battery power supply. The block diagram for the multimeter and battery power supply is shown in figure 6. For more detailed overall circuit information, refer to the complete schematic diagram (fig. 14).

a. Multimeter. The multimeter section comprises all the switches, test leads, tube, and indicating meter.

(1) *RANGE switch.* RANGE switch S1 is a two-section, wafer-type switch which selects the proper range for voltage and resistance measurements.

(2) *FUNCTION switch.* FUNCTION switch S2 is a two-section, wafer-type switch which connects the ohmmeter or voltmeter circuit to the cathode follower or connects the plate or filament supply to the meter for checking.

(3) *Cathode follower, V1.* The cathode follower stage receives the input voltage from the FUNCTION switch at a high impedance and converts it to a low impedance at a slightly lower voltage; then the output of the cathode follower is applied to meter M1. Power OFF switch S3 connects plate and filament voltage to the cathode follower.

(4) *Meter.* Meter M1 is a milliammeter with a 0- to 50-microampere movement with appropriate scales printed on its face.

b. Battery Power Supply. The battery power supply contains all the batteries required to supply power to the multimeter.

(1) *Ohmmeter supply.* The ohmmeter supply consists of two 1.5-volt batteries (BA–30) connected in series.

(2) *Plate supply.* The plate supply is a 45-volt battery (BA–414/U).

(3) *Filament supply.* The filament supply is a 1.5-volt battery (BA–30).

35. Cathode Follower

(fig. 7)

a. Tube V1 is a subminiature tetrode connected as a triode and used as a cathode follower. The cathode circuit load is used for the meter

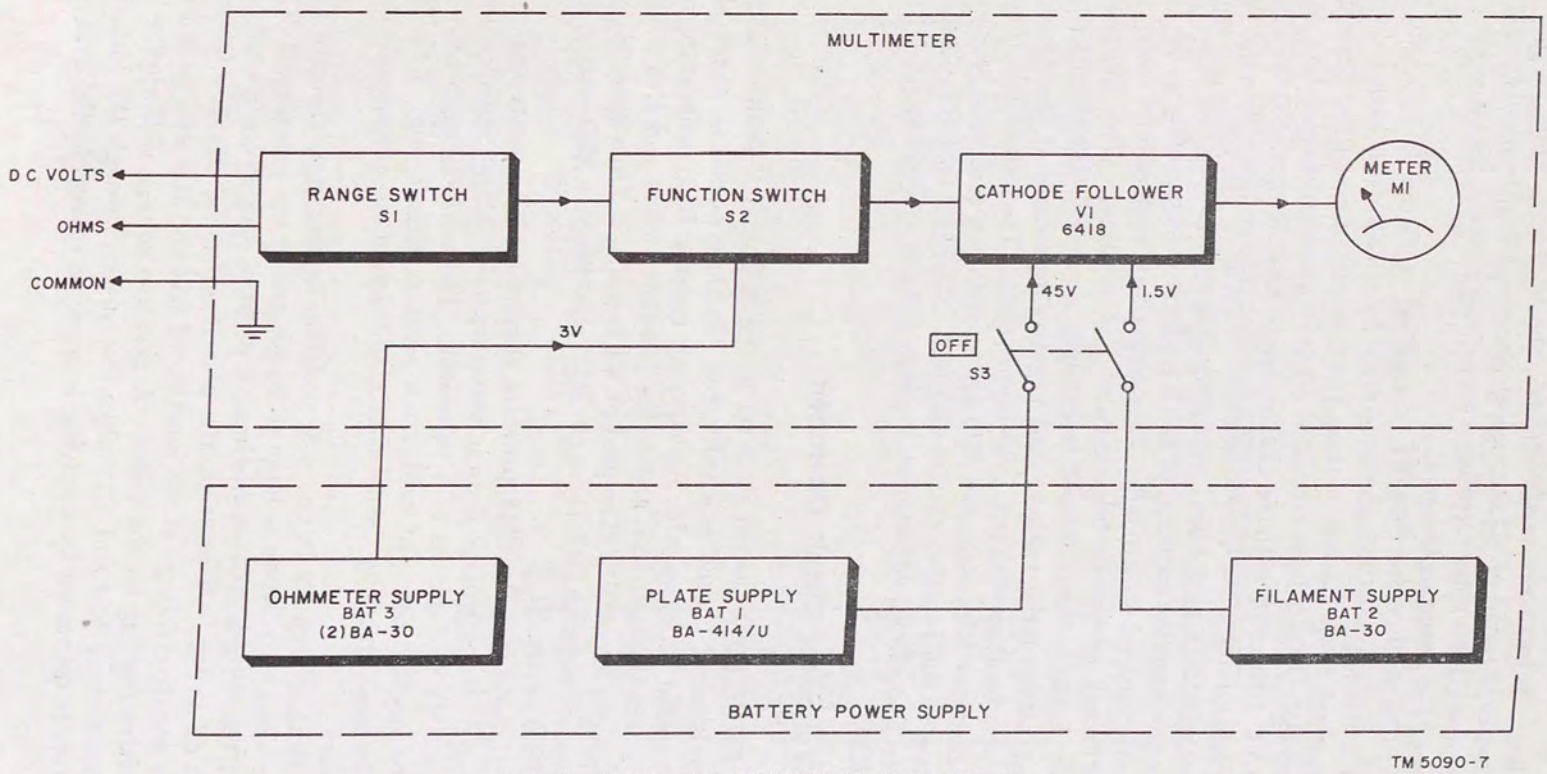


Figure 6. Multimeter AN/PRM–15, block diagram.

reading. When used as a voltmeter, the unknown input voltage is applied to the grid of V1 through grid current limiting resistor R17. Capacitor C1 provides filtering action which prevents any fluctuating voltage from reaching the grid.

b. Plate voltage for tube V1 is supplied from the 45-volt battery BAT 1 and applied through power OFF switch S3. Filament voltage is supplied from 1.5-volt battery BAT 2 and also applied through switch S3. The cathode circuit of V1 is returned to the negative side of BAT 1 through cathode load resistors R14, R15, and R16. The complete circuit from R16 to the negative terminal of BAT 1 (fig. 14) connects R16 to pins 5 and 8 of plug X2, through S3 and pin 9 of X3 to the negative terminal of BAT 1. Power supply battery BAT 1 is center tapped to ground. This center tap permits the meter to be adjusted accurately for a zero voltage reading. With the plate supply battery center tapped to ground, a point in the circuit connected between the positive and negative terminals of the battery must also be at ground potential (zero volts). The values of cathode load resistors R14, R15, and R16 are such that a zero voltage point appears at the junction of R14 and R15. ZERO ADJUST potentiometer R15 allows adjustment for zero volts at the junction of R14 and R15.

36. Voltmeter Circuit Operation
(fig. 7)

a. FUNCTION switch S2 is set to the +V or −V position when the multimeter is used as a voltmeter. In these positions, meter M1 is connected in series with multiplying resistor R18, calibration resistors R22 through R25, and to the junction of R14 and R15 in the cathode circuit of V1. The grid of V1 is connected to a point on an attenuator network R7 through R13 according to the setting of RANGE switch S1.

b. Meter multiplier R18 provides current-limiting protection for the meter, and a voltage drop in series with the voltage source which permits M1 to function as a voltmeter. The meter is calibrated at the factory by means of calibration resistors R22 through R25. It may be recalibrated by the deletion or addition of one or more of these resistors.

c. With switch S2 in the +V position, current flow through the meter causes a positive voltage to be present at the junction of R14 and R15. This condition produces a positive reading on the meter. With S2 in the −V position, the polarity of meter M1 is reversed, and a negative voltage at the junction of R14 and R15 also produces a positive reading on the meter. A negative voltage will appear at the junction of R14 and R15 when the current through the cathode resistors is decreased by applying a negative voltage to the grid of V1.

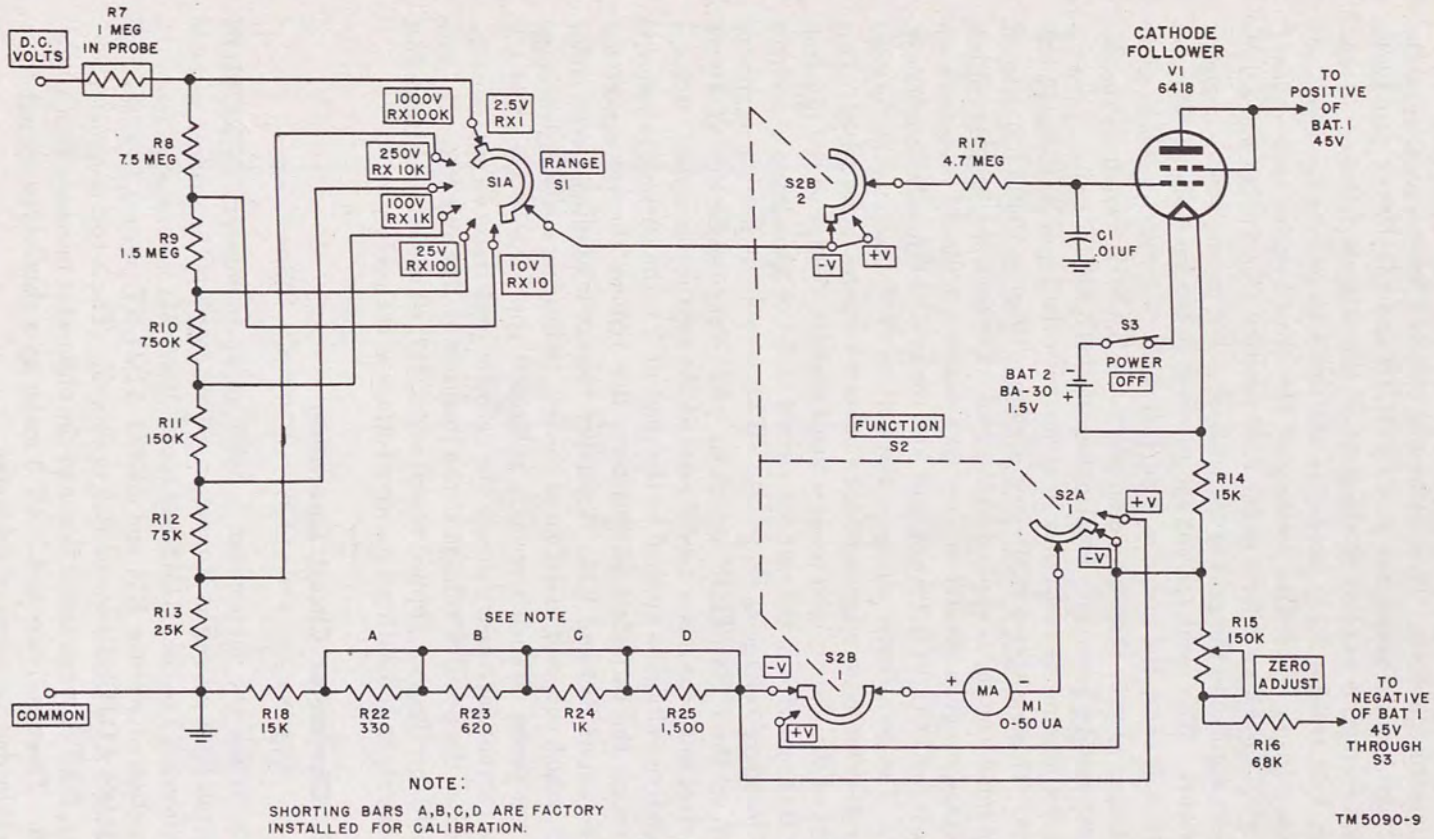


Figure 7. Voltmeter circuit, simplified schematic.

d. RANGE switch S1 selects the desired voltage range. Range selection is accomplished by resistors R8 through R13, a precision attenuator network. This attenuator selects a known portion of the voltage applied across the D. C. VOLTS and COMMON test leads. This voltage is applied to the grid of the cathode follower. Isolation load resistor R7 is located in the probe to prevent the test leads from causing capacitive loading of the circuit under measurement. With RANGE switch S1 in the 2.5V position (fig. 7), the input voltage is applied to the grid of V1 without going through the attenuator network. The resultant voltage increase at the junction of R14 and R15 will cause the meter to read full scale (2.5 volts). To measure voltages greater than 2.5 volts, place the RANGE switch in the desired voltage position. Positioning of the RANGE switch places a known amount of resistance in series with the input to the grid circuit. This resistance will cause a voltage drop so that a fraction of the input voltage is applied to the grid. For each successively higher voltage range, a greater amount of resistance is placed in series with the input D. C. VOLTS test lead, and the grid of the cathode follower.

e. The zero center mark on the bottom of the meter scale is used for discriminator alignment or to balance voltages in networks. This part of the scale is used to set a small positive voltage at the junction of R14 and R15 in the cathode circuit of V1 or to indicate a positive or negative voltage at the probe. With no voltage present at the input, set the FUNCTION switch to +V. Vary the ZERO ADJUST control until the meter needle rests on the zero center mark. When a negative voltage is applied to the grid of V1, the current is reduced through the cathode load resistors; this reduces the voltage at the junction of R14 and R15. A smaller voltage is applied across meter M1, which causes it to deflect to the left, indicating a negative voltage at the probe. When a positive voltage is applied to the grid of V1, the current increases through the cathode load resistors and thus increases the positive voltage at the junction of R14 and R15. A more positive voltage is applied across meter M1, which causes it to deflect to the right, indicating a positive voltage at the probe.

37. Ohmmeter Circuit Operation

(fig. 8)

a. When the multimeter is used as an ohmmeter, FUNCTION switch S2 is set to the R position. This connects the grid of cathode follower V1 to the OHMS test lead. Meter M1 is connected from the junction of resistor R14 and ZERO ADJUST control R15, through OHMS ADJUST resistor R19 to ground. The 3-volt ohmmeter supply, BAT 3, is connected to one of the ohmmeter resistors, R1 through R6. These resistors and BAT 3 make up a shunt-type circuit to select the desired range of the meter.

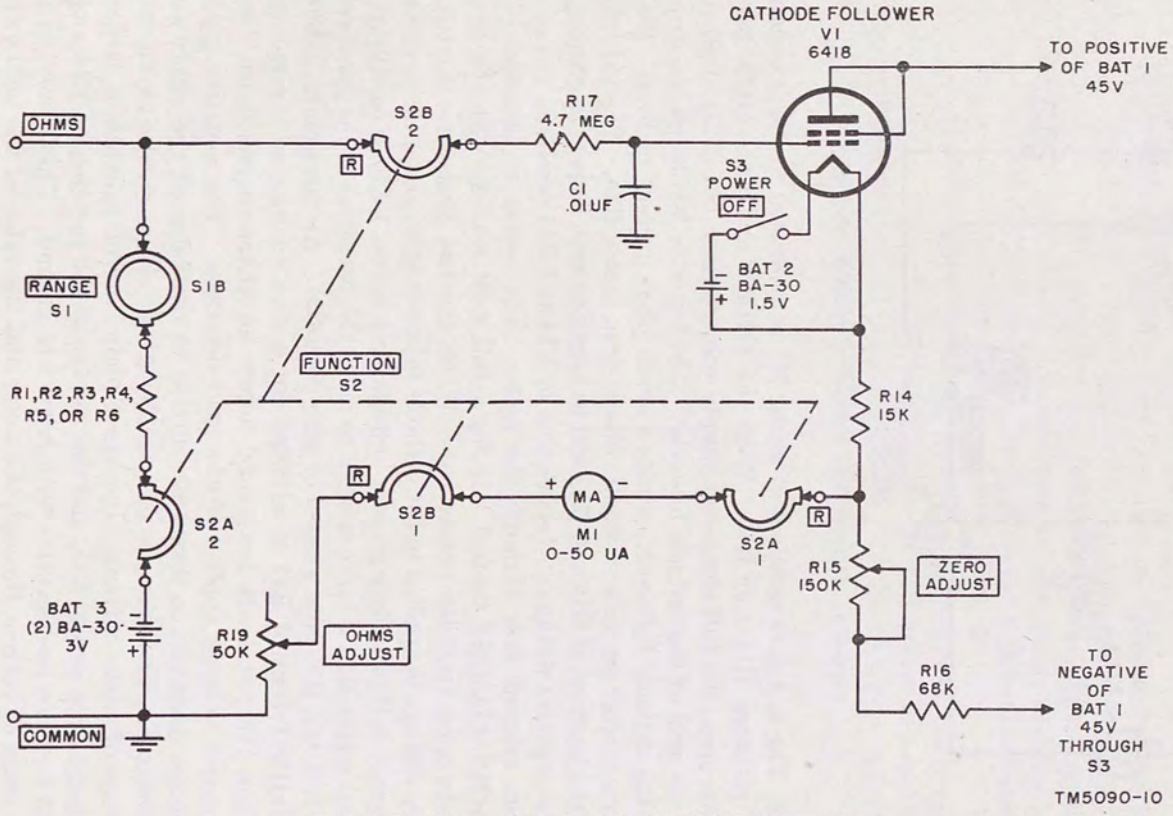


Figure 8. Ohmmeter circuit, simplified schematic.

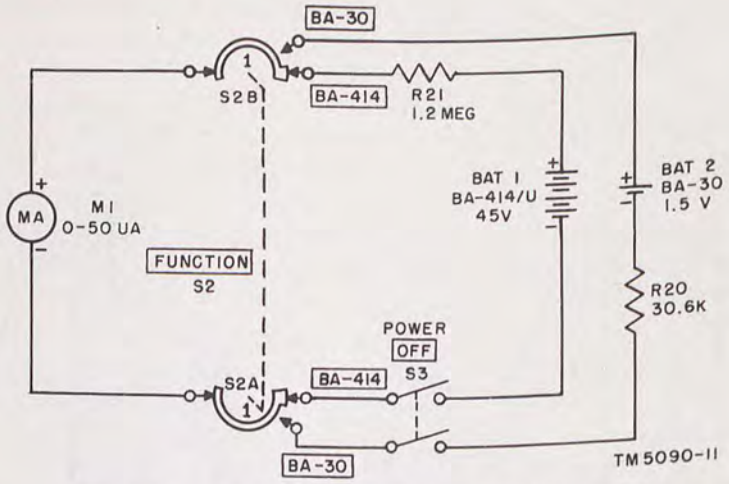


Figure 9. Battery test circuit, simplified schematic.

b. The negative terminal of meter M1 is connected to the junction of resistors R14 and R15. With the OHMS and COMMON test leads open, the full ohmmeter supply voltage from BAT 3 is applied to the grid of the cathode follower. The negative 3 volts on the grid of the cathode follower permits a small plate current to flow. The plate current provides a small voltage drop across R15. The voltage at the junction of R14 and R15 will be negative with respect to ground. The negative voltage at the junction of R14 and R15 results in a maximum current flow through the meter. The meter is adjusted by OHMS ADJUST control R19 for a full scale reading with the test leads open (infinite resistance). When the test leads are shorted, zero voltage is applied to the cathode follower grid, and a large plate current will provide a greater voltage drop across R15. The voltage drop across R15 is large enough to make the potential at the junction of R14 and R15 near ground or zero potential. At this point, ZERO ADJUST control R15 is adjusted for a zero reading on the meter. When the test leads are placed across an unknown resistance, the negative voltage applied to the grid decreases. The negative grid voltage decreases in direct proportion to the value of the unknown resistance. The decrease of negative grid voltage results in an increase of plate current. Increased plate current provides a larger voltage drop across R15, and the voltage at the junction of R14 and R15 becomes less negative with respect to ground. This results in a decrease of current through the meter and the value of the unknown resistance may be read directly from the meter scale.

38. Battery Test Operation

(fig. 9)

When the multimeter is used to check the plate and filament supplies (BAT 1 and BAT 2, respectively), FUNCTION switch S2 is set to the BA–414 or BA–30 position.

a. With FUNCTION switch S2 in the BA–414 position, meter M1, in series with meter multiplier R21, is connected across battery BAT 1. A good battery causes the meter to point to GOOD on the meter dial. A defective battery develops a high internal resistance, causing less current to flow through the meter which indicates a defective battery by a lower meter reading pointing to REPLACE.

b. With FUNCTION switch S2 in the BA–30 position, meter multiplier R20 is used and is connected in series with meter M1 and the parallel tube heater and battery BAT 2. The circuit now operates in the same manner as described in *a* above.

CHAPTER 6

FIELD MAINTENANCE

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

Section I. TROUBLESHOOTING AT FIELD MAINTENANCE LEVEL

39. Troubleshooting Procedures

a. General. The first step in servicing a defective multimeter is to sectionalize the fault. Sectionalization means tracing the fault to the major component or circuit responsible for the abnormal operation of the multimeter. The second step is to localize the fault. Localization means tracing the fault to the defective part responsible for the abnormal condition. Faults such as burned out resistors often can be located by sight and smell but, in the majority of cases, the faults must be localized by checking the resistances. The probable troubles listed in paragraph 43 will aid greatly in localizing trouble.

b. Sectionalization and Localization. Careful observation of the performance of the multimeter, during its different functions, may aid in sectionalizing the trouble. By inspection, the repairman may frequently discover the trouble or determine the circuit in which trouble exists. For example, if FUNCTION switch S2 will operate in all positions except that of R, trouble exists in the ohmmeter circuit.

c. Isolation. After the trouble has been localized to a particular circuit in the multimeter, use visual inspection, resistance measurements, and voltage measurements to determine the defective part.

40. Test Equipment Required for Troubleshooting

The test equipment and the associated technical manuals required for troubleshooting Multimeter AN/PRM–15 are listed in the following chart:

Test equipment	Technical manual
Meter Test Equipment AN/GSM–1B	TM 11–2535A
Electron Tube Test Set TV–7/U	TM 11–5083
Multimeter TS–352/U	TM 11–5527

41. Troubleshoooting Data

Take advantage of the material supplied in this manual. It will help in the rapid location of faults. Consult the following trouble-shooting data:

Fig. No.	Title
10	Multimeter AN/PRM–15, location of parts.
11	Terminal board, location of parts.
14	Multimeter AN/PRM–15, schematic diagram.
15	Multimeter AN/PRM–15, wiring diagram.

42. General Precautions

Carefully observe the following precautions when servicing the multimeter. Careless replacement of parts often causes new faults.

a. Note the position of component leads before unsoldering them. If many leads are involved, tag each lead.

b. Do not damage other leads by pushing or pulling them out of the way.

c. Use a small soldering iron when soldering small parts. If the parts are overheated, the value may be changed or the part may be ruined.

d. Do not permit drops of solder to fall into the multimeter. They may cause short circuits.

e. Make well-soldered joints. A carelessly soldered connection may create a new fault which may be very difficult to locate.

43. Troubleshooting Chart

As an aid in locating trouble in the multimeter, the following chart is supplied. This chart lists the symptoms which the repairman may observe while making tests.

Switch positions		Symptom	Probable trouble	Correction
FUNCTION switch (S2)	RANGE switch (S1)			
All positions	All positions	1. ZERO ADJUST control rotated clockwise past the click. No meter needle movement.	No battery power	Operate FUNCTION switch to BA–30 and BA–414, respectively, for a check. If there is no reading, check battery installation and connections, or replace batteries.
			Defective power OFF switch (S3).	Check wire connections and switch. Replace S3 if defective.
			Defective RANGE or FUNCTION switch.	Check for dirty contacts and loose connections. If necessary replace switches.
			Defective meter M1	Replace meter.
+V, −V, or R	All positions	2. Meter deflects off scale to right or left. No ZERO ADJUST control.	R15, R16, or R18 open	Check and replace defective part.
−V, or R	All positions	3. Meter deflects off scale to right.	Defective tube V1	Check and replace if defective.
			R14 open	Check and replace if defective.
+V	All positions	4. Meter deflects off scale to left.	R14 open	Check and replace if defective.
+V, or −V	All positions	5. No deflection of needle with dc voltage applied.	D. C. VOLTS or COMMON test lead open.	Check, and repair or replace defective lead.
			R7 in D. C. VOLTS probe open.	Check. Replace if defective.
			Capacitor C1 shorted	Check. Replace if defective.

+V, or −V	All positions	6. Meter needle drifts off scale	R13 or R17 open	Check. Replace defective resistor.
			RANGE or FUNCTION switch defective.	Check. Replace or repair defective switch.
	2.5V		Open resistor R8; dirty or open contact on S1.	Check R8 and replace if defective. Clean or repair contact.
	10V		Open resistor R9; dirty or open contact on S1.	Check R9 and replace if defective. Clean or repair contact.
	25V		Open resistor R10; dirty or open contact on S1.	Check and replace R10 if defective. Clean or repair contact.
	100V		Open resistor R11; dirty or open contact on S1.	Check R10 and replace if defective. Clean or repair contact.
	250V		Open resistor R12; dirty or open contact on S1.	Check R12 and replace if defective. Clean or repair contact.
	1000V		Dirty or open contact on S1	Clan or repair contact.
+V, −V, or R	All positions	7. Meter needle fluctuates	Tube V1 defective	Check V1 and replace if defective.
R	All positions	8. Meter reads zero. No OHMS ADJUST control; or, meter suddenly deflects full scale when OHMS ADJUST control is rotated clockwise.	Defective OHMS ADJUST control.	Check and replace R19 if defective.
R	All positions	9. Meter reads zero; or needle deflects off scale to the left.	Batteries improperly installed	Check battery installation and correct polarity error.

Switch positions		Symptom	Probable trouble	Correction
FUNCTION switch (S2)	RANGE switch (S1)			
R	All positions	10. OHMS ADJUST control cannot cause full scale deflection of meter needle.	Weak batteries	Replace batteries.
R	All positions	11. No needle deflection with test leads applied to resistance.	Open OHMS or COMMON test lead.	Check and repair defective test lead.
R	All positions	12. Meter drifts upscale	Defective RANGE or FUNCTION switch.	Check, repair, or replace defective part.
R	RX1		Open resistor R6, open or dirty contact on S1.	Check R6; clean or repair contact.
	RX10		Resistor R5 open; open or dirty contacts on S1.	Check R5; clean or repair contact.
	RX100		Resistor R4 open; open or dirty contact on S1.	Check R4; clean or repair contact.
	RX1K		Resistor R3 open; open or dirty contact on S1.	Check R3; clean or repair contact.
	RX10K		Resistor R2 open; open or dirty contact on S1.	Check R2; clean or repair contact.
	RX100K		Resistor R1 open; open or dirty contact on S1.	Check R1; clean or repair contact.

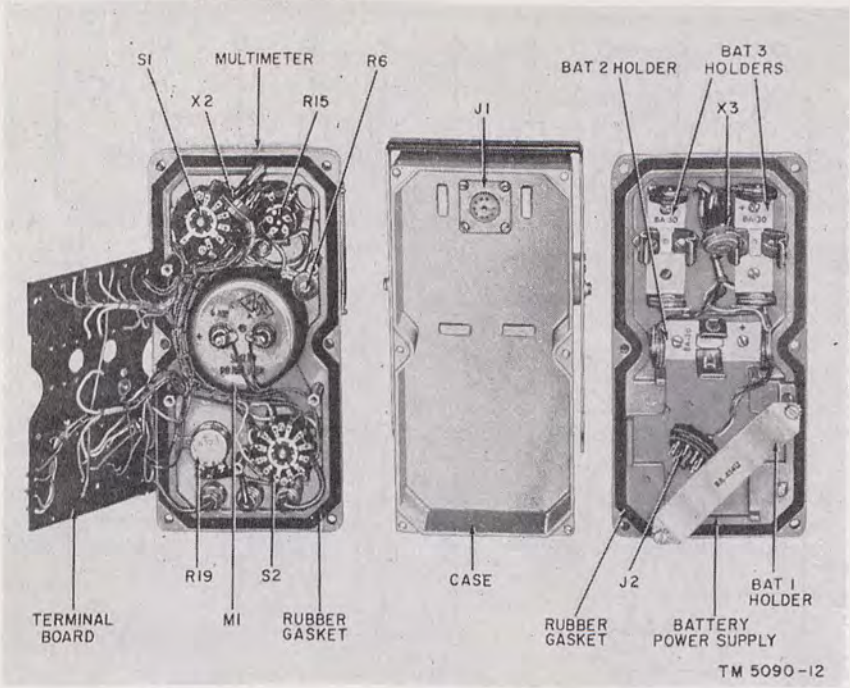


Figure 10. Multimeter AN/PRM–15, location of parts.

Section II. REPAIRS

44. Removal and Replacement of Parts Techniques

Note. All fixed resistors used in the multimeter have closer tolerances than those used in most radio equipments. If these resistors require replacement, use resistors of the same value as those removed. Even if slightly different values are used, the calibration of the multimeter will be inaccurate.

a. The multimeter front panel, and the battery power supply compartment are each held in place by six screws. After making repairs, and the front panel and battery supply compartment are replaced in their positions, tighten the 12 screws securely. This is to maintain the watertight fitness.

b. All the components of the multimeter are readily accessible (figs. 10 and 11) and may be easily replaced if found faulty.

c. The resistors, tube V1, a spare tube, and capacitor C1 are mounted on a terminal board (fig. 11). To remove the terminal board, remove the five screws which hold it to the multimeter. Do not pull the terminal board from the mountings with a quick movement. Wires connected to it may become detached. As shown in figure 10, place the terminal board to one side of the multimeter.

d. Tube V1 may be removed by removing the screw and clamp that holds it to the mounting, and by carefully pulling the tube's

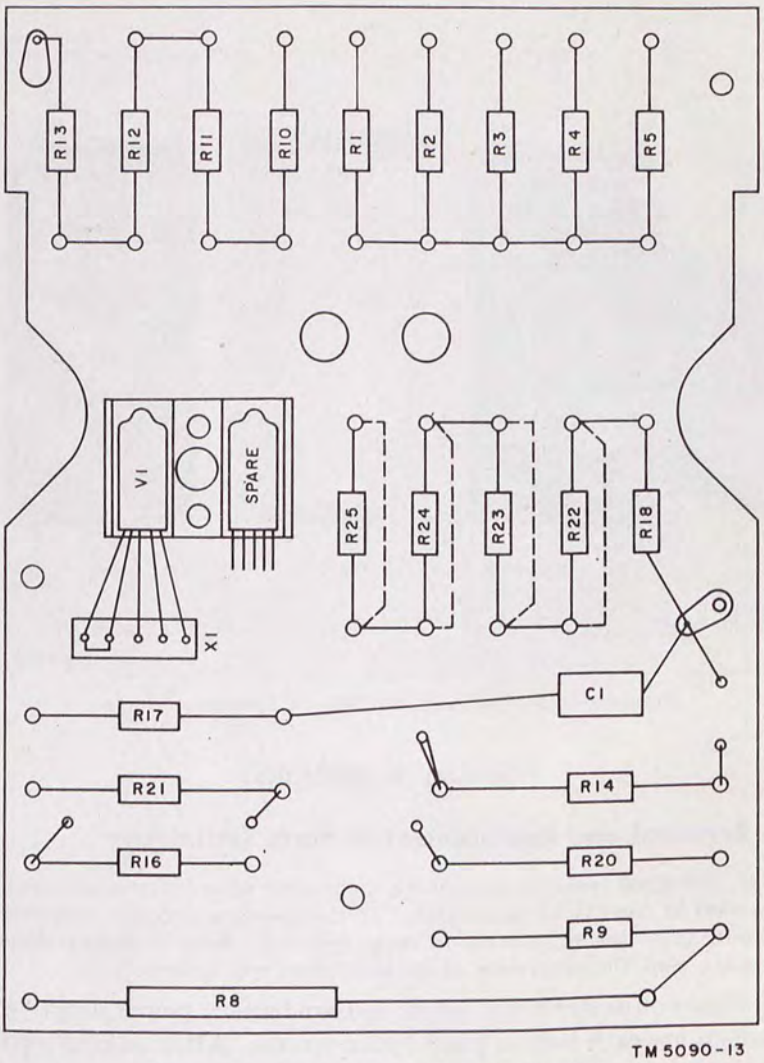


Figure 11. Terminal board, parts location.

element wires from socket X1 (fig. 11). When replacing the tube, be sure that the red dot on the tube coincides with the red dot in the socket. Do not permit the five wires (elements) to touch each other after insertion in the socket.

e. If either of the wafer switches must be removed, label each lead carefully. This will avoid wrong connections when a new switch is installed, or the old one reinstalled.

f. Jack J1 may be removed from the case by removing the four mounting screws. Note the positions of the pins before removing the part.

45. Refinishing

Instructions for refinishing badly marred equipment are outlined in TM 9–2851, Painting Instructions for Field Use.

Section III. CALIBRATION AND FINAL TESTING

46. Test Equipment Required for Final Testing

The following test equipment, part of Meter Testing Equipment AN/GSM–1B, is required for the calibration and final testing of Multimeter AN/PRM–15:

Item	Technical Manual
Meter Test Set TS–682/GSM–1	TM 11–2535A.
Decade Resistor TS–679/U	TM 11–5520.
1 3-megohm resistor	
1 300K resistor	

47. Calibration

Multimeter AN/PRM–15 is calibrated during manufacture. Recalibration is not required unless either meter M1, resistor R18, or resistors R22 through R25, is replaced. To calibrate the meter, use Meter Test Set TS–682/GSM–1 as follows:

a. Remove the six screws holding the multimeter panel to the case. Remove the multimeter from the case but, leave the connector socket (X2) attached to connector adapter J1 (fig. 10).

b. Turn the ZERO ADJUST control clockwise past the click.

c. Operate the FUNCTION switch to the +V position; and the RANGE switch to the 2.5V position.

d. Place the meter needle at zero with the ZERO ADJUST control.

e. Solder jumpers across calibration resistors R22 through R25 (fig. 11) if they were previously clipped during a former calibration.

f. Attach alligator clips to the D. C. VOLTS and COMMON test leads of the multimeter. Insert test cords into the 2.5 volt dc jacks of Meter Test Set TS–682/GSM–1. Apply 2.5 volts dc from the meter test set by attaching the alligator clips on the multimeter test leads to the 2.5 volt dc meter test set leads. The multimeter should read slightly past 2.5 volts on the 2.5V scale.

g. Clip the jumpers (fig. 11) one at the time until the meter reads exactly 2.5 volts, or as close as possible. If the meter reads less than full scale, reconnect the last jumper clipped and clip a jumper across a smaller value resistor.

48. Final Testing

a. General. The instructions given in *b* and *c* below, are intended as a guide in determining the quality of a repaired Multimeter AN/PRM–15. The minimum test requirements may be performed by maintenance personnel with adequate test equipment and the necessary skills. Repaired equipment meeting the following requirements, will perform satisfactorily.

b. Testing the Voltmeter.

(1) Turn the ZERO ADJUST control past the click.

(2) Operate the FUNCTION switch to the +V position; and the RANGE control to the 1000V position.

(3) Adjust the ZERO ADJUST control until the meter needle is at zero.

Warning: Meter Test Set TS–682/GSM–1 must be turned off before making the following connections.

(4) Plug meter Test Set TS–682/GSM–1 test cords into the 1,000-volt dc jacks on the meter test set, and adjust the meter test set for an output of 1,000 volts.

(5) Install alligator clips on the test probes of the multimeter COMMON and D. C. VOLTS test leads. Connect these clips to the meter test set 1,000-volt dc test leads.

(6) Turn the meter test set on. The meter on the multimeter should read within ±3 percent of full scale.

(7) With the RANGE control switch set at 250V, 100V, 25V, 10V, and 2.5V, respectively, repeat instructions in (3) through (6) above, with Meter Test Set TS–682/GSM–1 adjusted for corresponding voltages.

c. Testing the Ohmmeter. The accuracy of the ohmmeter is tested with Decade Resistor TS–679/U as follows:

(1) Operate the ZERO ADJUST control past the click.

(2) Operate the FUNCTION switch to position R and the RANGE switch to the RX100K position.

(3) Adjust the OHMS ADJUST control until the meter needle indicates a full scale reading (∞).

(4) Short the probe tips of the COMMON and OHMS test leads, and adjust the OHMS ADJUST control until the meter needle indicates zero.

(5) Readjust the OHMS ADJUST control until the meter needle indicates a full scale deflection.

(6) Apply the probe tips of the COMMON and OHMS test leads to the terminal leads of the 3-megohm resistor. The meter needle should indicate 3 megohms ±3 percent.

(7) Set the RANGE switch to RX10K. Apply the probe tips of the COMMON and OHMS test leads to a 300,000-ohm resistor. The meter should read 300,000 ohms ±3 percent.

(8) Set the RANGE switch to RX1K. Adjust the Decade Resistor TS–679/U pointer knob to position 3 on the TEN THOUSANDS scale. Insert the probe tips of the COMMON and OHMS test leads on the multimeter, into the binding posts on Decade Resistor TS–679/U. The multimeter should read 30,000 ohms ±3 percent.

(9) Set the RANGE switch to RX100 on the multimeter. Operate the Decade Resistor TS–679/U pointer knob to position 3 on the THOUSANDS scale. The meter should read 3,000 ohms ±3 percent.

(10) Set the RANGE switch to RX10, and the decade resistor pointer knob to position 3 on the HUNDREDS scale. The meter should read 300 ohms ±3 percent.

(11) Set the RANGE switch to RX1, and the decade resistor pointer to position 3 on the TENS scale. The meter should indicate 30 ohms ±3 percent.

CHAPTER 7

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

49. Disassembly

The following instructions are recommended as a general guide for preparing Multimeter AN/PRM–15 for transportation or storage:

a. Disconnect and remove the batteries from Battery Power Supply PP–1247/PRM–15.

b. Remove and place the alligator clips in the mounting provided on the cover.

c. Place the miniature probe tips on the cover.

d. Coil the test leads and store them on the cover.

e. Hook the cover to the case at one end, and tighten the thumbscrew at the other end of the case.

50. Repacking for Shipment or Limited Storage

a. Obtain the fiberboard carton in which the multimeter was shipped, and place the multimeter in the carton.

b. Insert the cushioning and desiccant (fig. 2).

c. Seal the top flaps with sealing tape.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

51. General

The demolition procedures outlined in paragraph 52 may be used to prevent the enemy from salvaging this multimeter. Demolition of the multimeter may be accomplished only upon order of the commander.

52 Methods of Destruction

a. Smash. Smash the meter and the entire case; use a sledge hammer, axe, pickaxe, hammer, crowbar, or any heavy tool.

b. Cut. Cut the test leads with an axe, handaxe, or machete.

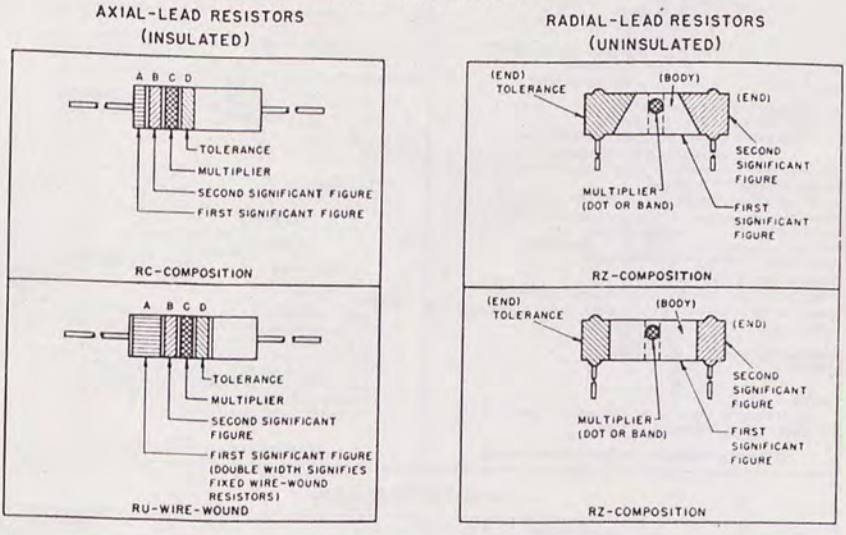
c. Burn. Burn the technical manual; use gasoline, kerosene, oil, flame thrower, or incendiary grenade.

d. Explosives. If an explosive is necessary, use firearms, grenades, or TNT.

e. Disposal. Bury or scatter the destroyed parts in slit trenches, fox holes, or throw them into streams of water.

f. Destroy. Destroy the complete unit.

RESISTOR COLOR CODE MARKING
(MIL-STD RESISTORS)



RESISTOR COLOR CODE

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

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

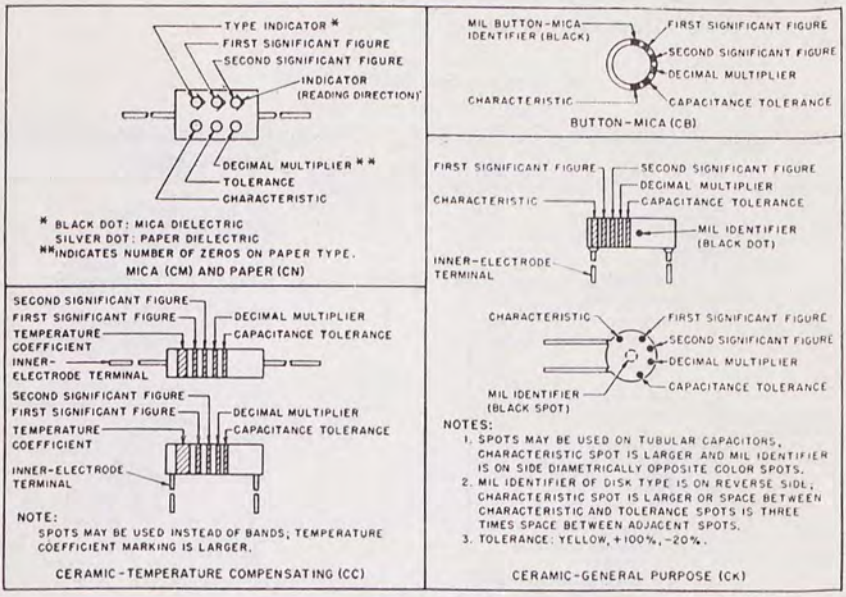
EXAMPLES (BAND MARKING):
10 OHMS ±20 PERCENT: BROWN BAND A; BLACK BAND B; BLACK BAND C; NO BAND D.
4.7 OHMS ±5 PERCENT: YELLOW BAND A; PURPLE BAND B; GOLD BAND C; GOLD BAND D.

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

STD-RI

Figure 12. MIL STD resistor color codes.

CAPACITOR COLOR CODE MARKING
(MIL-STD CAPACITORS)



CAPACITOR COLOR CODE

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

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

STD-CI

Figure 13. MIL STD capacitor color codes.

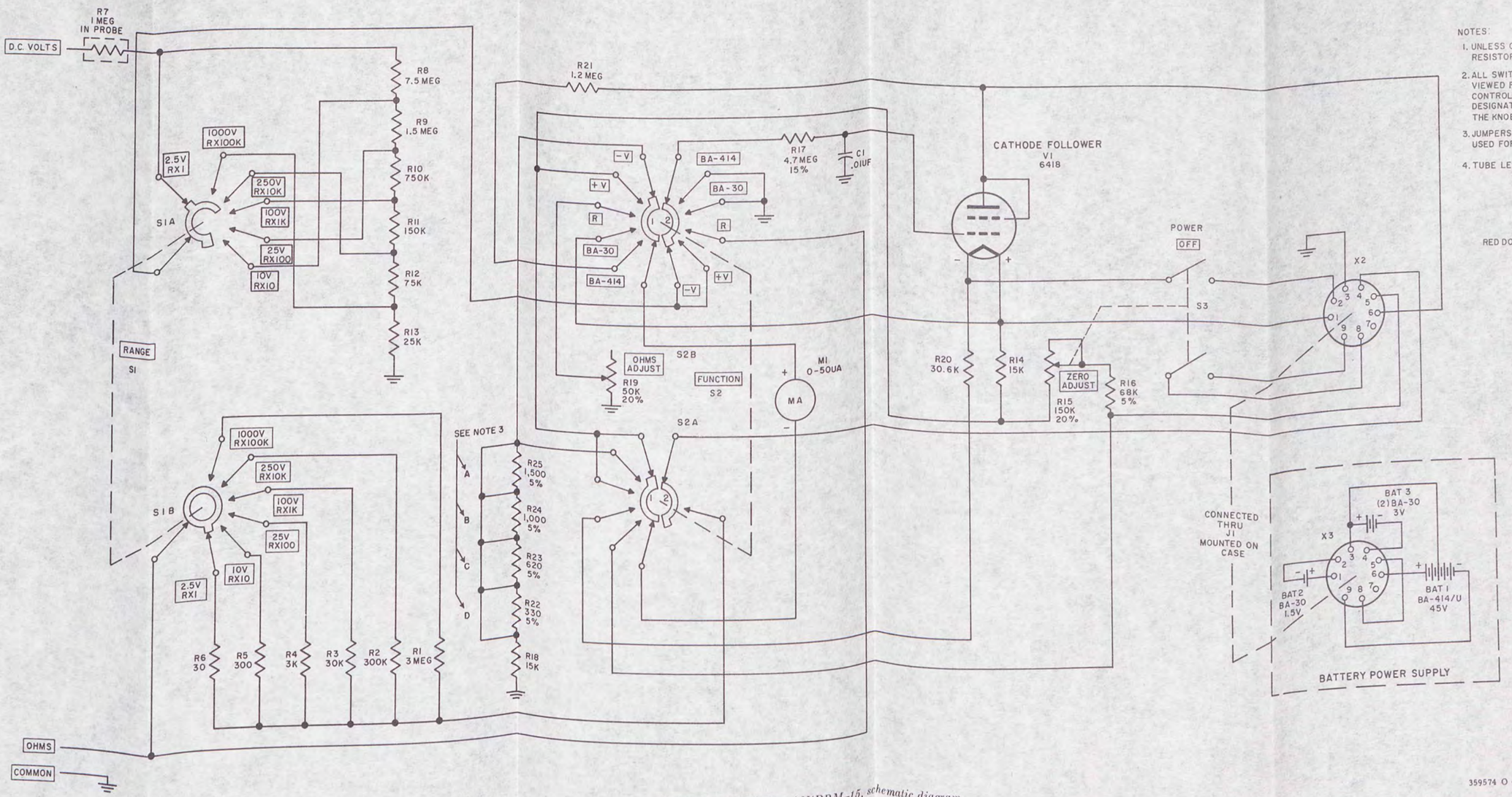


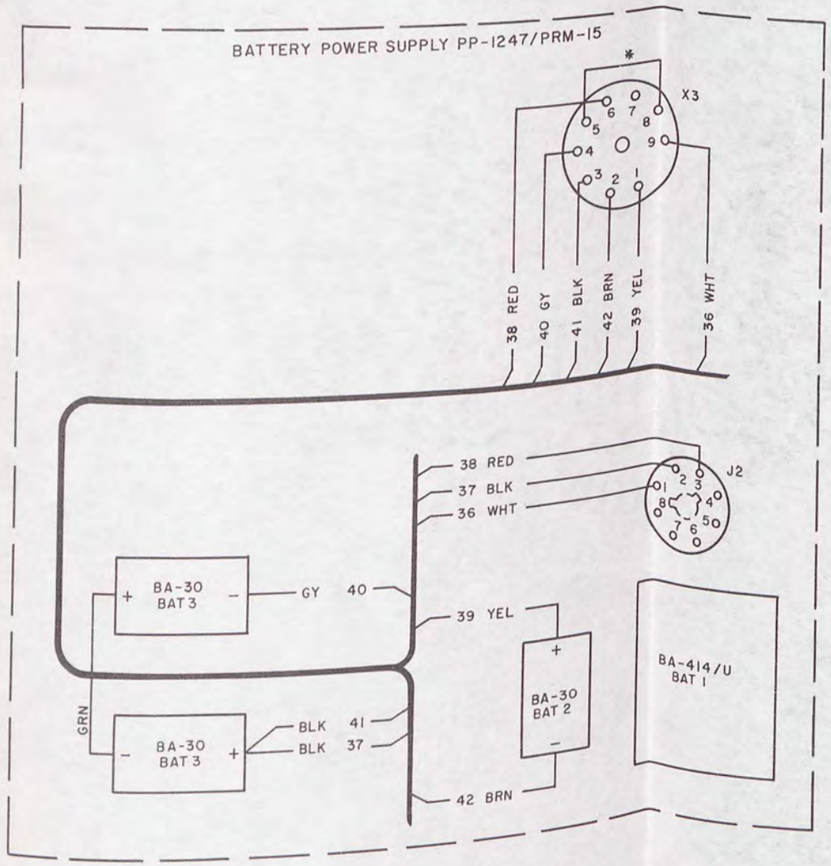
Figure 14. Multimeter AN/PRM-15, schematic diagram.

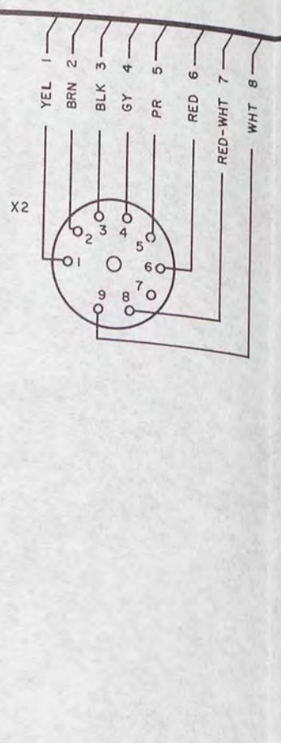
TM 5090-14

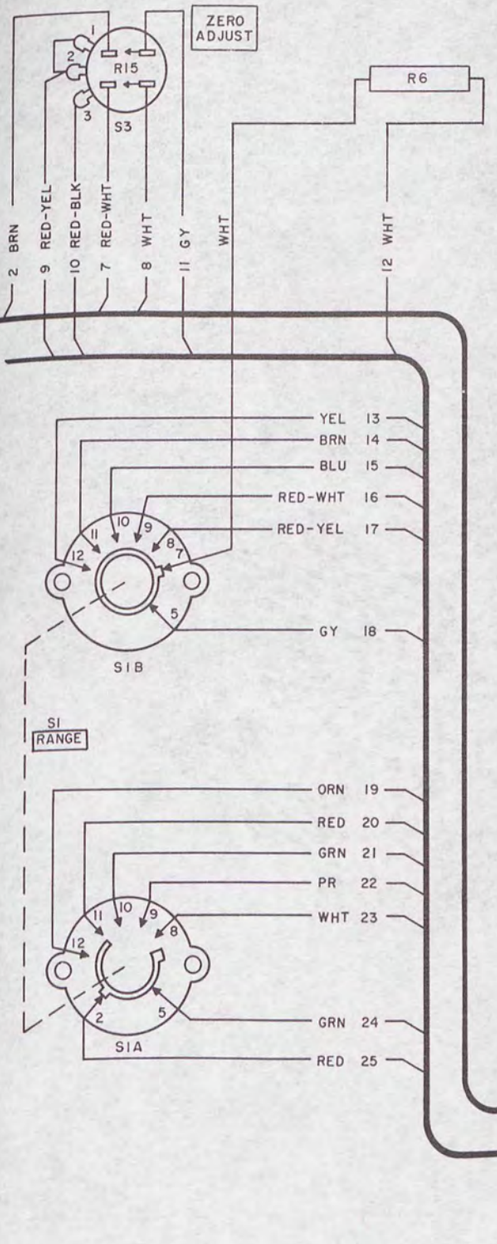
359574 O - 55 (Face page 44) No. 1

NOTES:

1. ALL WIRES ARE #22 AWG STRANDED.
2. ALL UNMARKED WIRES ARE #22 AWG BARE TINNED WIRES.
3. * INDICATES NO. 18 FIBERGLASS SLEEVING.
4. ALL SWITCHES SHOWN ARE VIEWED FROM REAR. SECTIONS DESIGNATED A ARE NEAREST THE KNOB.
5. ····· INDICATES JUMPERS ACROSS CALIBRATION RESISTORS. THE NUMBER OF JUMPERS WILL VARY IN ACCORDANCE WITH THE CALIBRATION OF EACH METER.







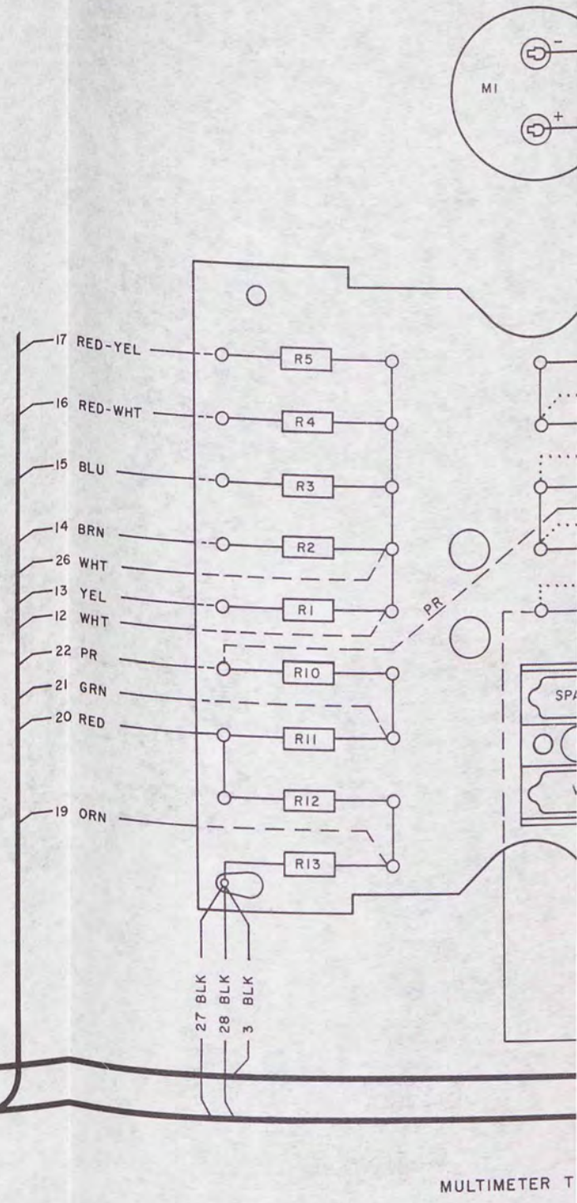


Figure 15. Multimeter AN/PRM-15, wiring diagram.

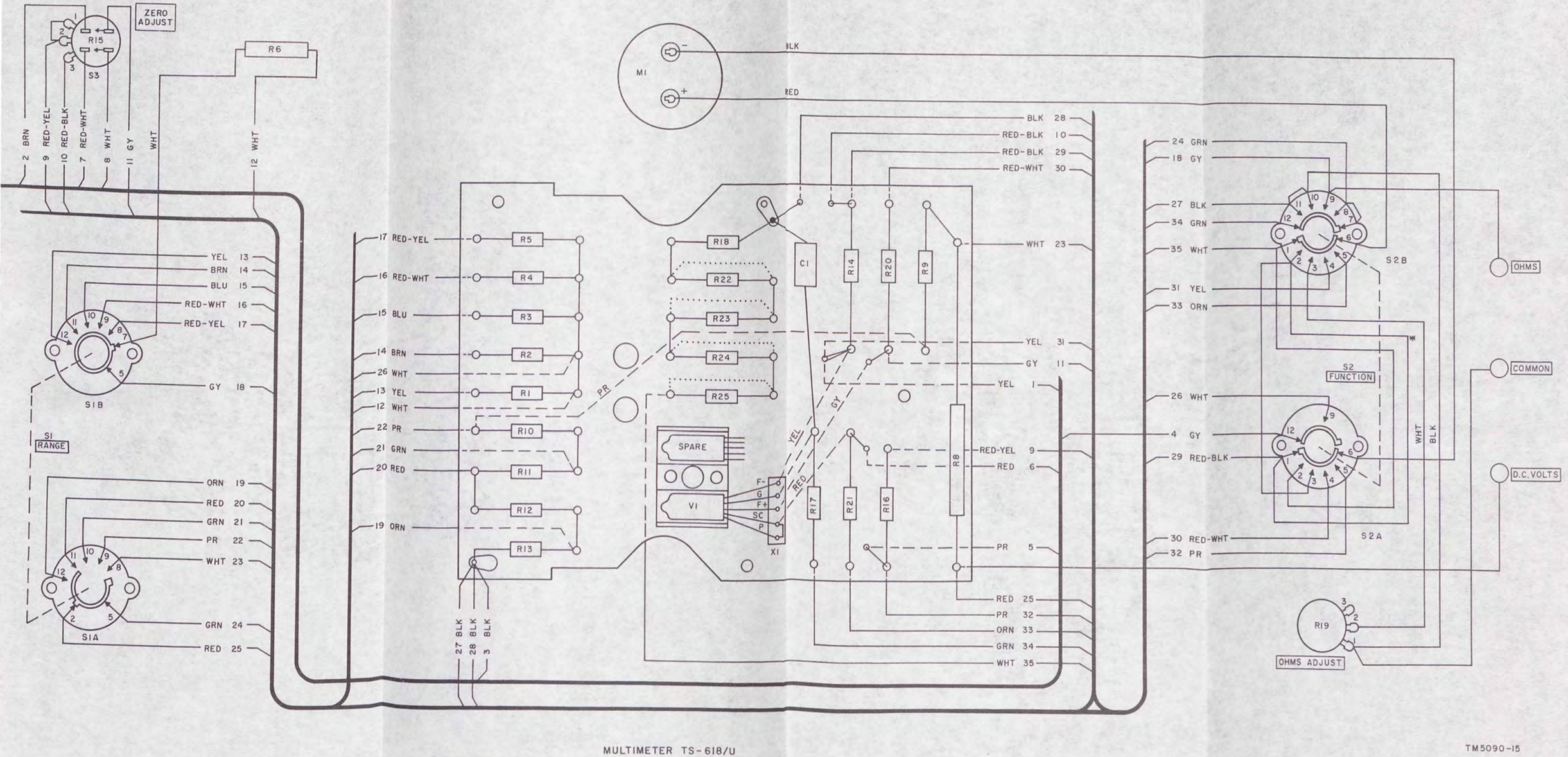


Figure 15. Multimeter AN/PRM-15, wiring diagram.

INDEX

	Paragraph	Page
Batteries:		
Battery Power Supply PP–1247/PRM–15	4*b*	4
Description	7*b*	6
Installation	11	8
Requisitioning	9	7
Testing	16*c*	13
Theory of battery testing circuit	38	31
Calibration of multimeter	47	39
Checking new equipment	10	8
Components, table	6	5
Controls	13, 14	10
Demolition of materiel:		
General	51	42
Methods of destruction	52	42
Description of multimeter	7	5
Disassembly for storage	49	42
Final testing	48	40
Forms and records	2	3
Lubrication	28	19
Operation:		
General	13	10
Inspecting new equipment	10	8
Reconditioned equipment	12	9
Under unusual conditions:		
Arctic climates	19	14
Desert climates	21	14
General	18	13
Tropical	20	14
Under usual conditions:		
Operational procedure	16	12
Preoperational procedure	15	11
Stopping	17	13
Organizational tools and equipment:		
General	22	15
Tools and materials	18	13
Packaging:		
Components, table	6	5
Contents, list	5*b*	4
Packaging data	5*a*	4

	Paragraph	Page
Preventive maintenance:		
Definition	24	15
Forms, use	26	16
Performing	27	16
Techniques	25	15
Purpose and use of multimeter	3	3
Reconditioned equipment	12	9
Repacking	50	42
Repairs:		
Refinishing	45	39
Removal and replacement of parts	44	37
Running spares	8	7
Rustproofing and painting	30	19
Scope	1	3
Technical characteristics	4	4
Test equipment for final testing	46	39
Test equipment for troubleshooting	40	32
Theory:		
Battery power supply	34*b*	24
Battery test operation	38	31
Block diagram	34	24
Cathode follwer circuitry	35	24
Multimeter circuitry operation	34*a*	24
Ohmmeter circuitry operation	37	28
Voltmeter circuitry operation	36	26
Tools	22, 23	15
Troubleshooting at organizational maintenance level:		
General	31	20
Using equipment performance checklist	33	20
Visual inspection	32	20
Troubleshooting chart	43	33
Troubleshooting data	41	33
Troubleshooting precautions	42	33
Troubleshooting procedures	39	32
Weatherproofing	29	19

[AG 413.74 (24 Aug 55)]

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Units organized under following TOE's:
5–15R (2)
6–115R (2)
6–116R (2)
6–501R (2)
6–538R (2)
6–545R (2)
6–546R (2)
6–547R (2)
6–575R (2)
6–576R (2)
6–577R (2)
6–615R (2)
6–616R (2)
7R (2)
7–11R (2)
7–12R (2)
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7–32R (2)
7–45R (2)
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11–128R (2)
11–500R (AA–AE) (2)
11–557R (2)
11–587R (2)
11–592R (2)
11–597R (2)
17R (2)
17–2R (2)
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17–25R (2)
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17–27R (2)
17–51R (2)
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17–55R (2)
17–115R (2)
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19–55R (2)
19–56R (2)
19–57R (2)
19–217R (2)
32–57R (2)
33–77R (2)
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44–26R (2)
44–70R (2)
44–125R (2)
44–126R (2)
44–275R (2)
44–315R (2)
44–316R (2)
44–416R (2)
55–116R (2)
57R (2)
57–57R (2)

NG: State AG (6); Units—same as Active Army except allowance is one copy to each unit.

USAR: None.

For explanation of abbreviations used, see SR 320–50–1.

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