DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S AND ORGANIZATIONAL

MAINTENANCE MANUAL

ELECTRONIC MULTIMETERS TS-505A/U

AND TS-505B/U AND MULTIMETERS

TS-505C/U AND TS-505D/U

This copy is a reprint which includes current pages from Changes 1 through 4.

HEADQUARTERS, DEPARTMENT OF THE ARMY
30 DECEMBER 1960

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

Be careful when working near the 250 volt ac power supply. circuits and the 115-volt ac line connections.

DEATH ON CONTACT
may result if operating personnel fail to observe safety precautions.

Be very careful when measuring voltages in excess of 200 volts. Physical contact with such voltages may result in serious injury or death. To insure safety, turn off the equipment which is being checked before either attaching or removing the test prods at the point of measurement.

DON'T TAKE CHANCES!

CHANGE
No. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *22 May 1974*

Operator's and Organizational
Maintenance Manual
ELECTRONIC MULTIMETERS TS-505A/U AND TS-505B/U
AND MULTIMETERS TS-505C/U AND TS-505D/U

TM 11-25-239-12 30 December 1960 is changed an follows:

Page 5, paragraph 1.1. Delete paragraph 1.1 and substitute:

1.1. Indexes of Publications

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

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

Paragraph 2. Delete paragraph 2 and substitute:

2. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenance levels are listed in and prescribed by TM 3-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58/NAVSUP PUB 378/AFR 71-4/MCO P4030.29, and DSAR 4145.8.

c. Discrepancy in Shipment Report (DlSREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33/AFM 75-18/MCO P4610.19A, and DSAR 4500.15.

Page 5. Paragraph 2.1 is added after paragraph 2.

2.1. Reporting of Errors

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

Page 6. After paragraph 4. add:

4.1. Items Comprising an Operable Equipment

FSN	*Qty*	*Nomenclature, part No., and mfg code*	*Usable on code*	*Fig. No.*
6625-243-0562		Electronic Multimeter TS-505/U, TS-505A,B,C,D/U which includes:		1,2
		NOTE The part number is follows by the applicable 5-digit Federal supply code for manufacturers (FSCM) identified in SB 708-42 and used to identify manufacturer, distributor, or Government agency, etc.		
		NOTE Number 1 in the usable on code column refers to TS-505/U; number 2 refers to TS-505A/U; number 3 refers to TS-505B/U; number 4 refers to TS-505C/U; and number 5 refers to TS-505D/U.		
		NOTE Dry batteries shown are used with the equipment but are not considered part of the equipment. They will not be preshipped automatically but are to be requisitioned in quantities necessary for the particular organization in accordance with SB 11-6.		
6135-120-1020		Battery BA-30	1	
6625-395-9313	2	Lead Set, Test CX-1331A/U	1	
6210-228-6037	1	Lens, Indicator, 10006-111, T2619	1	
6210-284-1459	1	Lens Indicator	2,3,4,5	3
6625-668-9731	1	Prod Test MX-1797/U; SM-B-147308, 80063	1,2,3,4,5	3
6625-669-0244	4	Tip, Test Prod; SC-B-82762, 80063	3,4,5	
6625-669-0246	6	Tip, Test Prod; SC-B-82765, 80063		

Page 36, appendix II. Delete appendix II and substitute:

APPENDIX II
BASIC ISSUE ITEMS LIST (BILL) AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST (ITIAL)

Section I. INTRODUCTION

1. Scope

This appendix lists only basic issue items required by the crew/operator for installation, operation, and maintenance of the TS 505A/U, TS-505B/U, TS-505C/U, and TS-505D/U.

2. General

This Basic Issue Items and Items Troop Installed or Authorized List is divided into the following sections:

a. Basic lssue Items List-Section II. A list, in alphabetical sequence, of items which are furnished with, and which must be turned in with the end item.

b. Items Troop *Installed or Authorized List - Section Ill.* Not applicable.

3. Explanation of Columns

The following provides an explanation of columns found m the tabular listings:

a. Illustration. This column *is* divided as follows:

(1) *Figure number.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number.* Not applicable.

b. Federal Stock Number. Indicates the Federal stock number assigned to the items and will be used for requisitioning purposes.

c. Part Number. Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements, to identify au item or range of items.

d. Federal Supply Code for Manufacturer (FSCM). The FSCM is a 5-digit numeric code used to identify the manufacturer, distributor, or Government agency, etc., and is identified in SB 708 42.

e. Description. Indicates the Federal item name and a minimum description required to identify the item.

f. Unit of Measure (U/M). Indicates the standard of basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation, (e.g., ea, in., pr, etc.). When the unit of measure differs from the unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

g. Quantity Furnished with Equipment (Basic Issue Items Only). Indicates the quantity of the basic item furnished with the equipment.

4. Special Information

Usable on codes are included in the description column. Identification of the usable on codes are as follows:

Code	*Used On*
1	TS-505/U
2	TS-505A/U
3	TS-505B/U
4	TS-505C/U
5	TS-505D/U

Section II. BASIC ISSUE ITEMS LIST

(1) *ILLUSTRATION* *(A) FIG. NO.*	*(B) ITEM NO.*	(2) *FEDERAL STOCK NUMBER*	(3) *PART NUMBER*	(4) *FSCM*	(5) *DESCRIPTION*	*USABLE ON CODE*	(6) *UNIT OF MEAS*	(7) *QTY FURN WITH EQUIP*
		6625-669-0076	M-123-2	98061	COVER, MULTIMETER	1	EA	1
		6625-668-9451	SM-C-147238	80063	COVER, MULTIMETER	2,3,4	EA	1
3		6625-657-2176	SM-C-181965	80063	COVER, MULTIMETER	5	EA	1

By Order of the Secretary of the Army:

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

Official:

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

DISTRIBUTION:

Active Army:
USASA (2)
CNGB (1)
ACS C- E (2)
Dir of Trans (1)
COE (1)
TSG (1)
USAARENBD (1)
USAMB (10)
AMC (1)
TRADOC (2)
ARADCOM (2)
ARADCOM Rgn (2)
OS Maj Comd (4)
LOGCOMDS (3)
MICOM (2)
TECOM (2)
USACC (4)

MDW (1)
Armies (2) Corps (2)
HISA (18)
Svc Colleges (1)
USASESS (5)
USAADS (2)
USAFAS (2)
USAARMS (2)
USAIS (2)
USAES (2)
USAINTCS (3)
WRAMC (1)
ATS (1)
Ft Gordon (10)
Ft Huachuca (10)
WSMR (1)
Ft Carson (6)
Ft Richardson (ECOM Ofc) (2)
Army Dep (1) except
    LBAD (14)
    SAAD (30)
    TOAD (14)
    ATAD (10)
GENDEP (2)
SIg Sec GENDEP (2)
Sig Dep (2)
SigFLDMS (1)
USAERDAA (1)
USAERDAW (1)
MAAG (1)
USARMIS (1)
Units org under fol TOE:
    (1 cy each)
    1-66
    1-56
    1-127
    1-137
    5-278
    5-500
    6-100
    6-155
    6-156
    6-185
    6-186
    6-200
    6-201
    6-215
    6-216
    6-300
    6-302
    6-615
    6 619
    7
    7-100
    9-47
    9 87
    9-227
    11-16
    11 35
    11-36
    11-38
    11-85
    11-86
    11-87
    11-96
    11-97
    11-98
    11-116
    11-117
    11-215
    11-216
    11 302
    11-500 (AA AC)
    17
    17-51
    17-100
    29-1
    29-15
    29-16
    29-21
    28-25
    29-26
    29-35
    29-36
    29-51
    29-55
    29-56
    29-57
    29 65
    29-75
    29-76
    29-79
    29 105
    29-109
    29-134
    29-136
    30-25
    30-26
    32-52
    32-56
    32-57
    32-67
    32-77
    32-78
    32 500
    37
    37-100
    38-51
    39-52
    44-102
    44-112
    44-435
    44-436
    44-437
    44-445
    44-535
    44 536
    44 537
    44 545
    44-546
    44-547
    44-548
    55 157
    57
    57-100

NG: State AG (3)
USAR: None
For explanation of abbreviations, see AR 320-50.

Changes force: C 1, C 2, and C 3

TM 11-6625-239-12
C 3

Operator's and Organizational Maintenance Manual

ELECTRONIC MULTIMETERS TS-505A/U, TS-505B/U,
MULTIMETERS TS-505C/U AND TS-505D/U

CHANGE
No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *23 April 1964*

TM 11-6625-239-12, 30 December 1960, is changed as follows:

Page 6, paragraph 4, "Accuracy" indications. Make the following changes:

Delete the information for "TS-505A/U and TS 505B/U" and substitute: ±5 percent of full scale on dc voltage; ±6 percent of full scale for 60 cps ac sinusoidal input; all other ac voltages from 30 cps to 500 mc are rough indications without accuracy requirements; ±4 percent of ohmmeter total arc length on ohms scales.

For "TS 505C/U and TS-505D/U" delete lines 1 through 8 and substitute: ±5 percent of full scale on dc voltage; ±6 percent of full scale for 60 cps ac sinusoidal input; all other ac voltages from 30 cps to 500 mc are rough indications only, without accuracy requirements; ±5 percent of ohmmeter total arc length on ohms scale.

Page 14, paragraph 17. Add after the last sentence of the note directly after the paragraph heading:

Readings obtained at all frequencies, other than 60 cps, are approximate and should be used only for relative voltage indication.

Page 15, paragraph 18. Add after the last sentence of the note directly after the paragraph heading:

Readings obtained at all frequencies, other than 60 cps, are approximate and should be used only for relative voltage indication.

By Order of the Secretary of the Army:

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

Official:

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

Distribution:

To be distributed in accordance with DA Form 12-32 Section II (Unclas) requirements for operation and maintenance -TMs - applicable to HAWK.

TECHNICAL MANUAL

Operator's and Organizational Maintenance Manual

ELECTRONIC MULTIMETERS TS-505A/U AND TS-505S/U AND MULTIMETERS TS-505C/U AND TS-505D/U

TM 11-6625-289 12
CHANGES NO. 2

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *23 September 1963*

TM 11-6625-239-12, 30 December 1960, is changed as follows:

Page 5. Paragraph 1. Add paragraph 1.1 after 1:

1.1. Index of Publications

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

Paragraph 2. Delete paragraph 2 and substitute:

2. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 88-750.

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

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

Page 20, chapter 3. Delete the section I heading, and paragraph 27 and 28 and substitute:

27. Scope of Maintenance

The maintenance duties assigned to the operator and unit repairman of the multimeter are listed below together with a reference to the paragraphs covering the specific maintenance functions. The tools and test equipment required are listed in paragraph 34.

a. Daily preventive maintenance checks and services (par. 28.2).
b. Weekly preventive maintenance checks and services (par. 28.3).
c. Monthly preventive maintenance checks and (par. 28.4).
d. Quarterly preventive maintenance checks and services (par. 28.5).
e. Cleaning (par. 28.6).
f. Touchup painting (par. 28.7).
g. Operator's visual inspection (par. 29).
h. Operational check (par. 30).
i. Unit repairman's visual inspection (par. 36).
j. Equipment performance check (par. 37)
k. Repairs:
(1) Removal of chassis (par. 31).
(2) Replacement of fuses and power indicator lamp (par. 32).
(3) Tube replacement (par. 38).
(4) Replacement of CR1 (par. 39).
(5) Replacement of D.C. probe (par. 40).
(6) Replacement of A.C. PROBE and COMMON OHMS probes (par. 41).

28. Preventive Maintenance

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

a. Systematic Care. The procedures given in paragraphs 28.2 through 28.6 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services chart (pars. 28.2 through 28.5) outlines functions to be performed at specific intervals. These checks and services are to maintain Army electronic equipment in a combat serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the chart indicates what to check, how to check, and what the normal conditions are. The *References* column lists the illustrations, paragraphs, or manuals that contain detailed repair or replacement procedure. If the defect cannot be remedied by performing the corrective actions listed, higher echelon maintenance or repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

28.1. Preventive Maintenance Checks and Services Periods

Preventive maintenance checks and services of the multimeter are required daily, weekly, and quarterly.

a. Paragraph 28.2 specifies the check and services that must be accomplished daily (or at least once each week if the equipment is maintained in standby condition).

b. Paragraphs 28.3, 28.4, and 28.6 specify additional checks and services that must be performed on a weekly, monthly, and quarterly basis, respectively.

28.2. Daily Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Completeness.....	See that the equipment is complete (appx II)	None.
2	Exterior surfaces.....	Clean the exterior surfaces, including the panel and meter glass (par. 28.6). Check meter glass and indicator lens for cracks.	None.
3	Connectors	Check the tightness of all connectors.....	None.
4	Controls and indicators.....	While making the opening checks (item 5), observe that the mechanical action of each knob, dial, and switch is smooth and free of external or internal binding, and that there is no excessive looseness. Also, check the meter for sticking or bent pointer.	None.
5	Operation.....	Operate the equipment according to paragraph 37	Par. 37

28.3. Weekly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Cables	Inspect cords, cables, and wires for chafed, cracked, or frayed insulation. Replace connectors that are broken, arced, stripped, or worn excessively.	None.
2	Handle and latches	Inspect handle, latches, and hinges for looseness. Replace or tighten as necessary.	None.
3	Metal surfaces	Inspect exposed metal surfaces for rust and corrosion. Clean and touchup paint as required (par. 28.7).	Par. 37

28.4. Monthly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Pluckout items	Inspect seating of pluckout items. Make sure that tube clamps grip tube bases tightly.	None.
2	Jacks	Inspect jacks for snug fit and good contact.	None.
3	Transformer terminals.....	Inspect the terminals on the power transformer. All nuts must be tight. There should be no evidence of dirt or corrosion.	None.
4	Terminal boards.....	Inspect terminal boards for loose connections and cracked or broken insulation.	None.
5	Resistors and capacitors	Inspect the resistors and capacitors for cracks, blistering, or other detrimental defects.	None.
6	Gaskets and insulators.....	Inspect gaskets, insulators, bushings, and sleeves for cracks, chipping, and excessive wear.	None.
7	Interior	Clean interior of chassis and cabinet	None.

28.5. Quarterly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Publications	See that all publications are complete, serviceable, and current.	DA Pam 310-4.
2	Modifications.....	Check DA Pam 310-4 to determine if new applicable MWO's have been published. All URGENT MWO's must be applied immediately. All NORMAL MWO's must be scheduled.	TM 38-750 and DA Pam 310-4.
3	Spare parts	Check for spare parts (operator and organizational) for general condition and method of storage. There should be no evidence of overstock, and all shortages must be on valid requisitions.	Appx II, figure 3, and TM 11-6635-239-20P.

28.6. Cleaning

Inspect the exterior of the equipment. The exterior surfaces should be clean, and free of dust, dirt, grease, and fungus.

a. Remove dust and loose dirt with a clean soft cloth.

Warning: **Cleaning compound is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.**

b. Remove grease, fungus, and ground-in dirt from the cases; use a cloth dampened (not wet) with cleaning compound (Federal stock No. 7930- 395-9542). After charting, wipe dry with a cloth.

c. Remove dust or dirt from plugs and jacks with a brush.

Caution: **Do not press on the meter face (glass) when cleaning; the meter may become damaged.**

d. Clean the front panel, meter, and control knobs; use a soft clean cloth. If necessary, dampen the cloth with water; mild soap may be used for more effective cleaning. Wipe dry with a cloth.

28.7. Touchup Painting Instructions

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

Page 21. Delete figure 9.

Page 22. Delete figure 10.

Page 23. Delete subparagraph 29*b*, and paragraph 30.

Page 25. Delete section II heading, and paragraphs 33 and 35.

Page 26. Delete figure 11.

Page 27. Make the following changes:

Delete paragraph 36.

Subparagraph 37*b*. Add the following to the chart:

Step No.	Action	Normal indication	Corrective measure
8	Turn FUNCTION switch to OHMS.	Meter pointer deflects to, or near, full-scale (∞).	Vary OHMS ADJ. control. Higher echelon repair required.
9	Rotate RANGE switch to desired resistance range.	Meter pointer indicates at, or near, full scale deflection (∞) for each position of RANGE switch.	Vary OHMS ADJ. control for each resistance range as required. Higher echelon repair required.
10	Short tips of OHMS and COMMON probes together.	Meter pointer deflects and indicates at, or near, zero.	Vary ZERO ADJ. control until meter pointer indicates zero. Higher echelon repair required.
11	Separate tips of OHMS and COMMON probes.	Meter pointer deflects to full-scale (∞).	Vary OHMS ADJ. control as necessary.
12	Connect OHMS and COMMON probes to a known resistance.	Meter indicates correct resistance within tolerances of the meter (par. 21) and the resistor.	Remove test probes from the resistor and recheck for a full-scale (∞) indication on meter. Vary OHMS ADJ. control as necessary. Short tips of OHMS and COMMON probes together and recheck for a zero indication on meter. Vary ZERO ADJ. control as necessary. Measure value of resistor again. If meter indication is beyond tolerances, check several resistors. Higher echelon repair required.

Page 35. Add the following to appendix I:

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work
TM 9 -213	Painting Instructions for Field Use.
TM 38- 750	The Army Equipment Record System and Procedures.

By Order of the Secretary of the Army:

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

Official:

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

Distribution:

Active Army:

DASA 16)
USASA (2)
CNGB (1)
CofEngrs 11)
TSG (1)
CSigO (7)
CofT (1)
CofSptS (1)
USACDA *(1))*
USCONARC (5)
USAMC (5)
ARADCOM (2)
ARADCOM Rgn (23
OS Maj Comd (3)
OS Base Comd (2)
LOGCOMD (2)
USAECOM (6)
USAMICOM 14)
USASCC (4)
MDW (1)
Armies (2)
Corps (2)
USA Corps (3)
USATC AD (2)
USATC Engr (2)
USATC Inf (2)
USATC Armor (2)
USASTC (5)
Instls (2) except
Fort Monmouth (65)
Svc Colleges (2)
Br Svc Sch (2)
GENDEP (OS) (2)
Sig Sec, GENDEP (OS) (6)
Sig Dep (08) (12)
Army Dep (2) except
Fort Worth Army Dep (8)
Lexington Army Dep (12)
Sacramento Army Dep (28)
Tobyhanna Army Dep (12)
USACECDA (1)
USAINTCA (6)
USALS (6)
CSTATC (6)
USARMIS Paraguay (5)
1st GM Bde (5)
USAMOAMA (5))
APG (5)
Jefferson PG. (5)
Dugway PG (5)
Raritan Arsenal (5)
Rock Island Arsenal (5)
USASATSA (5)
SIPRE (5)
Granite City Army Dep (6)
USAERDL (6)
USAPRDC (6)
Engr Cen (5)
Ft Belvoir (5)
MGH (6)
LGH (5)
B AMC (b!
USA Elct Rsch & Dev Actr (18)
White Sands
USA Elct Rach & Dev Actv (2)
Fort Huachuca
POE (1)
Trans Tml Comd (1))
Army Tml (1)
USAOSA (l)
AMS (1)
WRAMC (1)
AFIP (1)
Army Pictorial Cen (2)
118A Mob Spt Cen (1)
USA Elct Mat Agcy (12)
Chicago Proc Dist (1)
USARCARIB Sig Agcy (1)
84 Fld Maint Shops (8)
Units org under fol TOE:
(2) copies each
1-7 1-107 6-278 6-155
1-17 1-127 6-600 6-156
1 -87 1-137 (AA-
1-66 6-16 AD) 6-200
1-56 6-16 5-600 6-201
1-67 6 5-45 5-605 6-216
1-76 5-4 6 6-100 6-216
1-76 5-48 6-101 6-285
6-286
6-300
6-301
6-302
6-315
6-316
6-345
6-346
6-385
6-386
6-585
6-615
6-619
7
7-52
7-100
9-47
9-87
9-217
9-227
9-377
9-500
(AA-
AC)
11-5
11-6
11-7
11-8
11-16
11-35
11-36
11-38
11-55
11-56
11-57
11-58
11-85
11-86
11-87
11-96
11-97
11-98
11-116
11-117
11-156
11-157
11-215
11-216
11-500
(AA-
AE)
(RM-
RU)
11-555
11-557
11-558
11-587
11-592
11-597
11-608
17
17-51
17-100
29-1
29-15
29-16
29-21
29-25
29-26
29-35
29-36
29-51
29-55
29-56
29-57
29-65
29-75
29-76
29-79
29-105
29 109
30-25
30-26
32-51
32-52
32-56
32-57
32-67
32-68
32-77
32-78
32-500
33-56
33-500
(AA-
AC)
33-600
(AA-
AC)
37
37-100
39-51
39-52
44-102
44-112
44-435
44-436
44-437
44-445
44-446
44-447
44-448
44-535
44-536
44-537
44-544
44-545
44-546
44-547
44-548
55-157
57
57-100

NG: State AG (3); units - same as active Army except allowances is one copy for each unit.
USAR: None.
For explanation of abbreviations used, see AR 320-50.

AGO 6086A

Operator's and Organizational Maintenance Manual

ELECTRONIC MULTIMETERS TS-505A/U AND TS-505B/U AND MULTIMETERS TS-505C/U AND TS-505-D/U

TM 11-6625-239-12

CHANGES NO. 1

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *31 July 1961*

TM 11-6625-239-12, 30 December 1960, is changed as follows

Page 38. Add the following after appendix II:

APPENDIX III MAINTENANCE ALLOCATION CHART, ELECTRONIC MULTIMETER TS-505A,B,C,D/U

1. General

a. This appendix assigns maintenance functions and repair operations to be performed by the lowest appropriate maintenance echelon.

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

(1) *Part or component.* This column shows the nomenclature or standard item name. Additional descriptive data is included only where clarification is necessary to identify the part. Components and parts comprising a major end item are listed alphabetically. Assemblies and subassemblies are in alphabetical sequence with their components listed alphabetically immediately below the assembly listing.

(2) *Maintenance function.* This column indicates the various maintenance functions allocated to the echelon capable of performing the operations.

(a) Service. To clean, to preserve, and to replenish fuel and 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 service assemblies, subassemblies, and parts for unserviceable components.

These changes, together with TM 11-6625-239-20P, 31 July 1961, supersede TM11-6625-239-20P, 10 July 1959. including C L 26 April 1960, and C 2. 18 August 1960.

(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, inspecting, cleaning, preserving, adjusting, replacing, welding, riveting, and straightening.

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

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

(i) 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.

(j) 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.

(3) *1st, 2d, 3d, 4th, 5th echelon. The* symbol X 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 are as follows.

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

(2) 1st, 2d, 3d, 4th, and 5th echelon. The dagger (†) symbol indicates the echelons 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.

MAINTENANCE ALLOCATION CHART

(1) PART OR COMPONENT	(2) MAINTENANCE FUNCTION	(3) 1ST ECH	(4) 2ND ECH	(5) 3RD ECH	(6) 4TH ECH	(7) 5TH ECH	(8) TOOLS REQUIRED	(9) REMARKS
ELECTRONIC MULTIMETER TS-505/U; TS-505A,B,C,D/U								
	service	X	X				8	
	inspect	X						visual only
	test				X	X	2,4,5	
	replace				X			
	repair				X		6,7	
	calibrate				X	X	1,3	
	rebuild					X	6,7	

ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	1ST ECH	2ND ECH	3RD ECH	4TH ECH	5TH ECH	TOOL CODE	REMARKS
TS-505/U; TS-505A,B,C,D/U (continued)							
METER TEST SET TS-682/GSM-1				*	*	1	
MULTIMETER TS-352/U				*	*	2	
RESISTOR, DECADE ZM-16/U				*	*	3	
TEST SET, ELECTRON TUBE TV-7/U				*		4	
TEST SET, ELECTRON TUBE TV-2/U					*	5	
TOOL KIT TK-87/U				*	*	6	
TOOL KIT TK-88/U				*	*	7	
TOOLS AND TEST EQUIPMENT NORMALLY AVAILABLE TO THE REPAIRMAN USED BECAUSE OF HIS ASSIGNED MISSION	*	*				8	

BY ORDER OF THE SECRETARY OF THE ARMY:

G. H. DECKER,
General, United States Army,
Chief of Staff

Official

R. V. LEE,
Major General,, United States Army
The Adjutant General.

Distribution:

Active Army:

DASA (6)
CNGB (1)
Tech Stf, DA (1)
except CSigO (15)
Tech Stf Bd (1)
USCONARC (4)
USAARTYBD (1)
USAARMBD (2)
USAIB (1)
USARADBD (2)
USAABELCTBD (1)
USAAVNBD (1)
USAATBD (1)
ARADCOM (2)
ARADCOM Rgn (2)
OS Maj Comd (2)
OS BASE Comd (2)
LOGCOMD (2)
MDW ( )
Armies (2)
Corps (5)
USATC AD (2)
USATC Armor (2)
USATC Engr (2)
USATC FA (2)
USATC Inf (2)
Svc College (2)
Br Svc Sch (2)
GENDEP (2) except
Atlanta GENDEP (None)
Slg Sec, GENDEP (5)
Sig Dep (12)
Dugway PG (5)
Pine Bluff Arsenal (5)
Raritan Arsenal (5)
Redstone Arsenal (5)
SPIRE (5)
USA ERDL (5)
Granlte City Engr Dep (5)
Anniston Ord Dep (5)
Blue Grass Ord Dep (5)
Erie Ord Dep (5)
Letterkenny Ord Dep (5)
Navajo Ord Dep (5)
Senica Ord Dep (5)
Pueblo Ord Dep (5)
Madigan Gen Hosp (5)
Brooke Gen Hosp (5)
USAMOAMA (5)
APG (5)
QMRECOMD (5)
JCA (5)
White House Army Sig Agcy (5)
USMA (5)
USA Cml Cen (5)
CMLCMATCOM (5)
Ft Monmouth (263)
USA Corps (3)
AFIP (1)
WRAMC (1)
AFSSC (1)
USAEPG (2)
EMC (1)
USACA (2)
USASEA (1)
USA Carib 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 org under fol TOE:
(2 cy each UNOINDC)
1-7
1-17
1-37
1-107
5-15
5-16
5-278
5-500 (AA-AD)
5-600
5-605
6-100
6-101
6-300
6-301

6-315
6-316
6-585
6-630
7
7-52
B-47
9-87
9-217
9-227
9-377
9-500 (AA-AC)
9-510 (EA,EB)
11-5
11-6
11-7
11-8
11-15
11-16
11-38
11-55
11-56
11-57
11-85
11 -86
11-87
11-96
11-97
11-98
11-117
11-155
11-157
11-158
11 -500 (AA-AE),
(RA-RT) (4)
11-555
11-558
11-587
11-592
11-597
11-608
17
17-51
29-51
29-55
29-56
29-57
32-51
32-56
32-57
32-67
32-500
33-56
33-500 (AC)
33-600 (AA-AC)
39-51
39-52
39-61
44-12
44-102
44-435
44-436
44-437
44-445
44-446
44-447
44-448
44-535
44-536
44-537
44-544
44-545
44-546
44-547
44-548
55-157
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.

TECHNICAL MANUAL

NO. 11-6625 239-12

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *30 December 1960*

ELECTRONIC MULTIMETERS TS-505A/U AND TS-505B/U AND MULTIMETERS TS-505C/U AND TS-505D/U

*This manual supersedes so much of TM 11-5511A. 25 August 1955, including C1, 21 February 1956; C2, 23 November 1956; and C3, 2 January 1958, as pertains to operation and organizational maintenance and TM 11-6625-239-10P, 10 July 1959.

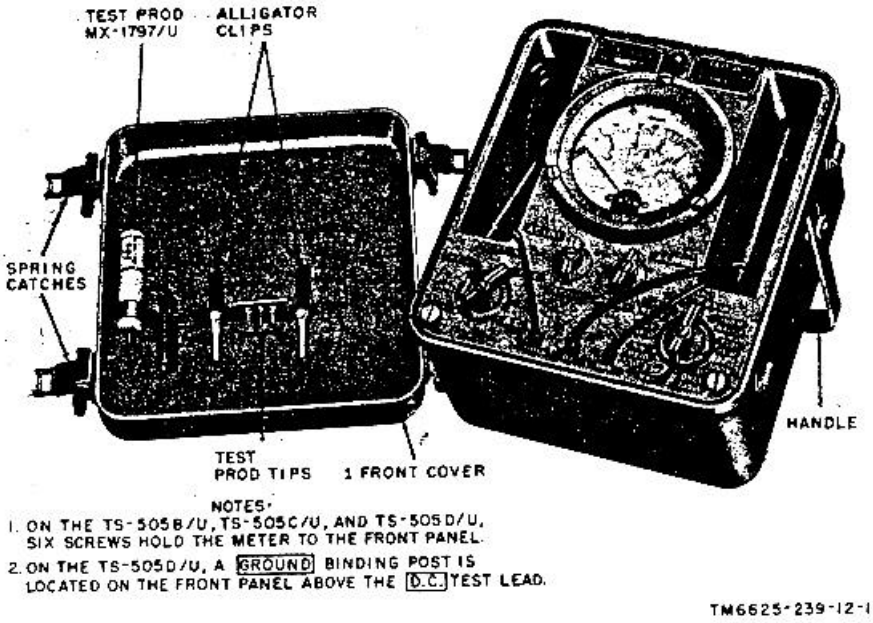


Figure 1. Electronic Multimeter TS-505A/U or TS-505B/U, or Multimeter TS-505C/U or TS-505/U, less running spares

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual Electronic Multimeters TS-505A/U and TS-505B/U, and Multimeters TS-505C/U and TS-505D/U (fig. 1) and covers installation, operation, and first and second echelon maintenance. It includes instructions for operation under usual and unusual conditions, cleaning and inspection of the equipment, and replacement of parts available to first and second echelon maintenance personnel.

b. Official nomenclature followed by (°) is used to indicate all models of the equipment item covered in this manual. Thus, TS-505(°)/U represents Electronic Multimeters TS-505A/U and TS-505B/U, and Multimeters TS-505C/U and TS-505D/U.

2. Forms *and* Records

a. Electronic Failure Report. Fill out and forward DD Form 787-1 (Electronic Failure Report (Signal Equipment)) to the Commanding Officer, U. S. Army Signal Materiel Support Agency, ATTN: SIGMS-ML, Fort Monmouth, N. J., as prescribed in AR 700-38.

b. Unsatisfactory Equipment Report. Fill out and forward AF TO Form 29 (Unsatisfactory Report) to the Commander, Air Materiel Command, Wright-Patterson Air Force Base, Ohio, as prescribed in AF TO 00-35D-54.

c. Report of Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army), Navy Shipping Guide, Article 1850-4 (Navy), and AFR 71 -4 (Air Force).

d. Preventive Maintenance Forms (fig. 9-11). Prepare DA Form 11-266 (Maintenance Check List for Signal Equipment (Test Equipment)) in accordance with instructions on the form.

e. Parts List Form. Forward DA Form 2028 (Recommended Changes to DA Technical Manual Parts Lists or Supply Manual 7, 8, or 9) directly to the Commanding Officer, U. S. Army Signal Materiel Support Agency, SIGMS-ML, Fort Monmouth, N. J., for comments on parts listings.

f. Comments on Manual. Forward all other comments on this manual directly to the Commanding Officer, U. S. Army Signal Materiel Support Agency, ATTN: SIGMS-PA2d, Fort Monmouth. N.J .

Section II. DESCRIPTION AND DATA

3. Purpose and Use

a. Purpose. Electronic Multimeters TS-505A/U and TS-505B/U, and Multimeters TS-505C/U and TS-505D/U measure resistance and alternating current (ac) and direct-current (dc) voltages in electrical and electronic equipments.

b. Use. The TS-505(*)/U can measure resistances from 1 ohm to 1,000 megohms, dc voltages from 0.05 volt to 1,000 volts, and ac voltages from 0.05 volt to 250 volts root mean square (rms) at frequencies from 30 cycles per second (cps) to 1 megacycle (mc). When Test Prod MX-1797/U is used with the D. C. probe, radio frequency (rf) voltages may be measured from 0.05 volt to 40 volts rms at frequencies from 500 kilocycles (kc) to 500 mc

Caution: Do not exceed a 10-second duration for measurements when measuring voltage above 25 volts ac at frequencies between 500 kc and 1 mc. Do not attempt to measure rf voltages greater than 40 volts rms with Test Prod MX-1797/U.

4. Technical Characteristics

Power supply:

Input voltage..... 98 to 132 volts ac, single phase.

Frequency..... 50 to 1,000 cps.

Power consumption ..... Approximately 21 watts.

Indicating meter ..... 1 milliampere dc for full-scale deflection

Dc voltage ranges..... 0 to 2.5 volts.
0 to 5 volts.
0 to 10 volts.
0 to 25 volts.
0 to 50 volts.
0 to 100 volts.
0 to 250 volts.
0 to 500 volts.
0 to 1,000 volts.
Dc zero center ranges..... -1.25 to +1.25 volts.
-2.5 to +2.5 volts.
-5 to +5 volts.
-12.5 to +12.5 volts.
-25 to +25 volts.
-50 to +50 volts.
-125 to +125 volts.
-250 to +250 volts.
-500 to +500 volts.
Ac voltage ranges..... 0 to 2.5 volts.
0 to 5 volts.
0 to 10 volts.
0 to 25 volts.
0 to 50 volts.
0 to 100 volts.
0 to 250 volts.
Rf Voltage range 0 to 40 volts.
Resistance ranges 0 to 1,000 ohms with 30 ohms at center scale.
0 to 10,000 ohms with 300 ohms at center scale.
0 to 100,000 ohms with 3,000 ohms at center scale.
0 to 1 megohm with 30,000 ohms at center scale.
0 to 10 megohm with 300,000 ohms at center scale.
0 to 100 megohms With 3 megohms at center scale.
0 to 1,000 megohms with 30 megohms at center scale.
Frequency range..... 30 cps to 1 mc, ac.
500 kc to 500 mc, rf (using Test Prod MX-1797/U).
Input impedance..... At least 6 megohms shunted by 2 uuf at audio frequencies; 40 megohms on 1,000 volts dc range, and ±500 volts dc range (zero center scale); 20 megohms on all other dc ranges.
Accuracy:
TS-505A/U and TS-505B/U. ±5 percent of full scale on dc voltage; ±6 percent of full scale for ac sinusoidal input from 30 cps to 1 mc on ac range; ±6 percent of full scale for rf sinusoidal input from 500 kc to 500 mc using Test Prod MX-1797/U (error may exceed ±8 percent of full scale for rf sinusoidal input below 1 mc and above 200 mc using Test Prod MX-1797/U); ±4 percent of ohmmeter total arc length on ohms scale.
TS-505C/U arid TS-505D/U. ±5 percent of full scale on dc voltage; ±6 percent of full scale (on all ac ranges including rf) from from 30 cps to 100 mc; ±8 percent of full scale from 100 mc to 500 mc; ±5 percent of ohmmeter total arc length on ohms scale.
Note. The meter scales are calibrated to indicate 0.707 of the peak voltage of a sine wave or a complex wave. For a sine wave, the meter indication is the rms value: for a complex wave, the meter indication is *not* the rms value of the complex wave.
Number of tubes..... 7.

5. Table of Components

(fig. 1 and 2)

The components of the TS 505(*)/U are listed in a below and the spare parts in *b* below.

a. Components.

Quantity	Item	Dimensions (in.)			Unit weight (lbs)
		Height	Depth	Width	
1	Electronic Multimeter TS-505A/U or TS-505B/U, or Multimeter TS-505C/U or TS-505D/U.	9-3/4	6-1/8	9	14
1	Test Prod MX-1797/U	3-3/8		5/8	
2	Alligator clip	2			
3	Tip, test prod (2, fig. 3)				
1 set	Running spares and accessory items (*b* below)				

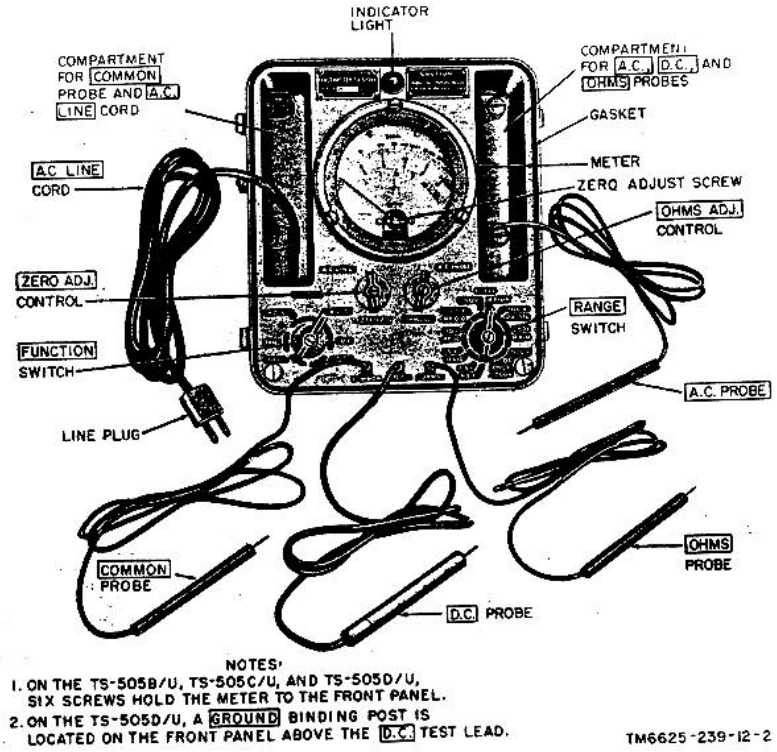


Figure 2. TS-505(*)/U, less cover, front view.

b. Running Spares and Accessory Items(fig. 3.)

Quantity	Item	Identification
1	Electron rube, type 5726/6AL5W	V6
1	Electron tube, type 6AU6WA.....	V1, V2
1	Electron tube, type 6X4W...	V7
1	Electron tube, type 12AT7WA	V3
1	Electron tube, type 5651WA	V4, V5

Quantity	Item	Identification
5	Fuses, 1 ampere, 250 volt, type 3AG	F1, F2
1	Lamp, LM-52	I1
1	Test Prod MX-1797/U	E2
2	Diode, germanium, type 1N70A	CR1
3	Tips, test prod.....	1

6. Common Names

Nomenclature	Common name
Electronic Multimeter TS-505A/U or TS-505B/U, or Multimeter TS-505C/U or TS-505D/U.	Multimeter
Test Prod MX-1797/U	Rf adapter

7. Description of Multimeter

The multimeter consists of a panel chassis assembly contained in a case. A carrying handle (fig. 1) attached to the case may be used as a stand when the multimeter is in use. A detachable cover, which protects the operating controls and the meter when the equipment is not in use, contains two jack-type alligator clips, three test prod tips, and the rf adapter. Spare fuses and germanium diodes are mounted in spring clips secured to the *chassis* (fig. 12). All controls, the meter, and the power indicator light lens are mounted on the front panel (fig. 2). The test leads and the A.C. LINE cord extend through holes in the front panel and are stored in two recessed compartments. The multimeter is watertight when properly closed.

a. Alligator Clips. The alligator clips (fig. 1) are each terminated in a pin jack to accommodate the multimeter probe tips. A plastic sleeve that surrounds the pin jack serves as an insulator. To aid in identifying the

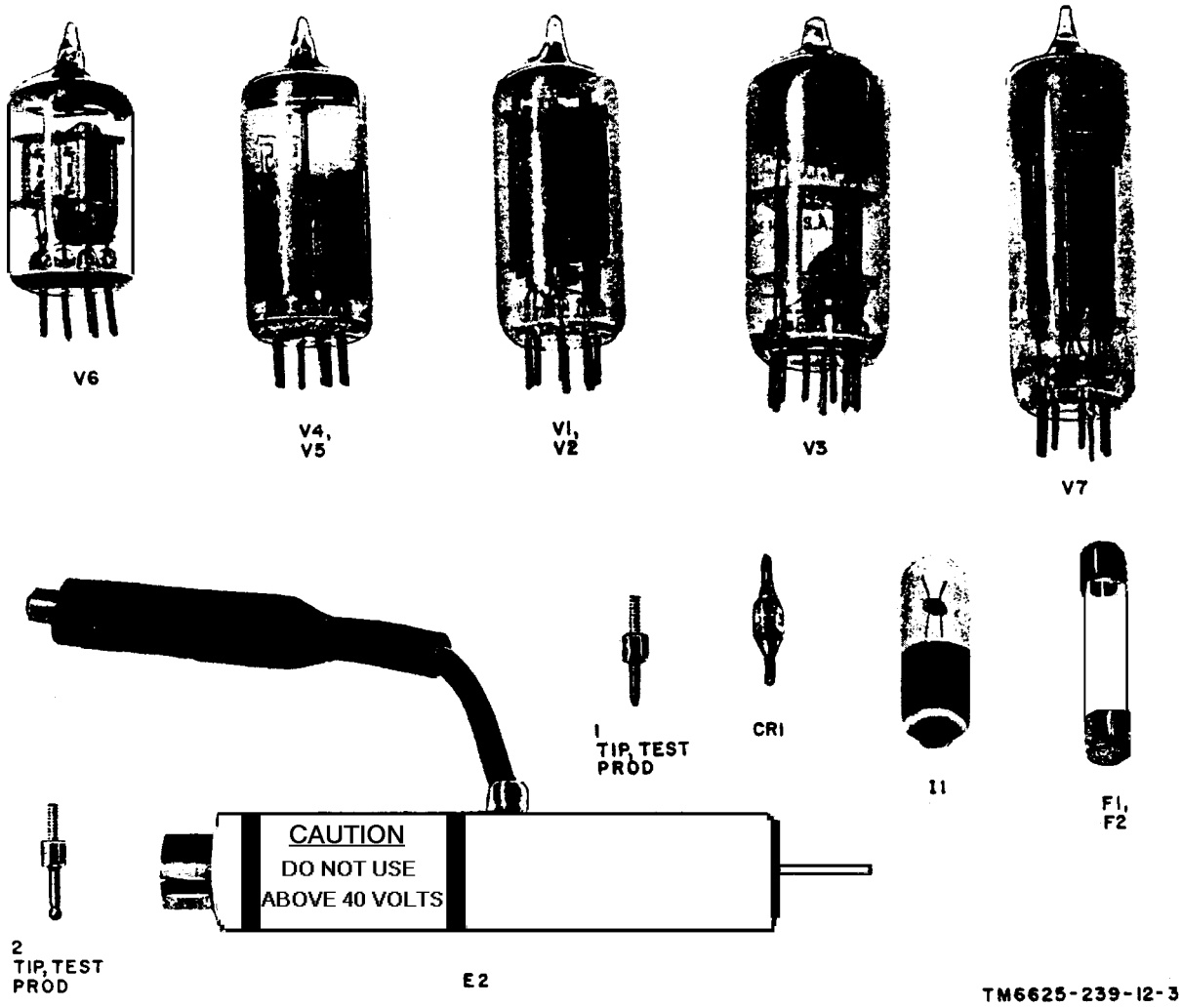


Figure 3. Running spares and accessory items.

test leads with which the alligator clips are used, one plastic sleeve is colored red and the other black.

b. Test Prod Tips. The test prod tips (1, fig. 3) secured to the cover of the multimeter threaded at one end and are interchangeable with the tips (2, fig. 3) attached to the probes. The small test prod tips are used when making measurements in miniature circuits or congested areas.

c. Rf Adapter. The rf adapter contains a germanium diode (CRT) and a resistor (fig. 3). A ground lead extends from the side of the adapter and is terminated with a rubber-shielded alligator clip.

8. Differences in Models

Multimeters TS-505(*)/U are similar in purpose, operation, and appearance. Some models have been modified to improve operational features. The differences are as follows:

Differences	TS-505A/U	TS-505B/U	TS-505C/U	TS-505D/U
Ground reference	Chassis	Chassis	Chassis	COMMON test lead
Accuracy	See paragraph 4	See paragraph 4	See paragraph 4	See paragraph 4
Resistor R1 (in A.C. PROBE).	Used	Not used on some.	Not used	Not used
Number of meter mounting screws	3	6	6	6
GROUND binding post.....	Not used	Not used	Not used	Used

CHAPTER 2
INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

9. Unpacking

a. Packaging Data. When packed for shipment, the multimeter is cushioned on all surfaces and placed within a water-resistant, fiberboard box 15-1/2 by 13-1/2 by 10-1/2 inches. Spare parts are wrapped in a small, flexible corrugated fiberboard package, sealed with pressure-sensitive tape, and taped to the multimeter. The water-resistant, fiberboard box is sealed with water-resistant, pressure-sensitive tape and placed within a wooden box. The wooden box will be strapped only for intertheater shipment. A typical wooden box and its contents are shown in figure 4.

b. Removing Contents.

(1) Cut and fold back the metal straps (when used).

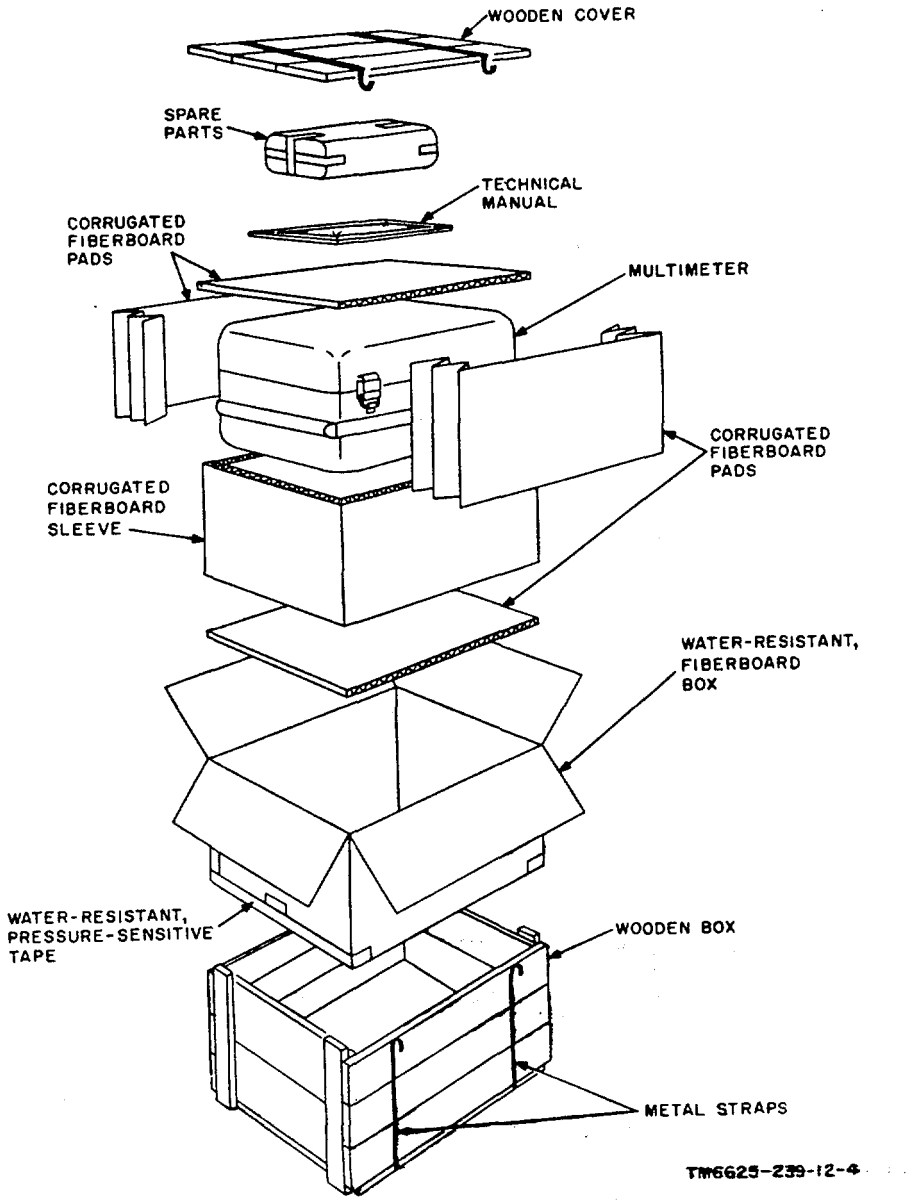


Figure 4. Typical packaging.

Remove the nails from the wooden cover and one side of the wooden box with a nailpuller. Remove the cover and the side. Do not attempt to pry off the cover or the side; prying may damage the equipment.

(3) Remove the envelope that contains the technical manual.

(4) Remove the water-resistant, fiberboard box from the wooden box.

(5) Open the water-resistant, fiberboard box and remove the spare parts package and the multimeter.

10. Checking Unpacked Equipment

a. After a multimeter is removed from its water-resistant, fiberboard box, release the fasteners, remove the cover, and proceed as follows:

(1) Check the equipment against the packing list. When no packing list accompanies the equipment, use the table of components (para 5) as a general check. If the equipment is damaged, refer to paragraph 2.

(2) Check to see that the rf adapter, the alligator clips, and the test prod tips are held firmly to the cover.

(3) Check all controls for ease of rotation. Tighten loose knobs.

(4) Check for a broken meter glass.

(5) Check to see that the meter pointer is not bent.

(6) Check the A.C. LINE cord, test leads, rf adapter ground lead, and the rubber gasket around the edge of the case and behind the meter for signs of deterioration.

b. If the equipment has been used or reconditioned, see whether it has been changed by a modification work order (MWO). If modified, the MWO number will appear on the front panel near the nomenclature plate.

Section II. CONTROLS AND INDICATORS

11. Damage from Improper Settings

Improper setting of the FUNCTION or RANGE switch may damage the multimeter. When measuring unknown voltage values, set the RANGE switch at the highest voltage range (1,000 volts de or 250 volts ac) and reduce the setting of the switch one step at a time until the meter pointer indicates above the center of the scale but less than a full-scale deflection. Be sure the FUNCTION switch is not in the OHMS position when measuring voltage.

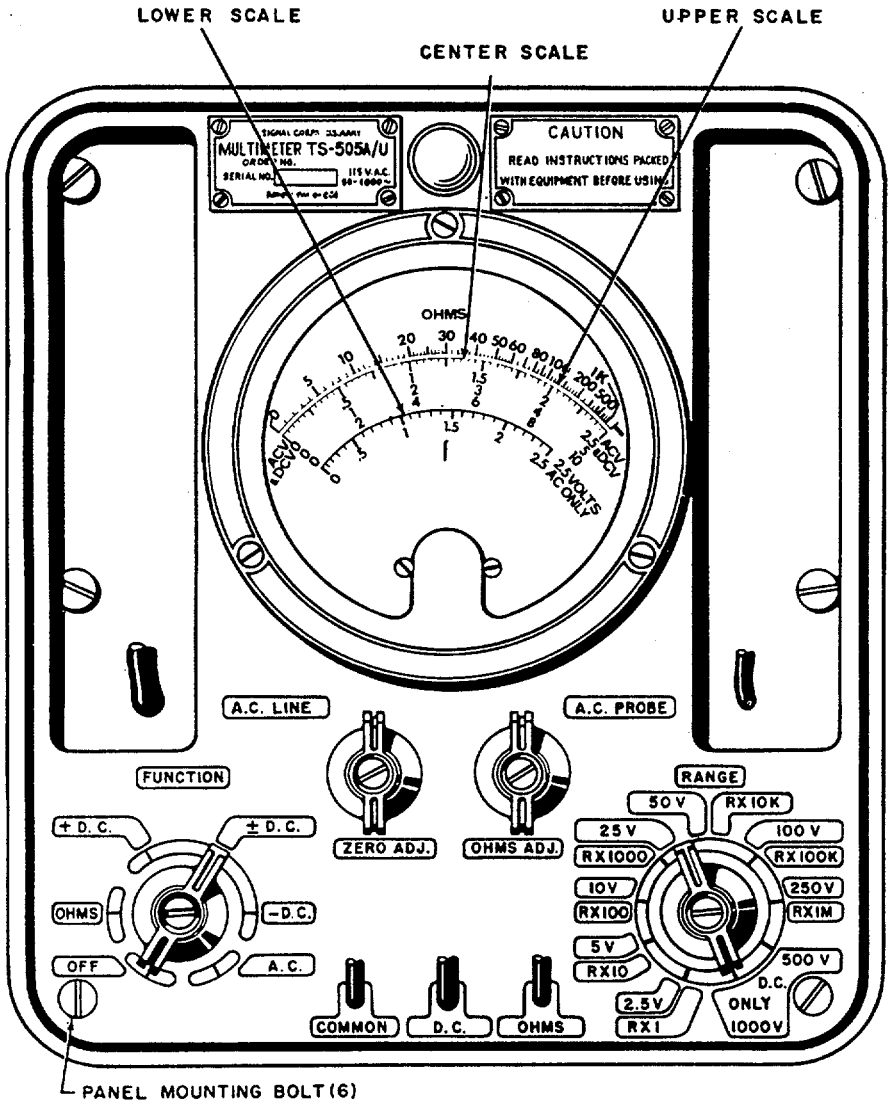
12. Controls, Indicators, and Test Probes

(fig. 5)

The following chart lists the controls, indicators and test probes of the multimeter and indicates their function.

Control, indicator, or test probe	Function	
	Switch position	*Action*
FUNCTION switch (6-position rotary switch).	OFF	Removes ac power from multimeter.
	OHMS	Sets up multimeter circuitry for resistance measurements. Used in conjunction with the RX1; RX10; RX100; RX1000, RX10K, RX100K, and RX1M positions of the RANGE switch.
	+D.C.	Sets up multimeter circuitry for positive dc voltage measurements. Used in conjunction with the 2.5V, 5V, 10V, 25V, 50V, 100V, 250V, 500V, and 1,000V positions of the RANGE switch.
	±D.C.	Sets up multimeter circuitry for positive or negative dc voltage measurements and sets meter pointer to center of scale. Used in conjunction with the dc voltage positions of the RANGE switch.
	-D.C.	Sets up multimeter circuitry for negative dc voltage measurements. Used in conjunction with the dc voltage positions of the RANGE switch.
	A.C.	Sets up multimeter circuitry for ac voltage measurements. Used in conjunction with the voltage positions of the FUNCTION switch.

Control, indicator, or test probe	Function
RANGE switch (9-position rotary switch).	Selects various voltage or resistance measurement ranges. The 500V and 1000V positions are for dc measurements.
ZERO ADJ. control	Used to set the meter pointer at zero on the OHMS and ACV&DCV scales., or to midscale when the FUNCTION switch is in the ±D.C. position.
OHMS ADJ. control	Used to set the meter point at ∞ on the OHMS scale when the FUNCTION switch is in the OHMS position.
Power indicator lamp	Lights when power is applied to the multimeter.
Meter	Indicates the value of voltage or resistance measured. The colored scales are used in conjunction with the same color voltage and resistance ranges of the RANGE switch, the various positions of the FUNCTION switch, and the test leads.
COMMON probe	Connects the ground, or common circuit of the multimeter (except on TS-505D/U), to the equipment under test.
D.C. probe	Connects equipment under test to the dc measuring circuits of the multimeter.
OHMS probe	Connects equipment under test to the ohmmeter circuit of the multimeter.
A.C. probe	Connects equipment under test to the ac measuring circuits of the multimeter.
GROUND binding post (TS-505D/U).	Used to connect multimeter case to an earth ground to eliminate shock hazard.



NOTES:

1. ON THE TS-505B/U, TS-505C/U, AND TS-505D/U, SIX SCREWS HOLD THE METER TO THE FRONT PANEL.
2. ON THE TS-505D/U, A GROUND BINDING POST IS LOCATED ABOVE THE D.C. TEST LEAD.

TM6625-239-12-5

Figure 5. TS-505(°)/U, front panel.

Section III. OPERATION UNDER USUAL CONDITIONS

13. General Instructions

The TS-505(°)/U may be used as an ohmmeter to measure resistance or as an ac or dc voltmeter for voltage measurements. Do not operate the multimeter until the function of all controls (para 12) and the operating procedures for each test (para 15-20) are understood. Refer to paragraph 19 when checking complex ac or rf voltages, and to paragraph 21 when accurate resistance measurements must be made.

14. Starting Procedure

Note. If an abnormal indication is obtained during the starting procedure, refer to the operational checklist (para 30) for corrective measures.

a. Open the spring catches and remove the cover from the multimeter.

b. Connect a lead from the GROUND binding post (TS-505D/U only) to a suitable ground, such as a water pipe.

c. Turn the FUNCTION switch (fig. 5) to the OFF position.

d. Observe the meter pointer. If the meter pointer is not within one-half scale division of zero, slowly turn the zero adjust screw (fig. 2) until the meter pointer indicates zero.

e. Remove all leads from both compartments and connect the A.C. LINE cord to the ac power source.

f. Turn the FUNCTION switch clockwise to any position; the power indicator lamp above the meter should light.

g. Allow the multimeter to warm up for at least 10 minutes before measuring voltages or resistances.

Note. It is normal for the meter pointer to drift while the multimeter is warming up.

15. Reading and Measuring +Dc and -Dc

Warning: Do not touch the case of the multimeter (except TS-505D/U) and the chassis of the equipment under test at the same time when measuring voltages.

a. Reading Dc Voltages. All dc voltages are read on the center scale of the meter (fig. 5). For maximum accuracy in de voltage measurements, set the RANGE switch so that the meter pointer deflects as close to full scale as possible.

Note. Refer to paragraph 16 if the polarity of the dc voltage to be measured is not known.

b. Zeroing Meter for +Dc or -Dc Measurements.

(1) Perform the starting procedures (para 14).

(2) Turn the FUNCTION switch (fig. 5) to the +D.C. position for positive dc voltage measurements or to the -D.C. position for negative de voltage measurements. After the multimeter has warmed up (para 14*g*), the meter pointer will probably be near, but not at, the 0 scale reading.

(3) Turn the RANGE switch to the 2.5V-RX1 position.

(4) Hold the D.C. and COMMON probe tips together, and turn the ZERO ADJ. control until the meter pointer indicates exactly 0 volt.

c. Measuring Dc Voltages.

(1) Turn the RANGE switch to a voltage range higher than the voltage to be measured. If the magnitude of the voltage to be measured is unknown, turn the RANGE switch to the 1000V-D.C. ONLY position. This procedure will protect the multimeter from an overload, which might damage the meter movement.

(2) Connect the COMMON probe tip to the nearest ground potential point of the voltage to be measured. Connect the D.C. probe tip to the other measurement point. The alligator clips, stored on the multimeter cover (fig. 1), may be used to connect the probes to the test points.

(3) If the meter pointer deflects below 0, turn the FUNCTION switch to the -D.C. position if it was previously in the +D.C. position, or the +D.C. position if it was previously in the -D.C. position.

(4) Turn the RANGE switch counterclockwise, one position at a time, until the on-scale deflection of the meter pointer is within the upper one-third portion of the de voltage scale.

(5) Read the meter.

16. Reading and Checking on ±Dc Scale

Warning: Do *not* touch the case of the multimeter (except TS-505D/U) and the chassis of the equipment under test at the same time when measuring voltages.

a. Reading ±Dc Voltages. When the FUNCTION switch is turned to the ±D.C. position, the meter pointer should indicate zero at the center of the scale. Deflection of the meter pointer to the right of zero center indicates a positive voltage; deflection of the meter pointer to the left of zero center indicates a negative voltage. *Voltage measurements cannot be read directly on the meter scale when the FUNCTION switch is set at the ±D.C. position.* The ±D.C. position (zero center scale) indicates the polarity of an unknown dc voltage or indicates a 0 dc voltage input to the multimeter.

Caution: **The maximum dc voltage which may be applied to the multimeter when the FUNCTION switch is set at the ±D.C. position is one-half the voltage indicated by the RANGE switch setting.**

b. Zeroing Meter for ±Dc Range.

(1) Perform the starting procedures (para 14).

(2) Turn the FUNCTION switch (fig. 5) to the ±D.C. position for +dc or -dc measurements.

(3) Turn the RANGE switch to the 2.5V-RX1 position.

(4) Hold the D.C. and COMMON probe tips together and turn the ZERO ADJ. control until the meter pointer is at exact zero center.

c. Checking Voltages on ±Dc Zero Center Scale.

(1) Turn the RANGE switch to a voltage scale higher than the voltage to be checked. If the magnitude of the voltage to be checked is unknown, turn the RANGE switch to the 1000V-D.C. ONLY position. If necessary, the RANGE switch can be rotated to a lower scale.

(2) Connect the COMMON probe tip to the nearest ground potential point of the voltage to be measured. Connect the D.C. probe tip to the other measurement point. The alligator clips may be used to connect the probes to the test points.

(3) If the meter pointer moves to the left, the input voltage is negative. If the meter pointer moves to the right, the input voltage is positive. If the meter pointer does not move, the input voltage is 0 volt.

17. Reading and Measuring Ac Voltages

Note. The procedures in this paragraph apply to measurements of ac voltages from 30 cps to 1 mc. For procedures covering measurement of higher-frequency voltages, refer to paragraph 18.

Warning: Do *not* touch the case of the multimeter (except TS-505D/U) and the chassis of the equipment under test at the same time when measuring voltages.

a. Reading Ac Voltages. Read all ac voltages, except those in the 0- to 2.5-volt range, on the center scale of the meter (fig. 5). When the RANGE switch is in the 2.5V-RX1 position, the voltages are read on the lower scale of the meter. The most accurate readings are obtained when the meter pointer is within the upper one-third portion of the ac voltage scale.

Note. The meter scales are calibrated to indicate 0.707 of the peak voltage of an ac sine wave or a complex wave. For a sine wave, the meter indication is the rms value of the sine wave. For information on the measurement of complex waves, refer to paragraph 19.

b. Zeroing Meter for Ac Measurements.

(1) Perform the starting procedures (para 14).

(2) Turn the FUNCTION switch to the A.C. position and hold the A.C. PROBE and COMMON probe tips together.

(3) Set the meter pointer to 0 by rotating the ZERO ADJ. control.

c. Measuring Ac Voltages.

Caution: **Do not exceed a 10-second duration for measurements when measuring voltages above 25 volts in the frequency range of 500 kc to 1 mc.**

(1) Turn the RANGE switch to a voltage scale higher than the voltage to be measured. If the magnitude of the voltage to be measured is unknown, turn the RANGE switch to the 250V-RX1M position. If necessary, the RANGE switch can be rotated to a lower scale. This procedure will protect the multimeter from a severe overload which might damage the meter movement.

Caution: **The maximum ac voltage which can be measured by the multimeter is 250 volts rms.**

(2) Connect the COMMON probe tip to the low potential point of the voltage to be measured. Connect the A.C. PROBE tip to the opposite point of the voltage to be measured. The alligator clips may be used to connect the probes to the test points.

(3) Turn the RANGE switch counterclockwise, one position until the largest on-scale deflection of the meter point is obtained.

(4) Read the meter.

18. Reading and Measuring Rf Voltages

Note. The procedures in this paragraph apply to measurement of rf voltages between 500 kc and 500 mc.

Warning: **Do *not* touch the case of the multimeter (except TS-505D/U) and the chassis of the equipment under test at the same time when measuring voltages.**

a. Reading Rf Voltages. Read rf voltages on the center scale of the meter (fig. 5). The most accurate readings are obtained when the meter pointer is within the upper one-third position of the dc voltage scale.

Note. The meter scales are calibrated to indicate 0.707 of the peak voltage of an ac sine wave or a complex wave. For a sine wave, the meter indication is the rms value of the sine wave. For information on measurement of complex waves refer to paragraph 19.

b. Zeroing Meter for Rf Measurements.

(1) Perform the starting procedures (para 14).

(2) Turn the FUNCTION switch to the +D.C. position. After the multimeter has warmed up (para 14*g*), the meter pointer will probably be near, but not at, zero.

(3) Turn the RANGE switch to the 2.5V-RX1 position.

(4) Hold the D.C. and COMMON probe tips together, and turn the ZERO ADJ. control until the meter pointer indicates exactly 0 volt.

c. Measuring Rf Voltages.

(1) Turn the RANGE switch to a voltage scale higher than the voltage to be measured. If the magnitude of the voltage to be measured is unknown, turn the RANGE switch to the 50V-RX10K position. If necessary, the RANGE switch can be rotated to a lower scale.

Caution: **Do not attempt to measure rf voltages greater than 40 volts rms. The rf adapter will be damaged if higher voltages are applied.**

(2) Remove the rf adapter from the clips inside the multimeter cover (fig. 1). Connect the rf adapter to the D.C. probe tip.

(3) Connect the alligator clip lead of the rf adapter to the low potential point of the voltage to be measured. Do *not* add extra length to the alligator clip lead; extra length will tend to cause rf loop effects.

(4) Connect the rf adapter tip to the high potential side of the rf voltage to be measured.

(5) Turn the RANGE switch counterclockwise, one position at a time until the largest on-scale deflection is obtained.

(6) Read the meter.

19. Turnover Effect

Complex ac or rf voltage waveforms may have *positive* peak values which are different from the *negative* peak values. If this condition occurs, the multimeter will indicate a certain reading when the rf adapter or A.C. PROBE and COMMON probes of the multimeter are applied to the circuit under test. A different reading will be obtained if the rf adapter or A.C. PROBE and COMMON probes of the multimeter are transposed. This condition is referred to as *turnover effect*. If this condition is suspected, use the following procedures:

a. Make an ac or an rf measurement as described in paragraphs 17 and 18 respectively. Observe and note the meter reading.

b. Transpose the connections of the multimeter to the circuit under test. Observe and note the meter reading.

c. Disconnect the multimeter from the circuit under test.

d. The readings obtained in *a* and *b* above may be used to calculate the mean voltage or the actual peak-to-peak voltage of the complex wave. Proceed as follows:

(1) To obtain the mean voltage, add the two readings (*a* and *b* above) and divide the sum by 2. The quotient is the mean voltage value.

(2) To obtain the peak-to-peak voltage, multiply *each* reading (*a* and *b* above) by 1.414, and add the products. The *sum* is the peak-to-peak voltage value.

20. Reading and Measuring Resistance.

a. Reading Resistances. Read resistance on the upper scale of the meter (fig. 5). The most accurate resistance readings are obtained when the meter pointer is in the center portion of the OHMS scale. The resistance reading is determined by multiplying the meter reading by the resistance multiplier value indicated opposite the RANGE switch setting. For example, if the meter reading is 30 and the RANGE switch is at the

50V-RX10K position, the resistance measured is 30 times 10,000, or 300,000 ohms.

b. Zeroing Meter for Resistance Measurements.

(1) Perform the starting procedures (para 14).

(2) Turn the FUNCTION switch to the OHMS position. The meter pointer should deflect to, or near, a full-scale reading (∞).

(3) Turn the OHMS ADJ. control to set the meter pointer at full scale (∞).

(4) Hold the OHMS and COMMON probe tips together and turn the RANGE switch to the 2.5V-RX1 position. The meter pointer should indicate approximately zero.

(5) Set the meter pointer to 0 by turning the ZERO ADJ. control.

(6) Recheck the ∞ setting by separating the OHMS and COMMON probes. Repeat (3) through (5) above until the meter indicates exactly ∞ and 0.

c. Measuring Resistance.

Caution: **Be certain that power to the equipment to be tested is turned off or the equipment is disconnected from the power source before attempting to measure resistance values. Discharge all capacitors in the circuit under test. External voltages which are applied to the ohms circuit of the multimeter may cause damage to the multimeter.**

(1) Connect the COMMON probe to one end (nearest the ground point) of the unknown resistance; connect the OHMS probe to the other end of the resistance. For example, when measuring the resistance of the plate load resistor of an amplifier tube, connect the COMMON probe to the end nearest B+, and connect the OHMS probe to the end nearest the plate of the tube.

(2) Turn the RANGE switch clockwise, one position at a time, until the meter pointer is closest to center scale.

(3) Disconnect the test leads from the resistance being checked. If the meter pointer does not indicate infinity, adjust it with the OHMS ADJ. control.

(4) Hold the OHMS and COMMON probe tips together, leave the RANGE switch in the desired position and, if necessary, readjust the meter pointer to zero with the ZERO ADJ. control.

(5) Reconnect the OHMS and COMMON probe tips to the resistance being measured and read the meter.

21. Limitations and Qualifications of Resistance Readings

Misinterpretations of resistance readings obtained with the TS-505(°)/U can result in unnecessary repairs to equipment.

a. The tolerance prescribed for a TS-505A/U or TS-505B/U is ±4 percent of arc length; the tolerance for a TS-505C/U or TS-505D/U is ±5 percent of arc length. This tolerance can be visualized by observing the equal divisions (fig. 5) of the 2.5-volt dc scale projected onto the OHMS scale. The distance between each two divisions of the 2.5-volt de scale is equal to 4 percent of the arc length. A resistor rated at exactly 30 ohms could produce a reading on a TS-505A/U or TS-505B/U between 25.5 and 35.5 ohms (fig. 6), with only a 4 percent of arc length meter tolerance considered. If the resistor has a tolerance of ±10 percent, the meter reading obtained would be between 22.7 and 38.1 ohms (fig. 7). The meter readings of a good resistor would vary even more when a TS-505C/U or TS-505D/U is used.

b. A computing device similar to the one shown in figure 8, and calibrated as shown, can be constructed of cardboard. The center scale (percentage of arc length) can then be made to rotate and the device used as an aid for determining the limits of acceptability of resistors tested with the TS-505(°)/U. Examples of the step-by-step procedure used to determine possible ohmmeter readings for a 30-ohm resistor, considering a ±4 percent arc length, are as follows:

(1) *Calculation for 0-percent tolerance resistor*(fig. 6).

(*a*) Rotate the percentage of arc length scale until the -0+ mark is aligned with 30 on the ohms scale.

(*b*) The possible meter reading due to meter tolerance is read on the ohms scale directly above the second division to the left and to the right of the -0+ mark on the percentage of arc length scale.

(2) *Calculation for ±10-percent tolerance resistor* (fig. 7).

(*a*) Compute the upper and lower tolerance limits of the resistor to be tested. The lower limit is. found to be 27 ohms and the upper limit 33 ohms.

(*b*) Align the -0+ mark oat the percentage of arc length scale with 27 on the ohms scale. The lower limit tolerance (22.7 ohms) is indicated on the ohms scale directly over the second division to the left of the -0+ mark.

(*c*) Align the -0+ mark on the percentage of arc length scale with 33 on the ohms scale. The upper limit tolerance (38.1 ohms) is indicated on the ohms scale directly over the second division to the right of the -0+ mark.

Note. Be sure to multiply the ohms scale reading by the correct multiplier when a resistance range other than RX1 is used.

c. The conditions outlined in *a* and *b* above point out the area of possible error that can be read when checking resistors of correct value. The same errors can occur (in reverse) wherein a resistor of incorrect value actually indicates a correct value when measured with the multimeter. Before accepting resistors that are within the specified limits or rejecting resistors that are just outside the specified limits, check with an ohmmeter that is more accurate than the TS-505(°)/U.

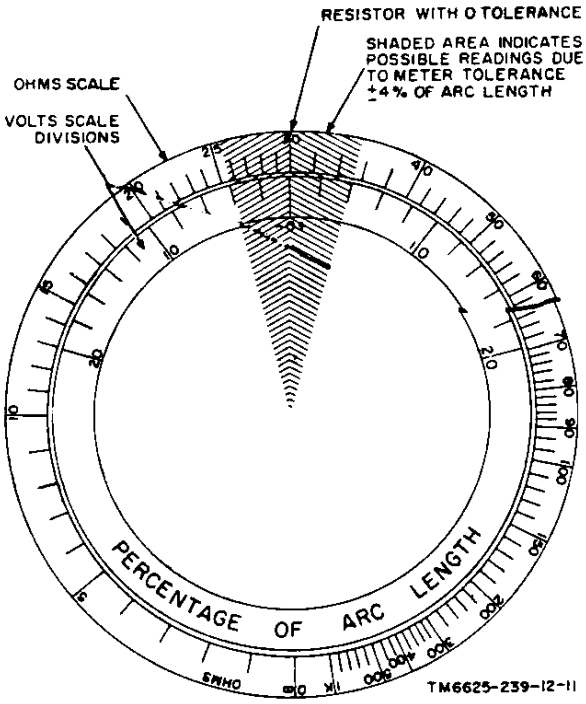


Figure 6. Computing device, indicating meter tolerance.

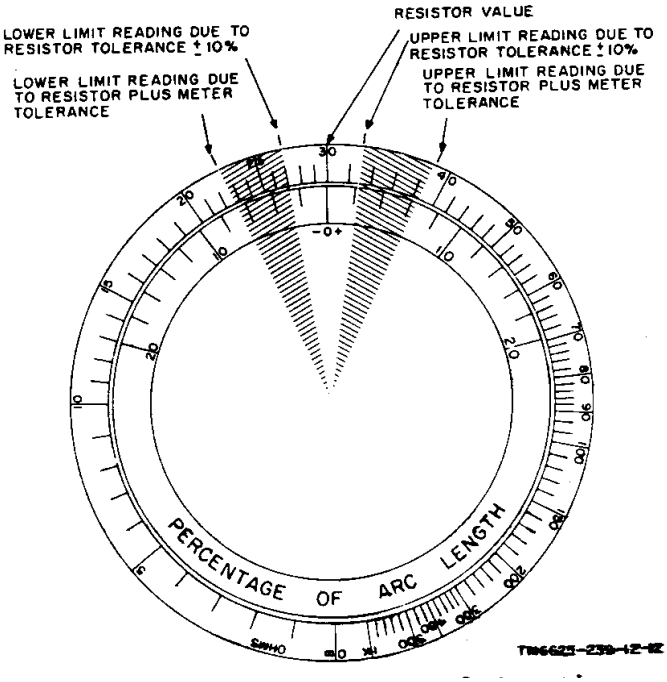


Figure 7. Computing device, indicating meter and resistance tolerance.

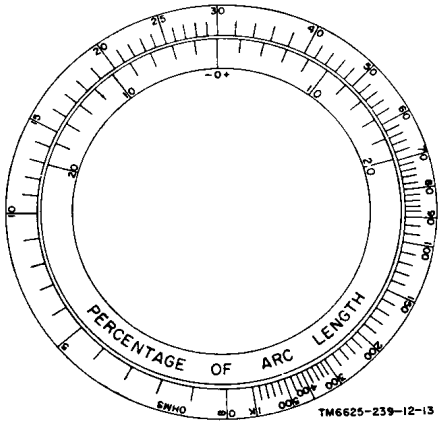


Figure 8. Computing device for determining limits of acceptance for resistors tested with Multimeter TS-505(*)/U.*

22. Stopping Procedure

a. Turn the RANGE switch (fig. 5) to the 1000V-D.C. ONLY position.

b. Turn the FUNCTION switch to the OFF position.

c. Disconnect the lead from the GROUND binding post (TS-505D/U).

d. Remove the A.C. LINE cord plug from the power source.

e. Replace the adapter and the alligator clips (if used) in their storage positions on the multimeter cover.

f. Replace the A.C. PROBE, the OHMS and D.C. probes, and leads in the right-hand recessed compartment; replace the A.C. LINE cord and the COMMON probe and lead in the left-hand recessed compartment.

g. Replace the cover on the multimeter and secure the spring catches.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

23. General

The multimeter is designed for normal operation under unusual climatic conditions. However, the operation of the equipment may be more difficult in regions where extreme cold, heat, humidity, or moisture conditions prevail. Paragraphs 24 through 26 provide operational information that may be used to minimize the effect of regional extremes.

24. Operation at Low Temperatures

Subzero temperatures and climatic conditions associated with cold weather may affect the efficient operation of the multimeter.

a. Extreme cold makes the A.C. LINE cord, the test leads, and other rubber parts stiff and brittle. Handle the equipment carefully to avoid cracking the insulation on the A.C. LINE cord and the test leads.

b. Inspect the rubber gaskets on the front panel, behind the meter, and surrounding the front controls for brittleness and air leaks. Check for the possibility of cold air leaking through the rubber gaskets. Cold air cools the electron tubes and may even crack the envelopes of the tubes.

c. Keep the equipment in a warm, dry location. If possible, keep the multimeter in a heated enclosure. A standby heater is not provided; therefore, leave the multimeter turned on if possible.

d. Allow the multimeter to warm up for 10 to 15 minutes before attempting to measure voltages or resistances. The length of warmup time depends upon the temperature of the surrounding air.

e. If equipment that has been exposed to the cold is brought into a warm room, moisture will form on it. Dry the equipment thoroughly.

f. Keep the cover of the multimeter closed at all times when the equipment is not in operation. This will prevent an accumulation of moisture within the equipment due to sweating.

25. Operation Under Tropical Conditions

Warm, damp climates expose the equipment to damage from moisture and fungus.

a. The high relative humidity causes condensation when the temperature of the equipment drops below that of the surrounding air. Adequate ventilation will minimize this condition.

b. Keep the cover of the multimeter closed as much as possible.

. *c.* Check the rubber gaskets for air leaks. Leaks will permit moisture condensation to occur within the unit and result in equipment damage.

d. Wipe all moisture and fungus from the exterior of the multimeter with a clean, lint-free cloth.

26. Operation in Desert Climates

Desert climates expose the multimeter to damage from dirt, dust, sand, and the effects of strong sunlight. Provide means for keeping dust and sand from accumulating on the front panel and from entering the holes in the rf adapter and alligator clips. Check the rubber gaskets frequently. Keep the multimeter cover tightly closed when the equipment is not in use.

CHAPTER 3
MAINTENANCE INSTRUCTIONS

Section I. OPERATOR'S MAINTENANCE

27. Scope of Operator's Maintenance

a. A list of maintenance duties normally performed by the operator of Multimeter TS-505(°)/U is given in *b* below. The only tools required are those tools normally available to the repairman-user because of his assigned mission.

b. Operator's maintenance for the multimeter consists of the following:

(1) Preventive maintenance (para 28).
(2) Visual inspection (para 29).
(3) Use of the operational checklist (para 30).
(4) Replacement of the fuses and power indicator lamp (para 32).

28. Operator's Preventive Maintenance

a. DA Form 11-266. DA Form 11-266 (fig. 9 and 10) is a preventive maintenance checklist to be used by the operator. Items that are not applicable to the equipment are lined out. Instructions for the use of the form appear on page 1 of the form.

b. Items. The information below supplements DA Form 11-266. The item numbers correspond to the item numbers on the form.

Item	Maintenance procedure
1	Use a clean cloth to remove dust, dirt, moisture, or grease from the case, the front panel, and the rf adapter. If necessary, wet a cloth with Cleaning Compound (Federal stock No. 7930-395-9542), clean the outside of the multimeter, and wipe the parts with a dry, clean cloth.
2	Inspect the clips that hold the rf adapter and the alligator clips for tight spring action. Inspect the D.C. probe; be sure the retainer (fig. 14) is tight. Check the GROUND terminal (TS-505D/U) for good spring action. Tighten the test prod tips.
7	Inspect the screws that secure part of the spring catches and the carrying handle; they should be tight.

Warning: **Cleaning compound is flammable and its fumes are toxic. Do not use it near a flame; provide adequate ventilation.**

MAINTENANCE CHECK LIST FOR SIGNAL EQUIPMENT
TEST EQUIPMENT
(AR 750-625)

EQUIPMENT NOMENCLATURE: ELECTRONIC MULTIMETER TS-505A/U

EQUIPMENT SERIAL NUMBER: 12

INSTRUCTIONS

This form may be used for a period of one month by using the correct dates and weeks of the month. It is to be used as a Preventive Maintenance check list for Signal equipment in actual use, or for a check on equipment prior to issue.

1. For detailed Preventive Maintenance instructions see:
   a. The Technical Manual *(in TM 11 series)* for the equipment. *(See DA Pamphlet Number 310-4)*
   b. The Supply Bulletin *(SB 11-100 series)* for the equipment. *(See DA Pamphlet Number 310-4)*
   c. The Department of the Army Lubrication Order. *(See DA Pamphlet Number 310-4)*

2. The following action will be taken by either the Communications Officer/ Chief for 1st echelon, or the Inspector for higher echelon
   a. Enter Equipment Nomenclature and Serial Number.
   b. Strike out items that do not apply to the equipment.

3. Operator/Inspector will enter in the columns entitled CONDITION, on the proper line, a notation regarding the condition, using symbols specified under LEGEND.

4. After operator completes each daily inspection he will initial over the appropriate dates under "Daily Condition for Month", then return form to his supervisor.

FOLD

TYPE OF INSPECTION

OPER-ATOR	2/3 ECH-ELON	DATE	SIGNATURE
✓		10 JULY 60	Paul, Jones

U S GOVERNMENT PRINTING OFFICE 1957 O—427138

DA FORM 1 MAY 57 11-266

Figure 9. DA Form 11-266, pages 1 and 4.

LEGEND for marking conditions:
Satisfactory, ✓.
Adjustment, Repair or Replacement required, X.
Defect corrected, (X).

DAILY CONDITION FOR MONTH OF JULY 1960

NO.	DAILY ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	2D 3D ECHELON
		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
1.	CLEAN DIRT AND MOISTURE FROM EXPOSED SURFACES OF ~~HOUSINGS~~, CASES, ~~CABINETS~~, CONTROL PANELS, ~~INTER-CONNECTING PLUGS~~, CABLES, ~~HEADSETS~~, METER WINDOWS, ETC.	✓	✓	✓	✓	✓	✓											
2.	INSPECT FOR LOOSENESS OF EXTERIOR ITEMS SUCH AS SWITCHES, KNOBS, JACKS, CONNECTORS AND PILOT LIGHTS.	✓	✓	✓	✓	✓	✓											
3.	INSPECT CONTROLS FOR BINDING, SCRAPING. TAP CONTROLS LIGHTLY FOR CUT-OUT DUE TO LOOSE CONTACTS.	✓	✓	✓	✓	✓	✓											
4.	DURING OPERATION BE ALERT FOR ANY UNUSUAL PERFORMANCE OR CONDITION.	✓	✓	✓	✓	✓	✓											

WEEKLY	CONDITION EACH WEEK 1ST	2D	3D	4TH	5TH	2D 3D ECH
5. INSPECT CORDS, CABLES, WIRE AND SHOCK MOUNTS FOR BREAKS, CUTS, KINKS, DETERIORATION, STRAIN AND FRAYING.	✓					
6. ~~INSPECT CANVAS AND LEATHER ITEMS FOR FUNGUS, FRAYING, TEARS, BROKEN ZIPPERS AND SNAP FASTENERS.~~						
7. HAND CHECK FOR LOOSENESS OF EXTERIOR ITEMS SUCH AS HANDLES, LATCHES, HINGES.	✓					
8. ~~INSPECT FOR LUBRICATION IN ACCORDANCE WITH APPLICABLE DA LUBRICATION ORDER.~~						
9. ~~INSPECT DRY BATTERIES FOR DIRT, LOOSE TERMINALS AND LEAKAGE.~~						
10. INSPECT EXPOSED METAL SURFACES FOR RUST AND CORROSION.	✓					
11. INSPECT METERS FOR DAMAGED GLASS AND CASES.	X					

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
12. ~~INSPECT SEATING OF READILY ACCESSIBLE ITEMS OF A PLUG-IN NATURE; CRYSTALS, FUSES, CONNECTORS, PLUG-IN COILS, LAMPS, ETC. DO NOT REMOVE, ROCK OR TWIST TO INSPECT. USE ONLY A DIRECT PRESSURE TO INSURE THE ITEM IS FULLY SEATED.~~	
13. ~~INSPECT FOR CLEANLINESS AND TIGHTNESS OF SUCH ITEMS AS SHOCK MOUNTS, ANTENNA, ANTENNA MOUNTS AND WAVE GUIDES.~~	
14. ~~INSPECT RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR DIRT, CORROSION, WORN OR BURNED CONTACTS.~~	

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
15. ~~INSPECT RESISTORS, BUSHINGS, INSULATORS FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE.~~	
16. ~~INSPECT JACKS AND CONNECTORS FOR SNUG FIT AND GOOD CONTACTS.~~	
17. ~~INSPECT VARIABLE CAPACITORS FOR DIRT AND MOISTURE.~~	
18. ~~INSPECT AIR FILTERS FOR CLEANLINESS.~~	
19. ~~INSPECT SCREWTYPE TERMINALS OF TRANSFORMERS, FIXED CAPACITORS, RESISTORS, CHOKES, POTENTIOMETERS AND RHEOSTATS FOR CORROSION, DIRT AND LOOSE CONTACTS.~~	
20. ~~CLEAN AND TIGHTEN SWITCHES, BLOWERS, RELAY GASES; CLEAN INTERIOR OF CHASSIS AND CABINETS.~~	
21. ~~INSPECT GENERATORS, MOTORS AND DYNAMOTORS FOR BRUSH WEAR, SPRING TENSION, ARCING AND COMMUTATOR WEAR.~~	
22. ~~INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS.~~	
23. ~~INSPECT GASKETS AND BUSHINGS FOR WEAR AND DAMAGE.~~	
24. ~~INSPECT CATHODE RAY TUBES FOR BURNED SCREEN SPOTS.~~	
25. ~~BEFORE STORING OR SHIPPING REMOVE ALL BATTERIES.~~	

~~IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING THE INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION. (Continue on page 4, if more space is needed)~~

ITEM 11. GLASS BROKEN. TURNED IN FOR HIGHER ECHELON REPAIR.

2 3

Figure 10. DA Form 11-266, pages 2 and 3.

29. Operator's Visual Inspection

a. Visual inspection will often determine the general condition of the multimeter and the amount of repair required. When the equipment fails to perform properly, check the items listed below.

(1) A.C. LINE cord improperly connected to power source.
(2) Rf adapter (if used) improperly connected to D.C. probe tip.
(3) Alligator clips (if used) defective or improperly connected to probe tips or equipment under test.
(4) Test leads improperly connected.
(5) Improper setting of controls.

b. If the above checks do not locate the trouble, proceed to the operational checklist (para 30).

30. Operational Checklist

a. General. This checklist outlines a procedure for systematically checking equipment operation. All corrective measures that can be performed by the operator are given in the Corrective measures column. If the corrective measures do not restore normal equipment operation, troubleshooting is required by higher echelon maintenance personnel. Note on the repair tag the corrective measures that were taken and how the equipment performed at the time of failure.

b. Procedure. Operate the multimeter as described in *c* below, in the order given. Observe equipment operation and perform the corrective measures indicated.

c. Checklist.

Action	Normal indication	Corrective measure
Turn FUNCTION switch to OFF.	Meter point should be within one-half scale division of zero.	Adjust meter point to zero (para 14*d*). Higher echelon require required.
Connect A.C. LINE cord to power source.	A.C. LINE cord plug fits securely in power source socket.	Spread prongs on plug until a secure fit is obtained.
Turn FUNCTION switch to +D.C. and allow a warm up time of at least 10 minutes.	Power indicator lamp lights and meter pointer drifts and gradually indicates at or near zero.	Check ac power source. Check power indicator lamp; replace (para 32*b*) if necessary. Remove chassis (para 31) and check fuses; replace (para 32*a*) if necessary. Higher echelon repair required.
Turn RANGE switch to 2.5V-RX1 and short tips of D.C. and COMMON probes together.	Meter point should be within one-half scale division of zero.	Rotate ZERO ADJ. control until meter pointer indicates zero. Higher echelon repair required.
Connect D.C. and COMMON probes to a +2.5-volt dc source.	Meter indicates between +2.375 and +2.625 volts.	Higher echelon repair required.
Turn FUNCTION switch to -D.C. and short tips of D.C. and COMMON probes together.	Meter pointer deflects and indicates at or near zero.	Rotate ZERO ADJ. control until meter pointer indicates zero. Higher echelon repair required.
Connect D.C. and COMMON probes to a -2.5-volt dc source.	Meter indicates between -2.375 and -2.625 volts.	Higher echelon repair required.
Turn FUNCTION switch to $\pm$D.C. and short tips of D.C. and COMMON probes together.	Meter point deflects to midscale within $\pm$1 scale division on dc scale.	Rotate ZERO ADJ. control until meter point is at midscale position. Higher echelon repair required.
Connect D.C. and COMMON probes to a +1.25-volt dc source.	Meter pointer deflects full scale to right.	Higher echelon repair required.

Action	Normal indication	Corrective measure
Connect D.C. and COMMON probes to a -1.25-volt dc source.	Meter pointer deflects full scale to left.	Higher echelon repair required.
Turn FUNCTION switch to A.C., RANGE switch to 5V-RX10, and short tips of COMMON and A.C. PROBE leads together.	Meter pointer deflects and indicates at or near zero.	Rotate ZERO ADJ. control until meter pointer indicates zero. Higher echelon repair required.
Connect COMMON and A.C. PROBE leads to a 5-volt ac source.	Meter indicates between 4.7 and 5.3 volts.	Higher echelon repair required.
Turn RANGE switch to 5V-RX10K and FUNCTION switch to +D.C. Connect rf adapter to D.C. probe, and short tips of rf adapter and COMMON probe together. *Caution:* An rf voltage in excess of 40 volts rms will damage the rf adapter.	Meter point deflects and indicates at or near zero.	Rotate ZERO ADJ. control until meter pointer indicates zero. Higher echelon repair required.
Connect rf adapter and COMMON probe to an rf voltage *less* than 40 volts rms. Reduce voltage range as necessary.	Meter indicates rf voltage level.	Connect spare rf adapter to D.C. probe and attempt to measure rf voltage again. Higher echelon repair required.
Turn FUNCTION switch to OHMS.	Meter point deflects to, or near, full scale (∞).	Vary OHMS ADJ. control. Higher echelon repair required.
Rotate RANGE switch to desired resistance range.	Meter pointer indicates at, or near, full-scale deflection (∞) for each position of RANGE switch.	Vary OHMS ADJ. control for each resistance range as required. Higher echelon repair required.
Short tips of OHMS and COMMON probes together.	Meter pointer deflects and indicates at, or near, zero.	Vary ZERO ADJ. control until meter pointer indicates zero. Higher echelon repair required.
Separate tips of OHMS and COMMON probes.	Meter pointer deflects to full scale (∞).	Vary OHMS ADJ. control as necessary.
Connect OHMS and COMMON probes to a known resistance.	Meter indicates correct resistance within tolerances of the meter (para 21) and the resistor.	Remove test probes from resistor and recheck for a full-scale (∞) indication on meter. Vary OHMS ADJ. control as necessary. Short tips of OHMS and COMMON probes together and recheck for a zero indication on meter. Vary ZERO ADJ. control as necessary. Measure value of resistor again. If meter indication is beyond tolerances, check several resistors. Higher echelon repair required.

31. Removal of Chassis

(fig. 1 & 2)

a. Removal.

(1) Remove the cover from the multimeter.

(2) Remove the A.C. LINE cord and all test leads from their compartments.

(3) Loosen the bolts that secure the front panel to the case, until the bolts are disengaged from the case.

(4) Stand the multimeter upright, in a normal using position, and slide the front panel and chassis assembly (a single unit) out of the case.

b. Replacement.

(1) Lay the multimeter case flat on a bench top.

(2) Place the front panel and chassis assembly in the case.

(3) Replace any bolts that may have dropped out, including the washer on the bolt, and secure the front panel and chassis assembly to the case.

(4) Replace the A.C. PROBE and the D.C. and OHMS probes in the right compartment, and the A.C. LINE cord and the COMMON probe in the left compartment.

(5) Replace the multimeter cover and secure the spring catches.

32. Replacement of Fuses and Power Indicator Lamp

a. Replacement of Fuses.

Caution: **Each fuse is rated at 1 ampere, 250 volts. When replacing a fuse, be sure to use a fuse of the same rating.**

The fuses (fig. 12) are mounted on spring clips that are secured to terminal boards on the multimeter chassis. Replace fuses as follows:

(1) Remove the front panel and chassis assembly from the case (para 31*a*).

(2) Remove line fuses F1 and F2 from their spring clips; use enough force to overcome the spring tension. Discard either or both fuses if defective.

(3) Replace a good line fuse by positioning it on the spring clips and pressing each end of the fuse until it is properly secured.

(4) Remove a spare fuse (F3 or F4) from its holder; install it ((3) above) in the missing line fuse position.

(5) Replace the front panel and chassis assembly in the case (para 31*b*).

b. Replacement of Power Indicator Lamp. The power indicator lamp is mounted on the chassis assembly and cannot be removed or replaced from the front panel. Replace the power indicator lamp as follows:

(1) Remove the front panel and chassis assembly (para 31*a*) from the case.

(2) Press the power indicator lamp (which has a bayonet base) inward.

(3) Rotate the lamp counterclockwise and remove it from the socket.

- (4) Place the new lamp in the socket and press it inward.

(5) Rotate the lamp clockwise and release it.

(6) Replace the front panel and chassis assembly (para 31*b*) in the case.

Section II. ORGANIZATIONAL MAINTENANCE

33. Scope of Unit Repairman's Maintenance

a. Second echelon maintenance duties are listed in *b* below. Their scope is determined by the available tools, materials, and spare parts.

b. Second echelon maintenance of the multimeter consists of the following:

(1) Preventive maintenance (para 35).

(2) Visual inspection (para 36).

(3) Troubleshooting (para 37).

(4) Testing and replacement of electron tubes (para 38).

(5) Replacement of the following items:

(*a*) Germanium diode CR1 (para 39).

(*b*) Test prods (para 40 and 41), A.C. LINE cord and plug, and Cable RG-58C/U for D.C. lead.

(*c*) Lampholder X11

(*d*) Alligator clips, test prod tips, knobs, tube shields, and carrying handle.

34. Tools and Test Equipment Required

The tools and test equipment required for second echelon maintenance are as follows:

a. Multimeter AN/URM-105.

b. Test Set, Electron Tube TV-7/U.

c. Tool Equipment TE-113.

35. Organizational Preventive Maintenance

. *a. DA Form 11-266.* DA Form 11-266 (fig. 9 and 11) is a preventive maintenance checklist to be used by second echelon maintenance personnel. Items not applicable to the equipment are lined out in figure 11. Instructions for the use of the form are on page 1 of the form.

b. Items. The information below supplements DA Form 11-266. The item numbers correspond to the item numbers on the form.

LEGEND for marking conditions:
Satisfactory, ✓
Adjustment, Repair or Replacement required, X.
Defect corrected, (X).

DAILY CONDITION FOR MONTH OF JULY 1960

NO.	DAILY ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2D 3D ECHELON
1	CLEAN DIRT AND MOISTURE FROM EXPOSED SURFACES OF HOUSINGS, ~~CASES, CABINETS,~~ CONTROL PANELS, ~~INTER-CONNECTING PLUGS~~, CABLES, ~~HEADSETS,~~ METER WINDOWS, ETC.																																✓
2	INSPECT FOR LOOSENESS OF EXTERIOR ITEMS SUCH AS SWITCHES, KNOBS, JACKS, CONNECTORS AND PILOT LIGHTS.																																✓
3	INSPECT CONTROLS FOR BINDING, SCRAPING. TAP CONTROLS LIGHTLY FOR CUT-OUT DUE TO LOOSE CONTACTS.																																✓
4	DURING OPERATION BE ALERT FOR ANY UNUSUAL PERFORMANCE OR CONDITION.																																✓

WEEKLY	CONDITION EACH WEEK 1ST	2D	3D	4TH	5TH	2D 3D ECH
5. INSPECT CORDS, CABLES, WIRE AND SHOCK MOUNTS FOR BREAKS, CUTS, KINKS, DETERIORATION, STRAIN AND FRAYING.						(X)
6. ~~INSPECT CANVAS AND LEATHER ITEMS FOR FUNGUS, FRAYING, TEARS, BROKEN ZIPPERS AND SNAP FASTENERS.~~						
7. HAND CHECK FOR LOOSENESS OF EXTERIOR ITEMS SUCH AS HANDLES, LATCHES, HINGES.						✓
8. ~~INSPECT FOR LUBRICATION IN ACCORDANCE WITH APPLICABLE DA LUBRICATION ORDER.~~						
9. ~~INSPECT DRY BATTERIES FOR DIRT, LOOSE TERMINALS AND LEAKAGE.~~						
10. INSPECT EXPOSED METAL SURFACES FOR RUST AND CORROSION						✓
11. INSPECT METERS FOR DAMAGED GLASS AND CASES.						✓

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
12. INSPECT SEATING OF READILY ACCESSIBLE ITEMS OF A PLUCK-OUT NATURE. CRYSTALS, FUSES, CONNECTORS, ~~PLUG-IN COILS~~, LAMPS, ETC. DO NOT REMOVE, ROCK OR TWIST TO INSPECT. USE ONLY A DIRECT PRESSURE TO INSURE THE ITEM IS FULLY SEATED.	✓
13. ~~INSPECT FOR CLEANLINESS AND TIGHTNESS OF SUCH ITEMS AS SHOCK MOUNTS, ANTENNA, ANTENNA MOUNTS AND WAVE GUIDES.~~	
14. ~~INSPECT RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR DIRT, CORROSION, WORN OR BURNED CONTACTS.~~	

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
15. INSPECT RESISTORS, BUSHINGS, INSULATORS FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE.	✓
16. INSPECT JACKS AND CONNECTORS FOR SNUG FIT AND GOOD CONTACTS.	✓
17. ~~INSPECT VARIABLE CAPACITORS FOR DIRT AND MOISTURE.~~	
18. ~~INSPECT AIR FILTERS FOR CLEANLINESS.~~	
19. INSPECT ~~SCREWTYPE TERMINALS OF TRANSFORMERS~~, FIXED CAPACITORS, RESISTORS, CHOKES, POTENTIOMETERS AND RHEOSTATS FOR CORROSION, DIRT AND LOOSE CONTACTS.	✓
20. CLEAN AND TIGHTEN SWITCHES, ~~BLOWERS, RELAY CASES~~ CLEAN INTERIOR OF CHASSIS ~~AND CABINETS.~~	✓
21. ~~INSPECT GENERATORS, MOTORS AND DYNAMOTORS FOR BRUSH WEAR, SPRING TENSION, ARCING AND COMMUTATOR WEAR.~~	
22. INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS.	✓
23. INSPECT GASKETS ~~AND BUSHINGS~~ FOR WEAR AND DAMAGE.	✓
24. ~~INSPECT CATHODE RAY TUBES FOR BURNED SCREEN SPOTS.~~	
25. ~~BEFORE STORING OR SHIPPING REMOVE ALL BATTERIES.~~	

IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING THE INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION. *(Continue on page 4, if more space is needed)*

2 3

Figure 11. DA Form 11-266, pages 2 and 3 (second echelon).

Warning: **Disconnect the multimeter from the ac power source before performing the following checks. After power is disconnected, some capacitors still may retain dangerous voltages. Before touching exposed electrical parts, short-circuit the parts to ground. When maintenance is completed, replace the multimeter in its case (para 31*b*) and check for satisfactory operation (para 30).**

Item	Maintenance procedure
12	Check the spring clips that hold the spare germanium diodes for good spring tension. Check for proper seating of tube shields.
16	Inspect the case grounding spring for cleanliness and adequate tension.

36. Unit Repairman's Visual Inspection

Before operating the multimeter, inspect it. Inspection will save time and may also avoid further damage to the equipment. Inspect the following for obvious defects:

a. The seating of all tubes in their sockets.
b. Wiring connections to the terminal boards.
c. Wiring connections to the switches, power indicator lamp, and the meter on the front panel.
d. Switch contacts for signs of wear, poor connection with rotor contact, blackening, or corrosion.
e. Terminal boards for cracks or loose terminals.
f. Resistors for indications of excessive heat and capacitors for bulges or splitting.

37. Equipment Performance Checklist

a. General. The equipment performance checklist provides a procedure for systematically checking equipment performance. All corrective measures that the second echelon repairman can perform are given in the corrective measures column. When using the checklist, start at the beginning and follow each step in order. If the corrective measures indicated do not fix the equipment, troubleshooting is required by higher echelon personnel. Note on the repair tag how the equipment performed and the corrective measures that were taken.

b. Checklist.

Step No.	Action	Normal indication	Corrective measure
1	Connect multimeter to ac power source and turn FUNCTION switch to +D.C.	Power indicator lamp lights.	Check ac power source. Check power indicator lamp; replace (para 32*b*) if necessary. Remove chassis (para 31) and check fuses; replace (para 32*a*) if necessary. Check A.C. LINE cord and plug; replace if defective. Higher echelon repair required.
		Meter point deflect and gradually indicates at or near zero.	Remove chassis (para 31*a*) and check tubes V1 through V5 and V7 (para 38)[a]; replace as necessary. Higher echelon repair required.
2	Leave FUNCTION switch in +D.C. position and turn RANGE switch to 2.5V-RX1.	Meter point is near zero on dc scale.	If ZERO ADJ. control will not adjust meter pointer to zero, check tubes V1 through V5 (para 38)[a]; replace as necessary. Higher echelon repair required.
3	Leave FUNCTION switch in +D.C. position and rotate RANGE switch through all positions. Repeat with FUNCTION switch at -D.C., then at ±D.C.	Meter point stays at zero on dc scale (center of scale for ±D.C.).	If meter point drifts, remove chassis (para 31*a*) and check tubes V1 and V2 (para 38)[a]; replace as necessary. Higher echelon repair required.
4	Measure a +dc and a -dc voltage. Turn FUNCTION switch to ±D.C. and measure each voltage again (RANGE switch set as necessary).	Meter indicates voltage measured (only indicates a + or - voltage on ±D.C. scale).	If meter does not indicate any dc voltage, check for good mechanical connection between the D.C. probe tip and resistor inside probe. Check for an open dc test lead; replace if necessary.

Step No.	Action	Normal indication	Corrective measure
			Set FUNCTION switch to OHMS and check COMMON lead for continuity. If alligator clips are used, check for continuity; replace if necessary. Higher echelon repair required. If meter point indicates a voltage but is unstable, remove chassis (para 31*a*) and check tubes V1 and V2 (para 38)[a]; replace if necessary. Higher echelon repair required.
5	Turn FUNCTION switch to +D.C., attach rf adapter to D.C. probe, and measure an rf voltage (1 to 500 mc) up to 40 volts rms. Set RANGE switch as necessary.	Meter indicates voltage measured.	If meter pointer stays at zero, remove rf adapter and replace it with the spare rf adapter. If meter now indicates, check germanium diode CR1 in defective rf adapter (fig. 13); replace CR1 (para 39) if necessary. Higher echelon repair required.
6	Set FUNCTION switch to A.C. (RANGE switch may be in any position).	With no ac voltage applied, meter pointer indicates zero.	If meter point deflects either negative or positive, remove the chassis (para 31*a*) and check tube V6; replace if necessary. Higher echelon repair required.
7	Leave FUNCTION switch in A.C. position and measure an ac voltage. Set RANGE switch as necessary.	Meter indicates voltage measured.	Check A.C. PROBE and COMMON leads for continuity. Check for a good mechanical connection between A.C. PROBE tip and resistor inside probe.[b] Remove chassis (para 31*a*) and check tube V6 (para 38); replace if necessary. Higher echelon repair required.

a Readjustment of the multimeter by higher echelon maintenance personnel may be necessary if V1, V2, or both are replace. Replace V1 and V2 in the same sockets from which they were removed.

b this resistor is not used on Multimeters TS-505C/U and TS-505D/U and is only used on some Electronic Multimeters TS-505B/U.

38. Tube Replacement

When trouble occurs, check the A.C. LINE cord connection, control settings, and wiring before removing any tubes. If tube failure is suspected, use the procedure in *a* or *b* below to check the tubes. Tube locations are shown in figure 12.

Caution: Do not rock or rotate a tube when removing it from a socket; pull it straight out with a tube puller.

a. Tube Substitution Method. Replace suspected tubes (*c* below), one at a time, with new tubes. Label tubes V1 and V2 to insure replacement in the original socket. If the equipment is still inoperative, remove the new tube and put back the original tube. Repeat this procedure with each suspected tube until the defective tube is located. If the multimeter is still inoperative, other checks (para 37*b*) are required.

b. Use of Tube Tester. Remove and test one tube at a time. Discard a tube only if its defect is obvious or if the tube tester shows it to be defective. Do not discard a tube that tests at or near its minimum test limit on the tube tester. Put back the original tube, or insert a new one if required, before testing the next ore.

c. Replacing Tubes in Multimeter TS-505(*)/U. Replace the tubes in the multimeter as follows:

(1) Remove the front panel and chassis assembly from the case (para 31*a*).

(2) Remove a tube shield by pressing down on the shield and rotating it counterclockwise until it is released.

(3) Remove the tube and replace it with one of the running spares.

(4) Set the tube (or a replacement) in the socket and place the tube shield over the tube.

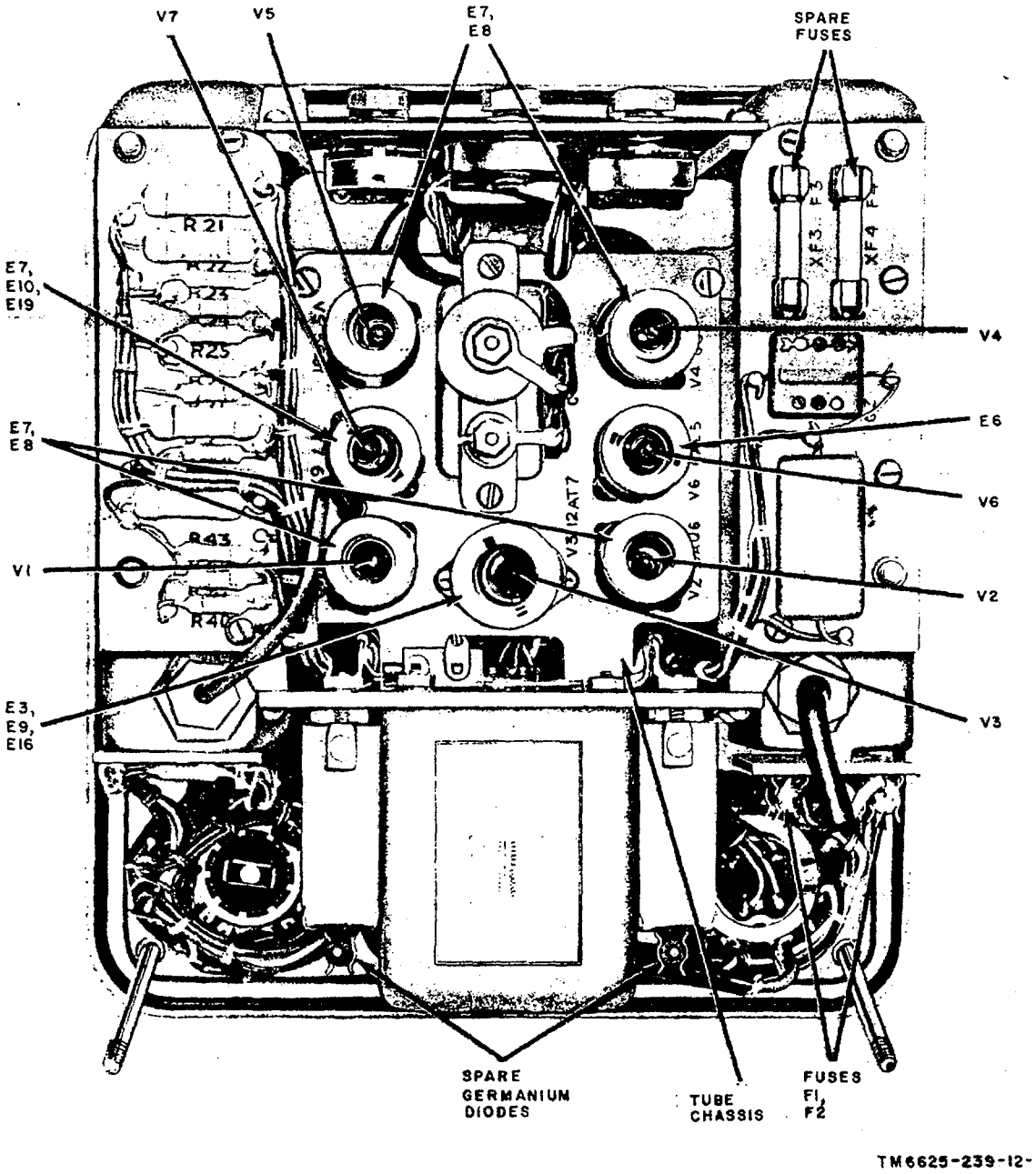


Figure 12. Tube and parts location.

(5) Replace a tube shield by pressing down, rotating it clockwise as far as it will turn, and releasing it.
(6) Replace the front panel and chassis assembly in the case (para 31*b*).

39. Replacement of CR1

(fig. 13)

a. Removal.

(1) Remove the cover from the multimeter.
(2) Remove the rf adapter from its spring clip on the cover.
(3) Remove the ground lead screw by grasping the ground lead sleeve firmly and rotating the ground lead screw counterclockwise. Be careful not to lose the ground lead sleeve.
(4) Slide the nose forward and off the rf shell and carriage.
(5) Remove the screws from the side of the rf shell and slide the shell back and off the carriage.

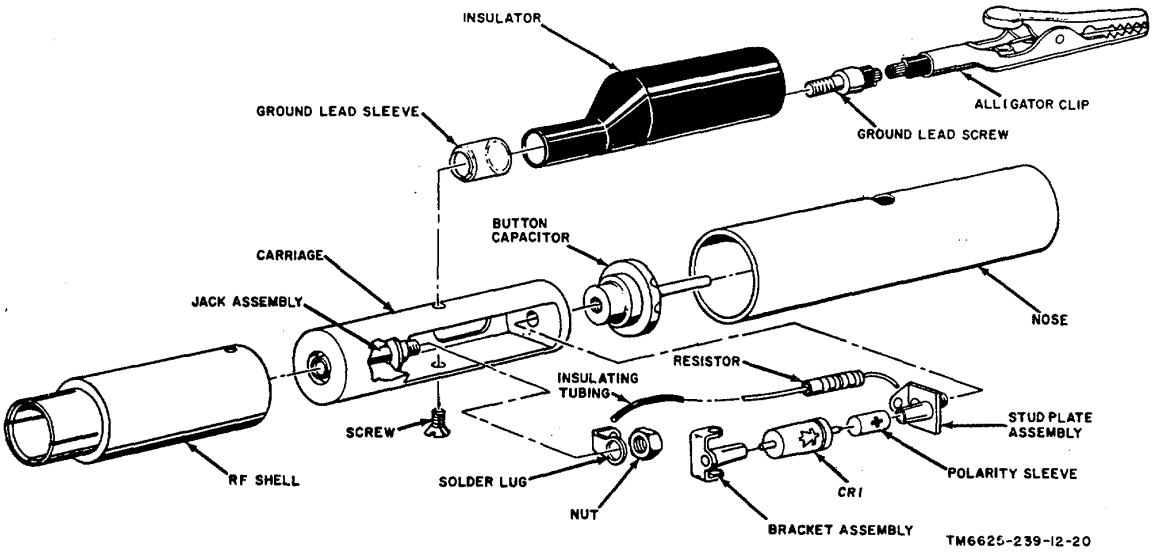


Figure 13. Rf adapter, exploded view.

(6) Unscrew the button capacitor from the threaded stud on the stud plate assembly.

Caution: **When performing the following step, be careful not to break the resistor leads when removing the stud plate assembly from the carriage.**

(7) Use a small pointed tool and press on the threaded stud on the stud plate assembly through the hole in the front of the carriage. Push the stud plate assembly, CR1, and the bracket assembly back and withdraw them from the side of the carriage.

. (8) Remove the bracket assembly from one end of CR1.

(9) Remove CR1 from the stud plate assembly.

b. Replacement.

(1) Connect CR1 to the stud plate assembly. Be sure that the arrow printed on the side of CR1 points toward the polarity sleeve.

(2) Connect the bracket assembly to the other end of CR1 so that the bracket assembly *wings* are toward the carriage.

(3) Replace the stud plate assembly, CR1, and the bracket assembly in the carriage; press them forward until the threaded stud on the stud plate assembly protrudes through the hole in the front of the carriage.

(4) Screw the button capacitor to the threaded stud on the stud plate assembly. *Tighten fingertight only.*

(5) Slide the rf shell over the end of the carriage opposite the button capacitor.

(6) Align one of the countersunk holes in the rf shell with the countersunk hole in the carriage and one of the threaded screwholes in the bracket assembly.

(7) Secure the rf shell to the carriage and bracket assembly with the screw.

(8) Place the nose over the rf shell so that the hole in the side of the nose is aligned with the remaining threaded screwhole in the bracket assembly.

(9) Secure the ground lead screw to the rf shell and bracket assembly.

(10) Replace the rf adapter under its spring clip on the multimeter cover (fig. 1).

(11) Replace the cover on the multimeter.

40. Replacement of D.C. Probe

a. Removal.

(1) Remove the cover from the multimeter.

(2) Remove the D.C. probe from its storage compartment.

(3) Unscrew the retainer (fig. 14) and slide the retainer and housing back onto the D.C. probe lead.

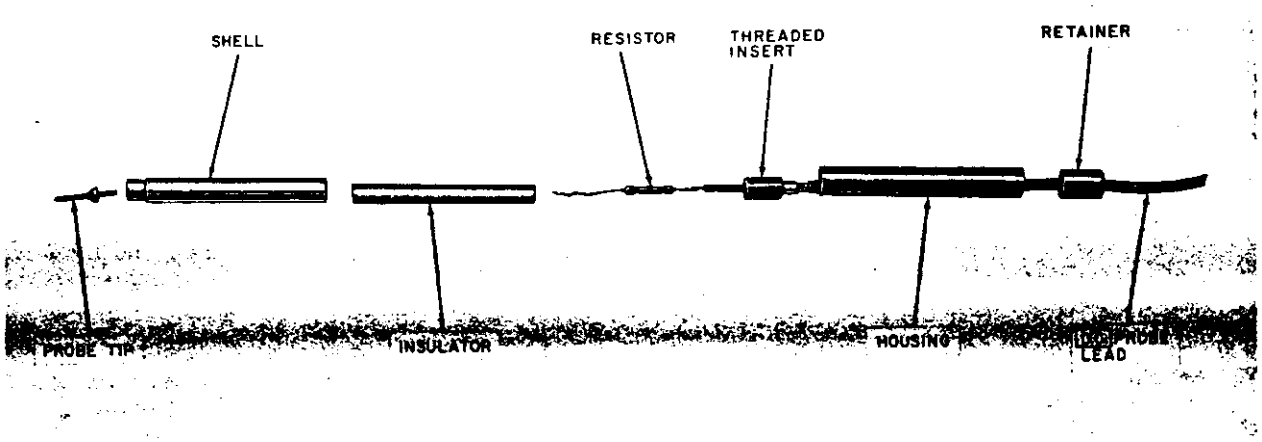


Figure 14. D.C. probe, exploded view.

(4) Unscrew the shell from the threaded insert and remove the shell.

(5) Unscrew the probe tip by turning it counterclockwise.

(6) Remove the metal washer (not shown) from the probe tip end of the insulator.

(7) Grasp the end of the resistor lead, which is exposed when the metal washer is removed, with long-nosed pliers and pull gently to straighten the lead.

(8) Remove the insulator to expose the resistor.

(9) Unsolder and remove the resistor from the D.C. probe lead.

(10) Unsolder and remove the threaded insert from the D.C. probe lead. screw.

b. Replacement. When installing a D.C. probe on a new lead (RG-58C/U), follow the instructions in (1) below; modify this step as necessary when the existing dc lead is used.

(1) Remove approximately 2-1/2 inches of the outside insulation and 2 inches of the braided shield. Press the remaining visible one-half inch of braided shield against the inner conductor insulation.

(2) Place the threaded insert on the dc lead, with the unthreaded part over the one-half inch of braided shield.

(3) Heat the unthreaded part of the insert sufficiently to melt solder. Solder the threaded insert to the braided shield through the holes in the unthreaded tip of the insert.

Note:. After the threaded insert has cooled, pull it to insure a good solder connection.

(4) Remove one-half inch of the inner conductor insulation and solder the inner conductor to the resistor.

(5) Replace the insulator over the resistor.

(6) Grasp the end of the resistor lead that protrudes from the end of the insulator with long-nosed pliers; form the end of the resistor lead into a small loop (or loops).

(7) Press the looped end of the resistor lead into the end of insulator.

(8) Place the metal washer (not shown) over the threaded end of the probe tip, and screw the probe tip to the insulator. Tighten the probe tip with pliers to insure a good mechanical connection between the metal washer and the looped end of the resistor.

(9) Secure the shell to the threaded insert.

(10) Replace the housing over the shell and secure with the retainer.

(11) Replace the D.C. probe in the storage compartment.

(12) Replace the cover on the multimeter.

41. Replacement of A.C. PROBE and COMMON and OHMS Probes

The construction of the A.C. PROBE and the COMMON and OHMS probes is identical, except that some

Electronic Multimeters TS-505B/U and all Electronic Multimeters TS-505A/U have a resistor inside the A.C. PROBE.

a. Removal.

(1) Remove the cover from the multimeter.

(2) Remove the probe that is to be replaced from its storage compartment.

(3) Unscrew and remove the probe tip.

(4) Remove the metal washer from the end of the probe.

(5) Grasp the end of the wire, which is exposed when the metal washer is removed, with long-nosed pliers and pull gently to straighten.

(6) Pull the test lead out of the probe.

b. Replacement.

(1) Replace the probe on the test lead.

(2) Grasp the end of the wire that protrudes from the end of the probe with long-nosed pliers; form the end of the wire into a small loop (or loops).

(3) Press the looped wire into the end of the probe.

(4) Place the metal washer over the threaded end of the probe tip and screw the probe tip to the end of the probe. Tighten the probe tip with pliers to insure a good mechanical connection between the metal washer and the looped end of the wire.

(5) Replace the probe in its storage compartment.

(6) Replace the cover on the multimeter.

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

Section I. SHIPMENT AND LIMITED STORAGE

42. Removal From Service

To prepare the multimeter for shipment or limited storage, proceed as follows:

a. Set the FUNCTION switch to OFF.

b. Disconnect the A.C. LINE cord from the power source and place the A.C. LINE cord and the COMMON

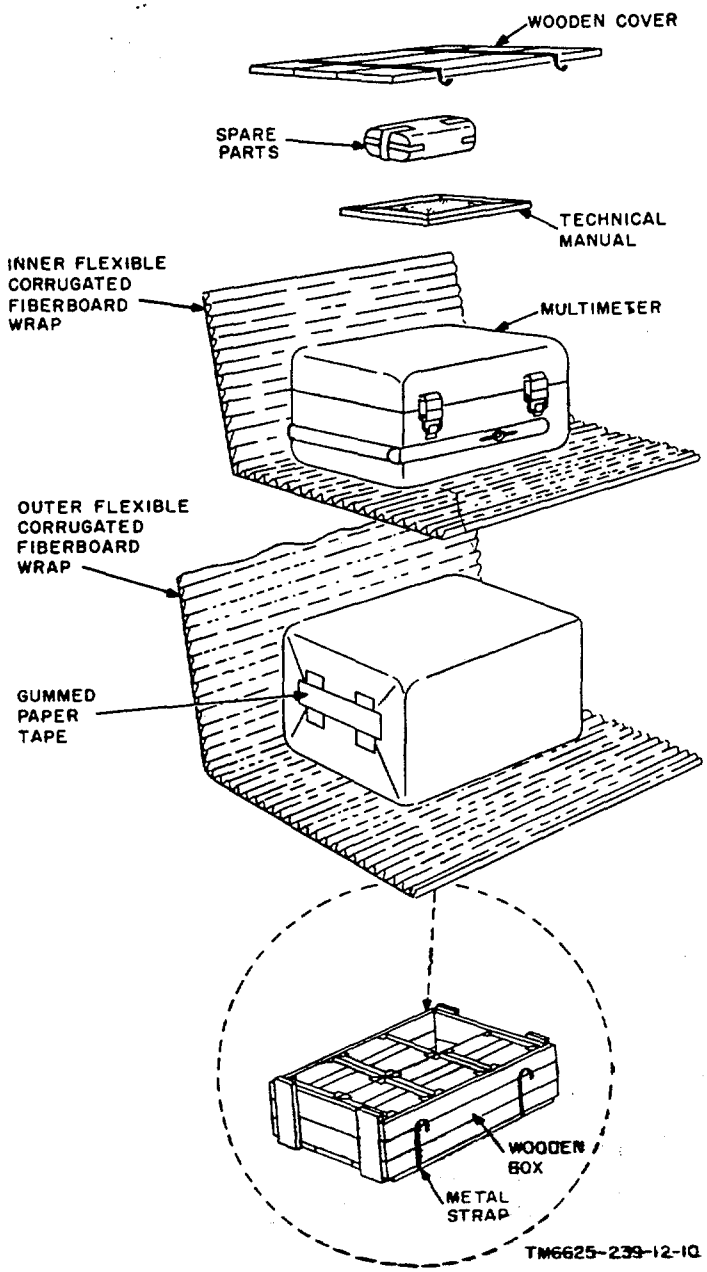


Figure 15. Typical field repackaging diagram.

probe in their storage compartment (fig. 2).

c. Place the A.C. PROBE and the OHMS and D.C. probes in the other storage compartment.

d. Place the rf adapter, alligator clips, and test prod tips in their storage positions on the cover.

e. Replace the cover on the multimeter.

43. Repackaging for Shipment or Limited Storage

(fig. 15)

The exact procedure for repackaging depends on the material available and the conditions under which the equipment is to be shipped or stored. Adopt the procedures outlined below whenever circumstances permit. The information concerning the original packaging (para 9) will also be helpful.

a. Material Requirements. The following materials are required for repackaging the multimeter. For stock numbers of materials, consult SB 38100.

Material	Quantity
Flexible corrugated fiberboard	32 sq ft
Waterproofed wrapped paper	20 sq ft
Gummed paper tape (3-inch)	10 ft
Waterproof pressure-sensitive tape (3-inch)	12 ft
Metal strapping (3/8 x 0.020-inch) (*Note:* Strapping seals required.)	14 ft
Wooden box (inside dimensions for 6 packaged multimeters: 46-1/2 by 27 x 10-1/2-inch)	1 ea (28 bd ft)

b. Packaging.

(1) Technical manuals. Package the technical manuals within a close-fitting bag fabricated of waterproofed wrapping paper. Seal the seams with pressure-sensitive tape.

(2) Spare parts. Wrap each part within a layer of flexible corrugated fiberboard. Seal the seams with gummed paper tape. Overwrap the flexible corrugated fiberboard with waterproofed wrapping paper and seal with waterproof pressure-sensitive tape.

(3) Multimeter. Wrap each multimeter within two layers of flexible corrugated fiberboard. Secure each layer with gummed paper tape. Secure the packaged technical manual ((1) above) and the spare parts ((2) above) to the wrapped multimeter with waterproof pressure-sensitive tape.

c. Packing.

(1) Fabricate a wooden box, the size of which is determined by the number of multimeters to be packed.

(2) Place the packaged multimeters (b (3) above) within the waterproofed wrapping paper lined (not shown) wooden box.

(3) Seal the waterproofed wrapping paper with waterproof pressure-sensitive tape.

(4) Nail down the wooden cover.

(5) Strap the wooden box when inter-theater shipment is involved.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

44. Authority for Demolition

The destruction procedures outlined in paragraph 45 will be used to prevent further use of the equipment. Demolition of the equipment will be accomplished only upon the order of the cornmander.

45. Methods of Destruction

Any or all of the methods of destruction given below may be used.

a. Smash. Use sledges, axes, hammers, crowbar, or any other heavy tools available; smash the case, cover, rf adapter, front panel, and meter.

b. Cut. Use axes, handaxes, machetes, or knives; cut the A.C. LINE cord and the test leads.

c. Burn. Use gasoline, kerosene, oil, or flamethrowers; burn the technical manuals and the test probes.

Warning: Be extremely careful with explosives and incendiary devices. Use the items only when the need is urgent.

d. Explode. Use grenades, TNT, or firearms if explosives are necessary

e. Dispose. Bury or scatter destroyed parts or throw them into nearby waterways.

APPENDIX I
REFERENCES

Following is a list of applicable references available to the operator or organizational maintenance personnel of the TS-505 (^{o})/U:

SB 38100	Preservation, Packaging and Packing Materials, Supplies and Equipment Used by the Army
TM 11-6625-203-12	Operation and Organizational Maintenance, Multimeter AN/URM-105, Including Multimeter ME-77/U
TM 11-6625-239-20P	Organizational Maintenance Repair Parts and Special Tools List and Maintenance Allocation Chart for Electronic Multimeters TS-505/U, TS-505A/U, TS-505B/U, TS-505C/U, and TS-505D/U
TM 11-6625-274-12	Operator's and Organizational Maintenance Manual, Test Sets, Electron Tube TV-7/U, TV-7A/U, TV-7B/U, and TV-7D/U

APPENDIX II
BASIC ISSUE ITEMS LIST FOR ELECTRONIC MULTIMETER TS-505A,B,C,D/U

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.* The dagger (†) indicates the model in which the part is used and further, by its position, designates the reference symbol in which the item is identified and/or the quantity used in each model where the quantity varies.

(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.

(6) *Expendability.* Expendable items are indicated by the letter X; nonexpendable items are indicated by NX.

(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.* The "Item No." column lists the part in the equipment. These same designations are also used on any illustrations of the equipment. The numbers in the "Figure No." column refer to the illustrations where the part is shown.

2. Batteries

Dry batteries shown are only used with the TS-505/U but are not considered part of the equipment. They will not be preshipped automatically but are to be requisitioned in quantities necessary for the particular organization, in accordance with SB 11-6.

3. Critical Items

A zero slash (⌀) in the "Description" column indicates items that are expected to fail during the first year or items that will make the equipment inoperative if they fail.

Section II. FUNCTIONAL PARTS LIST

(1) SOURCE MAINTENANCE AND RECOVERABLITY CODE				(2) FEDERAL STOCK NUMBER	(3) DESIGNATION BY MODEL					(4) DESCRIPTION	(5) UNIT OF ISSUE	(6) EXPEND-ABILITY	(7) QUAN-TITY AUTHO-RIZED	(8) ILLUSTRATIONS FIGURE NO.	(9) ILLUSTRATIONS I ITEM NO.
					1	2	3	4	5	ITEMS COMPRISING AN OPERABLE EQUIPMENT					
										ELECTRONIC MULTIMETER TS-505A,B,C,D/U					
										NOTE: Model Column 1 refers to TS-505/U; Column 2 refers to TS-505A/U; Column 3 refers to TS-505B/U; Column 4 refers to TS-505C/U; Column 5 refers to TS-505D/U.					
				6625-243-0562						ELECTRONIC MULTIMETER TS-505/U: TS-505A,B,C,D/U: Electronic type; 115 v ac; 50 to 100 cyc	ea	NX			
				Ord thru AGC	†	†	†	†	†	TECHNICAL MANUAL TM 11-6625-239-12	ea	X	2		
				6135-120-1020	†					⌀ BATTERY BA-30	ea	X	2		
				6625-669-0076	†					COVER, MULTIMETER: Specialty Packing part No. M-123-2	ea	X	1		
				6625-668-9451		†	†	†		COVER, MULTIMETER: SigC dwg No. SM-C-147238	ea	X	1		
				6625-657-2176					†	COVER, MULTIMETER: SigC dwg No. SM-C-181965	ea	X	1		
				5960-262-0152	†	†	†	†	†	ELECTRON TUBE: MIL type 6AU6WA	ea ea	X X	2 2	12 12	V3 V1 V1 V2
				5960-188-0880	†	†	†	†	†	ELECTRON TUBE: MIL type 6X1A	ea	X	1	12	V8
				5960-262-0167	†	†	†	†	†	ELECTRON TUBE: MIL type 12AT7WA	ea ea	X X	1 1	12 12	V5 V3
				5960-262-0286		†	†	†	†	ELECTRON TUBE: MIL type 5651WA	ea	X	2	12	V1 V5
				5960-262-0185	†	†	†	†	†	ELECTRON TUBE: MIL type 5726/6ALW	ea	X	1	12	V5
				5960-142-7383	†	†	†	†	†	FUSE, CARTRIDGE: MIL type F02G1R00A	ea	X	2		F1 F2
				6240-244-0483	†					LAMP, GLOW: GE type NE-32	ea	X	2		V6 V7
				6240-155-8706	†	†	†	†	†	LAMP, INCANDESCENT: MIL tpe MS155571-2, type TB-11	ea	X	1		I1
				6625-395-9313	†					LEAD SET, TEST CX-1331A/U	ea	NX	1		
				6210-228-6037	†					LENS, INDICATOR LIGHT: Dialco type No. 10006-111	ea	X	1		I2
				6210-284-1459		†	†	†	†	LENS, INDICATOR LIGHT	ea	X	1	3	
				6625-668-9731	†	†	†	†	†	PROD TEST MX-1797/U: SigC dwg No. SM-B-117308	ea	X	1	3	E2
				5960-224-4871	†	†	†	†		SEMI-CONDUCTOR DEVICE, DIODE: MIL type 1N70A	ea	X	1		CR1
				5960-617-5880					†	SEMI-CONDUCTOR DEVICE, DIODE: SigC dwg No SM-B-181960	ea	X	1		CR1
				5960-262-0015	†	†	†	†	†	SHIELD, ELECTRON TUBE: JAN type TS102U01	ea ea	X X	1 1		E6 E13

(1) SOURCE MAINTENANCE AND RECOVERABLITY CODE				(2) FEDERAL STOCK NUMBER	(3) DESIGNATION BY MODEL					(4) DESCRIPTION	(5) UNIT OF ISSUE	(6) EXPEND - ABILITY	(7) QUAN-TITY AUTHO-RIZED	(8) ILLUSTRATIONS	(9)
					1	2	3	4	5					FIGURE NO.	I ITEM NO.
					1	2	3	4	5	TS-505A,B,C,D/U (continued)					
				5960-272-9094	†			†	†	SHIELD, ELECTRON TUBE: JAN type TS102U02	ea	X	2		E7 E8
						†					ea	X	4		E14 E15 E17 E18
							†				ea	X	4		E1 E2 E4 E5
				5960-295-7652	†			†	†	SHIELD, ELECTRON TUBE: JAN type TS102U03	ea	X	1		E10
						†					ea	X	1		E19
							†				ea	X	1		E7
				5960-264-3004	†			†	†	SHIELD, ELECTRON TUBE: JAN type TS103U02	ea	X	1		E9
						†					ea	X	1		E16
							†				ea	X	1		E3
				6625-669-0244			†	†	†	TIP, TEST PROD: SigC dwg No. SC-B-82762	ea	X	1		
				6625-669-0246		†	†	†	†	TIP, TEST PROD: SigC dwg No. SC-B-82765	ea	X	3	3	
										RUNNING SPARES AND ACCESSORY ITEMS					
										ELECTRONIC MULTIMETER TS-505A,B,C,D/U					
				5960-262-0152	†	†	†	†	†	ELECTRON TUBE: MIL type 6AU6WA	ea	X	1		
				5960-188-0880	†	†	†	†	†	ELECTRON TUBE: MIL type 6X4W	ea	X	1		
				5960-262-0167	†	†	†	†	†	ELECTRON TUBE: MIL type 12AT7WA	ea	X	1		
				5960-262-0286		†	†	†	†	ELECTRON TUBE: MIL type 5651WA	ea	X	1		
				5960-262-0185	†	†	†	†	†	ELECTRON TUBE: MIL type 5726/6AL5W	ea	X	1		
				5920-142-7383	†	†	†	†	†	FUSE, CARTRIDGE: MIL type F02G1R00A	ea	X	5		
				6240-244-0483	†					LAMP, GLOW: GE type NE-32	ea	X	1		
				6240-155-8706	†	†	†	†	†	LAMP, INCANDESCENT: MIL type MS15571-2, type TB-14	ea	X	1		
				6625-395-9313	†					LEAD SET, TEST CS-1331A/U	ea	NX	1		
				6625-668-9731	†	†	†	†	†	PROD TEST MX-1797/U	ea	X	1		
				5960-224-4871	†	†	†	†		SEMI-CONDUCTOR DEVICE, DIODE: MIL type 1N70A	ea	X	2		
				5960-617-5880					†	SEMI-CONDUCTOR DEVICE, DIODE: SigC dwg No SM-B-181960	ea	X	2		
				6625-669-0246		†	†	†	†	TIP, TEST PROD: SigC dwg No. SC-B-82765	ea	X	3		

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

G. H. DECKER,
General, United States Army,
Chief of Staff.

Official:

R. V. LEE,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

To be distributed in accordance with DA Form 12-7 requirements for TM 11 Series (UNCL) Plus the following formula:

USASA (2)	11-157
CNGB (1)	11-158
Tech Stf, DA (1) except	11-500 (AA-AE) (4)
CSigO (36)	11-555
DASA (5)	11-557
US ARADCOM (2)	11-558
US ARADCOM Rgn (2)	11-587
MDW (1)	11-592
Seventh US Army (2)	11-597
EUSA (2)	11-608
Units org under fol TOE:	17
(2 copies ea except as indc)	29-51
1-7	29-55
1-17	29-56
1-37	29-57
1-67	32-51
1-107	32-56
5-278	32-57
6-100	32-500
6-101	33-56
6-301	39-52
6-316	39-61
7	44-12
7-52	44-101
9-217	44-435
9-510	44-437
11-5	44-445
11-6	44-446
11-7	44-447
11-8	44-448
11-15	44-535
11-16	44-537
11-38	44-445
11-55	44-547
11-56	44-549
11-57	55-157
11-58	57
11-155	

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 320-950.

☆U.S. GOVERNMENT PRINTING OFFICE: 1967 0-181-421 (60786)

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

PIN : 018850