DEPARTMENT OF THE ARMY TECHNICAL MANUAL

# OPERATION AND ORGANIZATIONAL MAINTENANCE

# ELECTRICAL METER TEST SET TS-656/U

**This copy is a reprint which includes current pages from Changes 2**

*HEADQUARTERS, DEPARTMENT OF THE ARMY*
*JULY 1959*

**WARNING**

**HIGH VOLTAGES EXIST IN THIS EQUIPMENT**

**Serious injury or death may result if safety precautions are not observed.**

**DON'T TAKE CHANCES!**

**VOLTAGES AS HIGH AS 500 VOLTS MAY EXIST AT THE OUTPUT JACKS**

**TM 11-6625-226-12**
***C2**

**Operation and Organizational Maintenance**
**ELECTRICAL METER TEST SET TS-656/U**

CHANGE
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON D.C., *20 November 1963*

TM 11-6625-226-12, 13 July 1959, is changed as follows:

Add the following note (as added by C 1, 18 Mar 60) in the places listed below:

**Note.**

**If the equipment has been out of service for 3 months or more, refer to paragraph 9.1.**

Inside front cover, after the **Warning** notice.
*Page 7*, section I, below the heading.
*Page 10*, section II below the heading.
*Page 13*, paragraph 22, after subparagraph b.

*Page 2*. Add paragraph 1.1 after paragraph 1.

**1.1. Index of Publications**

Refer to the latest issue of DA Pam 319-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment. DA Pam 310-4 is an index of current technical manuals, technical bulletins, Supply Manuals (types 4, 6, 7, 8, and 9), 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 and revisions of each publication.

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 38-750.

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

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

*Page 5*. Add paragraph 9.1 after paragraph 9 (as added by C 1).

**9.1. Preoperational Procedure**

If the test set has been in storage, or out of use for 3 or more months, the electrolytic capacitors contained within the equipment must be reformed. To polarize the electrolytic capacitors, proceed as follows:

**Warning:**

**When performing the following procedures, do not touch the case of the tester. Voltages as high as 500 volts may be present between the case and ground. If at any time during the procedures the 0.25A fuse burns open, turn in the equipment for higher echelon repair.**

*This change supersedes C1, 18 March 1960.

**TAGO 6897A-November**

*a.* Place the tester on a nonconducting surface, such as glass or rubber.

*b.* Set the ON-OFF switch (fig. 3) at OFF.

*c.* Set; the FUNCTION switch at DC VOLTS.

*d.* Rotate the DECREASE-INCREASE control to extreme left.

*e.* Connect the line cord to the power source.

*f.* Set the VOLTAGE range switch at 50V.

*g.* Set the ON-OFF switch at ON.

*h.* Rotate the DECREASE-INCREASE control to the right until the meter indicates 50 volts. Permit the tester to operate at this output for at least 10 minutes than rotate the DECREASE-INCREASE control to the extreme left.

*i.* Set the VOLTAGE range switch to 100V.

*j.* Rotate the DECREASE-INCREASE control to the right until the meter indicates 100 volts. Permit the tester to operate at this output for at least 10 minutes, then rotate the DECREASE-INCREASE control to the extreme left.

*k.* Set the VOLTAGE range switch to 250V.

*l.* Rotate the DECREASE-INCREASE control to the right until the meter indicates (in sequence) 150 volts, 200 volts, and 250 volts. Permit the tester to operate at each output for at least 10 minutes. Then, rotate the DECREASE, INCREASE control to the extreme left.

*m.* Set the VOLTAGE range switch to 500V.

*n.* Rotate the DECREASE-INCREASE control to the right until the meter indicates (in sequence) 300 volts, 350 volts, 400 volts, 450 volts, and 500 volts. Permit the tester to operate at each output for at least 10 minutes. Then, rotate the DECREASE-INCREASE control to the extreme left.

*o.* Set the ON-OFF switch OFF and disconnect the :line cord from the power source.

*Page 13.* Delete paragraphs 19 through 21 and substitute:

**19. Scope of Maintenance**

The maintenance duties assigned to the operator and organizational repairman of the equipment are listed below together with a reference to the paragraphs covering the specific maintenance functions.

*a.* Daily preventive maintenance checks and services (par. 21.1).

*b.* Weekly preventive maintenance checks and services (par. 21.2).

*c.* Monthly preventive maintenance checks and services (par. 21.3).

*d.* Quarterly preventive maintenance checks and services (par. 21.4).

*e.* Cleaning (par. 21.5).

*f.* Touchup painting (par. 21.6).

*g.* Repairs and adjustments.

(1) Replacement of lamps and fuses (par. 23).

(2) Repair of test leads (par. 24).

(3) Repair of line cord (par. 25).

**20. 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 21 through 21.6 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 charts (pars. 21.1-21.4) outline 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 charts indicate what to check, how to check, and what the normal conditions are. The references column lists the illustrations, paragraphs, or manuals that contain detailed repair or replacement procedures. If the defect cannot be remedied by the operator, 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.

**21. Preventive Maintenance Checks and Services Periods**

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

*a.* Paragraph 21.1 specifies the checks and services that must be accomplished daily (or

at least once each week if the equipment is maintained in standby condition).

*b.* Paragraphs 21.2, 21.3, and 21.4 specify *additional* checks and services that must be performed on a weekly, monthly, and quarterly basis, respectively.

**21.1. Daily Preventive Maintenance Checks and Services Chart**

| Sequence No. | Item | Procedures | References |
|---|---|---|---|
| 1 | Completeness | See that the equipment is complete TM 11-6625-226-12P. | |
| 2 | Exterior surfaces | Clean the exterior surfaces, including the panel and meter glass (par. 21.5). Check the meter glass and indicator lenses for cracks. | |
| 3 | Connectors | Check the tightness of all connectors. | |
| 4 | Controls and indicators | While making the operating 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. | |
| 5 | Operation | Operate the equipment according to paragraph 22 | Par. 22. |

**21.2. Weekly Preventive Maintenance Checks and Services Chart**

| Sequence No. | Item | Procedures | References |
|---|---|---|---|
| 1 | Cables | Inspect cords, cables, and wires for chafed, cracked, or frayed insulation. Replace connectors that are broken, arced, stripped, or worn excessively. | Pars. and 25. |
| 2 | Handles and latches | Inspect handles and latches, for looseness. Replace or tighten as necessary. | |
| 3 | Metal surfaces | Inspect exposed metal surfaces for rust and corrosion, touchup paint as required (par. 21.6). | |

**21.3. Monthly Preventive Maintenance Checks and Services Chart**

| Sequence No. | Item | Procedures | References |
|---|---|---|---|
| 1 | Pluckout items | Inspect seating of pluckout items. Make certain 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 blocks | Inspect terminal blocks 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. |

**21.4. Quarterly Preventive Maintenance Checks and Services Chart**

| Sequence No. | Item | Procedures | References |
|---|---|---|---|
| 1 | Publications | See that all publications are complete, serviceable, and current. | DA Pam 31(04. |

| Sequence No. | Item | Procedures | References |
|---|---|---|---|
| 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 38750 and DA Pam 310-4. |
| 3 | Spare parts | Check all spare parts (operator and organizational) for general condition and method of storage. There should be no evidence of overstock, and all shortages must be on valid requisition. | TM 11-6625-226-12P. |

**21.5. 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).

*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 be 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.

**21.6. 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.

*Pages 14 and 15*. Delete figures 4 and 5.

*Page 22*. Delete appendix I and substitute:

**APPENDIX I**
**REFERENCES**

| | |
|---|---|
| DA Pam 310-4 | Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 4, 6, 7, 8, and 9) Supply Bulletins, Lubrication Orders, and Modification Work Orders. |
| TM 9-213 | Painting Instructions for Field Use. |
| TM 11-6625-226-12P | Operator's and Organizational Repair Parts and Special Tools List for Test Set, Electrical Meter TS-656/U. |
| TM 38-750 | The Army Equipment Record System and Procedures. |

By Order of the Secretary of the Army:

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*General, United States Army,*
*Chief of Staff.*

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  11-157
  11-500 (AA-AE) (4)
  11-557
  11-587
  11-592
  11-597

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

TECHNICAL MANUAL

No. 11-6625-226-12

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *13 July 1959*

# ELECTRICAL METER TEST SET TS-656/U
# OPERATION AND ORGANIZATIONAL MAINTENANCE

## CHAPTER 1

## INTRODUCTION

### Section I. GENERAL

**1. Scope**

This manual describes Electrical Meter Test Set TS456/U and covers its installation, operation, and first and second echelon maintenance. It includes operation under usual conditions, instructions for cleaning and inspection of the
equipment, and replacement of parts available to first and second echelons of maintenance.

**2. Forms and Records**

*a. Unsatisfactory Equipment Reports*

(1) *For Army*. Fill out and forward DA Form 468 (Unsatisfactory Equipment Report) to the Commanding Officer, U.S. Army Signal Equipment Support Agency, Fort Monmouth, N.J., as prescribed in AR 700-38.

(2) *For Air Force*. 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.

*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); Navy Shipping Guide, Article 1850-4 (Navy); and AFR 714 (Air Force).

*c. Preventive Maintenance Form.* Prepare DA Form 11-266 (fig. 5) (Maintenance Check List for Signal Equipment (Test Equipment)), in accordance with instructions on the form.

*d. Parts List Form.* Forward DA Form 2028 (Recommended Changes to DA Technical Manual Parts Lists or Supply Manuals 7, 8, or 9) directly to the Commanding Officer, U.S. Army Signal Equipment Support Agency, Fort Monmouth, N.J., with comments on parts listings in the appendix.

***e. Comments on Manual.*** **Forward all other comments on this publication directly to the Commanding Officer, U.S. Army Signal Publications Agency, Fort Monmouth, N.J.**

### Section II. DESCRIPTION AND DATA

**3. Purpose and Use**

*a. Purpose.* Electrical Meter Test Set TS-656/U supplies accurately metered alternating current (ac) and direct current (dc) voltages and direct current outputs for testing meter movements.

*b. Use*. The TS-656/U is used to check the operation and accuracy of ac and dc ammeters and voltmeters. The meter to be tested is subjected to voltage or current comparable to that impressed on it during operating conditions The TS-656/U may also be used as a general purpose laboratory power supply.

**4. Technical Characteristics**

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; and 0 to 500 volts.

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; and 0 to 500 volts.

Direct current ranges.... 0 to 100 ua; 0 to 250 ua; 0 to 500 ua ; 0 to 1 ma; 0 to 2.5 ma, 0 to 5 ma; 0 to 10 ma: 0 to 25 ma; 0 to 50 ma; 0 to 100 ma; 0 to 250 ma; 0 to 500 ma; and 0 to 1 amp.

Output:
- Ac voltage ranges..... 250 ma maximum.
- Dc voltage ranges:
  - 0 to 2.5 volts through 0 to 50 volts..... 50 ma maximum.
  - 0 to 100 volts through 0 to 500 volts..... 250 ma maximum.
- Direct current ranges..... 750 millivolts maximum.
- Dc voltage range regulation:
  - 0 to 2.5 volts through 0 to 50 volts..... 10 percent at 15 ma.
  - 0 to 100 volts through 0 to 500 volts..... 2 percent at 15 ma.

Accuracy:
- Ac voltage ranges:
  - 50 ma load..... ± 2 1/2 percent from 55° to 95° F; ±4 1/2 percent at -4° and 125° F.
  - 250 ma load..... ± 3 1/2 percent from 55° to 95° F.; ± 4 1/2 percent at -4° and 125° F.
- Dc voltage ranges..... ± 2 percent from 55° to 95° F; ±3 percent at -4° and 125° F.
- Direct current ranges..... ± 2 percent from 55° to 95° F; ±3 percent at -4° and 125° F.

Meter:
- Type ..... Ruggedized, D'Arsonval movement.
- Resistance..... 2,875 ohms (temperature compensated ).
- Sensitivity..... 100 microamperes dc at 287.5 mv.
- Power requirements.. 120 volts ac, 60 cycles, 160 watts, single phase.

**5. Components of Electrical Meter Test Set TS656/U (fig. 1)**

| Quantity | Item | Dimensions (in.) (lb) | Weight |
|---|---|---|---|
| 1 | Tester..... | 17 3/4 x 14 1/4 x 11 3/4 .. | 49 |
| 1 | Test Lead Set CX-1331 /U. | 48 lg..... | 2.5 oz. |
| 1 set | Running spares consisting of: Fuse* (1/4 ampere), 2 ea. Fuse* (5 ampere), 4 ea. Lamp (NE-51), 1 ea. | | |

*Stored in spare fuse holders.

**6. Common Names**

| Nomenclature | Common name |
|---|---|
| Electrical Meter Test Set TS-656/U | Test set |
| Main component of TS-656/U | Tester |
| Test Lead Set CX-1331/U | Test leads |

**7. Description of Test Set**

The test set (fig. 1) is a self-contained metered power supply. The major components of the test set are the tester and the test leads.

*a. Tester.* The front panel of the tester contains the controls, indicators, jacks, fuses, and spare fuses. When the equipment is not in use, it is protected by a detachable watertight cover.

*b. Test Leads.* The test leads consist of two 48-inch cables, one red and one black. Each cable is terminated at the ends by sharp-pointed test prods; one test prod is 4 1/2 inches long and the other 1 1/2 inches long. When not in use, the test leads are stored between the cover and the front panel of the tester.

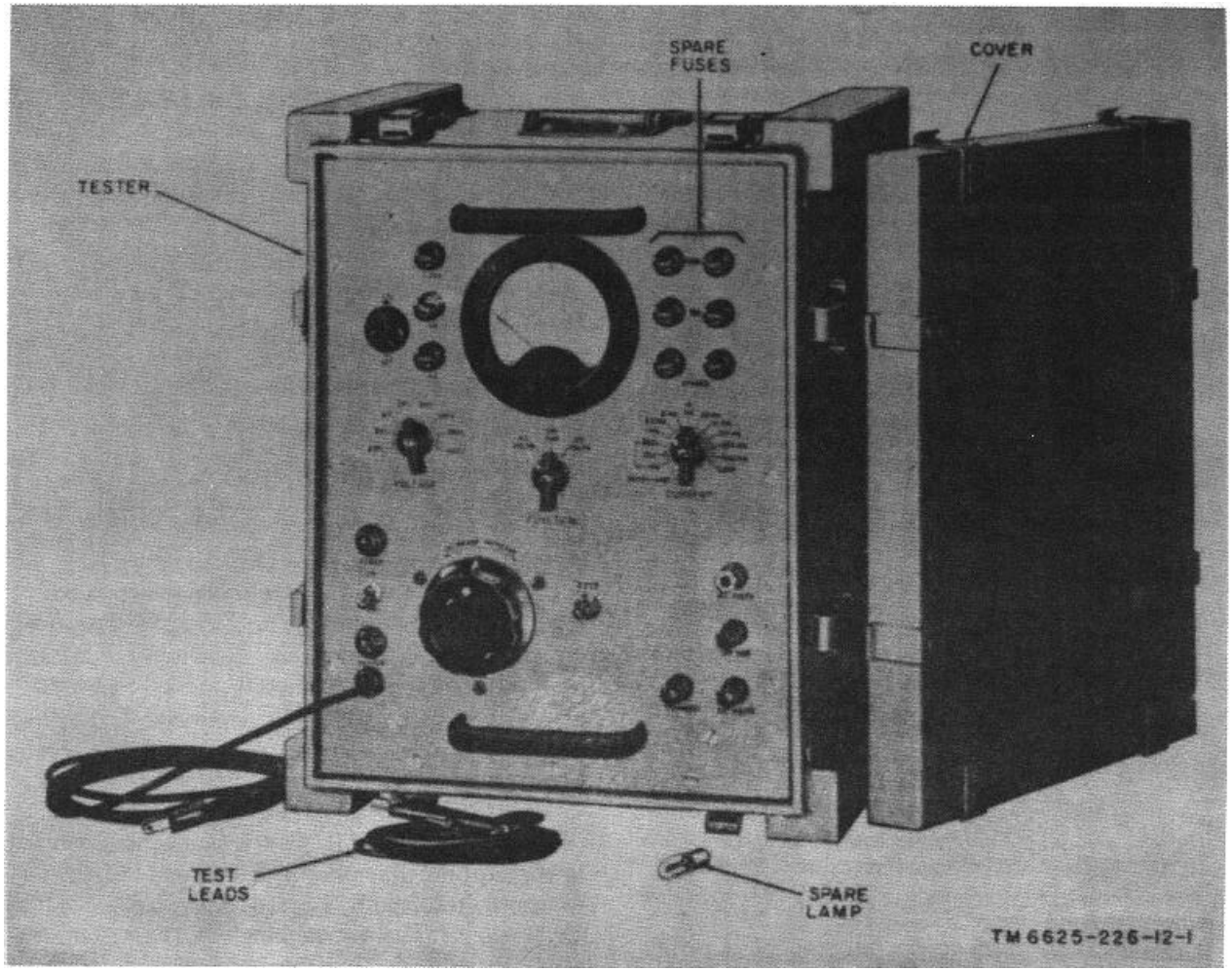


**Figure 1. Electrical meter test TS-656/U.**

## CHAPTER 2
## INSTALLATION

**8. Unpacking (fig. 2)**

*a. Packaging Data.* When packaged for shipment, the components of the TS-656/U are placed in a moisture-resistant corrugated carton. Three packaged equipments are packed in a wooden packing case. The dimensions are as follows:

| Item | Dimensions (in.) | Volume (cu ft) | Weight (lb) | Contents |
|---|---|---|---|---|
| Carton..... | 18 x 14 3/4 x 12 1/4 ... | 1.8 | 50 | TS-656/U. |
| Wooden packing case | 42 x 20 x 6 3/4..... | 8.16 | 165 | Three cartons, each containing a TS-656/U |

*b. Removing Contents.*

(1) Cut and fold back the metal straps.

(2) Remove the nails from the wooden cover and from one side of the case with a nail puller. Remove the cover and side.

**Note.**

**The remaining procedures apply to removing the contents from a carton.**

(3) Slit the moisture-resistant tape and open the moisture-resistant corrugated carton. Remove the technical manual.

(4) Open the moisture-vaporproof barrier and remove the test set wrapped in cushioning material.

(5) Remove the cushioning material and expose the test set.

**9. Checking Unpacked Equipment (figs. 1 and 2)**

*a.* Inspect the equipment for possible damage, such as bent panel, loose knobs, broken meter face, and cut or damaged cables. If the equipment has been damaged, refer to paragraph 2.

*b.* Check the equipment against the packing list. When no packing list accompanies the equipment, use the table of components (par. 5) as a general check.

*c.* Check to see that the proper fuses are inserted in the fuse holders (fig. 3) on the front panel of the tester.

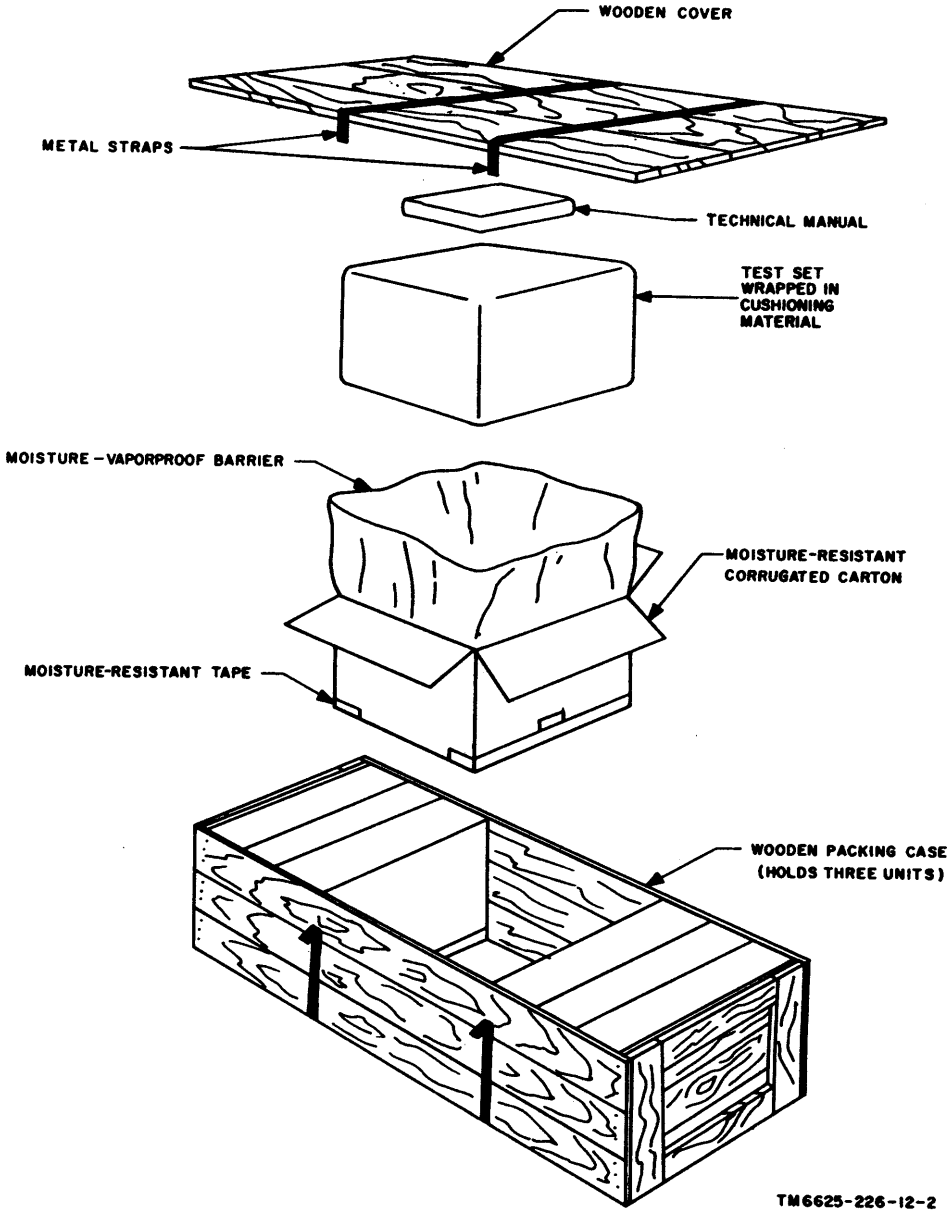


**Figure 2. Packaging diagram.**

## CHAPTER 3
## OPERATING INSTRUCTIONS

**Warning:**

**Be careful when operating this equipment. Voltages as high as 500 volts may be present at the output. Be sure that the equipment is dry. Serious injury or death may result from contact with the high voltage.**

### Section I. CONTROLS AND INSTRUMENTS

**10. General**

Haphazard operation or improper setting of the controls may cause injury to the operator or damage to the equipment under test. *Do not* press the TEST switch before the proper FUNCTION and range control settings are made.

**11. Controls, Indicators, and Jacks (fig. 3)**

The following chart lists the operating controls, indicators, and jacks, and states their functions:

| Control, indicator or jack | Function |
|---|---|
| ON-OFF switch | In ON position, applies power to the meter circuits.<br>In OFF position, disconnects power from meter circuits and applies power to internal heaters (except when line cord is disconnected). |
| HEATER lamp | Lights when power is applied to internal heaters. |
| POWER lamp | Lights when power is applied to meter circuits. |
| FUNCTION switch | Three-position rotary switch; selects mode of operation:<br>**Position — Action**<br>AC VOLTS — Sets up tester for ac voltage output.<br>DC VOLTS — Sets up tester for dc voltage output.<br>DIR CUR — Sets up tester for direct current output. |
| VOLTAGE range switch | Eight-position rotary switch; selects voltage output range for either ac or dc volts:<br>**Position — Action**<br>2.5V — Sets up tester for 0- to 2.5-volt output.<br>5V — Sets up tester for 0- to 5-volt output.<br>10V — Sets up tester for 0- to 10-volt output.<br>25V — Sets up tester for 0- to 25-volt output.<br>50V — Sets up tester for 0- to 50-volt output.<br>100V — Sets up tester for 0- to 100-volt output.<br>250V — Sets up tester for 0- to 250-volt output.<br>500V — Sets up tester for 0- to 500-volt output. |
| CURRENT range switch | Thirteen-position rotary switch; selects direct current range:<br>**Position — Action**<br>100 MICRO-AMP — Sets up tester for 0- to 100-ua output.<br>250 MICRO-AMP — Sets up tester for 0- to 250-ua output.<br>500 MICRO-AMP — Sets up tester for 0- to 500-ua output.<br>1 MA — Sets up tester for 0- to 1-ma output.<br>2.5 MA — Sets up tester for 0- to 2.5-ma output.<br>5 MA — Sets up tester for 0- to 5-ma output.<br>10 MA — Sets up tester for 0- to 10-ma output.<br>25 MA — Sets up tester for 0- to 25-ma output.<br>50 MA — Sets up tester for 0- to 50-ma output.<br>100 MA — Sets up tester for 0- to 100-ma output. |

| Control, indicator or jack | Function |
|---|---|
| | **Position** **Action** |
| | 250MA.....Sets up tester for 0- to 500-ma output. |
| | 1AMP .....Sets up tester for 0- to 1-ampere output. |
| TEST switch..... | Spring return toggle switch. Must be held in TEST position (up) to obtain output from tester. |
| DECREASE-INCREASE control..... | Adjusts output of tester: |
| | **Direction** **Action** |
| | DECREASE .....Decreases output (current or voltage) of tester. |
| | INCREASE.....Increases output (current or voltage) of tester. |
| Meter ..... | Indicates output voltage or current value. |
| AC VOLTS jack..... | Provides ac voltage connection to meter under test. |
| DC VOLTS jack..... | Provides positive dc voltage connection to meter under test. |
| DIR CUR. jack..... | Provides positive direct current connection to meter under test. |
| COMMON jack..... | Provides common (ground) connection to meter under test. |

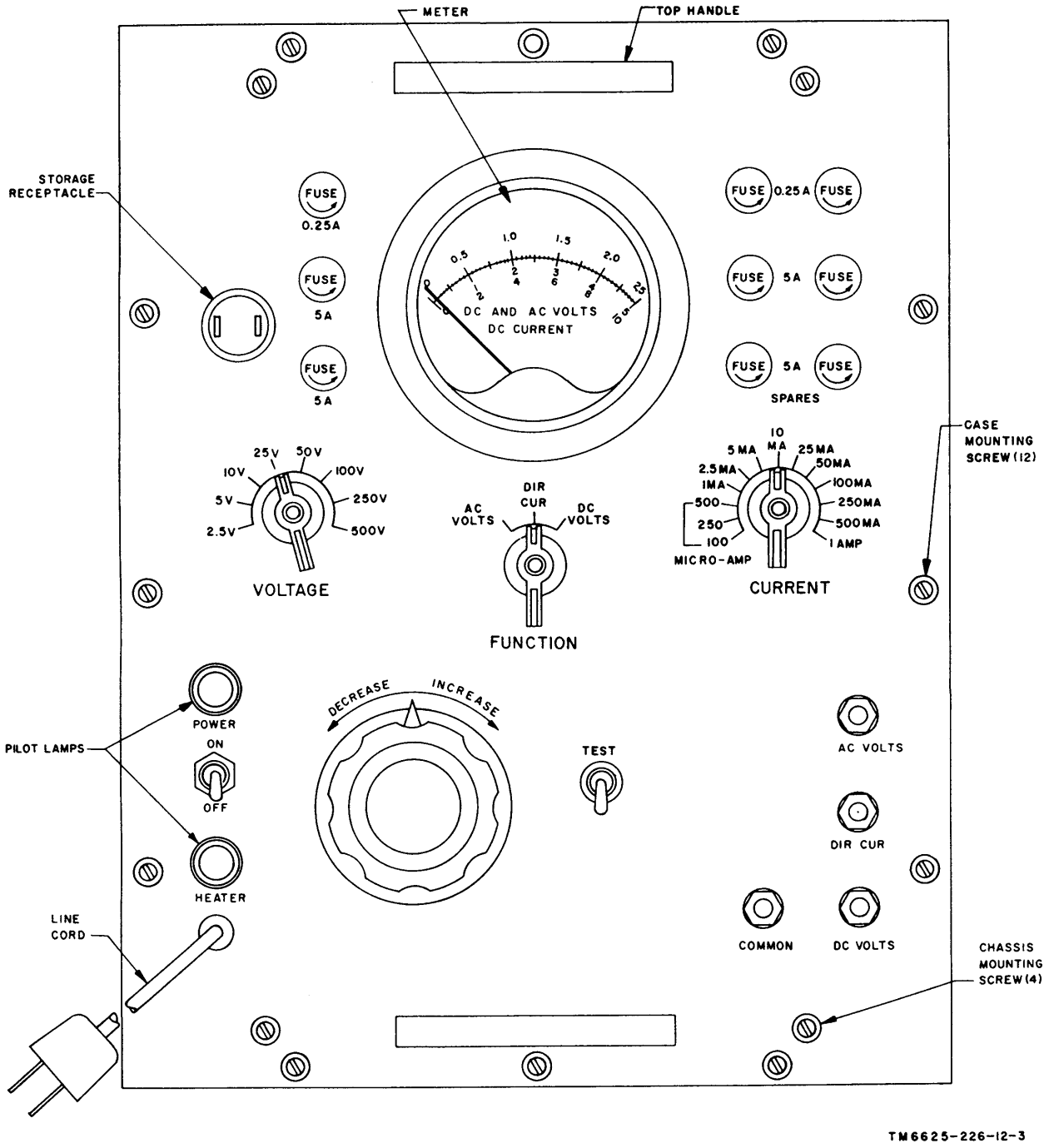


**Figure 3. Tester, front panel showing controls, indicators, and jacks.**

## Section II. OPERATING UNDER USUAL CONDITIONS

### 12. Testing Ac Voltage Meters

To test ac voltage meters, proceed as follows:

*a. Starting Procedure.*

(1) Connect the line cord (fig. 3) to a power source (par. 4).

(2) Plug the short test prod of the black test lead into the COMMON jack.

(3) Plug the short test prod of the red test lead into the AC VOLTS jack.

(4) Determine the range required for full-scale deflection of the meter under test.

**Note.**

**Full-scale information for the meter under test may be obtained from the name plate, available specifications, or from literature relative to the meter being tested. For best results, select a range on the tester that is the same or slightly higher than the full-scale value specified for the meter being tested. The tester should indicate not less than 40 percent of full-scale.**

(5) Rotate the FUNCTION switch to AC VOLTS and the VOLTAGE RANGE switch to the desired voltage range.

(6) Place the ON-OFF switch in the ON position.

(7) Adjust the DECREASE-INCREASE control until the meter on the tester indicates a value which is approximately that specified for the meter under test ((4) above).

(8) Connect the test leads to the meter under test.

*b. Operating Procedure.*

(1) Hold the TEST switch in the raised position and adjust the DECREASE-INCREASE control until the meter under test indicates *exactly* full-scale deflection, or until the meter on the tester indicates the *exact* full-scale value (a(4) above).

**Caution:**

**Be careful not to peg the needle of the meter under test. Full-scale deflection of a meter exists when the needle is exactly over the highest calibration mark (top mark) on the meter scale.**

(2) Note the indication of the tester and of the meter under test. If the two indications are the same, shut down the equipment (c below).

(3) If the indication of the tester differs from the value required for full-scale deflection (a(4) above), or if the meter under test does not indicate full-scale deflection:

(*a*) Record the indication of the tested. (Label this value $D_1$)

(*b*) Record the indication of the meter under test. (Label this value $D_2$)

(*c*) Shut down the tester (c below) and calculate the percentage of error (high or low sensitivity) as follows:

$$\frac{D_2-D_1}{D_3}(100)=\%\ \text{error}$$

Where:

$D_1$ = Tester indication ((*a*) above)

$D_2$ = Meter under test indication ((*b*) above)

$D_3$ = Normal full-scale deflection value (*a*(4) above)

*Example 1:*

$D_1 = 9.8$ volts

$D_2 = 10$ volts

$D_3 = 10$ volts

$$\frac{D_2-D_1}{D_3}(100)=\%\ \text{error}$$

$$\frac{10-9.8}{10}(100)=+2\%\ \text{error (or high sensitivity)}$$

*Example 2:*

$D_1 = 5$ volts

$D_2 = 4.8$ volts

$D_3 = 5$ volts

$$\frac{D_2-D_1}{D_3}(100)=\%\ \text{error}$$

$$\frac{4.8-5}{5}(100)=-4\%\ \text{error (or low sensitivity)}$$

*c. Stopping Procedure.*

(1) Place the ON-OFF switch in the OFF position and turn the DECREASE-INCREASE control to the extreme counterclockwise position.

(2) Disconnect the test leads from the meter under test and from the tester.

(3) If the tester is to be left in the standby condition, do not disconnect the line cord from the power source.

(4) If the tester is not to be left in the stand-by condition, disconnect the line cord from the power source.

**13. Testing Dc Voltage Meters**

To test dc voltage meters, proceed as follows:

*a. Starting Procedure.*

(1) Connect the line cord (fig. 3) to a power source.

(2) Plug the short test prod of the black test lead into the COMMON jack.

(3) Plug the short test prod of the red test lead into the DC VOLTS jack.

(4) Determine the range required for full-scale deflection of the meter under test (par. 12a(4)).

(5) Rotate the FUNCTION switch to DC VOLTS and the VOLTAGE range switch to the desired voltage range.

(6) Follow the procedures given in paragraph 12a(6) through (8). Be sure to observe polarity when connecting the test leads to the meter under test.

*b. Operating Procedure.* Follow the procedure given in paragraph 12b.

*c. Stopping Procedure.* Follow the procedure given in paragraph 12c.

**14. Testing Direct Current Meters**

To test direct current meters, proceed as follows:

*a. Starting Procedure.*

(1) Connect the line cord (fig. 3.) to a power source (par. 4).

(2) Plug the short test prod of the black test lead into the COMMON jack.

(3) Plug the short test prod of the red test lead into the DIR CUR jack.

(4) Determine the range required for full-scale deflection of the meter under test (par. 12a(4)).

(5) Rotate the FUNCTION switch to DIR CUR, the CURRENT range switch to the desired current range, and the DECREASE-INCREASE control to the extreme counterclockwise (zero) position.

(6) Place the ON-OFF switch in the ON position.

(7) Connect the test leads to the meter under test. Be sure to observe polarity.

*b. Operating Procedure.*

(1) Follow the procedures given in paragraph 12b.

(2) The following is an example calculation applicable to direct current instruments:

$$\frac{D_2 - D_1}{D_3}\ (100) = \%\ \text{error}$$

Where:

$D_1$ = Tester indication = 98 ma.

$D_2$ = Meter under test indication = 100 ma.

$D_3$ = Normal full-scale deflection value = 100 ma.

$$\frac{.1 - .098}{.1}(100) = +2\%\ \text{error (or high sensitivity)}$$

*c. Stopping Procedure.* Follow the procedures given in paragraph 12c.

**15. Operating Test Set as Power Supply**

The test set can be operated as a laboratory power source to supply ac voltage, dc voltage, or direct current.

*a. Ac Voltage Source*. The test set can supply nonregulated ac voltage up to 500 volts at a maximum of 250 milliamperes (ma). To use the equipment as an ac voltage source, proceed as follows:

(1) Connect the line cord and the test leads (par. 12a(1) through (3)).

(2) Determine the output voltage required for the operation.

(3) Rotate the FUNCTION switch (fig. 3) to AC VOLTS and the VOLTAGE range switch to the desired voltage range.

(4) Place the ON-OFF switch in the ON position.

(5) Adjust the DECREASE-INCREASE control until the meter on the tester indicates the desired voltage.

(6) Connect the test leads to the load, raise the TEST switch, and adjust the DECREASE-INCREASE control until the meter on the tester indicates the desired value.

(7) Perform the required operation on the load.

**Note.**

**To obtain an output from the tester, hold the TEST switch in the up position.**

(8) Shut down the equipment (par. 12c).

*b. Dc Voltage Source.* The test set can supply regulated dc voltages up to 500 volts, at a maximum of 50 ma in the 2.5- to 50-volt ranges, and at a maximum of 250 ma in the 100- to 500-volt ranges. To use the equipment as a dc voltage source, proceed as follows:

(1) Connect the line cord and the test leads (par. 13a(1) through (3)).

(2) Determine the output voltage required.

(3) Rotate the FUNCTION switch to DC

VOLTS and the VOLTAGE range switch to the desired voltage range.

(4) Follow the procedures given in a(4) through (8) above.

*c. Direct Current Source.* The test set can supply nonregulated direct current up to 1 ampere at a maximum voltage of 750 millivolts. To use the equipment as a direct current source, proceed as follows:

(1) Connect the line cord and the test leads (par. 14a(1) through (3)).

(2) Determine the output current required.

(3) Rotate the FUNCTION switch to DIR CUR, the CURRENT range switch to the desired current range, and the DECREASE-INCREASE control to the extreme counterclockwise (zero) position.

(4) Place the ON-OFF switch in the ON position.

(5) Follow the procedures given in a(6) through (8) above.

## Section III. OPERATION UNDER UNUSUAL CONDITIONS

### 16. Operation at Low Temperatures

The test set is intended for indoor use. When possible, store and use the equipment in a heated shelter. If the tester has been exposed to the cold, it 'will sweat until it reaches room temperature. Sweating also occurs when the equipment warms up during the day after exposure during a cold night. When the tester has reached room temperature, dry it thoroughly.

**Note.**

**During daytime standby, or overnight shutdown, place the ON-OFF switch in the OFF position and connect the line cord to a power source. The heaters will remain on and prevent condensation from forming.**

### 17. Operation Under Tropical Conditions

In tropical climates, store and operate the tester in a building or shelter if possible. High relative humidity causes condensation or moisture to form on the equipment. Clean the equipment frequently to keep it free from rust, corrosion, and fungus growth. Use the same procedures listed in paragraph 16 to keep the equipment dry.

### 18. Operation in Desert Climates

*a.* Conditions similar to those encountered in tropical climates (par. 7) often prevail in desert areas. In desert areas, high temperature during the day followed by a drop in temperature during the night causes condensation to form on equipment. Use the same precautions for storage and operation in desert climates as in tropical climates (par. 17).

*b.* Provides means for keeping dust and sand from entering the equipment. Be sure that the test set cover is properly closed and latched when the equipment is not in use. If possible, protect the equipment from the direct rays of the sun.

## CHAPTER 4
## MAINTENANCE INSTRUCTIONS

### 19. Scope of Maintenance

The procedures outlined in this chapter are to be performed by the operator or the organizational maintenance personnel. Organizational maintenance of the test set is limited to preventive maintenance and minor repairs. The tools and test equipment required are those that are normally available to the repairman-user because of his assigned mission.

### 20. Preventive Maintenance

*a. DA Form 11-266.* DA Form 11-266 (fig. 4 and 5) is a preventive maintenance check list to be used by maintenance personnel. Items not applicable to the tester are lined out in the figure. References in the ITEM block in the figure are to paragraphs pertinent to the particular item. Instructions for use of the form appear on the form.

*b. Items.* The information shown in this subparagraph supplements DA Form 11-266. The item numbers correspond to the ITEM numbers on the form.

| Item | Maintenance procedures |
|---|---|
| 1 .... | Use a clean cloth to remove dust, dirt, moisture, and grease from the case and front panel. If necessary, dampen the cloth with Cleaning Compound (Federal stock No. 7930-395-9542) and then wipe the parts with a dry clean cloth. **Warning: Cleaning Compound is flammable and its fumes are toxic. Do not use it near a flame; provide adequate ventilation.** |
| 3 .... | All control knobs should work smoothly, be tight on the shafts, and should not bind. Tighten all loose knobs and be sure that the knobs do not rub against the panel. |
| 5 .... | Repair cuts in the line cord insulation by covering them with rubber tape and then with friction tape. Do not attempt to repair cuts in the test lead insulation. Replace wire in such cases. |
| 11 .. | Wipe meter window with a solution of water and any washing detergent. Rinse cloth with clear water and rewipe the meter window. Allow to air dry. |

### 21. Visual Inspection

*a.* When the equipment fails to perform properly, turn off the power, disconnect the line cord from the power source, and check (1) through (3) below. Do not perform any check worth the power on.

(1) Wrong settings of switches and controls (par. 12 through 15).

(2) Line cord or test leads disconnected or poorly connected.

(3) Burned-out fuses (usually indicate some other fault).

*b.* If the above checks fail to locate the trouble, proceed to the equipment performance check list (par. 22).

### 22. Equipment Performance Check List

*a. General.* The equipment performance check list provides a procedure for systematically checking equipment performance. All corrective measures that the operator or the organizational maintenance man can perform are given in the Corrective measures column. When using the check list, start at the beginning and follow each step in order. If the corrective measure indicated does not fix the equipment, trouble shooting is required by higher echelon. Note on the repair tag how the equipment performed and the corrective measures that were taken.

*b. Procedure.* Place the test set in operation as shown in the check list (c below).

*c. Check List.* Perform the steps in the sequence given. Do not perform any corrective measures until the equipment has been shut down (par. 12c).

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

EQUIPMENT NOMENCLATURE
ELECTRICAL METER TEST SET TS-656/U

EQUIPMENT SERIAL NUMBER
ORDER NO 39185-PP-58-A3-A3

**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 |
|---|---|---|---|
| ✓ | | 8 May 59 | J. Smith. |
| ✓ | | 15 May 59 | J. Smith. |
| ✓ | | 22 May 59 | J. Smith. |
| ✓ | | 29 May 59 | J. Smith. |
| | ✓ | 29 May 59 | B. Jones. |
| | | | |

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4

DA FORM 1 MAY 57 11-266

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Figure 4. 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 May 1959

| 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, INTERCONNECTING PLUGS, CABLES, ~~HEADSETS~~, METER WINDOWS, ETC. PAR.20b | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| 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. PAR.20b | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| 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. PAR.20b | ✓ | ✓ | ✓ | ✓ | | ✓ |
| 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. PAR.20b | ✓ | ✓ | ✓ | ✓ | | ✓ |

| 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 CHOKE 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. | X |
| 17. ~~INSPECT VARIABLE CAPACITORS FOR DIRT AND MOISTURE.~~ | |
| 18. ~~INSPECT AIR FILTERS FOR CLEANLINESS.~~ | |
| 19. INSPECT ~~SCREW TYPE 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)*

ITEM 16. STORAGE RECEPTACLE BROKEN. REFERRED TO HIGHER ECHELON FOR REPLACEMENT.

2 3

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Figure 5. DA Form 11-266, pages 2 and 3.

| | Step | Action | Normal indication | Corrective measures |
|---|---|---|---|---|
| **PREPARATORY** | 1 | Connect line cord to power source; place ON-OFF switch in OFF position. | HEATER lamp lights | *a.* Replace HEATER lamp (par. 23*a*).<br>*b.* Check both 5-ampere fuses (fig. 3) and replace if necessary (par. 23b).<br>*c.* Check line cord and repair or replace as necessary (par. 25).<br>*d.* Higher echelon repair required. |
| | 2 | Plug short test prod of black test lead into COMMON jack. | | |
| | 3 | Plug short test prod of red test lead into AC VOLTS jack.<br>**Note. Be sure that the long test prods do not touch each other.** | | |
| **EQUIPMENT PERFORMANCE** | 4 | Set FUNCTION switch in AC VOLTS position. | | |
| | 5 | Place ON-OFF switch in ON position. | POWER lamp lights | *a.* Replace POWER lamp (par. 23a).<br>*b.* Higher echelon repair required. |
| | 6 | Set VOLTAGE range switch on 2.5V and adjust DECREASE-INCREASE control for full-scale deflection. | Meter indicates full-scale deflection. | *a.* Check 0.25A fuse (fig. 3) and replace if necessary.<br>*b.* Higher echelon repair required. |
| | 7 | Repeat the procedure given in item 6 above for each position of VOLTAGE range switch. | Meter indicates full-scale deflection for each switch position. | Higher echelon repair required. |
| | 8 | Set FUNCTION switch on DC VOLTS. | | |
| | 9 | Set VOLTAGE range switch on 500V and adjust DECREASE-INCREASE control for full-scale deflection. | Meter indicates full-scale deflection. | Higher echelon repair required. |
| | 10 | Set FUNCTION switch on DIR CUR and DECREASE-INCREASE control in extreme counterclockwise position. | Meter indicates zero (0) amperes<br>**Note. If meter indicates a value other than zero. DO NOT proceed any further. Shut down the equipment** | Higher echelon repair required. |
| | 11 | Connect red test lead between COMMON jack and DIR CUR jack. | Test prods fit securely into jack | *a.* Repair or replace test prods (par. 24).<br>*b.* Higher echelon repair required |
| | 12 | Set CURRENT range switch at 100 MICRO-AMP raise TEST switch, and adjust DECREASE-INCREASE control for full-scale deflection. | Meter indicates full-scale deflection. | *a.* Repair (par. 24) or replace test lead.<br>*b.* Higher echelon repair required. |
| | 13 | Repeat the procedure given in item 12 above for each position of CURRENT range switch. | Meter indicates full-scale deflection for each position of switch. | Higher echelon repair required. |
| | 14 | Repeat procedures given in items 10 through 12 above, using black test lead. | | |
| **STOP** | 15 | Remove black test lead from tester. | | |
| | 16 | Place ON-OFF switch in OFF position; disconnect line cord from power source. | | |
| | 17 | Turn DECREASE-INCREASE control to extreme counter-clockwise position. | | |

**23. Replacement of Lamps and Fuses**

*a. Replacement of Defective Lamps.* The following procedures apply to the POWER lamp (fig. 3) and to the HEATER lamp.

(1) Turn the indicator jewel (fig. 7) counterclockwise and pull it out to expose the defective lamp.

(2) Press in on the lamp and turn it counterclockwise to unlock it.

(3) Pull the defective lamp out and replace it with a new one. Push the lamp in and twist it clockwise to lock.

(4) Replace the indicator jewel on the lamp holder; turn clockwise to secure in place.

*b. Replacement of Defective Fuses.*

(1) Turn knurled cap of fuse holder counterclockwise and pull it out to expose the defective fuse.

(2) Pull the defective fuse out and replace it with a new one.

(3) Replace the knurled cap on the fuse holder; turn clockwise to secure in place.

**24. Repair of Test Leads (fig. 6)**

Other than color, both test leads are the same. The following procedures apply to both test leads.

**Warning:**

**The tester may deliver up to 500 volts at low impedance. Failure to keep the test leads in good condition will expose the operator to high voltages and may cause serious injury or death.**

*a. Disassembly.*

(1) Unscrew the tip from the sleeve at each end of the cable.

(2) Remove the washers and pull the sleeves off the cable.

*b. Reassembly.*

(1) Skin the insulation at each end of the replacement cable back 1 inch.

**Note.**

**The replacement cable must be at least 48 inches long.**

(2) Twist the exposed wire strands at each end of the cable tightly together.

(3) Feed the twisted ends of the cable through the internal slots in the sleeves.

(4) Coil the twisted wire ends in a clockwise direction and press them into the threaded ends of the sleeves.

(5) Place a washer on the threaded portion of each tip; screw a tip into the threaded hole in the end of each sleeve.

**25. Repair of Line Cord**

*a. Plug Replacement (fig. 7).*

(1) Remove the screw from the rear of the cap; pull the cap off the plug.

(2) Unscrew both screws at each prong in the plug to release the two leads.

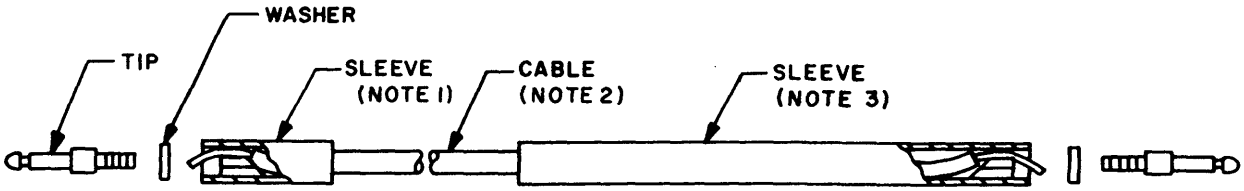
(3) Pull the cap and plug off the line cord.

(4) Cut 3 inches off the line cord, skin the ends of the leads back 1/2 inch, and skin the outer covering back 1 inch.

(5) Place the cap over the line cord with the open end facing the end of the leads.

(6) Thread the leads through the hole in the plug; fasten the wire under the screws in each prong.

(7) Replace the cap and secure the holding screw.




NOTES:

1. RED SLEEVE IS MX-1906/U; BLACK SLEEVE IS MX-1907/U.
2. RED CABLE IS WS17/U; BLACK CABLE IS WS16/U.
3. RED SLEEVE IS MX-1909/U; BLACK SLEEVE IS MX-1910/U.

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**Figure 6. Test lead, exploded view.**

*b. Line Cord Replacement.*

(1) Remove the plug from the line cord (a( 1 ) through (3) above).

(2) Unscrew the case mounting screws (fig. 3) and lift the panel and chassis assembly from the case.

(3) Unsolder the line cord from its point of connection to the 5A fuse holders (fig. 7).

(4) Squeeze the strain relief bushing along the parting lines of the halves and pull it from the front face of the panel.

(5) Thread the replacement line cord through the hole in the panel and dress it between the variac (not shown) and the ON-OFF switch.

(6) Thread the line cord inside the two outer supporting posts (not shown) on the terminal board at the back of the VOLTAGE switch.

(7) Skin the ends of the line cord and solder the leads to the rear contact on the 5A fuse holders.

(8) Pull the excess line cord back through the panel hole.

(9) Place the strain relief bushing parts around the line cord; squeeze with pliers while bushing the bushing into the panel hole.

(10) Replace the plug on the line cord a(4) through (7) above).

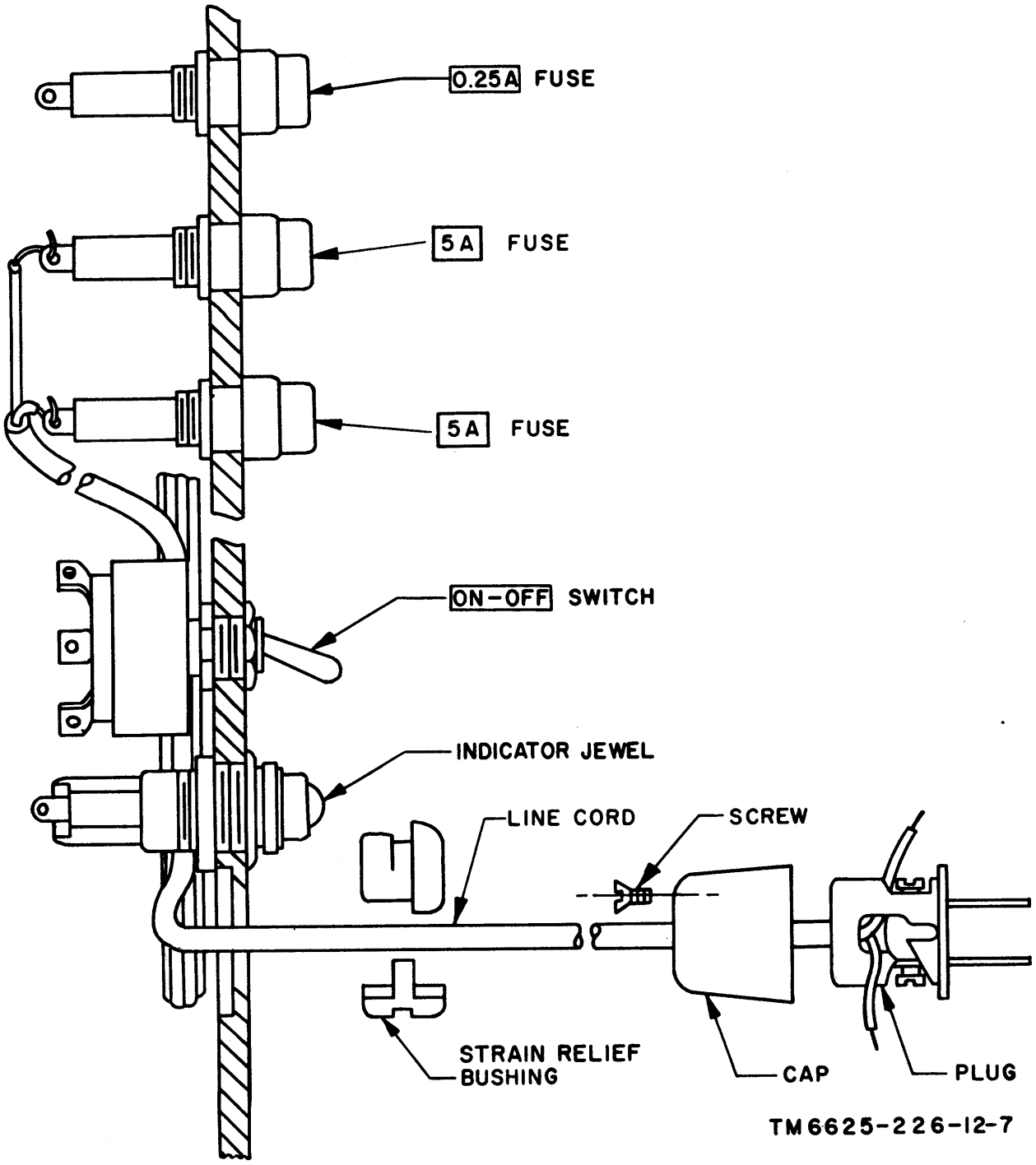


Figure 7. Partial cutaway view of tester front panel.

## CHAPTER 5

## SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

### Section I. SHIPMENT AND LIMITED STORAGE

**26. Disassembly of Equipment**

To disassemble the tester, proceed as follows:

*a.* Disconnect the line cord from the power source and plug it into the storage receptacle (fig. 3).

*b.* Disconnect the test leads from the tester.

*c.* Coil. the test leads and lay them on top of the panel; secure the cover to the case.

**27. Repackaging for Shipment or Limited Storage**

The exact procedure for repackaging depends on the material available and the conditions under which the equipment is to be shipped or stored.

Adapt the procedures outlined below whenever circumstances permit.

*a. Material Requirement.* The following materials are required for packaging Electrical Meter Test Set TS-656/U., For stock numbers of materials, consult SB 38100.

| Material | Dimensions (in.) |
|---|---|
| Cushion material ..... | 120 x 12. |
| Moistureproof barrier bag..... | 26 x 16 x 12. |
| Cardboard carton ..... | 18 x 14 3/4 x 11 3/4 |
| Water-resistant tape (3-inch) | 96. |
| Wooden packing ..... | 20 x 16 3/4 x 13 3/4. |

*b. Packaging* (fig. 2). Package the tester as outlined below:

(1) Wrap the test set securely with cushioning material.

(2) Place the wrapped test set in the Moistureproof barrier bag; seal the bag.

(3) Place the package in the Moistureproof cardboard carton.

(4) Seal the cardboard carton with the moisture-resistant tape.

(5) Place the carton in the wooden packing case; lay the manual envelope on top of the carton.

(6) Nail the wooden cover to the case.

(7) Secure the wooden packing case with two metal straps.

### Section II. DEMOLITION TO PREVENT ENEMY USE

**28. Authority for Demolition**

The demolition procedures given in paragraph 29 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished only upon the order of the commander.

**29. Methods of Destruction**

Any or all of the methods of destruction given below may be used. The time available will be the major determining factor for the methods to be used in most instances when destruction of equipment is undertaken. The tactical situation also will determine in what manner the destruction will be carried out.

*a. Smash.* Use sledges, axes, hammers, crowbars, and any other heavy tools available to smash the tester.

(1) Use the heaviest tool on hand to smash the meter and the knobs.

**Note. Heavy tools will effectively damage the external parts ((1) above), but the remainder of the exposed surfaces of the equipment are constructed of aluminum plate; attempts to damage them by smashing will be useless.**

(2) Remove the panel from the case. With a heavy hammer or bar, smash as many as possible of the exposed parts of the chassis.

*b. Cut*. Use axes, handaxes, machetes, and similar tools to cut cabling, cording, and wiring.

Use a heavy axe or machete to cut power cable.

Cut all cords and cables in a number of places.

If time permits, slash all internal cabling and cable harnesses.

*c. Explode.* Use explosives to complete demolition, when time does not permit complete demolition by other means. Power charges, fragmentation grenades, or incendiary grenades may be used. Incendiary grenades usually are most effective if destruction of small parts and wiring is desired.

*d. Dispose*. Bury or scatter destroyed parts or throw them into near-by waterways. This is particularly important if a number of parts have not been completely destroyed.

## APPENDIX I

## REFERENCES

Following is a list of applicable references available to the operator and organizational maintenance personnel.

SB 38100. Preservation, Packaging and Packing' Materials, Supplies, and Equipment used in the Army

TM 11-664. Theory and Use of Electronic Test Equipment

## APPENDIX II

## MAINTENANCE ALLOCATION FOR ELECTRICAL METER TEST SET TS-656/U

### 1. General

*a.* This appendix assigns maintenance functions and repair operations to be performed by the lowest appropriate maintenance echelon. It also specifies the tools and other test, equipment authorized at each echelon to perform the assigned maintenance function.

*b*. Column headings of the Maintenance ; tion chart are defined as follows:

(1*) Part or component*. Only the nomenclature or standard item name is annotated in this column. Additional descriptive data are 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 will 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 operation. These are defined as follows:

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

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

(c) *Tes*t. To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages and meters.

(*d*) *Replace*. To substitute serviceable assemblies, subassemblies, and parts for unserviceable components.

(*e*) *Repair*. To restore to a serviceable condition by replacing unserviceable parts or by any other action required utilizing tools, equipment, and skills available, to include welding, grinding, riveting, straightening, and adjusting.

(*f*) *Calibrate*. To determine, check, or rectify the graduation of an Instrument, weapon, or weapons system, or components of a weapons system.

(*g*) *Rebuild*. To restore to a condition comparable to new by disassembling the item to determine the condition of its component parts and reassembling it using serviceable, rebuilt, or new assemblies, subassemblies, and parts.

(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*. The numbers in this column indicate the tool and test equipment required to perform the maintenance functions. These numbers are identified in the Allocation of Tools for Maintenance Functions chart..

(5) *Remarks*. This column contains any notations necessary to clarify the data cited in the preceding columns.

*c*. Column headings in the Allocation of Tools for Maintenance Functions are defined as follows:

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

(2) *1st, 2d, 3d, 4th, 6th echelon.* The dagger indicates that the tool or test equipment is allocated to that echelon.

(3) *Tool code.* The numbers in this column are code numbers that stand for the as-.

sociated tool equipment and are used in Maintenance Allocation Chart to refer to the indicated item.

(4) *Remarks*. Not used.

### 2. Maintenance by Using Organizations

When this equipment is used by signal service 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

| Parts or component (1) | Maintenance function (2) | 1st ech. (3) | 2nd ech. (4) | 3rd ech. (5) | 4th ech. (6) | 5th ech. (7) | Tools required (8) | Remarks (9) |
|---|---|---|---|---|---|---|---|---|
| TEST SET, ELECTRICAL METER TS-656/U | | | | | | | | |
| | service | X | | | | | | |
| | inspect | X | | | | | | Visual only |
| | test | | | | X | X | 2, 4 | |
| | repair | | | | X | | 3 | |
| | calibrate | | | | X | X | 1 | |
| | rebuild | | | | | X | | |
| CABLE ASSEMBLY, POWER, ELECTRICAL | repair | | X | | | | | |
| BUSHING, STRAIN RELIEF | replace | | X | | | | | |
| CABLE, POWER, ELECTRICAL | replace | | | X | | | | |
| CONNECTOR | replace | | X | | | | | |
| CAPACITORS | replace | | | | X | | | |
| CASE, TRANSIT | replace | | | | X | | | Fabricate |
| CATCHES | replace | | | | X | | | Obtain from salvage |
| COVER | replace | | | | X | | | Fabricate |
| GASKET | replace | | | x | | | | |
| HANDLES | REPLACE | | | | x | | | Fabricate |
| CONNECTORS | REPLACE | | | | X | | | |
| FUSES- | REPLACE | X | | | | | | |
| FUSEHOLDERS | REPLACE | | | X | | | | |
| CARS, ELECTRICAL | REPLACE | | X | | | | | |
| HANDLES | REPLACE | | | | x | | | Fabricate |
| KNOBS | REPLACE | | X | | | | | |
| LAMPS, INCANDESCENT | REPLACE | X | | | | | | |
| LEADS, ELECTRICAL CX-1331/U | repair | | X | | | | | |

## Section II. MAINTENANCE ALLOCATION CHART

| Parts or component (1) | Maintenance function (2) | 1st ech. (3) | 2nd ech. (4) | 3rd ech. (5) | 4th ech. (6) | 5th ech. (7) | Tools required (8) | Remarks (9) |
|---|---|---|---|---|---|---|---|---|
| TS-636/U (continued) | | | | | | | | |
| CABLE | REPLACE | | X | | | | | |
| PRODS, TEST | REPLACE | | X | | | | | |
| TIPS, PIN | REPLACE | | X | | | | | |
| LIGHTS, INDICATOR | REPLACE | | | X | | | | |
| LENSES, INDICATOR LIGHT | REPLACE | | X | | | | | |
| LUGS, TERMINAL | REPLACE | | | X | | | | Available in standard Maintenance Kits |
| METER | REPLACE | | | | X | | | |
| NUTS (Common Hardware) | REPLACE | | | | X | | | Available in standard Maintenance Kits |
| PLATES, MOUNTING | REPLACE | | | | X | | | Fabricate |
| POSTS, BINDING | REPLACE | | X | | | | | |
| REACTOR | REPLACE | | | | X | | | |
| RESISTORS | REPLACE | | | | X | | | |
| RESISTORS | REPLACE | | | | X | | | |
| SCREWS (Common Hardware) | REPLACE | | | | X | | | Available in standard Maintenance Kits |
| SEMI-CONDUCTOR DEVICES, DIODE | REPLACE | | | | X | | | |
| SPACERS | REPLACE | | | | X | | | Fabricate |
| SWITCH, TELEPHONE | REPLACE | | | | X | | | |
| SWITCHES, ROTARY | REPLACE | | | | X | | | |
| SWITCH, TOGGLE | REPLACE | | | X | | | | |
| TRANSFORMER, PO(W ER | REPLACE | | | | X | | | |
| TRANSFORMER, VARIABLE | REPLACE | | | | X | | | |
| WASHERS (Coon Hardware) | REPLACE | | | | X | | | Available in standard Maintenance Kits |

## Section III. ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS

| Tools Required For Maintenance Functions (1) | 1st ech. (2) | 2nd ech. (3) | 3rd ech. (4) | 4th ech. (5) | 5th ech. (6) | Tool Code (7) | Remarks (8) |
|---|---|---|---|---|---|---|---|
| TS-656/U | | | | | | | |
| METER TEST SET TS-682/GS1 | | | | † | † | 1 | |
| MULTIMETER AN/UR-105 | | | | † | † | 2 | |
| TOOL EQUIPMENT TK-21/G | | | | † | † | 3 | |
| VOLTMETER, ME 1-30/U | | | | † | † | 4 | |

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Sector Comd, USA (RES) (1)
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11-16 (2)
11-57 (2)
11-97 (2)
11-98 (2)
11-117 (2)
11-155 (2)
11-500 (AA-AE) (2)
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For explanation of abbreviations used, see AR 320-50.



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# The Metric System and Equivalents

### *Linear Measure*

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

### *Weights*

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

### *Liquid Measure*

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

### *Square Measure*

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

### *Cubic Measure*

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

# Approximate Conversion Factors

| *To change* | *To* | *Multiply by* | *To change* | *To* | *Multiply by* |
|---|---|---|---|---|---|
| inches | centimeters | 2.540 | ounce-inches | Newton-meters | .007062 |
| feet | meters | .305 | centimeters | inches | .394 |
| yards | meters | .914 | meters | feet | 3.280 |
| miles | kilometers | 1.609 | meters | yards | 1.094 |
| square inches | square centimeters | 6.451 | kilometers | miles | .621 |
| square feet | square meters | .093 | square centimeters | square inches | .155 |
| square yards | square meters | .836 | square meters | square feet | 10.764 |
| square miles | square kilometers | 2.590 | square meters | square yards | 1.196 |
| acres | square hectometers | .405 | square kilometers | square miles | .386 |
| cubic feet | cubic meters | .028 | square hectometers | acres | 2.471 |
| cubic yards | cubic meters | .765 | cubic meters | cubic feet | 35.315 |
| fluid ounces | milliliters | 29,573 | cubic meters | cubic yards | 1.308 |
| pints | liters | .473 | milliliters | fluid ounces | .034 |
| quarts | liters | .946 | liters | pints | 2.113 |
| gallons | liters | 3.785 | liters | quarts | 1.057 |
| ounces | grams | 28.349 | liters | gallons | .264 |
| pounds | kilograms | .454 | grams | ounces | .035 |
| short tons | metric tons | .907 | kilograms | pounds | 2.205 |
| pound-feet | Newton-meters | 1.356 | metric tons | short tons | 1.102 |
| pound-inches | Newton-meters | .11296 | | | |

# Temperature (Exact)

| | | | | |
|---|---|---|---|---|
| °F | Fahrenheit temperature | 5/9 (after subtracting 32) | Celsius temperature | °C |

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