TM 11-6625-203-12

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

4152D US ...
DELGADO COLLEGE, 615 CITY PARK AVENUE
NEW ORLEANS, LOUISIANA 70119

OPERATION AND ORGANIZATIONAL MAINTENANCE MULTIMETER AN/URM-105 INCLUDING MULTIMETER ME-77/U

HEADQUARTERS, DEPARTMENT OF THE ARMY

JUNE 1959

WARNING

HIGH VOLTAGE

as high as 50,000 VOLTS
may be measured with this equipment

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 ensure 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!

TECHNICAL MANUAL
No. 11–6625–203–12

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *11 June 1959*

MULTIMETER AN/URM–105, INCLUDING MULTIMETER ME–77/U

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual describes Multimeter AN/URM–105, its operation, and organizational maintenance. It covers the operation, cleaning, and inspection of the equipment.

b. Throughout this manual, Multimeter ME–77/U, the major component of the AN/URM–105, is referred to as *multimeter*.

2. Forms and Records

a. Unsatisfactory Equipment Reports. 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.

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 71–4 (Air Force).

c. Preventive Maintenance Form. Prepare DA Form 11–266 (figs. 5 and 6) (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, and 9) directly to the Commanding Officer, U.S. Army Signal Equipment Support Agency, Fort Monmouth, N.J., with comments on parts listings.

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. Multimeter AN/URM–105 is a voltmeter-ohmmeter that is used to measure direct current (dc) voltage, alternating current (ac) voltage, and resistance.

b. Additional accessories are available to extend the dc voltage range and to enable the use of the multimeter as an ammeter.

(1) The dc voltage range may be extended up to 50,000 volts with the use of external multipliers (par. 22*b* and *c*).

(2) Current measurements up to 100 amperes may be made with the use of an external shunt (par. 22*a*).

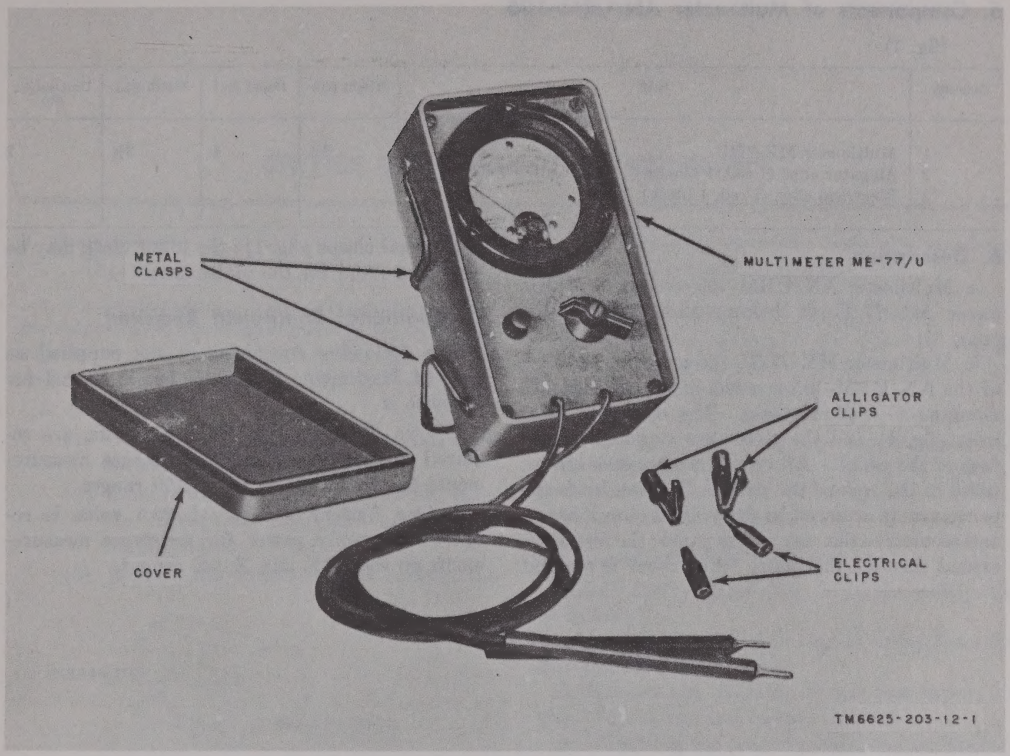


Figure 1. Multimeter AN/URM-105.

4. Technical Characteristics

Ranges:	
Dc voltage	0 to 1, 10, 100, and 1,000 volts at 20,000 ohms per volt.
Ac voltage	0 to 10, 100, and 1,000 volts at 1,000 ohms per volt.
Resistance	0 to 2,000, 20,000, 200,000, 2,000,000 and 20,000,000 ohms.
Direct current	External shunt required.
Frequency range	30 cycles to 10,000 cycles.
Usable temperature range	0° F. to +131° F.
Meter:	
Type	3½ inch, sealed, flush mounting, ruggedized.
Current sensitivity	50-microamperes dc.
Meter—Continued	
Voltage sensitivity	0.25 volt ±2% of full scale.
Terminal impedance	5,000 ohms.
Accuracy:	
Dc ranges	±3% of full scale value at 77° F.; ±5% at 0° F. and 131° F.
Ac ranges	±4% of full scale value at 77° F.; ±7% at 0° F. and 131° F.
Resistance	±5% of indicated value at 77° F.; ±7% at 0° F. and 131° F.
Power supply for resistance measurements.	Battery: 1.5 volts on X1, X10, and X100 ranges; 22.5 volts on X1K and X10K ranges.

5. Components of Multimeter AN/URM–105

(fig. 1)

Quantity	Item	Height (in.)	Depth (in.)	Width (in.)	Unit weight (lb)
1	Multimeter ME–77/U	6⅝	4	3¼	2
2	Alligator clips (1 red, 1 black).				
2	Electrical clips.(1 red, 1 black).				

6. Description

a. Multimeter AN/URM–105 consists of Multimeter ME–77/U (*b* below) and several clips (par. 5).

b. Multimeter ME–77/U, the major component of the AN/URM–105, consists of a panel (fig. 3) mounted in a plastic case. The operating controls (fig. 4) and the meter are mounted on the face of the panel. All circuit components are secured to the rear of the panel. The test leads are permanently attached to the printed circuit board and secured to the rear of the panel; the test leads extend through the panel. The cover is secured with metal clasps (fig. 1); the lower clasp may be used as a stand for the multimeter.

7. Additional Equipment Required

The following equipment is not supplied as part of Multimeter ME–77/U but is needed for use with it:

a. Two Batteries BA–58/U, 1.5 volts, are required to supply power for resistance measurements on the X1, X10, and X100 ranges.

b. One Battery BA–261/U, 22.5 volts, is required to supply power for resistance measurements on the X1K and X10K ranges.

CHAPTER 2

SERVICE UPON RECEIPT OF EQUIPMENT

8. Unpacking

(fig. 2)

a. Packaging Data. The multimeter is packed for shipment in a corrugated carton 7¼ by 5½ by 4¾ inches; the weight is 2.5 pounds, and the volume is approximately 190 cubic inches.

b. Unpacking.

(1) Open the corrugated carton and fold back the top flaps.

(2) Remove the wrapped multimeter; open the corrugated fiberboard and remove the multimeter.

(3) Remove the envelopes that contain the technical manuals; open the envelopes and remove the manuals.

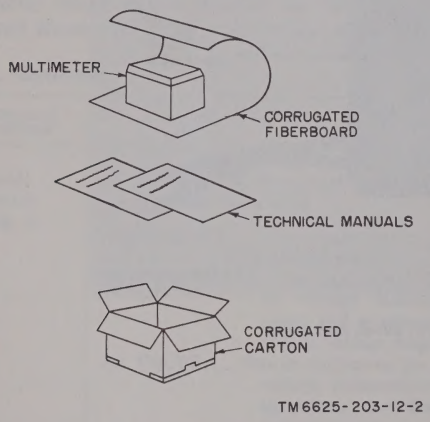


Figure 2. Packaging diagram.

9. Checking Unpacked Equipment

a. Inspect the equipment for possible damage incurred during shipment. 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. If the equipment is incomplete, refer to paragraph 2.

10. Installation of Batteries

Install the batteries (par. 7) in the multimeter as follows:

a. Lift the metal clasps (fig. 1) away from the case and remove the cover.

b. Remove the retaining screws that secure the panel to the case and remove the panel.

c. Observing the polarity indicated on the battery holder (fig. 3), install Battery BA–261/U and Batteries BA–58/U. Check to be sure that the batteries are firmly seated against both contacts.

d. Replace the panel in the case and check for sufficient battery voltage (par. 21).

e. Secure the panel to the case with the retaining screws.

f. Coil the test leads on top of the panel; place the alligator clips and electrical clips on the panel.

g. Replace the cover and secure it with the metal clasps.

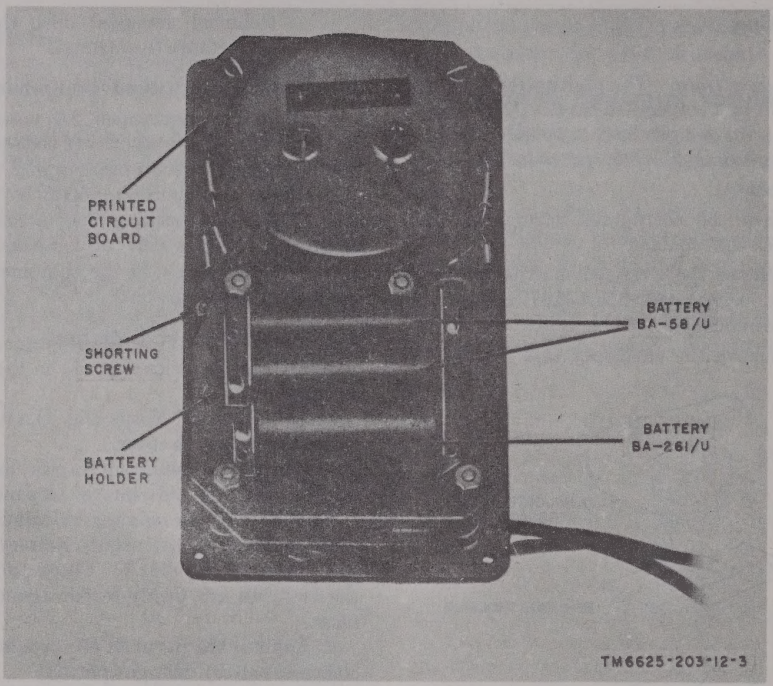


Figure 3. Multimeter ME-77/U, panel, rear view.

CHAPTER 3

OPERATING INSTRUCTIONS

11. Damage from Improper Settings

a. Improper setting of the selector switch (fig. 4) may damage the multimeter. When measuring unknown voltage values, start at the highest range (1,000 volts) and reduce the setting of the selector switch one step at a time until the meter pointer indicates near the center of the scale.

b. The multimeter is shipped with the shorting screw (fig. 3) in the open position. When making direct current measurements (par. 23), the shorting screw must be placed in the closed position. When the shorting screw is in the closed position and the selector switch is in the EXT. SHUNT position, the meter is connected directly in parallel with the test leads. If the meter is connected directly into a circuit without the use of an external shunt, the meter will become damaged.

12. Controls

Control or indicator	Function
Selector switch (fig. 4).	Selects mode of operation and desired voltage or resistance range: *Switch position* — *Action* OFF — Shorts out meter. DC VOLTS — Sets up multimeter for dc voltage measurements and selects one of four voltage ranges. AC VOLTS — Sets up multimeter for ac voltage measurements and selects one of three voltage ranges. OHMS — Sets up multimeter for resistance measurements and selects one of five resistance ranges. EXT. SHUNT — Sets up multimeter for measuring current when shorting screw is in *closed* position.
OHMS ADJ. control.	Adjusts meter pointer to zero (0) on OHMS scale when selector switch is set to one of OHMS ranges.
Meter	Indicates voltage, resistance, or current value being measured.
Shorting screw (fig. 3).	In *closed* position, sets up multimeter for measuring current when selector switch is in EXT. SHUNT position; in *open* position, prevents damage to meter if voltage is applied to test leads with selector switch in EXT. SHUNT position.

13. Dc Voltage Measurements (fig. 4)

a. To measure dc voltage up to 1,000 volts, proceed as follows:

(1) Set the selector switch to the DC VOLTS range that includes the voltage value to be measured.

***Caution:* If the voltage value to be measured is unknown, set the selector switch to the 1,000-volt range and, if necessary, reduce the setting of the selector switch one step at a time until the meter pointer indicates near the center of the scale.**

(2) Observing polarity, hold the test prods in parallel with the circuit that is being measured. If the meter pointer deflects to the left (below zero), reverse the test prod connections.

(3) Read the indications on the meter; refer to the following chart and perform the indicated action to determine the measured voltage value.

Range	Action
0 to 1 volt	Divide meter reading by 10.
0 to 10 volts	Use direct meter reading.
0 to 100 volts	Multiply meter reading by 10.
0 to 1,000 volts	Multiply meter reading by 100.

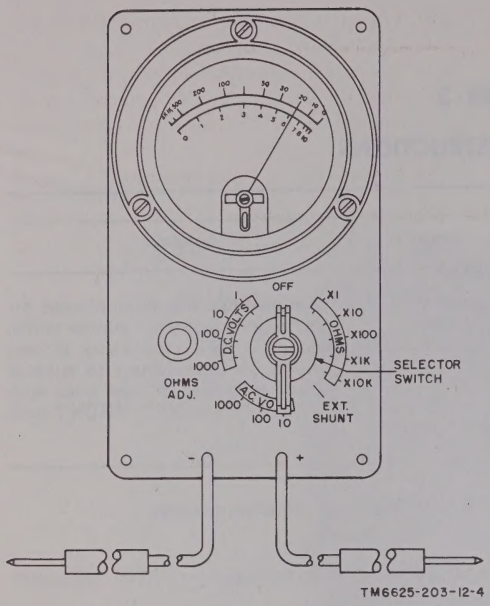


Figure 4. Multimeter ME-77/U, operating controls and indicator.

(4) Remove the test prods from the circuit.

(5) Set the selector switch to the highest dc voltage range.

b. To measure dc voltage up to 10,000 volts, refer to paragraph 24*a*.

c. To measure dc voltage up to 50,000 volts, refer to paragraph 24*b*.

14. Ac Voltage Measurements

a. Set the selector switch to the AC VOLTS range that includes the voltage value to be measured.

Caution: If the voltage value to be measured is unknown, set the selector switch to the 1,000-volt range and, if necessary, reduce the setting of the selector switch one step at a time until the meter pointer indicates near the center of the scale.

b. Hold the test prods in parallel with the circuit being measured.

c. Read the indication on the meter; refer to the chart in paragraph 13*a*(3) and perform the indicated action to determine the measured voltage value.

d. Remove the test leads from the circuit.

e. Set the selector switch to the highest ac voltage range.

15. Resistance Measurements

***Caution:* Turn off or disconnect the power from the equipment under test when measuring resistance. Damage to the multimeter may result if an external voltage is applied to the multimeter when it is arranged for resistance measurements.**

a. Set the selector switch to the desired resistance range.

b. Zero adjust the multimeter before making resistance measurements. Each time the range switch is turned to a different resistance range, repeat the zero adjusting procedure. Zero adjust the multimeter as follows:

(1) Touch the test lead prods together.

(2) Turn the OHMS ADJ. control to position the meter pointer at 0 on the right side of the OHMS scale. If the meter pointer cannot be adjusted to 0, replace the batteries (par. 21).

c. Connect the test prods in parallel with the resistance to be measured.

d. Read the meter indication on the OHMS scale and multiply by the factor indicated by the position of the selector switch. For example, if the selector switch is in the X10 position, multiply the meter reading by 10.

e. Remove the test prods from the circuit.

f. If the multimeter is not to be used immediately for additional resistance measurements, place the selector switch in the OFF position.

16. Preparation for Current Measurements

The multimeter *cannot* be used to measure current without an external shunt (par. 22*a*). To prepare the multimeter for current measurements, proceed as follows:

a. Remove the retaining screws that secure the panel to the case and remove the panel.

b. Remove the nut from the shorting screw (fig. 3) and remove the shorting screw from the printed circuit board.

c. Remove the insulating washer (not shown) from the shorting screw.

d. Replace the shorting screw in the printed circuit board; place the insulating washer on the shorting screw and secure the screw with the nut.

e. The shorting screw will now contact the printed circuit and complete the circuit from the test leads to the meter when the selector switch is in the **EXT. SHUNT** position.

f. Replace the panel in the case and secure the panel with the retaining screws.

g. After current measurements (par. 23) have been completed, place the shorting screw in the open position as follows:

(1) Remove the panel from the case.

(2) Remove the nut, insulating washer, and shorting screw from the printed circuit board.

(3) Place the insulating washer on the shorting screw.

(4) Replace the shorting screw, with the insulating washer, in the printed circuit board; secure the shorting screw with the nut.

(5) Replace the panel in the case.

17. Stopping Procedure

a. Set the selector switch (fig. 4) to the OFF position.

b. Coil the test leads and place them on top of the panel.

c. Place the alligator clips (fig. 1) and the electrical clips on top of the panel.

d. Replace the cover and secure it with the metal clasps.

CHAPTER 4

MAINTENANCE INSTRUCTIONS

18. Scope of Organizational Maintenance

a. Organizational maintenance for Multimeter AN/URM–105 consists of the following:

(1) Preventive maintenance (par. 20).

(2) Replacement of batteries (par. 21).

b. If the multimeter is inoperative and the batteries are not defective, higher echelon repair is required. Note on the repair tag what corrective measures were taken and how the equipment performed at the time of failure.

19. Tools, Test Equipment, and Materials Required

a. Tools and Test Equipment. The tools and test equipment required are normally available to the repairman-user because of his assigned mission.

b. Materials.

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

(2) Lint-free cloth.

(3) Friction tape.

20. Preventive Maintenance

a. DA Form 11–266. DA Form 11–266 (figs. 5 and 6) is a preventive maintenance check list to be used by organizational maintenance personnel. Items not applicable to the multimeter are lined out in figure 6. References in the ITEM block are to paragraphs that contain additional maintenance information pertinent to the particular item. Instructions for use of the form appear on the form.

b. Items. The following information 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, and grease from the case, panel, and test leads. If necessary, wet the cloth with Cleaning Compound and then wipe the parts dry with a clean cloth. ***Warning:* Cleaning Compound is flammable and its fumes are toxic. Do not use near a flame; provide adequate ventilation.**
3	Control knobs should work smoothly, be tight on the shafts, and should not bind. Tighten loose knobs and be sure that the knobs do not rub against the panel.
5	Inspect the test leads for obvious defects. If the tips of the test prods are broken, replace them. Repair small cuts in the test-lead insulation with friction tape.
11	Place the multimeter on its back; set the selector switch to the OFF position and observe the position of the meter pointer. The pointer should rest exactly over 0 on the AC and DC VOLTS scale. If the meter pointer does not rest over 0, higher echelon repair is required.

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

EQUIPMENT NOMENCLATURE: MULTIMETER AN/URM-105

EQUIPMENT SERIAL NUMBER: 999

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
✓		7 MAY 59	R White
	✓	7 MAY 59	W Black

U. S. GOVERNMENT PRINTING OFFICE: 1957 O—427138

4

DA FORM 1 MAY 57 11-266

TM6625-203-12-5

Figure 5. 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

NO.	DAILY ITEM	1 RW 17	2 RW 18	3 RW 19	4 RW 20	5 RW 21	6 RW 22	7 RW 23	8 24	9 25	10 26	11 27	12 28	13 29	14 30	15 31	16	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. 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	(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 LO 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	X					X

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
12. ~~INSPECT SEATING OF READILY ACCESSIBLE ITEMS OF A PLUG-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 THAT 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 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 11. METER POINTER RESTS BELOW ZERO. REPORTED TO HIGHER ECHELON FOR REPAIR.

2 3

TM6625-203-12-6

Figure 6. DA Form 11–266, pages 2 and 3.

21. Replacement of Batteries

a. Check for sufficient battery voltage as follows:

(1) Set the selector switch (fig. 4) to OHMS X1.

(2) Touch the tips of the test prods together; the meter pointer should deflect to the right.

(3) Turn the OHMS ADJ. control to its maximum clockwise position; the meter pointer should deflect to zero (0) or to the right of zero on the OHMS scale. If the meter pointer does not deflect to zero or to the right of zero, replace Batteries BA–58/U (*b* below).

(4) Set the selector switch to OHMS X1K and check to be sure that the tips of the test prods are touching. The meter pointer should deflect to zero or to the right of zero. If the meter pointer does not deflect to zero or to the right of zero, replace Battery BA–261/U (*b* below).

(5) Set the selector switch to OFF, separate the test prods, and turn the OHMS ADJ. control to its maximum counterclockwise position.

b. Replace the batteries as follows:

(1) Remove the retaining screws that secure the panel to the case and remove the panel.

(2) Replace the batteries as required.

(3) Replace the panel in the case but do not secure the panel.

(4) Repeat the checking procedure in *a* above.

(5) Secure the panel with the retaining screws.

CHAPTER 5

AUXILIARY EQUIPMENT

22. Description and Use of Auxiliary Equipment

a. Multirange Instrument Shunt MX–1471/U (fig. 7). Multirange Instrument Shunt MX–1471/U (shunt) contains seven precision shunt resistors accessible from terminals on the panel. The MX–1471/U enables the multimeter to be used for dc current measurements (par. 23) in seven ranges as follows:

(1) 0 to 100 microamperes.
(2) 0 to 1 milliampere.
(3) 0 to 10 milliamperes.
(4) 0 to 100 milliamperes.
(5) 0 to 1 ampere.
(6) 0 to 10 amperes.

Caution: **Do not use Test Lead Set CX–1331/U for current measurements greater than 10 amperes. The size of the wire used in the test leads will not safely handle more than 10 amperes.**

(7) 0 to 100 amperes.

b. Electrical Instrument Multiplier MX–1472/U (fig. 8). Electrical Instrument Multiplier MX–1472/U contains a precision resistor assembly terminated at one end with an alligator clip and at the other end with a tip jack. The MX–1472/U enables the multimeter to be used for dc voltage measurements up to 10,000 volts (par. 24*a*).

c. Electrical Instrument Multiplier MX–2005/U (fig. 8). Electrical Instrument Multiplier MX–2005/U is similar to the MX–1472/U (*b* above) except that it enables the multimeter to be used for dc voltage measurements up to 50,000 volts (par. 24*b*).

23. Direct Current Measurements

Caution: **When measuring current, always connect the multimeter in series with the circuit under test. Be sure that the test lead polarity is observed (black is negative and red is positive). Wrong connections may damage the meter.**

a. Place the shorting screw in the closed position (par. 16).

b. Connect the multimeter and the shunt as follows:

(1) Select the appropriate current range (par. 22*a*).

Caution: **If the current value to be measured is not known, connect the multimeter and the shunt to measure current on the highest range. Perform the procedures in *c* through *g* below to determine the approximate current value to be measured. Turn off the equipment under test and reconnect the multimeter and shunt using the appropriate current range.**

(2) Connect Test Lead Set CX–1331/U to the terminals on the shunt; connect the black lead to the black (COMMON) terminal and the red lead to the red terminal corresponding to the selected current range ((1) above).

Caution: **Do not use Test Lead Set CX–1331/U for current measurements greater than 10 amperes. The size of the wire used in the test leads will not safely handle more than 10 amperes.**

(3) Connect the multimeter leads to the front of the terminals ((2) above); insert the tip of the black test prod into the black terminal and the tip of the red test prod into the red terminal.

c. Check to be sure that the power has been turned off or disconnected from the equipment under test.

d. Observing polarity, connect the test leads in series with the circuit under test. Connect the test leads so that electrons enter through the black test prod and return through the red test prod.

e. Set the selector switch (fig. 4) to the EXT. SHUNT position.

f. Turn on the equipment under test.

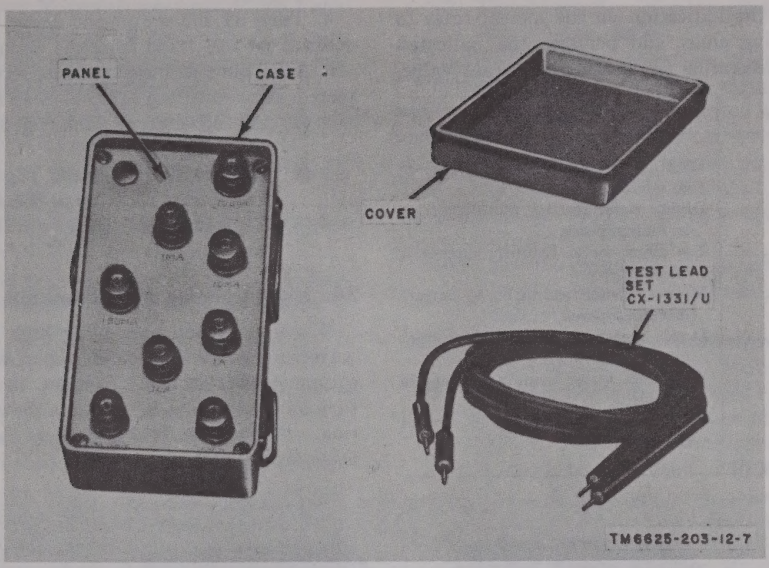


Figure 7. Multirange Instrument Shunt MX–1471/U.

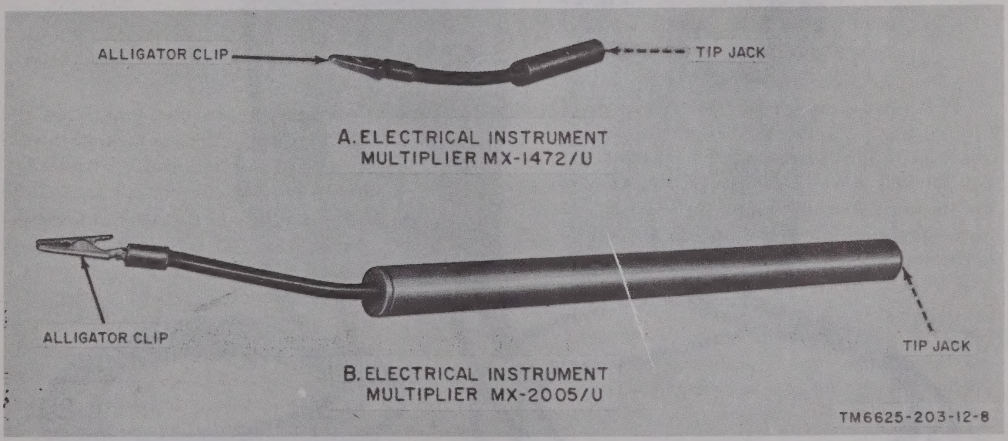


Figure 8. Electrical Instrument Multiplier MX–1472/U and Electrical Instrument Multiplier MX–2005/U.

g. Read the indication on the meter; refer to the following chart and perform the indicated action to determine the measured current value.

Shunt range	Action
0 to 100 UA	Multiply meter reading by 10; current in microamperes.
0 to 1 MA	Divide meter reading by 10; current in milliamperes.
0 to 10 MA	Use direct meter reading; current in milliamperes.
0 to 100 MA	Multiply meter reading by 10; current in milliamperes.
0 to 1 A	Divide meter reading by 10; current in amperes.
0 to 10 A	Use direct meter reading; current in amperes.
0 to 100 A	Multiply meter reading by 10; current in amperes.

h. Turn off the equipment under test and disconnect the test leads from the circuit.

i. After current measurements have been completed, shut down the equipment as follows:

(1) Set the selector switch (fig. 4) to the OFF position.

(2) Remove the test leads (fig. 9) and the multimeter leads from the shunt.

(3) Place the shorting screw in the open position (par. 16*g*).

24. High Voltage Measurements

Warning: When measuring high voltages, always turn off or disconnect the power from the equipment under test. Connect the test prods, turn on the equipment, and note the meter indication. *Do not handle any part of the equipment when the power is on.*

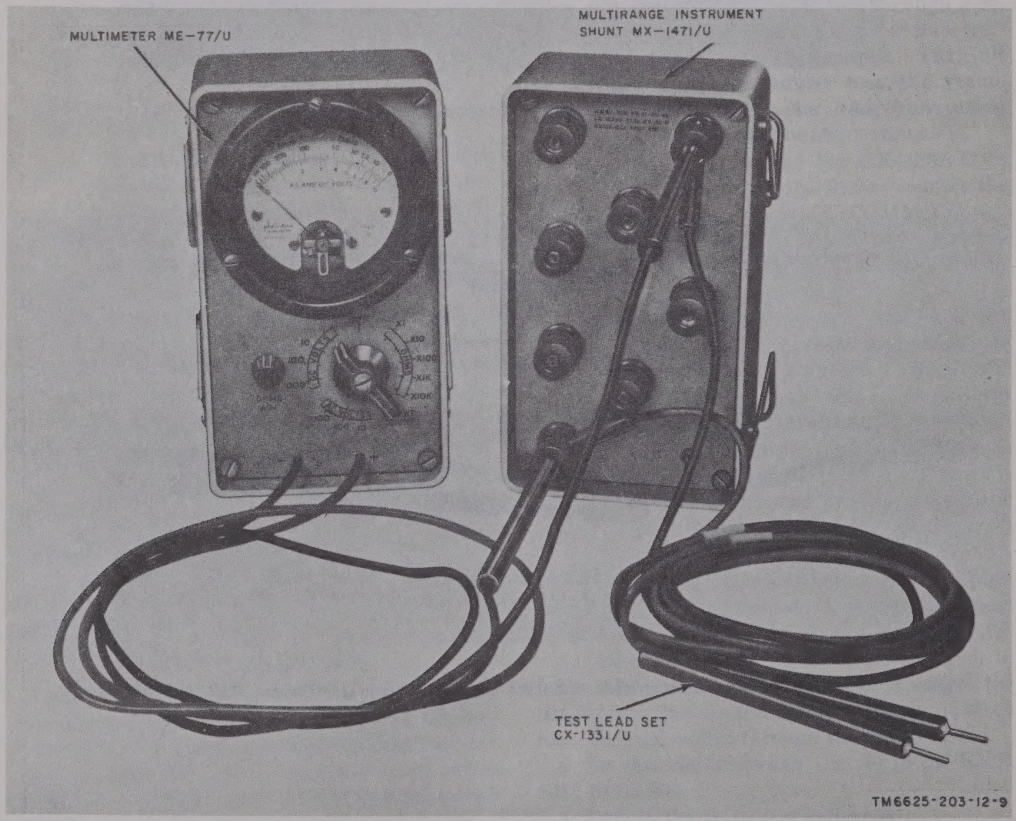


Figure 9. Multimeter ME-77/U and Multirange Instrument Shunt MX-4171/U connected for current measurements.

a. Dc Voltage Measurements up to 10,000 Volts.

Warning: **Discharge all high voltage capacitors in the equipment being checked before connecting or disconnecting the test prods.**

(1) Connect the tip of the red test prod into the tip jack on the MX–1472/U.

(2) Connect the black alligator clip to the black test prod.

(3) Set the selector switch (fig. 4) to the 1000 DC VOLTS range.

(4) Check to be sure that the power has been turned off or disconnected from the equipment under test.

(5) Observing polarity, connect the alligator clips in parallel with the circuit being measured.

(6) Turn on the equipment under test.

(7) Read the indication on the meter; multiply the meter indication by 1,000 to determine the measured voltage value.

(8) Turn off the equipment under test and discharge the high voltage capacitors.

(9) Disconnect the alligator clips from the circuit being checked.

b. Dc Voltage Measurements up to 50,000 Volts.

Warning: **Discharge all high voltage capacitors in the equipment being checked before connecting or disconnecting the test prods.**

(1) Connect the tip of the red test prod into the tip jack on the MX–2005/U.

(2) Perform the procedures in *a*(2) through (6) above.

(3) Read the indication on the meter; multiply the meter by 10,000 to determine the measured voltage value.

Caution: **The resistor assembly used in the MX–2005/U will enable voltage measurements up to 100,000 volts; however, insulation resistance of the MX–2005/U *limits the maximum voltage* that can be measured to 50,000 volts.**

(4) Turn off the equipment under test and discharge the high voltage capacitors.

(5) Disconnect the alligator clips from the circuit being checked.

CHAPTER 6

SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

25. Disassembly of Equipment

a. Remove the panel from the case.

b. Remove the batteries from the battery holder.

c. Replace the panel.

d. Coil the test leads and place them on top of the panel.

e. Place the alligator clips and the electrical clips on top of the panel.

f. Place the cover on the multimeter and secure the cover with the metal clasps.

26. 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. The information concerning the original packaging (par. 8) will also be helpful.

a. Material Requirements. The following materials are required for packaging Multimeter AN/URM-105. For stock numbers of materials, consult SB 38-100 (Preservation, Packaging and Packing Materials, Supplies, and Equipment used by the Army).

Material	Quantity
Waterproof paper	6 sq ft
Waterproof tape	10 ft
Corrugated cardboard	10 sq ft
Gummed tape	4 ft
Filler material	1 lb

b. Packaging.

(1) Cushion the multimeter with pads of filler material on all sides. Place the cushioned unit within a wrap of corrugated cardboard and secure the ends with gummed tape.

(2) Package each technical manual within a close-fitting bag fabricated of waterproof paper; seal the bags with waterproof tape.

(3) Use corrugated cardboard and form a carton large enough to hold the packaged multimeter and technical manuals. Line the carton with waterproof paper. Place the packages in the carton and fill all voids with filler material. Seal the waterproof carton liner with waterproof tape; seal the carton with gummed tape.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

27. Authority for Demolition

The demolition procedures in paragraph 28 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 commanding officer.

28. Methods of Destruction

The size and construction of the multimeter particularly lends itself to destruction by smashing.

a. Use sledges, axes, hammers, crowbars, or any heavy tool available to smash the multimeter; if time permits, remove the panel from the case before smashing.

b. Burn technical manuals.

c. Bury or scatter the destroyed parts in slit trenches, foxholes, or throw them into streams.

APPENDIX I

REFERENCES

SB 38–100 Preservation, Packaging and Packing Materials, Supplies, and Equipment Used by the Army.

TM 11–6625–203–12P Operator's and Organizational Maintenance Repair Parts and Special Tools List for Multimeter AN/URM–105.

APPENDIX II

MAINTENANCE ALLOCATION CHART FOR MULTIMETER AN/URM–105

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 equipment authorized at each echelon to perform the assigned maintenance function.

b. Columns in Maintenance Allocation Chart are as follows:

(1) *Part or component.* Only the nomenclature or standard item name is shown in this column. 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 operation.

(*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*) *Test.* 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. Repairs include welding, grinding, riveting, straightening, adjusting, etc.

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

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

(3) *1st, 2nd, 3rd, 4th, 5th echelon.* The symbol X indicates the echelon responsible for performing that particular maintenance operation. It 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.

(5) *Remarks.* This column contains any notations necessary to clarify 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 tool and test equipments required to perform the maintenance functions.

(2) *1st, 2nd, 3rd, 4th, 5th echelon.* The dagger (†) indicates the echelon to which the tool or test equipment is allocated.

(3) *Tool code.* The numbers in this column are code numbers for the associated tool equipment and are used in the Maintenance Allocation Chart to refer to the indicated item.

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

2. Maintenance by Using Organizations

Maintenance functions allocated up to and including fourth echelon are authorized to the organization operating this equipment, when used by signal service organizations organic to theater headquarters, or communication zones, to provide theater communications.

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
MULTIMETER AN/URM-105								
	repair				X			
	rebuild					X		
	service	X	X					
	inspect		X	X	X			
	test		X	X	X	X	1,2,3,4	Code 2,4 only at 2nd and 3rd echelon.
	calibrate				X	X	1,2,3,4	
CLIPS, ELECTRICAL	replace		X					
MULTIMETER ME-77/U	repair				X			
	rebuild					X		
	service	X	X					
	inspect		X	X	X			
	test		X	X	X	X	1,2,3,4	Code 2,4 only at 2nd and 3rd echelon.
	calibrate				X	X	1,2,3,4	
BOARD, PRINTED CIRCUIT	replace				X			
CASE, METER	replace				X			
COVER	replace		X					
GASKET	replace		X					
HOLDER, SPRING	replace		X					
KNOBS	replace		X					
SCREW, MACHINE	replace		X					
LEAD, TEST	repair		X					
CABLE	replace			X				
TIP, TEST LEAD	replace		X					
NUTS (common hardware)	replace			X				Available in Maintenance Equipment ME-9 and Hardware Kit MK-41/U
PANEL, MOUNTING	replace				X			
RECTIFIER, METALLIC	replace				X			
RESISTORS	replace				X			
SCREWS (common hardware)	replace			X				Available in Maintenance Equipment ME-9 and Hardware Kit MK-41/U
SWITCH, ROTARY	replace				X			
TERMINAL BOARD	replace				X			Fabricate
VOLTMETER	replace				X			
	repair					X		
WASHERS (common hardware)	replace			X				Available in Maintenance Equipment ME-9 and Hardware Kit MK-41/U

ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS

(1) TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	(2) 1ST ECH.	(3) 2ND ECH.	(4) 3RD ECH.	(5) 4TH ECH.	(6) 5TH ECH.	(7) TOOL CODE	(8) REMARKS
AN/URM-105							
METER TEST EQUIPMENT AN/GSM-16				†		1	Second and third level maintenance will be performed at forth echelon
MULTIMETER AN/URM-105				†		2	
TEST SET, ELECTRON TUBE TV-6/U				†		3	
TOOL EQUIPMENT TK-21/G				†		4	

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USA Sig Msl Spt Agcy (13)
USA Sig Pub Agcy (8)
TASSA (15)
Midwestern Rgn Ofc (TASSA) (15)
USA Elct PG (1)
Dugway PG (5)
Aberdeen PG (5)
Pine Bluff Arsenal (5)
Rocky Mt Arsenal (5)
Benicia Arsenal (5)
Raritan Arsenal (5)
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USA Med Rsch Lab (5)
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