TM 11-6625-2988-14

TECHNICAL MANUAL

# OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

# RADIATION HAZARD METER

# ME-513/U
# (NSN 6625-01-068-1485)

HEADQUARTERS, DEPARTMENT OF THE ARMY

17 JUNE 1981

## SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL
2. IF POSSIBLE , TURN OFF THE ELECTRICAL POWER
3. IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A WOODEN POLE OR A ROPE OR SOME OTHER INSULATING MATERIAL
4. SEND FOR HELP AS SOON AS POSSIBLE
5. AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *17 June 1981*

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**REPORTING OF ERRORS**

You can improve this manual by recommending improvements using DA Form 2028-2 located in the back of the manual. Simply tear out the self-addressed form, fill it out as shown on the sample, fold it where shown, and drop it in the mail.

If there are no blank DA Forms 2028-2 in the back of your manual, use the standard DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forward to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN:DRSEL-ME-MQ, Fort Monmouth, NJ 07703.

In either case a reply will be forwarded direct to you.

# SECTION 0

# GENERAL

## 1. Scope

This manual describes Radiation Hazard Meter ME–513/U (fig. 1) and provides maintenance instructions, testing procedures, and replacement parts list. A parts manual containing ordering information and National Stock Numbers will be available approximately six months after the date of this manual.

## 2. Indexes of Publications

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

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

## 3. Forms and Records

*a. Reports of Maintenance* and *Unsatisfactory Equipment*. Maintenance forms, records, and reports which are to be used by maintenance personnel at all levels of maintenance are listed in and prescribed by TM 38–750.

*b. Report of Packaging and Handling Deficiencies.* Fill out and forward SF 364 (Report of Discrepancy (ROD ) as prescribed in AR 735-11–2/DLAR 4140.5/NAVMATINST 4355.73/AFR 400-54/MCO 4430.3E.

c. *Discrepancy in Shipment Report (DISREP) (SF* 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38 /NAVSUPINST 4610.33B/ AFR 75-18/MCO P461O.19C and DLAR 4500.15.

## *4.* Reporting Equipment Improvement Recommendations (EIR)

EIR's will be prepared using SF 368 (Quality Deficiency Report). Instructions for preparing EIR's are provided in TM 38-750, the Army Maintenance Management System. EIR's should be mailed direct to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. A reply will be furnished direct to you.

## 5. Administrative Storage.

Administrative storage of equipment issued to and used by Army activities shall be in accordance with TM 740-90–1 and paragraph 18.

## 6. Destruction of Army Electronics Materiel.

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

## SAFETY PRECAUTIONS

A periodic review of safety precautions in TB 385–4 is recommended. When the equipment is to be operated in or near a radiation field a review of TB MED 270, Control of Hazards to Health from Microwave Radiation is recommended.

**WARNING**

The batteries used in this Radiation Hazard Meter contain mercury and require special handling to prevent explosion as follows:

Do not dispose in fire.
Do not short circuit.
Return to Property Disposal Officer for disposal in accordance with DLSC Handbook 41601,

# SECTION I

# INTRODUCTION

## 1. General

The Radiation Hazard Meter ME-515/U is a portable battery-operated device which detects and measures potentially hazardous electromagnetic radiation emanating from rf and microwave energy sources. It responds isotropically; that is, irrespectively of the direction and polarization of the incident energy. The Radiation Hazard Meter ME–513/U (See Figure 1) is comprised of four basic components: (1) the power density meter assembly (hereinafter referred to as the power density meter), (2) probe assembly, (3) cable assembly, and (4) the carrying case. The power density meter is the hand-held, battery-operated device which contains a differential amplifier circuit card assembly, associated controls, and a meter to indicate power density in milliwatts per square centimeter. Detection of power density is accomplished by means of the probe assembly which is connected to the power density meter. If desired, the cable assembly may be connected between the probe assembly and the power density meter for extension purposes. All three assemblies are conveniently stored in the carrying case.

## 2. Technical Characteristics

The Radiation Hazard Meter operates over the frequency range from 0.3 to 18 GHz and over a power density range of 30 dB. It has three 10 dB ranges with full scale readings of 2mW/cm$^2$, 20mW/cm$^2$, and 200mW/cm$^2$. Wideband frequency performance and accurate power density measurement results from the thermocouple array in the isotropic probe which holds frequency sensitivity over the operating band to within ± 1dB. pertinent technical characteristics of the Radiation Hazard Meter are given in Table 1.

## 3. Test Equipment Required

Test equipment required to maintain the power density meter and probe assembly is listed in Table 2.

## 4. Warranty Data

The manufacturer warranties all parts of this equipment to be free from defects caused by faulty material or poor workmanship. This warranty excludes batteries, natural rubber, and material normally consumed in operation unless such excepted items fail as a result of improper application by the manufacturer. Liability under this warranty is limited to the obligation to repair, or to replace without charge, any part found to be defective under normal use and service within one year after delivery of the equipment. The warranty period shall not include any period of time the unit or part fails to perform satisfactorily due to such defect, and any unit, part or component repaired or replaced by the manufacturer pursuant to this warranty shall itself be guaranteed as specified above.

## 5. Safety Precautions

The following precautions are defined as mandatory where the possibility exists that safe levels of radiation may be exceeded.

a. The transmitting antenna of the radiating device is never pointed directly at the monitoring personnel for the initial power measure at any point. Orientation of the antenna and other operating procedures related to the survey are performed at the direction of the monitoring personnel.

b. Systems operators should pay particular attention to the instructions issued by the monitoring personnel. The transmitting antenna of the radiating device should be moved slowly to prevent accidental exposure of personnel to high levels of radiation.

c. When there is a probability that exposure of monitoring personnel will exceed the recommended levels, remote detecting devices should be used or the average power output reduced and the readings raised proportionately.

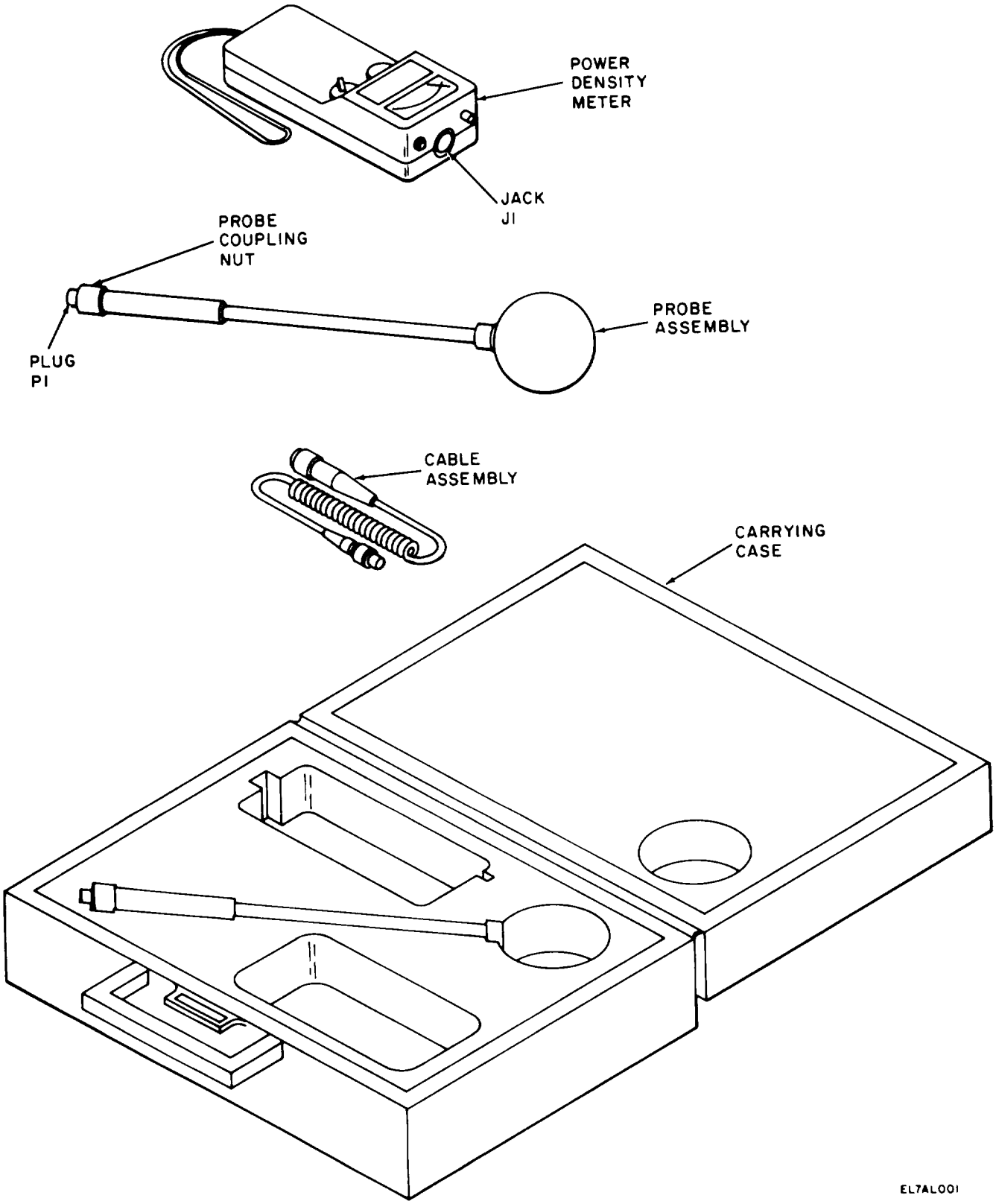



*Figure 1. Radiation Hazard Meter ME-513/U*

Table 1. Technical Characteristics

| Characteristic | Parameters |
|---|---|
| Frequency Range | 0.3 to 18.0 GHz |
| Power Density Range | 30 dB dynamic range. Three 10 dB ranges with full scale readings of 2 mW/cm', 20 mW/cm$^{s}$, and 200 mW/cm' |
| Frequency Sensitivity | ± 1.0 dB |
| Calibration Accuracy | ± 0.6 dB (at 2460 MHz) |
| Power Overload (at 25" C)* | 0.6 W/cm* average |
| Polarization | Isotropic response; ± 0.5 dB maximum deviation from energy incident from any direction except from/through handle |
| Noise | Less than 1 percent peak-to-peak on most sensitive range |
| Response Time | 1.6 seconds (approx. ) |
| Battery Operation | 600 hours expendable |
| Recorder Output | 0.124 volts full scale into a nominal resistance of 100 K ohms |
| Operating Temperature Range | 0°C to +50°C |
| Size | |
| Probe | 13.25" long x 2.75" max. dia (336 x 70 mm) |
| Power Density Meter | 2.60" x 1.63" x 6.38" (64x 41 x 162 mm) |
| Cable Assy | 4' long (1.22 m) |
| Carrying Case | 13.60" x 10.00" x 4.15" (343 x 254x 106 mm) |
| Weight | 3.25 lbs ( 1.47 kg) |

* Although the Radiation Hazard Meter will take this overload for short periods of time, extended periods of operation at this level, or exceeding this rating, may result in permanent change in its thin-film element characteristics or even burnout. Maximum care should be exercised to avoid this.

Table 2. Test Equipment Required

| Nomenclature | Part/ Model no. | Application |
|---|---|---|
| Multimeter | AN/USM-223 | Troubleshooting |

*d.* Protective clothing or shielded vans should be used by monitoring personnel when exposure to high levels of radiation is possible.

*e.* Personnel occupancy of an area must be controlled while measurements are being made, to prevent inadvertent exposures to radiation.

**WARNING**

Possible harmful effects result from exposure to electromagnetic radiation in the frequency range from 10 MHz to 100 GHz. The CW radiation protection guide is 10 mW/cm$^{2}$. For modulated fields the power density of 10 mW/cm$^{2}$ as averaged over any six minute period should not be exceeded. These formulated recommendations by the American National Standards Institute ANSI document C95.1–1974) pertain to both whole body irradiation and partial body irradiation.

# SECTION II

# PREPARATION FOR USE

## 6. Unpacking

The power density meter, probe assembly, and cable assembly are shipped in the carrying case. No special unpacking procedures are required.

## 7. Inspection

After unpacking, visually check all equipment for signs of damage which may have occurred during shipment.

## 8. Preparation For Use

To prepare the Radiation Hazard Meter (Figure 1) for use, connect plug P1 of the probe assembly to jack J1 of the power density meter, being sure to properly align the polarizing keys. Then, finger-tighten the probe assembly coupling nut to a snug fit. If the cable assembly is used, install it between plug P1 of the probe assembly and jack J1 of the power density meter following the same procedure as described above.

## 9. Electrical Connections

Since the Radiation Hazard Meter is battery-operated, no electrical source, other than its internal batteries, is required.

## 10. Battery Installation

For proper operation, the Radiation Hazard Meter requires two 4.2 volt batteries. To ‘install the batteries, see Figure 6 and perform the following procedures:

(1) Loosen the four screws (28) which secure the power density meter cover to the housing (1) and remove the cover (2).

(2) Loosen the captive screw on battery clamp (30).

**CAUTION**

Equipment damage may result if the batteries are replaced in the power density meter with the incorrect polarity.

(3) Install the two 4.2 volt batteries (8), being certain to observe the proper polarity. Polarity indicators are molded in the housing beneath the batteries.

**NOTE**

Batteries must always be replaced in pairs.

(4) Tighten the captive screw on battery clamp (30).

(5) Replace the cover (2) on the housing (1) and secure with four screws (28).

## 11. Testing

After the Radiation Hazard Meter has been unpacked, inspected, and assembled, verify its proper operation by performing the procedures contained in Paragraph 15c.

# SECTION III

# THEORY OF OPERATION

## 12. Theory of Operation (See Figure FO-1).

The probe assembly of the Radiation Hazard Meter is isotropic in nature and employs three orthogonally oriented (aligned at right angles to each other) thin film thermocouple arrays to detect radiation. These arrays contain a large number of series-connected thermal junctions mounted between a pair of thermally-conductive dielectric wafers which enhance sensitivity and reduce drift. When the probe assembly is irradiated, alternate junctions located within the rf field rise in temperature relative to adjacent thermally sinked junctions. By keeping the temperature differential small, the probe assembly acts as a true square-law (rms) detector, producing a dc voltage directly proportional to the absorbed radiation, Wideband frequency performance results from the design of the thermocouple array, which is equivalent to a thin-film resistive screen of high surface resistivity relative to free space impedance. This provides an almost constant effective aperture to radiation fields ranging from UHF to K-band wavelengths.

a. When the OFF/ON switch S2 is set to ON, the probe assembly dc output voltage is routed via the cable assembly (when used ) to the power density meter powered by batteries BT1 and BT2. The power density meter accepts the dc voltage at connector J1 and routes it to amplifier U1 on the differential amplifier printed wiring board assembly. The output from amplifier U1 is then applied through the normally closed contacts of switch S3 to meter M1. This meter is calibrated to indicate power density in $mW/cm^2$. Resistors R13, R14 and R15 and the setting of the range switch S1 form part of the amplifier feedback loop and vary the gain of the amplifier in accordance with the magnitude of the probe input voltage.

*b.* Capacitors C1 and C2 provide a response delay to field variations detected by the probe. The circuit is designed to respond from 10% to 90% of some maximum value in 1.5 seconds.

c. Since the power density meter is battery operated, a means of checking the battery condition is provided when switch S3 is operated. Meter Ml then indicates the condition of batteries BT1 and BT2. Potentiometers R7 and R1O provide course zero control and differential balance, respectively. Fine zero control is provided by ZERO potentiometer R5.

*d.* When it is desired to produce a permanent record of power density vs. time, RCDR connector J2 provides a means for a remote recorder to be connected. Connector J2 also enables remote monitoring of radiation levels.

# SECTION IV

# OPERATING INSTRUCTIONS

## 13. Operating Controls, Indicators and Connectors

All operating controls, indicators and connectors are contained on the power density meter. Refer to Table 3 for a functional description of these components. Figure 2 shows the location of each control, indicator and connector.

## 14. Operating Instructions

To operate the Radiation Hazard Meter, see Figure 2 and perform the following procedure with the probe assembly free of any significant radiation field:

**NOTE**

For convenient reference, simplified operating instructions are provided on the bottom of the power density meter.

(1) Set OFF/ON switch to ON.

(2) Check battery condition by performing the procedures contained in Paragraph 15c.

(3) Set range switch to position 2 (maximum sensitivity) and zero the meter with ZERO control. With meter zeroed on this scale, it need not be adjusted again when changing range. The Radiation Hazard Meter is now ready for use.

**WARNING**

Always approach an unknown radiation field cautiously, starting as far away as practical and extending the. probe assembly at arm's length toward the energy source. Allow 2 to 3 seconds for the power density meter to respond. Observe all safety precautions. Do not walk into any suspected radiation field until the power density is determined safe.

(4) Visually inspect area to identify potential or reported radiation hazard sources (e.g. waveguide joints, cable bends, connectors or cabinet doors).

Table 3. Operating Controls, Indicators and Connectors

| Fig 2 index no. | Control, indicator or connector | Ref des | Function |
|---|---|---|---|
| 1 | Battery Check Switch | S3 | When depressed, connects meter Ml to batteries for battery condition verification. |
| 2 | Probe Connector | J1 | Provides means of connecting probe assembly to power density meter. |
| 3 | RCDR Recorder Jack | J2 | Provides means of connecting external recording device to power density meter to enable a permanent record of power density versus time to be made, or to permit remote monitoring of the radiation level. |
| 4 | Meter | M1 | Indicates power density in mW/cm' and indicates condition of batteries when switch S3 is depressed. |
| 5 | OFF/ON Switch | S2 | Connects operating voltage to all power density meter circuits. |
| 6 | Range Switch (mW/cm' 2, 20 200) | S1 | Provides the means to select meter Ml sensitivity. |
| 7 | ZERO Potentiometer | R5 | Provides the means to zero set meter M1. |
| 8 | Zero Control | | Provides the means to mechanically zero meter Ml. |

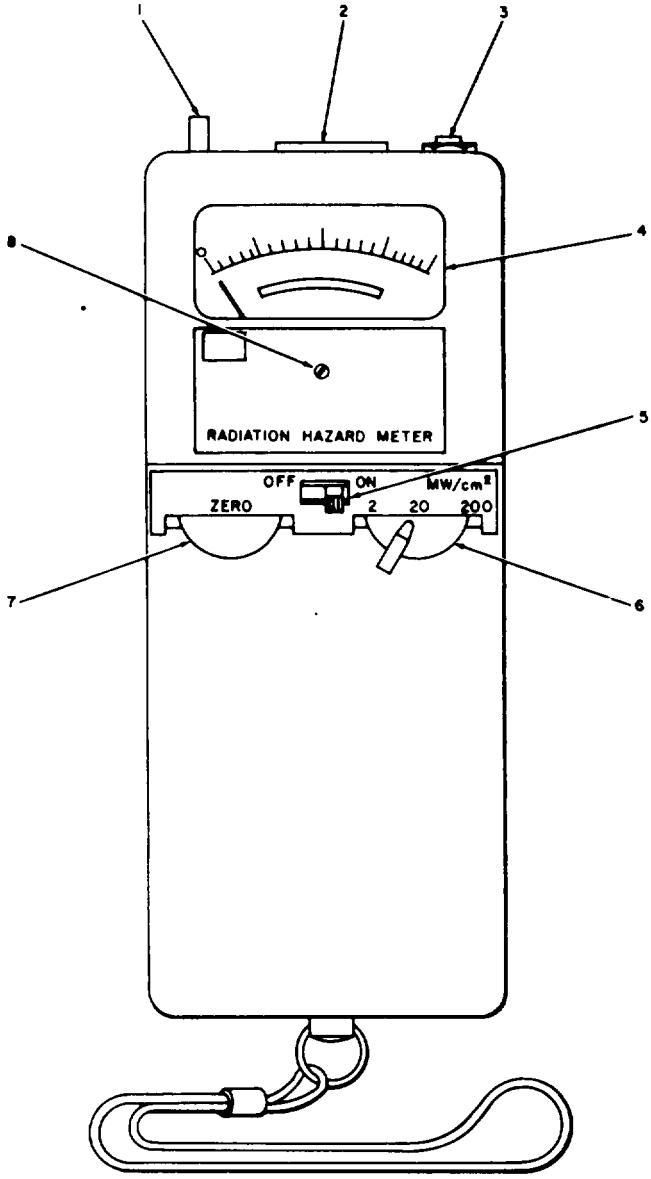



*Figure 2. Power Density Meter Controls, Indicators and Connectors*

(5) Select meter range, based on preevaluation of source or on-site reports. If the approximate field strength is unknown, always start with the lowest range setting (2).

(6) Expose probe to field; allow at least 1.5 seconds for measurement of any point in space to be surveyed.

**NOTE**

For maximum accuracy, rotate the probe about its axis and average the minimum and maximum indications for each measurement.

(7) Move through area. At arbitrary survey points, slowly move probe in broad sweep to check for "hot" spots or multiple sources or both. If practical, record levels and location of survey points.

(8) Continue survey until radiation source is identified and determined safe or hazardous.

**CAUTION**

To avoid drain on batteries, make certain that OFF/ON switch is set to OFF when meter is not in use.

# SECTION V

# MAINTENANCE INSTRUCTIONS

## 15. Preventive Maintenance

Periodic maintenance of the Radiation Hazard Meter consists of cleaning, inspection, and battery condition verification.

u. *Cleaning*. Cleaning of the Radiation Hazard Meter is restricted to the use of a clean lint-free cloth for dusting the outside surfaces. Cleaning should be performed at time of visual inspection.

*b. Visual Inspection.* Inspection of the Radiation Hazard Meter should be performed on a monthly basis or after every 100 hours of operation. To inspect the Radiation Hazard Meter, perform visual inspection in accordance with Table 4.

c. *Battery Condition Verification*. To check battery condition, see Figure 2 and proceed as follows :

(1) Set OFF/ON switch to ON.

(2) Depress battery check switch S3 while observing meter Ml for indication of battery condition. If meter indicates GOOD, the Radiation Hazard Meter is ready for operation. If meter Ml indicates REPL., refer to Paragraph 10 for replacement of batteries.

## 16. Corrective Maintenance

This paragraph contains that information necessary to test, troubleshoot, and repair the Radiation Hazard Meter.

a. *Test Equipment Required*. Test equipment necessary to troubleshoot the power density meter and probe assembly is listed in Table 2.

*b. Performance Verification.* Performance verification of the Radiation Hazard Meter consists of checking the condition of the batteries as described in Paragraph 15c.

c. *Troubleshooting.* Troubleshooting of the Radiation Hazard Meter is accomplished using standard shop techniques and the guide provided in Table 5. See Figure FO–1 for detailed schematic diagram.

*d. Disassembly*. Disassembly of the Radiation Hazard Meter is limited to the removal of chassis mounted components of the power density meter, the two foam portions of the probe assembly, and the cable assembly. To disassemble the power density meter, see Figure 6 and perform steps 1 through 18 of the following procedure.

**NOTE**

To disassemble the probe assembly, see Figure 4 and perform step 19 of the following procedure.

(1) Loosen four captive screws (28, Figure 6 Sheet 2 of 2 ) and remove cover (2) from housing (1).

(2) Loosen one captive screw (28) to remove battery clamp (30) and remove batteries BT1 and BT2 (8).

(3) Remove housing cover (15) by loosening and removing machine screws (35).

(4) Tag and identify all leads connected to terminals of printed wiring board assembly (17). Remove leads.

(5) Tag and identify leads connected to meter (3 Figure 6 Sheet 1 of 2). Remove leads.

(6) Carefully remove meter (3) by loosening two screws (26 Figure 6 Sheet 2 of 2) and removing both clips (19) away from meter. Remove meter.

(7) Tag and identify leads connected to filters (16). Remove leads and unscrew filters from case (14).

(8) Remove printed wiring board assembly (17) by loosening and removing machine screws (27) and insulating washers (32). If necessary, disassemble components of board using standard shop techniques.

(9) Remove range switch and zero potentiometer knobs (10 and 11 ) by loosening and removing two setscrews (36) on each knob.

(10) Tag and identify leads connected to range switch (5) and potentiometer (4), Remove leads.

Table 4. Visual Inspection Checklist

| Item | Inspect for | Corrective action |
|---|---|---|
| Capacitors | Overheated or bulging capacitors. | Replace defective capacitors. |
| Connectors | Bent pins. | Replace defective connector on power density meter or cable assembly only. |
| Cover | Damaged cover. | Repair or replace damaged cover. |
| Housing | Scratches and obliterated panel markings. | Clean and retouch panel. |
| Integrated circuit | Charring or burn symptoms. | Remove and replace defective integrated circuit. |
| Knobs | Loosened or cracked knobs. | Tighten if loose. Replace if cracked. |
| Meter | Damaged meter. | Replace defective meter. |
| Resistors | Overheated or cracked resistors. | Replace defective resistor(s), |
| Switches | Positive detent action for rotary and slide switches. Positive spring return action for pushbutton switch. | Replace defective switch. |
| Wiring | Cold or unsoldered joints, frayed wires, and broken insulation. Loose or broken cable clamp. | Resolder and/or replace as required. |

Table 5. Radiation Hazard Meter Troubleshooting Guide

| Symptom | Probable Cause | Remedy |
|---|---|---|
| Meter MI cannot be mechanically zeroed. | Meter Ml. | Replace meter MI. |
| Meter Ml cannot be electrically zeroed. | 1. Batteries BT1 and BT2 are not properly functioning. | 1. Test batteries BT1 and BT2. Replace as pairs if necessary. Refer to Paragraph 10. |
| | 2. Battery circuit is defective. | 2. Use Multimeter AN/ USM-223 to measure at least 8.1 volts dc across upper left and lower right battery points (both batteries). If voltage is not present, check OFF/ON switch S2 and circuit wiring. Replace defective switch or wiring. |
| | 3. ZERO potentiometer R5 is defective. | 3. Replace ZERO potentiometer R5. |
| | 4. Meter MI is defective. | 4. Replace meter Ml. |
| | 5. Differential amplifier printed wiring board assembly is defective. | 5. Troubleshoot differential amplifier printed wiring board assembly and replace defective component. |
| Meter Ml needle alternately pegs downscale and upscale with very slight adjustment of ZERO control. | Defective probe assembly. | Replace probe assembly. |
| Meter Ml needle does not deflect when battery check switch S3 is depressed. | 1. Batteries BT1 and BT2 are not properly functioning. | 1. Test batteries BT1 and BT2 Replace as pairs if necessary. Refer to Paragraph 10. |
| | 2. Battery circuit is defective. | 2. Use Multimeter AN/USM-223 to measure at least 8.1 volts dc across upper left and lower right battery points (both batteries). If voltage is not present, check OFF/ON switch S2 and circuit wiring. Replace defective switch or wiring. |
| | 3. Battery check switch S3 is defective. | 3. Replace battery check switch S3. |

Table 5. Radiation Hazard Meter Troubleshooting Guide (Continued)

| Symptom | | Remedy |
|---|---|---|
| Meter Ml does not indicate zero, after being electrically zeroed, when range switch S1 is set to all three positions. | 1. Range switch S1 is defective.<br>2. Meter Ml is defective.<br>3. Differential amplifier printed wiring board assembly is defective. | 1. Replace switch.<br>2. Replace meter.<br>3. Troubleshoot differential amplifier printed wiring board assembly and replace defective component. |
| Known radiation cannot be measured. | 1. Probe assembly is defective. | 1. If any of the following resistance measurements cannot be obtained, replace probe assembly.<br>*Plug P1Pins* — Resistance<br>1 and 3 — 97.8 to 137.3K ohms<br>4 and case — O ohms<br>6 and 6 — 0 to 10K ohms (older units) O to 5K ohms (newer units) |
| | 2. Cable assembly is defective (if used). | 2. Repair or replace cable assembly. |
| | 3. Filter is defective. | 3. Remove batteries. Check filters FL1 through FL7 for coax open (end to end) *or* short (body to center). Replace defective filter. |
| | 4. Differential amplifier printed wiring board assembly is defective. | 4. Troubleshoot differential amplifier printed wiring board assembly and replace defective component. |

(11) Remove case (14) from housing (1) by loosening and removing two standoffs (34) and washers (21).

(12) Carefully remove range switch (5) and potentiometer (4) from case (14),

(13) Remove nameplate panel (13), then remove slide switch (6) by drilling out two eyelets (46).

(14) Tag and identify leads connected to pushbutton switch (7). Remove leads.

(15) Remove pushbutton switch (7) by loosening and removing dress nut (25).

(16) Tag and identify wires connected to jack (45). Remove wires and remove jack by loosening and removing its attaching nut.

(17) Tag and identify leads connected to plug (12). Remove leads.

(18) Remove plug (12) by loosening its attaching hardware and withdraw plug (12) from housing (1).

(19) When it is necessary to disassemble the foam from the probe assembly, remove caution nameplate (3, Figure 4) from around the sensing head and remove the rear and front sensing heads (1 and 2) as follows:

(a) Locate captive nut on wand directly below foam (rear sensing head (1, Figure 4) and unscrew (ccw) to remove protective foam from probe assembly.

(b) Remove and discard caution nameplate (3).

(c) Using a sharp blade, cut approximately $^{1}/_{4}$-inch deep along seam at interface between front and rear sensing heads (2 and 1). Separate the two sensing heads and discard the front sensing head (2).

(d) Carefully break cement board between the threaded adapter assembly and the rear sensing head (1). Remove threaded adapter assembly and discard the rear sensing head (1).

e. *Reassembly*. Reassembly of the Radiation Hazard Meter is limited to the replacement of those components removed in Paragraph d. above, See applicable figures and perform the required steps of Paragraph d. in the reverse order of disassembly. Reassemble probe in accordance with Paragraph f. below.

*f. Probe Reassembly*. On the probe assembly, to replace the front and rear sensing heads (2 and 1, Figure 4), proceed as follows:

(1) Carefully position the threaded adapter assembly through the rear sensing head (1) and pull threaded adapter assembly with fingers

through rear of rear sensing head (1) until it fits snugly.

(2) Apply small amounts of casein cement to the inside-of the replacement rear sensing head so that it flows onto the three visible black portions of the perimeter of the threaded adapter assembly approximately mid-way between the three rectangular white insulators attached to the threaded adapter assembly. Be careful not to get any cement on the insulators.

(3) Apply small amounts of casein cement to the six small dots on the surface of the rear sensing head (1) that contacts the front sensing head (2).

(4) Attach replacement from sensing head (2) to rear sensing head (1) and allow four hours at room temperature for cement to cure.

(5) Apply new caution nameplate (3).

(6) Position sensing head on wand and secure with captive nut.

(7) Check basic functions as described in Paragraph 14.

g. *Repair and Replacment.* Repair of the Radiation Hazard Meter is limited to the replacement of components. Prior to removing electrical components, see Figures 3 through 7 for parts location and perform the following:

(1) Remove batteries BT1 and BT2 before attempting the replacement of any components. Refer to Paragraph 10.

(2) When disconnecting leads from components, tag and identify the leads to ensure proper reconnection.

(3) Before using any tool, electrostatically neutralize it by touching it to a large metallic mass or a known ground.

(4) Make resistance checks using the higher ohmeter ranges only.

(5) To avoid damage to the printed circuit board, use a temperature-controlled 1/8 inch soldering iron set to 700°F whenever possible if component replacement is required. The heat of the soldering iron will permit the component to be removed through the conformal coating. After component replacement has been made, thoroughly remove all flux remains using a clean stiff brush dipped in Freon TMC™ solvent. Then permit a one-minute drying period and apply Humiseal 1B31™ coating using a second clean stiff brush. Allow a one hour curing period before calibrating the unit.

*h. Battery Replacement.* Replace both batteries in accordance with Paragraph 10. After batteries are replaced, verify battery condition by performing the procedure contained in Paragraph 15C, and set OFF/ON switch to OFF.

# SECTION VI

# PREPARATION FOR RESHIPMENT AND STORAGE

## 17. Reshipment

The Radiation Hazard Meter requires no special preparation for reshipment. The cable assembly, probe assembly, and power density meter can be repacked in the carrying case for reshipment.

## 18. Storage

No special storage requirements apply for the Radiation Hazard Meter. Room ambient temperatures indoors will provide an adequate storage environment for the meter. Battery shelf–life can be extended if the unit is stored in a relatively cool environment.

# SECTION VII

# PARTS LIST

## 19. Parts List

This section contains information necessary to locate, identify, and requisition components of the Radiation Hazard Meter ME-513/U. Each parts list is supported by illustrations and each component shown on the illustration is keyed to these parts lists. The lists contain the part number, Federal Supply Codes for Manufacturers (FSCM), description, and quantity per end item of the parts shown on the associated illustrations. The names and addresses for each manufacturer of components parts of the radiation hazard meter is listed below:

| *FSCM* | *Manufacturer's Name and Address* |
|---|---|
| 02660 | Bunker Ramo Corporation<br>Amphenol Connector Division<br>2801 S. 25th Avenue<br>Broadview, IL 60153 |
| 06640 | Amatom Electronic Hardware<br>Division of Mite Corporation<br>446 Blake Street<br>New Haven, CT 06515 |
| 06666 | Precision Monolithic<br>Santa Clara, CA |
| 11332 | General Microwave Corp.<br>155 Marine Street<br>Farmingdale, NY 11735 |
| 16546 | U.S. Capacitor Corporation<br>Burbank, CA |
| 61957 | USM Corporation<br>140 Federal Street<br>Boston, MA 02107 |
| 70903 | Belden Corporation<br>2000 S, Batavia Avenue<br>Geneva, IL 60134 |
| 79136 | Waldes Kohinoor Incorporated<br>47–16 Austel Road<br>Long Island City, NY 11101 |
| 79963 | Zerick Manufacturing Company<br>Radio Circle<br>Mt. Kisco, NY 10549 |
| 80294 | Bourns Incorporated<br>Instrument Division<br>6135 Magnolia Avenue<br>Riverside, CA 92506 |
| 81349 | Military Specifications<br>Promulgated by Military Departments Under Authority of Defense Standardization Manual 41203–M |
| 82389 | Switchcraft Incorporated<br>5555 N. Elston Avenue<br>Chicago, IL 60630 |
| 88044 | Aeronautical Standards Group<br>Department of Navy and Air Force<br>Silver Springs, MD |
| 88245 | Litton Precision Products<br>USECO Division<br>Litton Industries<br>Van Nuys, CA |
| 90303 | Mallory Battery Company<br>Tarrytown, NY |

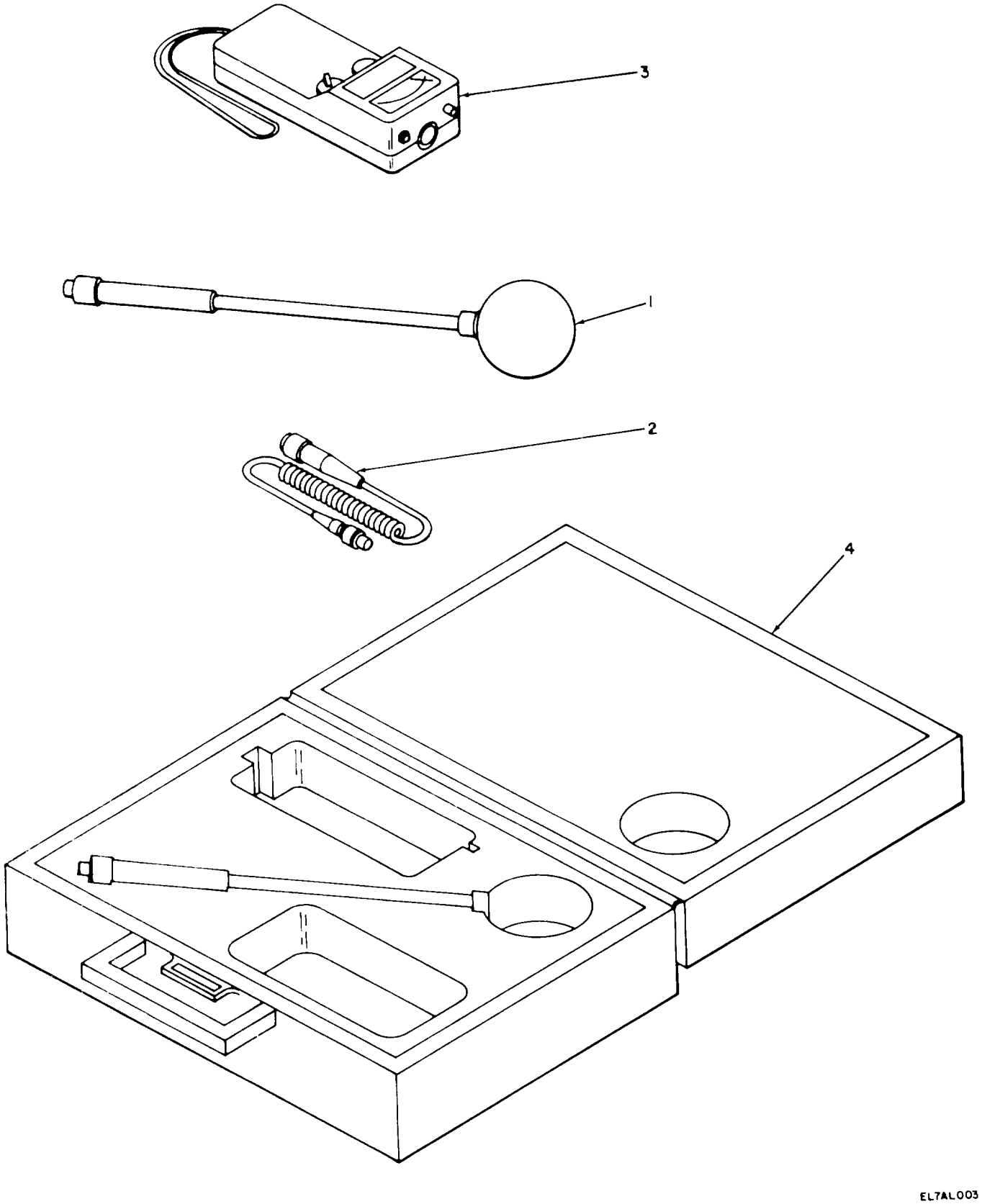
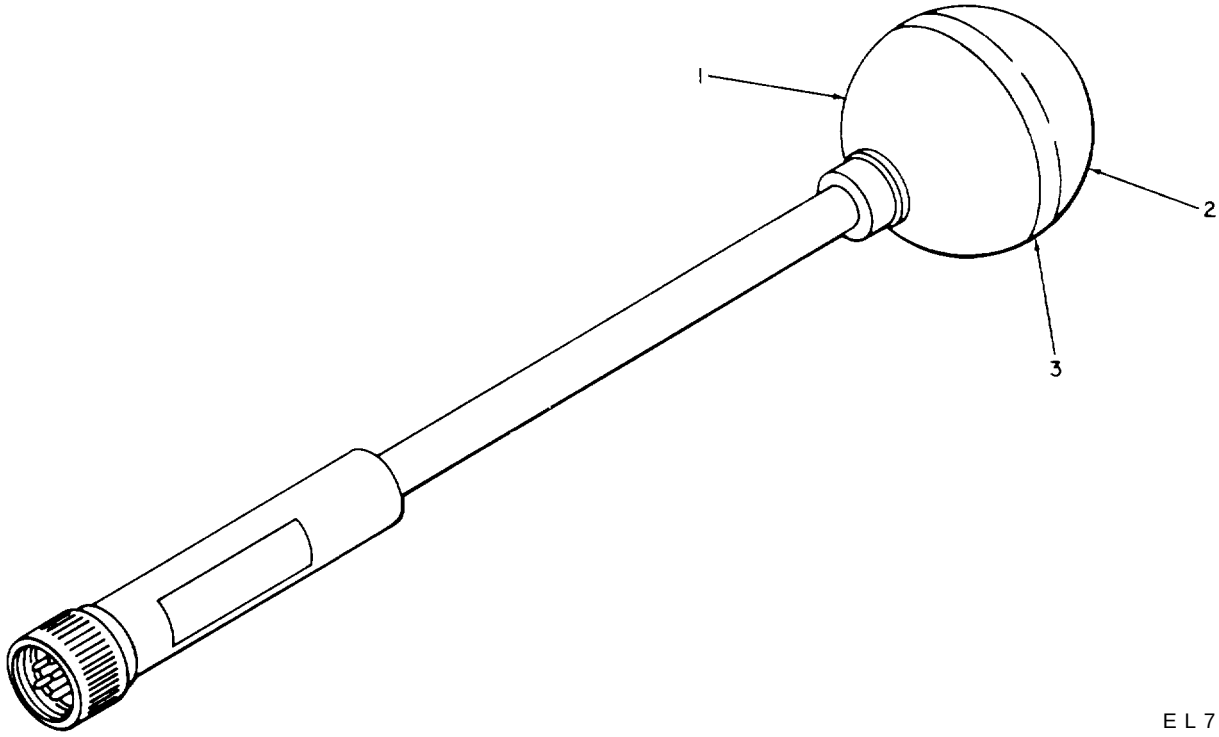
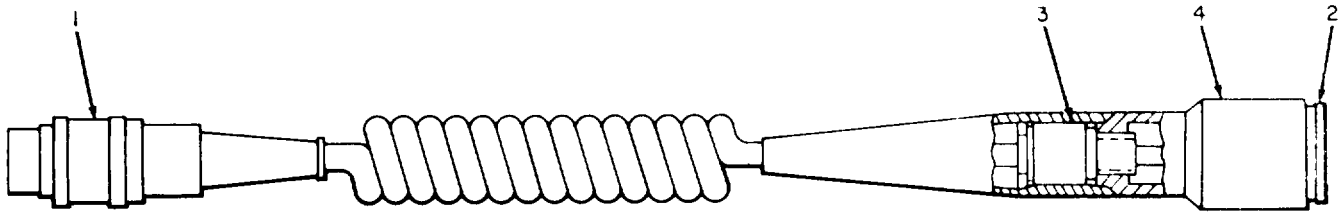



Figure 3. Radiation Hazard Meter ME-513/U




EL7AL004

*Figure 4. Probe Assembly, Part Number 8422-G1*




EL7AL005

*Figure 5. Cable Assembly, Part Number 7888-1*

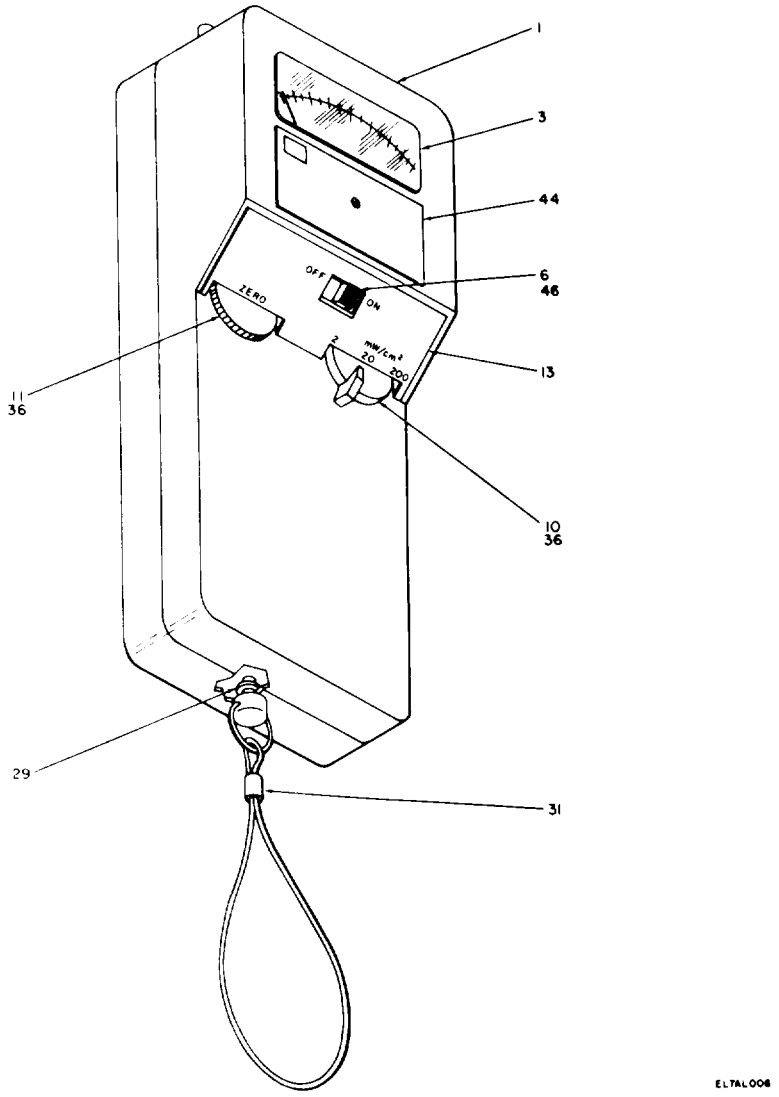



Figure 6. Power Density Meter Assembly, Part Number 9160-G1 (Sheet 1 of 2)

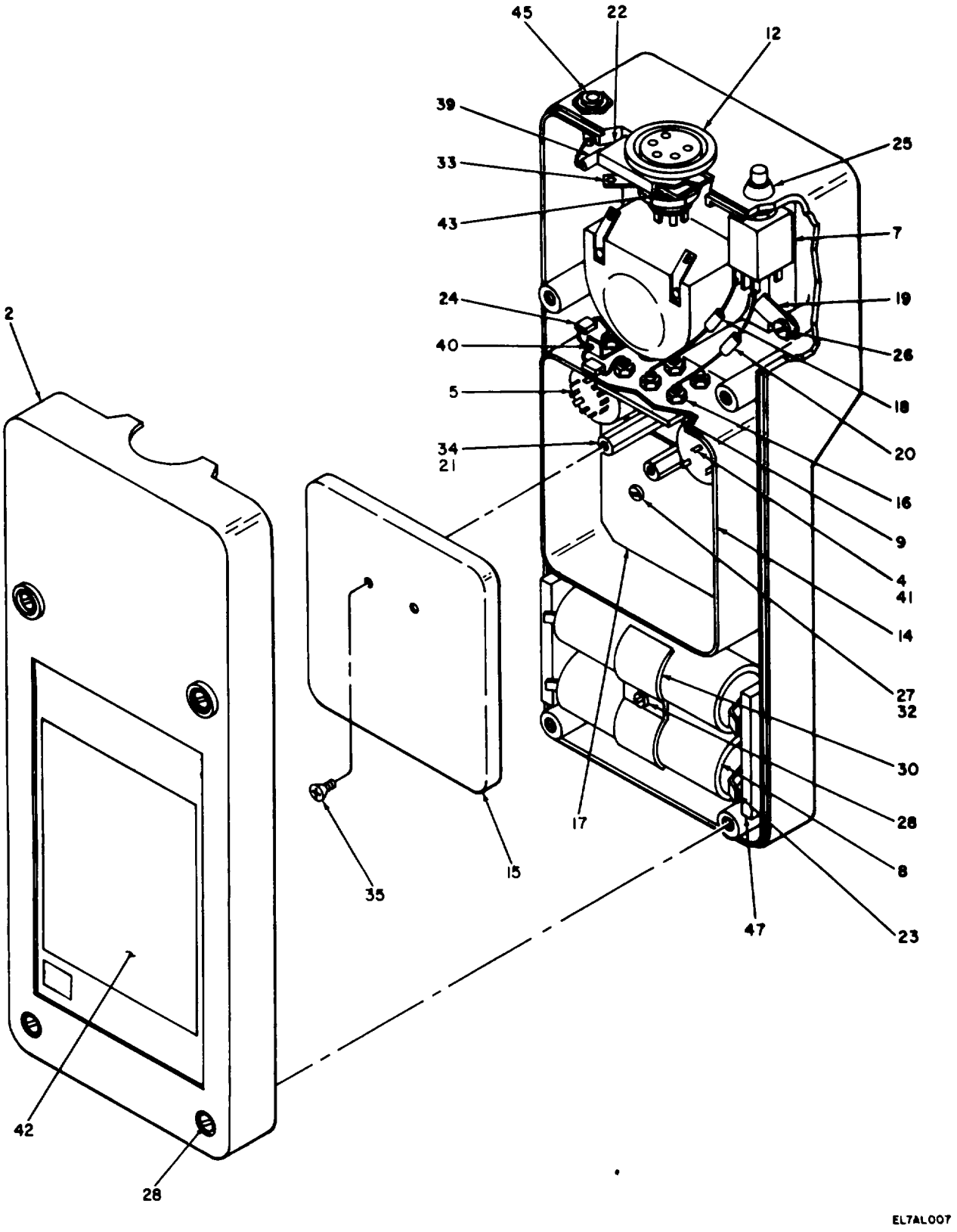



*Figure 6. Power Density Meter Assembly, Part Number 9160-G1 (Sheet 2 of 2)*

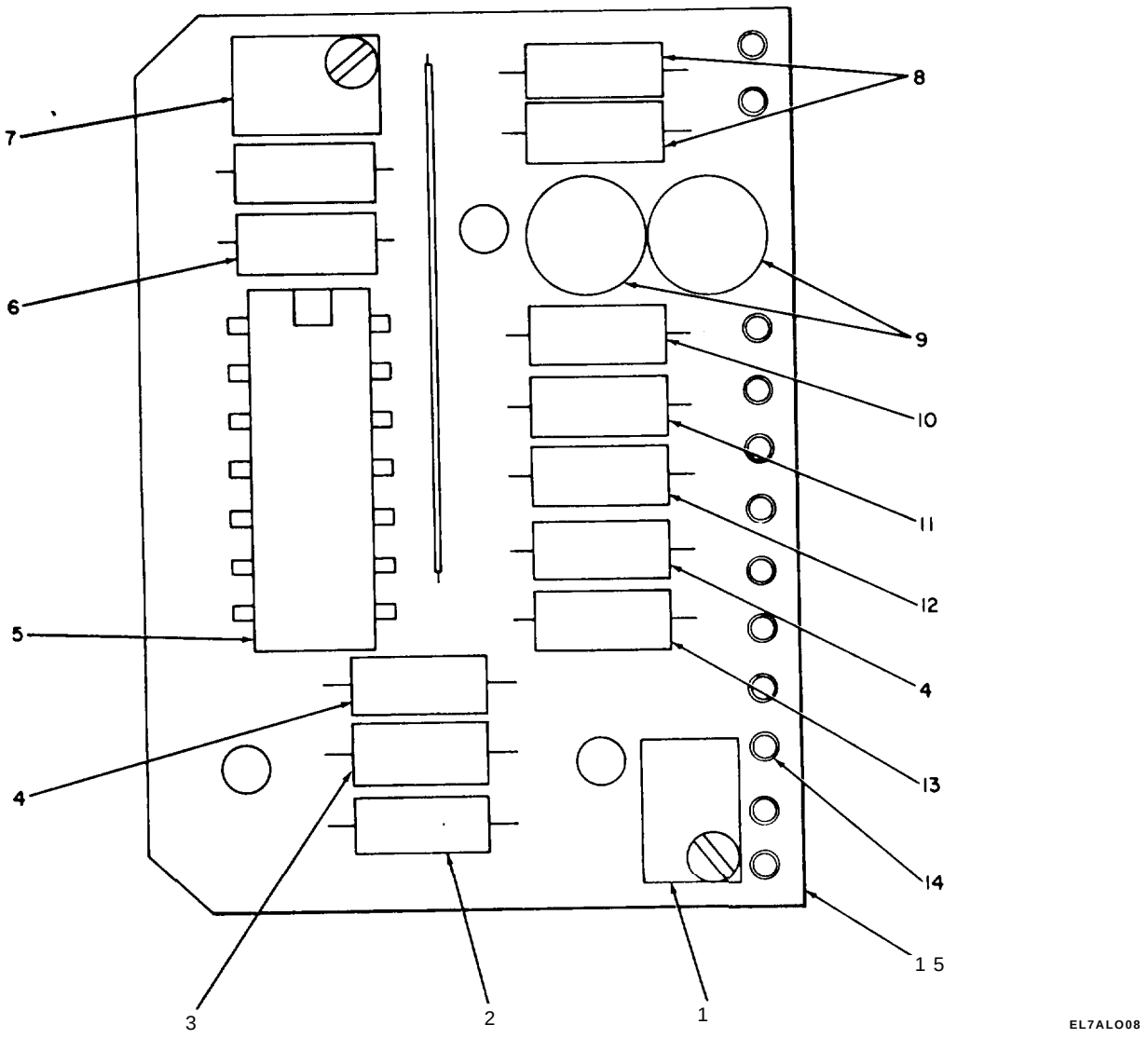



Figure 7. Differential Amplifier Printed Wiring Board Assembly, Part Number **9089-G1**

Table 6. Radiation Hazard Meter ME–51S/U Parts List

| Figure & index no. | Part number | FSCM | Description | Qty |
|---|---|---|---|---|
| 3- | 8385-G3 | 11332 | RADIATION HAZARD METER ME-513/U | REF |
| -1 | 8422-G1 | 11332 | ● PROBE ASSEMBLY (See fig. 4 for breakdown) | 1 |
| -2 | 7888-1 | 11332 | ● CABLE ASSEMBLY (See fig. 5 for breakdown) | 1 |
| -3 | 9160-G1 | 11392 | ● POWER DENSITY METER ASSEMBLY (See fig. 6 for breakdown) | 1 |
| -4 | 11154-G2 | 11332 | ● CASE, Carrying | 1 |

Table 7. Probe Assembly Parts List

| Figure & index no. | Part number | FSCM | Description | Qty |
|---|---|---|---|---|
| 4- | 8422-G1 | 11332 | PROBE ASSEMBLY | REF |
| -1 | 8091-P1 | 11332 | ● SENSING HEAD, Rear | 1 |
| -2 | 8092-P1 | 11332 | ● SENSING HEAD, Front | 1 |
| -3 | 8471-P1 | 11332 | ● NAMEPLATE, Caution | 1 |

Table 8. Cable Assembly Parts List

| Figure & index no. | Part number | FSCM | Description | Qty |
|---|---|---|---|---|
| 5- | 7888-1 | 11332 | CABLE ASSEMBLY | REF |
| -1 | 91-T-3400-1 | 02660 | ● PLUG, Connector (P1) | 1 |
| -2 | 91-T-3403-9 | 02660 | ● PLUG, Connector (P2) | 1 |
| -3 | Mx1530A/U | 81349 | ● TERMINATION | 1 |
| -4 | 8283-P1 | 11332 | ● BOOT, Connector | 1 |
| -5 | 7430-3 | 11332 | ● ADAPTER, Connector | 1 |

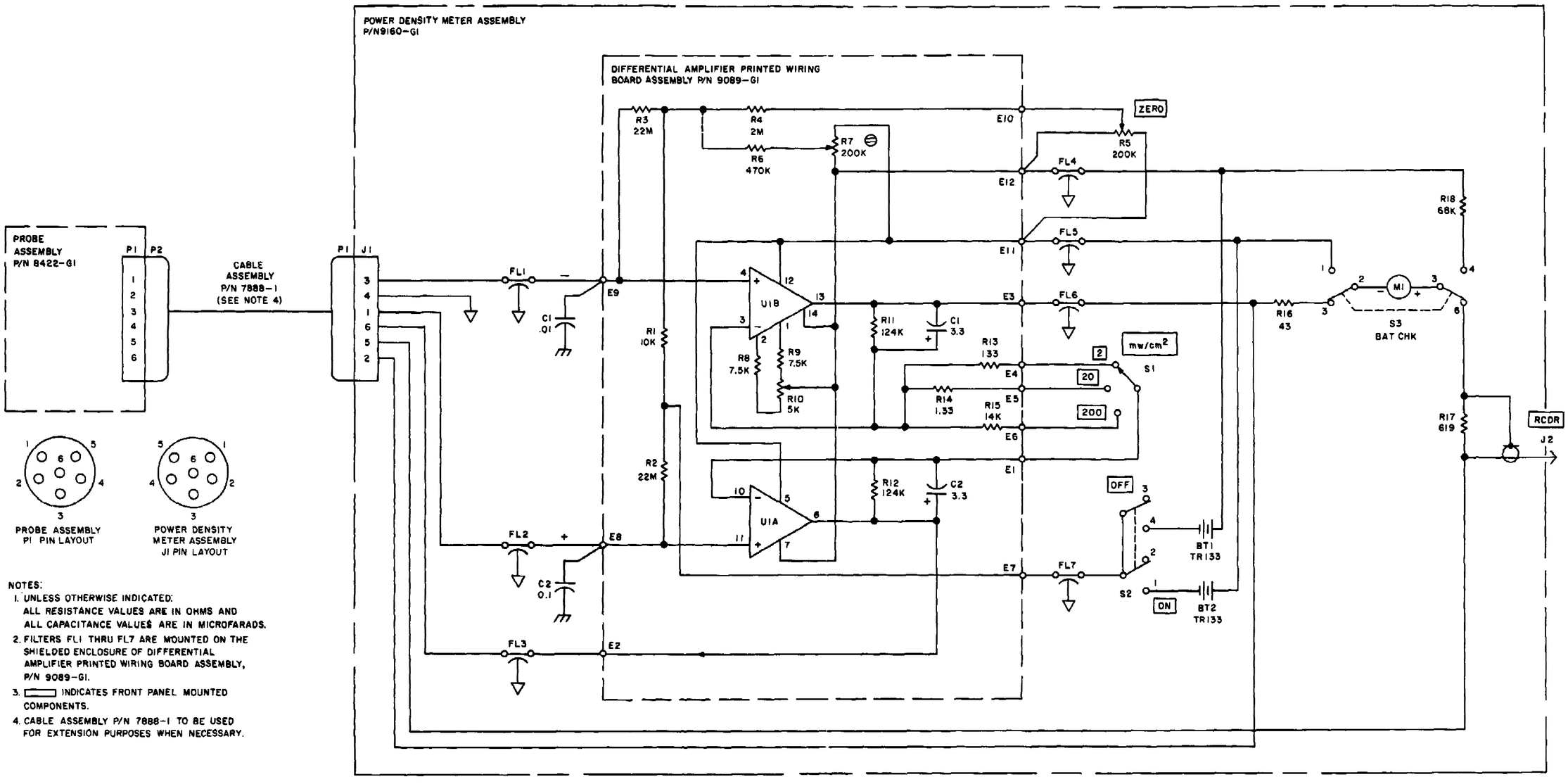
Table 9. Power Density Meter Parts List

| Figure & index no. | Part number | FSCM | Description | Qty |
|---|---|---|---|---|
| 6- | 9160-G1 | 11332 | POWER DENSITY METER ASSEMBLY | REF |
| -1 | 7328–3 | 11332 | ● HOUSING | 1 |
| -2 | 7313-3 | 11332 | ● COVER | 1 |
| -3 | 9884P1 | 11332 | ● METER (M1) | 1 |
| -4 | 7374-3 | 11332 | ● POTENTIOMETER Modified (R5) | 1 |
| -5 | 7373–3 | 11332 | ● SWITCH, RANGE (S1) | 1 |
| -6 | 8073-3 | 11332 | ● SWITCH, Slide, Zero (S2) | 1 |
| -7 | 11368P1 | 11332 | ● SWITCH, Pushbutton (S3) | 1 |
| -8 | TR-133 | 90303 | ● BATTERY (BT1, BT2) | 2 |
| -9 | 9086P1 | 11332 | ● NUT, Plate | 1 |
| -10 | 7866-3 | 11332 | ● KNOB, Range Switch | 1 |
| -11 | 7865-3 | 11332 | ● KNOB, Zero | 1 |
| -12 | 91T–3403-9 | 02660 | ● PLUG, Connector (J1) | 1 |
| -13 | 7326-3 | 11332 | ● PANEL, Nameplate | 1 |
| -14 | 9094P1 | 11332 | ● CASE, Electronic | 1 |
| -15 | 9095P1 | 11332 | ● HOUSING COVER, Electronic | 1 |
| –16 | 3223–000 0 | 16546 | ● FILTER, Feedthru (FL1-FL7) | 7 |
| -17 | 9089G1 | 11332 | ● PRINTED WIRING BOARD ASSEMBLY, Differential Amplifier (See fig. 7 for breakdown) | 1 |
| -18 | ERCA683J25 | 81349 | ● RESISTOR, Carbon Fixed, 68K ohms (R18) | 1 |
| -19 | 7320-3 | 11332 | ● CLIP, Meter | 2 |
| -20 | ERCA430J25 | 81349 | ● RESISTOR, Carbon Fixed, 43 ohms (R16) | 1 |
| -21 | CS260-2 | 11332 | ● WASHER, Flat | 2 |
| -22 | 7372-3 | 11332 | CLIP, Connector | 1 |
| -23 | 7376-3 | 11332 | ● CLIP, Battery Contact | 4 |
| -24 | CK05BX103K | 81349 | ● CAPACITOR, Fixed, Ceramic .01 uf ± 10%, 100V (C1, C2) | 2 |
| -25 | N-43 | 70063 | ● DRESS NUT | 1 |
| -26 | Commercial | | ● SCREW, 4X1/4 Type Z, Pan Head, self tapping, Phillips, Corrosion resisting steel | 2 |
| 6-27 | CS211-23 | 11332 | ● SCREW, Machine 2-56 x 3/16 | 3 |
| -28 | 7377-5 | 11332 | ● SCREW, Captive | 6 |

| Figure & index no. | Part number | FSCM | Description | Qty |
|---|---|---|---|---|
| -29 | X5133-9 | 79136 | • RING, Retaining | 1 |
| -30 | 7375–3 | 11332 | • CLAMP, Battery | 1 |
| -31 | HS-4 | Shigoto Ind | • STRAP, Hand | 1 |
| -32 | 2315-N089 | 06540 | • WASHER, Insulated | 3 |
| -33 | 8101P1 | 11332 | • LUG, Connector | 1 |
| -34 | 9729-A-0440-16 | 06540 | • STANDOFF, Hex Male/Female | 2 |
| -35 | Commercial | | • SCREW, Machine, 4-40 x 3/16, 100° Flat head, Phillips, Corrosion resisting steel | 2 |
| -36 | CS250-22 | 11332 | • SETSCREW, 1-56 x 1/8 | 4 |
| -37 | 8640 | 70903 | • CABLE, 2 Conductor, shielded, 6“ | 1 |
| -38 | 850 | 82389 | • PLUG, Connector | 1 |
| -39 | RN55D6190F | 81349 | • RESISTOR, Film, Fixed, 619 ohms ±1%. (R17) | 1 |
| -40 | 597 | 79963 | • LUG, Ground | 1 |
| -41 | AN960C416L | 88044 | • WASHER, Flat | 4 |
| -42 | 7917-5 | 11332 | • NAMEPLATE | 1 |
| -43 | 8096P1 | 11332 | • CONNECTOR, Shim | 1 |
| -44 | 7926-3 | 11332 | • PLATE, Identification | 1 |
| -45 | TR-2A | 82389 | • JACK, Recorder | 1 |
| -46 | SE-34 | 61957 | • EYELET | 2 |
| -47 | 9042P1 | 11332 | • STOP, Battery Contact | 2 |

Table 10. Deferential Amplifier Printed Wiring Board Assembly Parts List

| Figure & index no. | Part number | FSCM | Description | Qty |
|---|---|---|---|---|
| 7- | 9089-G1 | 11332 | PRINTED WIRING BOARD ASSEMBLY, Differential | REF |
| -1 | 64Y204 | 80294 | • RESISTOR, Variable, Cermet, 200K ohms (R7) | 1 |
| -2 | RC07GF474J | 81349 | • RESISTOR, Composition, Fixed, 470K ohms ±5% (R6) | 1 |
| -3 | RC07GF205J | 81349 | • RESISTOR, Fixed Composition 2 Megohm, ±5% (R4) | 1 |
| -4 | RC07GF226J | 81349 | • RESISTOR, Fixed, Composition 22 Megohm ±5% (R2, R3) | 2 |
| -5 | OP-1OEY | 06665 | • INTEGRATED CIRCUIT (U1) | 1 |
| -6 | RN55D7501F | 81349 | • RESISTOR, Film, Fixed, 7.5K ohms &170 (R8, R9) | 2 |
| -7 | 64Y502 | 80294 | • RESISTOR, Variable, Film, 5K ohms (R10) | 1 |
| -8 | RN55D1243F | 81349 | • RESISTOR, Film, Fixed, 124K ohms ±1% (R11, R12) | 2 |
| -9 | DIT3R3C25 | 16546 | • CAPACITOR, Fixed, Tantalum, 3.3 µF 25 VDC (C1, C2) | 2 |
| -10 | RN55D1330F | 81349 | • RESISTOR, Film, Fixed, 133 ohms ±1% (R13) | 1 |
| -11 | RN55D1331F | 81349 | • RESISTOR, Film, Fixed, 1.33K ohms ±1% (R14) | 1 |
| -12 | RN55D1402F | 81349 | • RESISTOR, Film, Fixed, 14K ohms ±1% (R15) | 1 |
| -13 | RCO7GF103J | 81349 | • RESISTOR, Composition, Fixed, 10K ohms ±5% (R1) | 1 |
| -14 | 2031A | 88245 | • TERMINAL, Solder | 12 |
| -15 | 9088-P1 | 11332 | • Board, Printed Wiring Differential Amplifier | 1 |







NOTES:

1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS AND
   ALL CAPACITANCE VALUES ARE IN MICROFARADS.
2. FILTERS FL1 THRU FL7 ARE MOUNTED ON THE SHIELDED ENCLOSURE OF DIFFERENTIAL AMPLIFIER PRINTED WIRING BOARD ASSEMBLY, P/N 9089-G1.
3. ▭ INDICATES FRONT PANEL MOUNTED COMPONENTS.
4. CABLE ASSEMBLY P/N 7888-1 TO BE USED FOR EXTENSION PURPOSES WHEN NECESSARY.

Figure FO-1. Radiation Hazard Meter ME-513/U, Schematic Diagram

# APPENDIX A

# REFERENCES

| | |
|---|---|
| DA Pam 310-4 | Index of Technical manuals, Technical Bulletins Supply Manuals (Types 7, 8, and 9), Supply Bulletins and Lubrication Orders. |
| DA Pam 310-7 | US Army Equipment Index of Modification Work Orders. |
| TB 43-180 | Calibration Requirements for the Maintenance of Army Materiel. |
| TB 385-4 | Safety Precautions for Maintenance of Electrical/Electronic Equipment. |
| TB MED 523 | Control of Hazards to Health From Microwave Radiation. |
| TM 11-6625–654-14 | Operator's, Organizational, Direct Support, and General Support Maintenance Repairs Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools List) for Multimeter AN/USM-223. |
| TM 38-750 | The Army Maintenance Management System (TAMMS). |
| TM 750–244-2 | Procedure for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command). |
| TM 740-90-1 | Administrative Storage of Equipment. |

# APPENDIX B

## COMPONENTS OF END ITEM LIST

| Quantity | Component | |
|---|---|---|
| 1 | Radiation Hazard Meter ME-513/U | 6625-01-068-1485 |
| | Consisting of: | |
| 1 | Power Density Meter Assembly | |
| 1 | Probe Assembly p/n 8422–G1 | |
| 1 | Cable Assembly p/n 7888-1 | |
| 1 | Carrying Case p/n 11154-G2 | |
| 1 | TM 11-6625-2988-14 | |
| 2 | Batteries, 4.2 volts, BA-1098/U | 6135-00–566-8318 |

**WARNING**

The batteries used in this meter contain mercury and require special handling to avoid explosion as follows:

Do not dispose in fire.

Do not short circuit.

Return to Property Disposal Officer for disposal in accordance with DLSC Handbook 41601.

# APPENDIX C

# MAINTENANCE ALLOCATION

## Section I. INTRODUCTION

### C-1 . General

This appendix provides a summary of the maintenance operations for Radiation Hazard Meter ME-513/U. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

### C-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

*a. Inspect.* To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

*b. Test.* To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

*d. Adjust.* To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

*e. Align.* To adjust specified variable elements of an item to bring about optimum or desired performance.

*f.* Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. *Install.* The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

*h. Replace.* The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

*i. Repair.* The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serciveability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

*j. Overhaul.* That maintenance effort (service/action ) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

*k. Rebuild.* Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

### C–3. Column Entries

*a. Column 1, Group Number.* Column 1 lists group numbers, the purpose of which is to iden-

tify components, assemblies, subassemblies, and modules with the next higher assembly.

*b. Column* 2, *Component/Assembly.* Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. *Column* 3, *Maintenance Functions.* Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

*d. Column 4, Maintenance Category.* Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn (s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "work time" figures will be shown for each category. The number of task-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authoirzed in the maintenance allocation chart. Subcolumns of column 4 are as follows:

C -—Operator/Crew
O—Organizational
F—Direct Support
H—General Support
D—Depot

*e. Column* 5, *Tools and Equipment.* Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

*f. Column* 6, *Remarks.* Column 6 contains an alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item oposite the patricular code.

## C-4. Tool and Test Equipment Requirements (Sec. III)

*a. Tool or Test Equipment Reference Code.* The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

*b. Maintenance Category.* The codes in this column indicate the maintenance category allocated the tool or test equipment.

*c. Nomenclature.* This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

*d. National/NATO Stock Number.* This column lists the National/NATO stock number of the specific tool or test equipment.

*e. Tool Number.* This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

## C-5. Remarks (Sec. IV)

*a. Reference Code.* This code refers to the appropriate item in section II, column 6.

*b. Remarks.* This column provides the required explanatory information necessary to clarify items appearing in section II.

(Next printed page is C-3)

SECTION II MAINTENANCE ALLOCATION CHART
FOR
RADIATION HAZARD METER ME-513/U

| (1) GROUP NUMBER | (2) COMPONENT ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE CATEGORY C | O | F | H | D | (5) TOOLS AND EQPT. | (6) REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 00 | ME-513/U | Inspect | 0.1 | | | | | | 1 |
| | | Test | | | | 0.5 | | | |
| | | Service | | | | 0.5 | | | 2 |
| | | Repair | | | | 1.0 | | | |
| | | Overhaul | | | | | 4.0 | All | All* |
| 01 | Probe Assembly, part number 8422-G1 | Inspect | | 0.1 | | | | | |
| | | Service | | 0.1 | | | | | |
| | | Install | 0.1 | | | | | | |
| | | Replace | 0.1 | | | | | | |
| 02 | Cable Assembly, part number 7888-1 | Test | | | | 0.2 | | 2 | |
| | | Install | 0.1 | | | | | | |
| | | Repalr | | | | 0.5 | | | 3 |
| | | Replace | 0.1 | | | | | | |
| 03 | Power Density Meter, part number 9160-G1 | Inspect | 0.1 | | | | | | |
| | | Test | | | | 0.4 | | 2 | 4 |
| | | Service | 0.1 | | | | | | |
| | | Repair | | | | 1.0 | | | 5 |
| | | Replace | | 0,2 | | | | | |
| 0301 | Differential Amplifier Circuit Card Assembly part number 9089-G1 | Inspect | | | | 0.1 | | | |
| | | Test | | | | 0.5 | | 2 | |
| | | Install | | | | 0.5 | | | |
| | | Repair | | | | 1.0 | | | 6 |
| | | Replace | | | | 1.0 | | | |

* Final testing and calibration can be performed only at White Sands anechoic facilities in-Army. Factory calibrated prior to first delivery.

SECTION III TOOL AND TEST EQUIPMENT REQuIREMENTS
FOR
RADIATION HAZARD METER ME-513/U

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE CATEGORY | NOMENCLATURE | NATIONAL/NATO STOCK NUMBER | TOOL NUMBER |
|---|---|---|---|---|
| 1 | D | Digital Voltmeter AN/USM-451 | 6625-01-060-6804 | |
| 2 | H | Multimeter AN/USM-223 | 6625-00-999-7465 | |

SECTION IV. REMARKS

| REFERENCE CODE | REMARKS |
|---|---|
| 1 | By zeroing the meter and performing battery test. |
| 2 | By replacement of 01, 02, and 03. |
| 3 | By replacement of P1 or P2. |
| 4 | By replacement of BT1 and BT2. |
| 5 | By replacement of C1, C2, FL1-FL7, J1, J2, M, R5, R16, R17, R18, S1 - S3 or 0301. |
| 6 | By replacement of C1, C2, R1-R4, R-6, R15, or U1. |

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|---|---|---|---|---|
| PAGE NO | PARAGRAPH | FIGURE NO | TABLE NO | |
| 2-25 | 2-28 | | | Recommend that the installation antenna alignment procedure be changed throughout to specify a $2^{o}$ IFF antenna lag rather than $1^{o}$.<br><br>REASON: Experience has shown that with only a $1^{o}$ lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to $2^{o}$ without degradation of operation. |
| 3-10 | 3-3 | | 3-1 | Item 5, Function column. Change "2 db" to "3db."<br><br>REASON: The adjustment procedure the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator. |
| 5-6 | 5-8 | | | Add new step f.1 to read, "Replace cover plate removed in step e.1, above."<br><br>REASON: To replace the cover plate. |
| E-5 | | | | For item 2, change the NSN to read: 5835-00-134-9186.<br><br>REASON: Accuracy. |
| E-8 | | E-3 | | Identify the cover on the junction box (item no. 5).<br><br>REASON: It is a separate item and is not called out on figure 19. |
| E-9 | | | | Add the cover of the junction box as an item in the listing for figure 19.<br>REASON: Same as above. |

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US Army Communications and
Electronics Materiel Readiness Command
ATTN: DRSEL-ME-MQ
Fort Monmouth, New Jersey 07703

# THE METRIC SYSTEM AND EQUIVALENTS

## 'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

## 'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

## LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

## SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

## CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

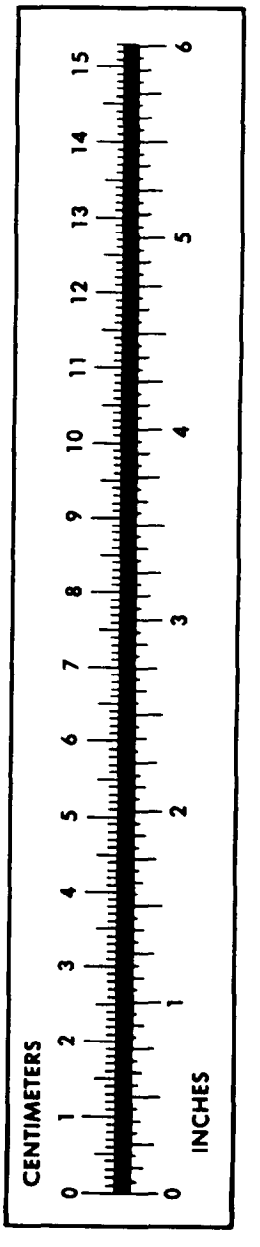
## TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

## APPROXIMATE CONVERSION FACTORS

| TO CHANGE | TO | MULTIPLY BY |
|---|---|---|
| Inches | Centimeters | 2.540 |
| Feet | Meters | 0.305 |
| Yards | Meters | 0.914 |
| Miles | Kilometers | 1.609 |
| Square Inches | Square Centimeters | 6.451 |
| Square Feet | Square Meters | 0.093 |
| Square Yards | Square Meters | 0.836 |
| Square Miles | Square Kilometers | 2.590 |
| Acres | Square Hectometers | 0.405 |
| Cubic Feet | Cubic Meters | 0.028 |
| Cubic Yards | Cubic Meters | 0.765 |
| Fluid Ounces | Milliliters | 29.573 |
| ıts | Liters | 0.473 |
| arts | Liters | 0.946 |
| allons | Liters | 3.785 |
| Ounces | Grams | 28.349 |
| Pounds | Kilograms | 0.454 |
| Short Tons | Metric Tons | 0.907 |
| Pound-Feet | Newton-Meters | 1.356 |
| Pounds per Square Inch | Kilopascals | 6.895 |
| Miles per Gallon | Kilometers per Liter | 0.425 |
| Miles per Hour | Kilometers per Hour | 1.609 |

| TO CHANGE | TO | MULTIPLY BY |
|---|---|---|
| Centimeters | Inches | 0.394 |
| Meters | Feet | 3.280 |
| Meters | Yards | 1.094 |
| Kilometers | Miles | 0.621 |
| Square Centimeters | Square Inches | 0.155 |
| Square Meters | Square Feet | 10.764 |
| Square Meters | Square Yards | 1.196 |
| Square Kilometers | Square Miles | 0.386 |
| Square Hectometers | Acres | 2.471 |
| Cubic Meters | Cubic Feet | 35.315 |
| Cubic Meters | Cubic Yards | 1.308 |
| Milliliters | Fluid Ounces | 0.034 |
| Liters | Pints | 2.113 |
| Liters | Quarts | 1.057 |
| ers | Gallons | 0.264 |
| ms | Ounces | 0.035 |
| ograms | Pounds | 2.205 |
| Metric Tons | Short Tons | 1.102 |
| Newton-Meters | Pounds-Feet | 0.738 |
| Kilopascals | Pounds per Square Inch | 0.145 |
| lometers per Liter | Miles per Gallon | 2.354 |
| meters per Hour | Miles per Hour | 0.621 |



**PIN: 049013-000**