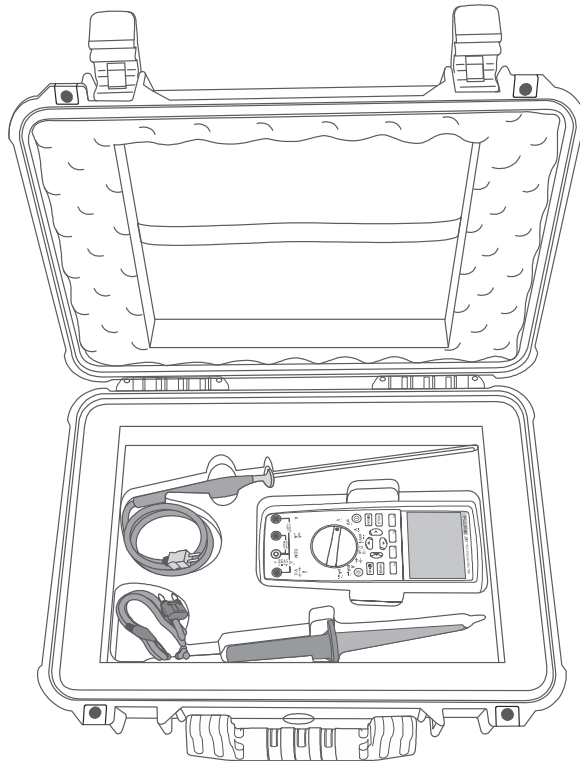


TM 11-6625-1753-10

**TECHNICAL MANUAL
OPERATOR'S MANUAL
FOR
AN/GSM-437 MULTIMETER SET
(NSN 6625-01-585-9211)**



DISTRIBUTION STATEMENT A – Approved for public release, distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY

15 MAY 2013

WARNING SUMMARY

Warning Summary

This warning summary contains general safety warnings and hazardous material warnings that must be understood and applied during operation and maintenance of this equipment. Failure to observe these precautions could result in serious injury or death to personnel. Also included are explanations of safety and hazard icons used within this technical manual.

FOR INFORMATION ON FIRST AID:

Refer to FM 4-25.11.

EXPLANATION OF WARNING ICONS



Electrical – electrical wire to arm with electricity symbol running through human body shows that shock hazard is present.

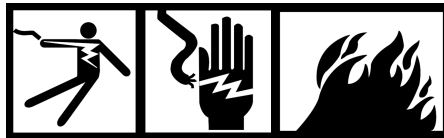


Electrical – electrical wire to hand with electricity symbol running through hand shows that shock hazard is present.



Fire – flame shows that a material may ignite and cause burns.

WARNING



Do not connect the temperature probe thermocouple to electrically live circuits. This could result in fire or electric shock. Failure to comply may result in injury or death to personnel.

WARNING



Never attempt an in-circuit current measurement where the open-circuit potential to earth is greater than 1,000 V. This could result in electrical shock. Failure to comply may result in injury or death to personnel.

WARNING SUMMARY – (Continued)

WARNING



Do not place the test probes across (in parallel with) a powered circuit when a lead is plugged into a current terminal. This causes a short circuit because the resistance through the multimeter's current terminals is very low. This could result in electrical shock. Failure to comply may result in injury or death to personnel.

WARNING



Remove all jewelry such as rings, ID tags, bracelets, etc. prior to working on or around electronic equipment. Jewelry and tools can contact active electrical circuits and cause a direct short, severe burns, or electrical shock. Failure to comply may result in injury or death to personnel.

WARNING



Remove the test leads and any input signals before performing any maintenance on the multimeter to prevent electrical shock and personnel injury.

Failure to follow this warning can result in death, injury and/or to equipment damage.

LIST OF EFFECTIVE PAGES/WORK PACKAGES

NOTE: The portion of text affected by the change is indicated by a vertical bar in the outer margins of the page. Changes to illustrations are indicated by a vertical bar adjacent to the title. Zero in the "Change No." column indicates an original page or work package.

Date of issue for original manual is:

Original 15 MAY 2013

TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS THREE AND TOTAL NUMBER OF WORK PACKAGES IS 21 CONSISTING OF THE FOLLOWING:

| Page/WP No. | Change No. | Page/WP No. | Change No. |
|----------------------------|------------|--------------------------|------------|
| Cover | 0 | WP 0010 (4 pages) | 0 |
| (Warning Summary (2 page)) | 0 | (Chapter 5 - Title page) | 0 |
| i-iv | 0 | WP 0011 (2 pages) | 0 |
| ii Blank | 0 | WP 0012 (4 pages) | 0 |
| (Chapter 1 - title page) | 0 | WP 0013 (4 pages) | 0 |
| WP 0001 (4 pages) | 0 | WP 0014 (4 pages) | 0 |
| WP 0002 (8 pages) | 0 | WP 0015 (4 pages) | 0 |
| WP 0003 (14 pages) | 0 | (Chapter 6 - Title page) | 0 |
| (Chapter 2 - title page) | 0 | WP 0016 (2 pages) | 0 |
| WP 0004 (4 pages) | 0 | WP 0017 (4 pages) | 0 |
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HEADQUARTERS DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 15 MAY 2013

TECHNICAL MANUAL
OPERATOR'S MANUAL
FOR
AN/GSM-437 MULTIMETER SET
(NSN 6625-01-585-9211)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MSS-LP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also send in your comments electronically to our E-mail address: 2028@redstone.army.mil or by fax 256-842-6546/DSN 788-6546. For the World Wide Web use: <https://amcom2028.redstone.army.mil>. Instructions for sending an electronic 2028 can be found at the back of this manual.

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HOW TO USE THIS MANUAL

INTRODUCTION

This manual is designed to help you operate the components found within the AN/GSM-437 Multimeter Set and to perform operator troubleshooting and maintenance on the equipment.

This manual is written in a work package format:

1. Chapters divide the manual into major categories of information.
2. Each chapter is divided into work packages, which are identified by a 4-digit number (e.g., 0001, 0002) located on the upper right-hand corner of each page. The work package page number (e.g., 0001-1, 0001-2) is located in the center at the bottom of each page.

Read through this manual to become familiar with its organization and contents before attempting to operate or maintain the equipment.

Each work package begins on a right-hand page with a work package number. Pages are numbered after the work package number. (EXAMPLE: 1000-1; means Work Package (WP) 1000, page 1.)

In addition to text, there are illustrations showing:

1. Components, controls, and indicators.
2. How to take a component off and put it back on.
3. Cleaning and inspection criteria are also listed when necessary.

CONTENTS OF THIS MANUAL

A *Warning Summary* is located at the beginning of this manual. Become familiar with these warnings before operating or performing operator troubleshooting or maintenance on the machine.

A *Table of Contents* is located in the front of the manual and lists all chapters and work packages in this manual.

1. The Table of Contents also provides Reporting Errors and Recommending Improvements information and DA Form 2028 addresses for the submittal of corrections to this manual.
2. If you cannot find what you are looking for in the Table of Contents, refer to the alphabetical Index at the back of this manual.

CHAPTER 1. INTRODUCTORY INFORMATION, EQUIPMENT DESCRIPTION AND THEORY OF OPERATION: Provides general information on the manual and the equipment.

CHAPTER 2. OPERATOR INSTRUCTIONS: Explains and illustrates all operator controls and indicators. It also describes how to perform all operating procedures for the machine: Operation Under Usual Conditions and Operation Under Unusual Conditions.

CHAPTER 3. TROUBLESHOOTING PROCEDURES: Covers all troubleshooting procedures. WP 0007 contains a Troubleshooting Symptom Index. WP 0008 contains the troubleshooting procedures. The AN/GSM-437 Multimeter Set may not work properly during operation. When malfunctions occur, the operator should go to and look for the problem in the symptom (malfunction) index of the troubleshooting section. This index will direct the operator to the procedure for correcting the problem. The troubleshooting procedure is a step-by-step process which, if followed, will accomplish all the things the operator can do to identify exactly what is wrong and correct it. The procedures may direct the operator to other sections of the manual, such as Maintenance Procedures. When the operator has done all that can be done and the problem still exists, the operator will be directed to notify next level of maintenance. If there is no procedure provided in the symptom (malfunction) index to correct the problem, the operator should notify THE next level of maintenance.

CHAPTER 4. PREVENTIVE MAINTENANCE INSTRUCTIONS: Areas covered are Preventive Maintenance Checks and Services (PMCS).

CHAPTER 5. MAINTENANCE INSTRUCTIONS: Areas covered are operator-level maintenance tasks.

CHAPTER 6. SUPPORTING INFORMATION: References, Components of End Item (COEI) and Basic Issue Items (BII) Lists, Additional Authorization List (AAL), and Expendable and Durable Items List are covered.

HOW TO USE THIS MANUAL – (Continued)

FEATURES OF THIS MANUAL

Information is provided throughout the manual which does not fit into a procedural step. This information is in the form of Warnings, Cautions, and Notes. Warnings are provided where injury or death may occur to personnel working with the AN/GSM-437 Multimeter Set.

There are also a number of general warnings which should be read before using the AN/GSM-437 Multimeter Set. The pages with general warnings follow the cover and are lettered with lower case alphabetical characters such as "a," "b," etc. Summary warnings follow full page warnings.

Warnings are provided where injury or death may occur if proper precautions are not taken.

Cautions are provided where equipment may be damaged but no personnel injuries should result.

Notes provide information to operate the AN/GSM-437 Multimeter Set, but do not cover equipment damage or personnel injury.

WARNINGS, **CAUTIONS**, **NOTES**, subject headings, and other important information are highlighted in **BOLD** print as a visual aid.

1. A **WARNING** indicates a hazard which may result in injury or death to personnel.
2. A **CAUTION** is a reminder of safety practices or directs attention to usage practices that may result in damage to equipment.
3. A **NOTE** is a statement containing information that will make the procedures easier to perform.

Statements and words of particular interest may be printed in underlined or CAPITAL letters to create emphasis.

Within a procedural step, reference may be made to another work package in this manual or to another manual. These references indicate where you should look for more complete information.

1. If you are told: "Replace fuse (WP 0014)," go to WP 0014 in this manual for instructions on how to replace a fuse.
2. If you are told: "For complete information on servicing batteries, refer to TM 9-6140-200-14," go to the References work package (WP 0016) in this manual for complete information on the TM 9-6140-200-14.

Illustrations are placed after, and as close as possible to, the procedural steps to which they apply. Callouts placed on the art are text or numbers.

Dashed leader lines also indicate an item that is hidden from view.

Technical instructions include standard units first, followed by metric units.

CHAPTER 1
GENERAL INFORMATION, EQUIPMENT DESCRIPTION AND THEORY OF
OPERATION
FOR
AN/GSM-437 MULTIMETER SET

CHAPTER 1

GENERAL INFORMATION, EQUIPMENT DESCRIPTION AND THEORY OF OPERATION

WORK PACKAGE INDEX

| Title | WP Sequence No. |
|--|------------------------|
| GENERAL INFORMATION | 0001 |
| EQUIPMENT DESCRIPTION AND DATA | 0002 |
| THEORY OF OPERATION | 0003 |

OPERATOR INSTRUCTIONS

GENERAL INFORMATION

SCOPE

Type of Manual: Operator's - provides operating instructions, troubleshooting procedures, and maintenance tasks on the multimeter.

Equipment Name and Model Number: AN/GSM-437 Multimeter Set.

Purpose of Equipment: The AN/GSM-437 Multimeter Set is an item of general purpose test equipment designed to measure and indicate various electrical characteristics needed to test and troubleshoot electrical equipment.

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by (as applicable) DA PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual; DA PAM 738-751, Functional Users Manual for The Army Maintenance Management Systems - Aviation (TAMMS-A); or AR 700-138, Army Logistics Readiness and Sustainability.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your multimeter needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you do not like about your equipment. Let us know why you do not like the design or performance. If you have Internet access, the easiest and fastest way to report problems or suggestions is to go to https://www.pdrep.csd.disa.mil/pdrep_files/accessforms/useraccess.htm, click on "Reporting Tools", under the PDREP Functionality and then click on "Product Quality Deficiency Report (PQDR). The Internet form lets you choose to submit an EIR, a Product Quality Deficiency Report (PQDR), or a Warranty Claim Action (WCA). You may also submit your information using an SF Form 368 (*Product Quality Deficiency Report*). You can send your SF Form 368 via e-mail, regular mail, or facsimile using the addresses/facsimile numbers specified in DA PAM 750-8, *TAMMS Users Manual*. We will send you a reply.

CORROSION PREVENTION AND CONTROL (CPC)

1. CPC of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.
2. Corrosion specifically occurs with metals. It is an electrochemical process that causes the degradation of metals. It is commonly caused by exposure to moisture, acids, bases, or salts. An example is the rusting of iron. Corrosion damage in metals can be seen, depending on the metal, as tarnishing, pitting, fogging, surface residue, and/or cracking.
3. Plastics, composites, and rubbers can also degrade. Degradation is caused by thermal (heat), oxidation (oxygen), solvation (solvents), or photolytic (light, typically UV) processes. The most common exposures are excessive heat or light. Damage from these processes will appear as cracking, softening, swelling, and/or breaking.
4. SF Form 368, *Product Quality Deficiency Report* should be submitted to the address specified in DA PAM 750-8, *TAMMS Users Manual*.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

For destruction of Army materiel to prevent enemy use, refer to TM 750-244-2.

PREPARATION FOR STORAGE OR SHIPMENT

The AN/GSM-437 Multimeter Set (Figure 1.) is a kit consisting of a digital multimeter, two specialty probes, operators manual, training CD, various supporting attachments and leads.

GENERAL INFORMATION - (CONTINUED)

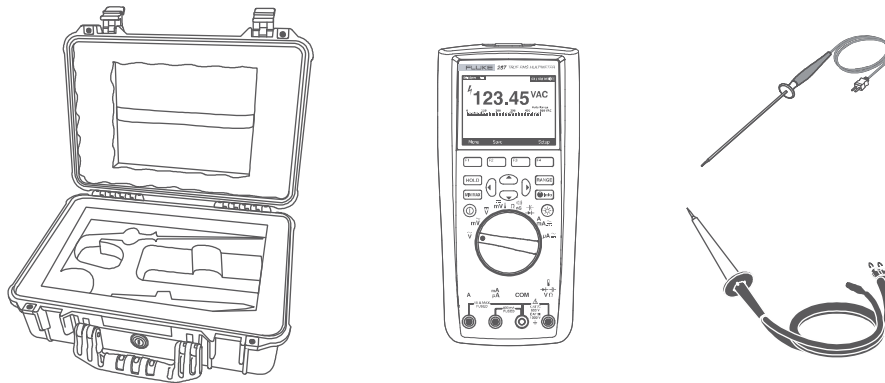


Figure 1. Major AN/GSM-437 Components

NOTE

Do not place any loose batteries into the hard case.

Hard case latches can be difficult to open or close. A hard strike with the palm of your hand may be required to engage the lock is in properly locked.

Prior to storage/shipment, perform the following steps:

1. Ensure that all components are clean and dry prior to storing them into the hard case.
2. If the AN/GSM-437 is to be in storage/inactive for more than three months, remove the six batteries from the multimeter (WP 0014) prior to stowage. Properly dispose the batteries.
3. Use the checklist located in the hard case to ensure that all components are present.
4. Ensure that both latches are properly engaged.
5. Install locking device(s), as desired.

NOMENCLATURE CROSS-REFERENCE LIST

Common names will be used when major components of the AN/GSM-437 Multimeter Set are mentioned in this manual.

NOTE

Official nomenclature must be used when filling out report forms or looking up Technical Manuals.

Table 1. Nomenclature Cross-Reference List

| Common Name | Official Nomenclature |
|-------------|---------------------------|
| AN/GSM-437 | AN/GSM-437 Multimeter Set |

LIST OF ABBREVIATIONS/ACRONYMS

NOTE

Refer to ASME Y14.38-2007, *Abbreviations and Acronyms*, for standard abbreviations.

GENERAL INFORMATION - (CONTINUED)

Table 2. List of Abbreviations/Acronyms

| ABBREVIATION/ACRONYM | DEFINITION |
|----------------------|---|
| Ω | ohms |
| A | Amperage |
| AAL | Additional Authorization List |
| AC | Alternating Current |
| ADC | Analog-to-Digital Converter |
| ASME | American Society for Mechanical Engineers |
| AUP | Acceptable Use Policy |
| BII | Basic Issue Item |
| BNC | Bayonet Neill Concelman (coaxial connector) |
| C | Celsius |
| CAGEC | Commercial And Government Entity Code |
| CAT | Common Table of Allowances |
| CCB | Configuration Control Board |
| CMB | Configuration Management Board |
| COEI | Components Of End Item |
| CON | Certificate of Networthiness |
| CPC | Corrosion Prevention and Control |
| CTA | Common Table of Allowances |
| dB | deciBel |
| dBm | power ratio in decibels (dB) of the measured power referenced to one milliwatt (mW) |
| dBV | power ratio in decibels (dB) of the measured power referenced to one milliwatt (mW) |
| DC | Direct Current |
| DISN | Defense Information System Network |
| ECP | Engineering Change Proposal |
| EIR | Equipment Improvement Recommendation |
| EMP | ElectroMagnetic Pulse |
| ESD | ElectroStatic Discharge |
| F | Fahrenheit |
| FIG | Figure |
| GIG | Global Information Grid |
| HCI | Hardness Critical Item |
| Hz | Hertz |
| IA | Information Assurance |
| IAM | Information Assurance Manager |
| IAW | In Accordance With |
| in | inch |
| IS | Information System |
| JTA | Joint Table of Allowances |
| LWN | Land War Network |
| mA | milliAmperage |
| MAC | Maintenance Allocation Chart |
| MAX | MAXimum |
| MIN | MINimum |
| ms | millisecond |
| MTOE | Modified Table of Organization and Equipment |
| mV | milliVoltage |
| ns | nanosiemens |
| NSN | National Stock Number |
| oz | ounce |
| PD TMDE | Product Director Test, Measurement, and Diagnostics Equipment |
| PIT | Platform IT |
| PMCS | Preventive Maintenance Checks and Services |

GENERAL INFORMATION - (CONTINUED)

| ABBREVIATION/ACRONYM | DEFINITION |
|-----------------------------|--|
| P/N | Part Number |
| PQDR | Product Quality Deficiency Report |
| QTY | QuantITy |
| Recm | Recommended |
| rms | root mean square |
| RPSTL | Repair Parts and Special Tools List |
| Rqr | Required |
| SMR | Source, Maintenance, Recoverable |
| TDA | Table of Distribution and Allowance |
| TE | Test and Evaluation |
| TM | Technical Manual |
| TMDE | Test, Measurement and Diagnostic Equipment |
| TOC | Table Of Contents |
| TOE | Table of Organization & Equipment |
| U/I | Unit of Issue |
| U/M | Unit of Measure |
| μA | microAmperage |
| UV | UltraViolet |
| V | Voltage |
| VA | Volt-Ampere |
| VAC | Voltage Alternating Current |
| VDC | Voltage Direct Current |
| VGA | Video Graphics Array |
| WCA | Warranty Claim Action |

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS

EQUIPMENT DESCRIPTION AND DATA

CHARACTERISTICS

The AN/GSM-437 Multimeter Set contains a multimeter and supporting attachments and probes. The multimeter is a true-rms digital multimeter with capabilities of measuring AC and DC voltage, AC and DC current, resistance, decibels, and temperature. The multimeter can display multiple values at the same time. It is highly accurate and provides many features which result in convenience of use. A high voltage probe and temperature probe are also included to provide the user with additional capabilities.

CAPABILITIES

- Zoom-on trend provides unprecedented ability to view and analyze recorded data; see detail at X5 magnification.
- Simplified Record screen when setting up for recording.
- Logging function with expanded memory for unattended monitoring of signals over time. Users can graphically review logged readings without a PC. Store up to 15,000 recorded events.
- Large 50,000 count, $\frac{1}{4}$ video graphics array (VGA) display with white backlight. Multiple sets of measurement information can be displayed at the same time.
- Logging function is an essential tool for documenting the performance of your designs, processes or systems, or unattended monitoring while you work on other projects. It plots measurements as a single line to help detect signal anomalies over time.
- i-info button provides built-in help screens for measurement functions.
- Name saved measurements and recall measurements made in the field.
- Real Time Clock - for automatic time-stamping of saved readings.
- Min/Max/Average with Time Stamp to record signal fluctuations.
- Softkeys/buttons allow for scrolling, easy navigation control, and access to secondary functions.
- True-rms AC voltage and current for accurate measurements on complex signals or non-linear loads.
- Temperature function can measure in degrees Fahrenheit ($^{\circ}$ F) or degrees Centigrade ($^{\circ}$ C).
- Relative mode to remove test lead resistance from low ohms or capacitance measurements.
- Temperature probe included in the AN/GSM-437 hard case.
- High voltage probe included in AN/GSM-437 hard case.
- Supporting multimeter leads and attachments included in AN/GSM-437 hard case.

EQUIPMENT DESCRIPTION AND DATA - (CONTINUED)

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

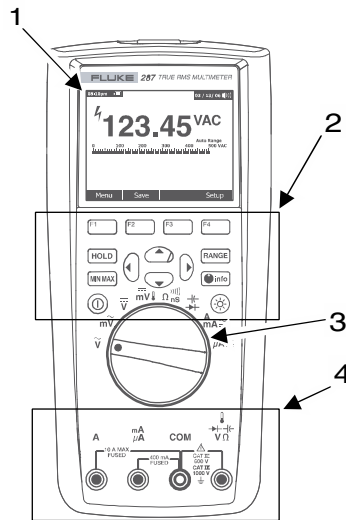
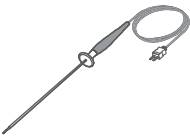



Figure 1. Major Multimeter Features

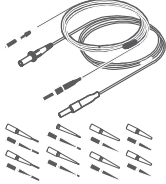


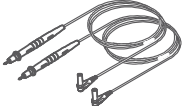



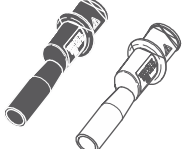
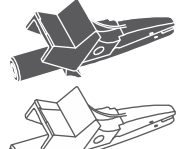
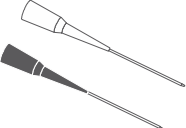
Table 1. Major Multimeter Features

| Item # | Component | Description |
|--------|------------------|--|
| 1 | Display | Large 50,000 count, 1/4 VGA display with white backlight. Multiple sets of measurement information can be displayed at the same time. |
| 2 | Softkeys/Buttons | The 14 softkeys/buttons on the front of the multimeter activate features that augment the rotary switch selected functions, navigate menus, or control power to multimeter. Buttons perform one function only, like turning the multimeter on and off. Softkeys are used to navigate through and select function options. |
| 3 | Rotary Switch | Used to select a primary measurement function by positioning the rotary switch to one of the icons around its perimeter. For each function, the multimeter presents a standard display for that function (range, measurement units, and modifiers). Button choices made in one function do not carry over into another function. |
| 4 | Terminals | All functions, except current, use the temp/diode/capacitance/volt/ohm and COM input terminals. The two current input terminals (A and mA/μA) are used as follows: Current from 0 to 400 mA, use the mA/uA and COM terminals. Current greater than 400 mA, use the A and COM terminals. |

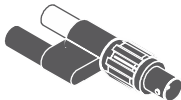

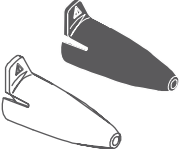
Table 2. Multimeter Attachments

| Component | Description |
|---|--|
|  | Temperature Probe - Measures temperature. It is located in the hard case and uses a special adapter (provided in the soft case) to attach to the multimeter. The multimeter can be set to display reading in degrees Fahrenheit (°F) or degrees Celsius (°C). |
|  | High Voltage Probe - Designed to extend the voltage measuring capability to 6,000 volts peak AC or DC Overvoltage Category I. This means the probe can only be used to take measurements on energy limited circuits within equipment. Examples include high voltage within televisions or photocopy machines. This probe should not be used to measure high voltages on power distribution systems. |

EQUIPMENT DESCRIPTION AND DATA - (CONTINUED)

| Component | Description |
|---|--|
|  | <p>Automotive Test Set - Consists of a set of black/red test leads and various sized probe tips. The tips are designed to insert into/fit over various sizes of pins/sockets found in connectors.</p> |
|  | <p>USB Interface Cable w/CD - A cable used to connect the multimeter to a computer. The CD contains the Windows drivers needed to make the connection. The cable is used when an upgrade to the multimeter operating firmware is required. Any upgrade should only be performed at the calibration facility. This IS will not be connected to any system or network without the express written consent of the Information Assurance Manager (IAM) and the CCB or CMB. See WP 0020 for additional Information Assurance Guidance.</p> |
|  | <p>Cable Assembly, Radio Frequency - This is a male BNC to BNC cable used to connect the multimeter inputs (using an adapter) to various pieces of equipment to measure wave signals such as sine waves and square waves.</p> |
|  | <p>Standard Test Lead Set - Used with the multimeter to take most measurements. Attachments for the probe tips are available in the soft case to assist in taking measurements.</p> |
|  | <p>Hook Probe Test Leads - Set of test leads (red/black) with built-in medium-sized hook probes. Hook probes are normally used to hook to a component when taking a measurement.</p> |
|  | <p>Test Lead Set - Right angle test leads (red/black) with no probes. User may attach appropriate probes for the measurement being taken.</p> |
|  | <p>Hook Clip Set - Attaches to the end of any test lead set. Hook probes are normally used to hook to a component when taking a measurement.</p> |
|  | <p>Large Alligator Clip Set - Set of two clips (red and black). Attaches to any test lead set. Used to attach to components when taking higher voltage measurements.</p> |
|  | <p>EX. Large Alligator Clip Set - Set of two clips (red and black). Attaches to multimeter probe tips and are used to attach to components when taking higher voltage measurements.</p> |
|  | <p>Fine Tip Attachment Set - Set of two probes (red and black). Attaches to the end of the standard probe set. Allows the user to access hard-to-reach components and allows for precision probe placement.</p> |

EQUIPMENT DESCRIPTION AND DATA - (CONTINUED)

| Component | Description |
|---|---|
|  | Adapter, Dual Banana Plug to F/BNC - Connects into multimeter terminals. Once connected, a BNC cable can be connected to the adapter to allow signal measurement. |
|  | Temperature Probe Adapter - Used with the temperature probe. The adapter plugs into the multimeter terminals and then the probe is plugged into the adapter. |
|  | Probe Covers - The caps effectively reduce the amount of exposed metal at the probe tip when measuring voltages that are considered CAT III or CAT IV measurement environments found in three-phase power systems. |

MULTIMETER SPECIFICATIONS

GENERAL SPECIFICATIONS: Maximum voltage between any terminal and earth ground: 1,000 V.

Table 3. General Specifications List

| | |
|--|--|
| Fuse protection for mA or μA inputs | 0.44 A (44/100 A, 440 mA), 1,000 V FAST fuse |
| Fuse protection for A input | 11 A, 1,000 V fuse |
| Battery type | Six, AA alkaline batteries, NEDA 15A IEC LR6 |
| Battery life | 100 hours minimum, 200 hours in logging mode. |
| Temperature Operating Storage | -4°F (-20°C) to 131°F (55°C) -40°F (-40°C) to 140°F (60°C) |
| Relative Humidity | 0% to 90% (32°F [0°C] to 99°F [37°C]) 0% to 65% (99°F [37°C] to 113°F [45°C]) 0% to 45% (113°F [45°C] to 151°F [55°C]) |
| Altitude Operating Storage | 9,843 feet (3,000 m) 32,808 feet (10,000 m) |
| Temperature Coefficient | 0.05 X (specified accuracy) /°C (<65°F [18°C] or >82°F [28°C]) |
| Vibration | Random Vibration per MIL-PRF-28800F Class 2 |
| Shock | 3.28 feet (1 meter) drop per IEC/EN 61010-1 2nd Edition |
| Size (HxWxL) | 8.75 in x 4.03 in x 2.38 in (22.2 cm x 10.2 cm x 6.0 cm) |
| Weight | 28.0 oz. (871 g) |
| Safety Standards US ANSI UL CSA CE European | Complies with ANSI/ISA 82.02.01 (61010-1) 2004 UL 61010 (2003) CAN/CSA-C22.2 No 61010-1-04 to 1000 V Measurement Category III and 600 V Measurement Category IV, Pollution Degree 2 IEC/EN 61010-1 2nd Edition Pollution Degree 2 |
| Electromagnetic Compatibility Standards (EMC) US FCC European EMC Australian EMC | FCC CFR47: Part 15 CLASS A EN61326-1 N10140 |
| Certifications | UL, CE, CSA, N10140 |

ADDITIONAL DATA

EQUIPMENT DESCRIPTION AND DATA - (CONTINUED)

Accuracy: Accuracy is specified for a period of one year after calibration, at 64°F to 82°F (18°C to 28°C), with relative humidity to 90%. Accuracy specifications are given as: \pm ([% of reading] + [number of least significant digits]). Accuracy specification assumes ambient temperature stable at $\pm 33.8^\circ\text{F}$ (1°C). For ambient temperature changes of $\pm 41^\circ\text{F}$ (5°C), rated accuracy applies after two hours.

True-rms: AC mV, AC V, AC μA , AC mA, and AC A specifications are AC-coupled, true-rms, and are specified from 2% of range to 100% of range, except 10 A range is specified from 10% to 100% of range.

Crest Factor: Accuracy is specified with AC crest factor ≤ 3.0 at full-scale, increasing linearly to 5.0 at half-scale, except the 1,000 V range, where it is 1.5 at full scale, increasing linearly to 3.0 at half-scale, and 500 mV and 5,000 μA , where it is ≤ 3.0 at 80% of full scale, increasing linearly to 5.0 at half-scale. For non-sinusoidal waveforms, add $\pm(0.3\%$ of range and 0.1% of reading).

AC Floor: When the input leads are shorted together in the AC functions, the multimeter may display a residual reading up to 200 counts. A 200-count residual reading will cause only a 20-count change for readings at 2% of range. Using REL to offset this reading may produce a much larger constant error in later measurements.

Table 4. AC Voltage Specifications

| Function | Range | Resolution | Accuracy | | | | |
|----------|-------------------|------------|-------------|-------------|-----------------|--------------|---------------|
| | | | 20 to 45 Hz | 45 to 65 Hz | 65 Hz to 10 kHz | 10 to 20 kHz | 20 to 100 kHz |
| AC mV | 50 mV [1] | 0.001 mV | 1.5% +60 | 0.3% +25 | 0.4% +25 | 0.7% +40 | 3.5% +40 [3] |
| | 500 mV | 0.01 mV | 1.5% +60 | 0.3% +25 | 0.4% +25 | 0.7% +40 | 3.5% +40 |
| AC V | 5 V [1] | 0.0001 V | 1.5% +60 | 0.3% +25 | 0.6% +25 | 1.5% +40 | 3.5% +40 [3] |
| | 50 V [1] | 0.001 V | 1.5% +60 | 0.3% +25 | 0.4% +25 | 0.7% +40 | 3.5% +40 |
| | 500 V [1] | 0.01 V | 1.5% +60 | 0.3% +25 | 0.4% +25 | Not Spec'd | Not Spec'd |
| | 1,000 V | 0.1 V | 1.5% +60 | 0.3% +25 | 0.4% +25 | Not Spec'd | Not Spec'd |
| dBV | -70 to -62 dB [2] | 0.01 dB | 3 dB | 1.5 dB | 2 dB | 2 dB | 3 dB |
| | -62 to -52 dB [2] | 0.01 dB | 1.5 dB | 1.0 dB | 1 dB | 1 dB | 2 dB |
| | -52 to -6 dB [2] | 0.01 dB | 0.2 dB | 0.1 dB | 0.1 dB | 0.2 dB | 0.8 dB |
| | -6 to +34 dB [2] | 0.01 dB | 0.2 dB | 0.1 dB | 0.1 dB | 0.2 dB | 0.8 dB |
| | 34 to 60 dB [2] | 0.01 dB | 0.2 dB | 0.1 dB | 0.1 dB | Not Spec'd | Not Spec'd |

[1] Below 5% of range, add 20 counts.

[2] dBm (600 Ω) is specified by adding +2.2 dB to the dBV range values.

[3] Add 2.5% above 65 kHz.

Table 5. AC Current Specifications

| Function | Range | Resolution | Accuracy | | | |
|----------------------|---------------------|--------------------|-------------|-------------|-------------|-------------------|
| | | | 20 to 45 Hz | 45 to 1 kHz | 1 to 20 kHz | 20 to 100 kHz [4] |
| AC μA [3] | 500 μA | 0.01 μA | 1% +20 | 0.6% +20 | 0.6% +20 | 5% +40 |
| | 5,000 μA | 0.1 μA | 1% +5 | 0.6% +5 | 0.6% +10 | 5% +40 |
| AC mA [3] | 50 mA | 0.001 mA | 1% +20 | 0.6% +20 | 0.6% +20 | 5% +40 |
| | 400 mA | 0.01 mA | 1% +5 | 0.6% +5 | 1.5% +10 | 5% +40 |

EQUIPMENT DESCRIPTION AND DATA - (CONTINUED)

| Function | Range | Resolution | Accuracy | | | |
|----------|----------|------------|-------------|-------------|-------------|-------------------|
| | | | 20 to 45 Hz | 45 to 1 kHz | 1 to 20 kHz | 20 to 100 kHz [4] |
| AC A [2] | 5 A | 0.0001 A | 1.5% +20 | 0.8% +20 | 3% +10 [4] | Not Spec'd |
| | 10 A [1] | 0.001 A | 1.5% +5 | 0.8% +5 | 3% +10 [4] | Not Spec'd |

[1] 10 A range (10% to 100% of range).
 [2] 20 A for 30 seconds on, 10 minutes off. >10 A not specified.
 [3] 400 mA continuous; 550 mA for two minutes on, one minute off.
 [4] Verified by design and type tests.

Table 6. DC Voltage Specifications

| Function | Range | Resolution | Accuracy | | | | |
|----------|-----------|------------|---------------|-------------------------------------|----------------|-------------|--------------|
| | | | DC [2] | AC over DC, DC over AC, AC + DC [2] | | | |
| | | | | 20 to 45 Hz | 45 Hz to 1 kHz | 1 to 20 kHz | 20 to 35 kHz |
| DC mV | 50 mV [3] | 0.001 mV | 0.05% +20 [4] | 2 % + 80 | 0.5 % + 80 | 1.5% +40 | 5% +40 |
| | 500 mV | 0.01 mV | 0.025% +2 [5] | | | 1.5% +40 | 5% +40 |
| DC V [1] | 5 V | 0.0001 V | 0.025% +2 | 2 % + 80 | 0.5 % + 80 | 1.5% +40 | 5% +40 |
| | 50 V | 0.001 V | 0.025% +2 | | | 1.5% +40 | 5% +40 |
| | 500 V | 0.01 V | 0.03% +2 | | | Not Spec'd | Not Spec'd |
| | 1,000 V | 0.1 V | 0.03% +2 | | | Not Spec'd | Not Spec'd |

[1] Add 20 counts in dual display AC over DC, DC over AC, or AC+DC.
 [2] AC+DC ranges are specified from 2% to 140% of range, except 1,000 V is specified from 2% to 100% of range.
 [3] When using the relative mode (REL Δ) to compensate for offsets.
 [4] Add 4 counts/10 mV AC in dual display AC over DC, DC over AC, or AC + DC
 [5] Add 10 counts/100 mV AC in dual display AC over DC, DC over AC, or AC + DC.

Table 7. DC Current Specifications

| Function | Range | Resolution | Accuracy | | | | |
|-----------|----------|------------|---------------|-------------------------------------|----------------|-------------|--------------|
| | | | DC [1][3] | AC over DC, DC over AC, AC + DC [1] | | | |
| | | | | 20 to 45 Hz | 45 Hz to 1 kHz | 1 to 20 kHz | 20 to 35 kHz |
| DC μA [4] | 500 μA | 0.01 μA | 0.075% +20 | 1% +20 | 0.6% +20 | 0.6% +20 | 5% +40 |
| | 5,000 μA | 0.1 μA | 0.075% +2 | 1% +5 | 0.6% +5 | 0.6% +10 | 5% +40 |
| DC mA [4] | 50 mA | 0.001 mA | 0.05% +10 [6] | 1% +20 | 0.6% +20 | 0.6% +20 | 5% +40 |
| | 400 mA | 0.01 mA | 0.15% +2 | 1% +5 | 0.6% +5 | 1.5% +10 | 5% +40 |
| DC A [2] | 5 A | 0.0001 A | 0.3% +10 | 1.5% +20 | 0.8% +20 | 3% +10 [5] | Not Spec'd |
| | 10 A | 0.001 A | 0.3% +2 | 1.5% +10 | 0.8% +10 | 3% +10 [5] | Not Spec'd |

[1] AC+DC ranges are specified from 2% to 140% of range.
 [2] 20 A for 30 seconds on, 10 minutes off. >10 A not specified.
 [3] Add 20 counts in dual display AC over DC, DC over AC or AC+DC.
 [4] 400 mA continuous; 550 mA for two minutes on, one minute off.
 [5] Verified by design and type tests.
 [6] Temperature coefficient: 0.1 X (specified accuracy) / °F (<64.4°F or > 82.4°F) or / °C (<18 °C or > 28 °C)

EQUIPMENT DESCRIPTION AND DATA - (CONTINUED)

Table 8. Resistance Specifications

| Function | Range | Resolution | Accuracy |
|-------------------------------------|------------------------------------|-------------------|------------|
| Resistance | 50 Ω [1] | 0.001 Ω | 0.15% + 20 |
| | 500 Ω [1] | 0.01 Ω | 0.05% + 10 |
| | 5 k Ω [1] | 0.0001 k Ω | 0.05% + 2 |
| | 50 k Ω [1] | 0.001 k Ω | 0.05% + 2 |
| | 500 k Ω | 0.01 k Ω | 0.05% + 2 |
| | 5 M Ω | 0.0001 M Ω | 0.15% + 4 |
| | 30 M Ω | 0.001 M Ω | 1.5% + 4 |
| | 50 M Ω | 0.01 M Ω | 1.5% + 4 |
| | 50 M Ω up to 100 M Ω | 0.1 M Ω | 3.0% + 2 |
| 100 M Ω up to 500 M Ω | 0.1 M Ω | 8% + 2 | |
| Conductance | 50 nS [2] | 0.01 nS | 1% + 10 |

[1] When using the relative mode (REL Q) to compensate for offsets.
[2] Add 20 counts above 33 nS in 50 nS range.

Table 9. Temperature Specifications

| Temperature | Resolution | Accuracy [1,2] |
|--------------------|------------|----------------|
| -200°C to +1,350°C | 0.1°C | 1% + 10 |
| -328°F to +2,462°F | 0.1°F | 1% + 18 |

[1] Does not include error of the thermocouple probe.
[2] Accuracy specification assumes ambient temperature stable to $\pm 1.8^\circ\text{F}$ ($\pm 1^\circ\text{C}$). For ambient temperature changes of $\pm 9^\circ\text{F}$ ($\pm 5^\circ\text{C}$), rated accuracy applies after two hours.

Table 10. MIN MAX, Recording, and Peak Specifications

| Function | Nominal Response | Accuracy |
|-----------------------|--------------------------------|--|
| MIN MAX, Recording | 200 ms to 80% (DC function) | Specified accuracy ± 12 counts for changes > 425 ms in duration in manual range. |
| | 350 ms to 80% (AC function) | Specified accuracy ± 40 counts for changes > 1.5 seconds in duration in manual range. |
| Peak | 250 μS (peak) [1] | Specified accuracy ± 100 counts [2] up to 5,000 count (full range) reading. For higher peak reading (to 12,000 counts), specified accuracy $\pm 2\%$ [3] of reading. |
| Crest Factor | 350 ms to 80% | For periodic waveforms from 50 to 440 Hz $\pm (4\% + 1 \text{ count})$. |

[1] For repetitive peaks; 2.5 ms for single events. Peak not specified for 500 μA DC, 50 mA DC, 5 A DC.
[2] 200 counts in 500 mV AC, 500 μA AC, 50 mA AC, 5 A AC.
[3] 3% in 500 mV AC, 500 μA AC, 50 mA AC, 5 A AC.

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS

THEORY OF OPERATION

INTRODUCTION

This work package provides a theory of operation of a digital multimeter and functional descriptions of multimeter functions and how they are used. Functions that are specific to an individual operation are covered in WP 0005/WP 0006, "Operation Under Usual/Unusual Conditions".

THEORY OF OPERATION

A digital multimeter is essentially a voltage-to-display device. Because a voltage difference between two input terminals is measured, the multimeter will have a differential amplifier (diff amp) front end that operates over a range and shifts an input signal into a range and DC offset compatible with an analog-to-digital converter (ADC) that has a multiple-digit decimal output.

Selecting voltage, current, resistance, temperature, etc. is done by the rotary switch. Once a mode is selected, the multimeter has many supporting functions that can be selected through a various menu selections. Many of these functions are described in the upcoming sections.

Controlling Multimeter Power

The multimeter is powered by six AA batteries and controlled through a front panel power switch and internal circuits designed to help conserve battery power. The following describes several techniques for controlling multimeter power.

NOTE





Collected data is retained when the multimeter is turned off while in record, MIN MAX record, or Peak record modes. The next time the multimeter is turned on, the display shows the collected data in stopped mode. Pressing the function softkey labeled Save (F2) will save the data.

The multimeter will display a "Batteries low" message whenever the battery level will not support a selected function.


Powering the Multimeter On and Off Manually - with the multimeter off, press On/Off button to turn on the multimeter. Pressing On/Off button while the multimeter is on causes it to turn off.

Battery Level Indicator - the battery level indicator in the upper left-hand corner of the display indicates the relative condition of the batteries. Table 1 describes the various battery levels the indicator represents.

Table 1. Battery Capacity

| Indication | Battery Capacity |
|---|----------------------|
|  | Full capacity (100%) |
|  | 3/4 capacity (75%) |
|  | 1/2 capacity (50%) |
|  | 1/4 capacity (25%) |

THEORY OF OPERATION - (CONTINUED)

| Indication | Battery Capacity |
|--|--|
|  | Almost empty (less than one day) (almost 0%) [1] |
| [1] when critically low, a “Replace Batteries” pop-up message appears 15 seconds before the multimeter shuts down. | |

Automatic Power-Off - the multimeter automatically turns off if the rotary switch is not moved or a softkey/button is not pressed for 15 minutes (default). Pressing the On/Off button will turn the multimeter back on after it is powered off automatically. To change the timeout period or completely disable automatic power-off, refer to “Setting Backlight and Auto Off Timeouts” later in this chapter.

Battery Saver Mode - if Auto Off is enabled (set to a time period), and MIN MAX record, Peak record, Recording, or AutoHold is enabled, the multimeter will enter a battery-saver mode if a softkey/button is not pressed or the rotary switch is not moved for a set period of time. For the recording mode, the time period is five minutes. For MIN MAX, Peak, and AutoHold modes, the time period is the same as was set for the Auto Off feature. (See the “Setting Backlight and Auto Off Timeouts” section later in this chapter.) Battery saver mode conserves battery power by shutting down circuits not necessary for the selected function, including the display. However, the LED surrounding the On/Off button will continue to flash to indicate the multimeter is still collecting data.

The multimeter “wakes up” from battery-save mode under the following conditions:

- A softkey/button is pressed.
- The rotary switch is moved.
- A lead is removed or inserted into a current input jack.
- The multimeter changes range.

These conditions, with the exception of moving the rotary switch, only awaken the multimeter and do not change the multimeter’s function or mode of operation.

Controlling the Backlight

If viewing the display becomes difficult in low-light conditions, press the backlight button to activate the LCD backlight. When depressed, the backlight button cycles the backlight through three states: low, high, and off. The multimeter displays a message if the battery level will not support the backlight operation.

To conserve battery life, a user-adjustable timeout controls how long the backlight stays on. The default timeout is five minutes. To change the timeout, refer to “Setting Backlight and Auto Off Timeouts” later in this chapter.

Selecting the Range

The multimeter’s selected range is always displayed above the right-hand end of the bar graph as shown in Figure 1.. Pressing the RANGE button switches the multimeter between manual and auto-ranging. It also cycles through the multimeter ranges when manual ranging is enabled.

THEORY OF OPERATION - (CONTINUED)

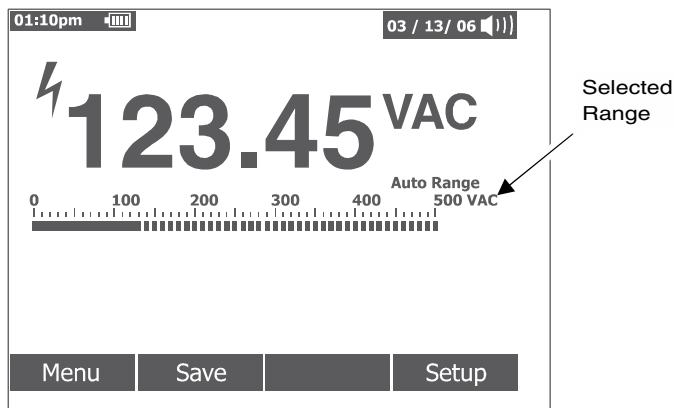


Figure 1. Range Indicator

NOTE

You cannot use the RANGE button in conductance, diode test, and temperature functions. These functions all use a fixed range.

In auto-range, the multimeter selects the lowest range to display the highest available precision (resolution) for the input signal. If manual range is already enabled, press and hold the RANGE button for one second to enter the auto-ranging mode.

If auto-range is enabled, press the RANGE button to enter manual ranging. Each additional press of the RANGE button sets the multimeter to the next higher range (unless it is already in the highest range, at which point the range switches to the lowest range.)

Understanding Function Menus

Each primary measurement function (rotary switch position) has a number of optional sub-functions or modes accessed by pressing the softkey labeled Menu (F1). A typical menu is shown in Figure 2..

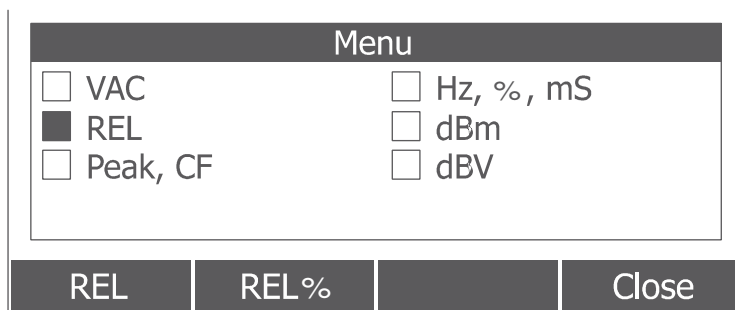


Figure 2. Function Menu

Menu selection is indicated by the filled-in black square (hereafter referred to as the menu selector) to the left of a menu item. Use the four arrow softkeys to position the menu selector next to a menu item. As the menu selector moves between menu items, the four Function softkeys and their labels change to reflect the available functions and/or modes available for the selection menu item.

The example menu in Figure 2. shows the REL (Relative) function as the current selection. The function selected when the menu opens is the function selected the last time the menu was used. To access the Hz menu item from the REL item, press the right arrow softkey once, followed by one press of the up arrow softkey. As the menu

THEORY OF OPERATION - (CONTINUED)

selector moves between the menu items, the softkey labels change to indicate each softkey's function. Once the desired function or mode appears in one of the softkey labels, press the appropriate F1–F4 (it would be F2 in above example) softkey to activate it. The pop-up menu closes and the display changes to reflect the selection just made. Pressing the softkey labeled Close (F4) closes the pop-up menu, leaving the multimeter in the state it was in before pressing the Menu (F1) softkey.

In most cases, the softkeys revealed by the menu selection act like toggles. The example menu shown in Figure 2. shows REL, REL%, and Close softkey labels. In this example, the multimeter is not in the relative mode, so pressing the softkey labeled REL would activate, or toggle, the relative mode. If, on the other hand, the multimeter is already in the relative mode, pressing the same softkey would disable the relative function.

In some cases, pressing a function that cannot be used with other functions appearing in the menu turns off the previously selected function. For example, in Figure 2., if the multimeter is already in the relative function, pressing REL% causes the multimeter to turn off relative and display relative percent.

In cases where multiple modes have been selected, selecting the first (top-left) menu item always turns off all other functions and modes, and returns the multimeter to the primary function selected by the rotary switch. For example, assume that the multimeter is set up for frequency (Hz) and is displaying in relative mode as selected through the menu in Figure 2.. Moving the menu selector to the menu item labeled VAC and pressing the softkey labeled VAC clears both frequency and relative selections, leaving the multimeter in volts AC only.

Menu selections are remembered for each rotary switch position. For example, selecting REL for the volts AC position causes REL to be selected the next time the menu is opened in volts AC, even though in the interim, Hz,%ms was selected from a similar menu for the millivolts AC function.

Up to two columns of four items each are displayed at any one time. If more than eight menu items are available for a primary function, back-to-back arrows appear in the lower right-hand corner of the page area of the display, indicating that more menu items are available. With the menu selector on one of the items in the left column, press the left arrow softkey to scroll the screen horizontally and reveal the off-screen menu items. Conversely, with the menu selector on an item in the right-hand column, press the right arrow softkey to reveal the off-screen menu items.

Input Alert™ Feature

If a test lead is plugged into the mA/μA or A terminal, but the rotary switch is not set to the correct current position, the beeper sounds (if the beeper function is enabled) and the multimeter displays "Leads connected incorrectly". This warning is intended to stop you from attempting to measure voltage, continuity, resistance, capacitance, or diode values when the leads are plugged into a current terminal.

Using the info Button

While operating the multimeter, more information about a selected function, a front-panel button, or a menu item may be necessary. Press the info button to open an information window that lists topics covering the functions and modifiers that are available at the time the button is pressed. Each topic provides a brief explanation on a multimeter function or feature.

The information revealed when the info button is depressed is not meant to replace the more detailed information found in this manual. Function and feature explanations are brief and only meant to refresh a user's memory.

The number of information topics displayed at any one time may exceed the display area. Use the down arrow softkey and the up arrow softkey to move from topic to topic. Use the button labeled More, or the down arrow softkey and the up arrow softkey to scroll through the information a full screen at a time.

Pressing the softkey labeled Close (F4) or the info button will close the information window.

Hold and AutoHold Mode

To freeze the display for any function, press the HOLD button. Only the mini-measurement display and hazardous voltage icon (a lightning bolt) continue to indicate the actual input. The battery level indicator is also active. The multimeter's function softkeys are relabeled for saving the frozen reading or activating the AutoHold mode.

THEORY OF OPERATION - (CONTINUED)

If the HOLD button is pressed while MIN MAX record, peak record, or a recording session is in progress, the display freezes but the data acquisition continues in the background. Pressing the HOLD button again updates the display to reflect data that was acquired during the hold.

Pressing the softkey labeled AutoHOLD (F1) activates AutoHold if the multimeter is not in the Peak, MIN MAX, or Record modes. AutoHold operation monitors the input signal and updates the display and, if enabled, sounds the beeper, whenever a new stable measurement is detected. A stable measurement is one that does not vary more than a selected adjustable percentage (AutoHold threshold) for at least one second. The multimeter filters out open lead conditions so the multimeter leads can be moved between test points without triggering a display update.

NOTE

For temperature measurements, the AutoHold threshold is a percent of 100 degrees. The default AutoHold threshold is 4% of 100 degrees, or 4 degrees Fahrenheit or Celsius.

Pressing the HOLD button while in AutoHold mode forces the multimeter's display to update with the present measurement, just as if a stable measurement had been detected.

To set the AutoHOLD Threshold Value, press the button labeled Setup (F4) to access the setup menu. Using the cursor buttons, move the menu selector next to the menu item labeled Recording and press the softkey labeled Recording (F1) to open the recording setup screen. Using the cursor buttons, move the menu selector next to the menu item labeled Event Threshold for AutoHOLD and then press the softkey labeled Edit (F1). Press the up or down softkeys to scroll through the AutoHold threshold values. With the desired value selected, press the softkey labeled Close (F4).

Measuring Crest Factor

Crest factor is a measure of signal distortion and is calculated as a signal's peak value over its rms value. This is an important measurement when looking at power quality issues.

The multimeter's crest factor function is only available for the AC measurements: Vac, mVac, Aac, mAac, and μ Aac. With the multimeter in one of the AC measurement functions, press the softkey labeled Menu (F1). Using the arrow softkeys, move the menu selector next to the menu item labeled Peak,CF and press the softkey labeled CF (F2). The crest factor value is shown in the primary display, while the AC measurement appears in the secondary display. Frequency, duty cycle, and pulse width are not allowed during crest factor measurements.

Capturing Peak Values

Peak record is almost the same as MIN MAX record explained earlier in this manual. The significant difference between the two recording functions is the shorter response time for peak recording: 250 μ s. With this short response time, the actual peak values of a sinusoidal signal are measurable. Transients are more accurately measured using the peak record feature.

To activate the peak mode, press the softkey labeled Menu (F1). Using the arrow softkeys, move the menu selector next to the menu item labeled Peak, CF or Peak. Press the softkey labeled Peak (F1) to start the peak recording session.

As shown in Figure 3., the primary display shows the "live" measurement present on the multimeter's inputs. In the secondary area of the display, the maximum and minimum peak values, as well as the average value, are shown along with their respective time stamps. The time stamp next to the average value indicates the elapsed time of the peak recording session. The peak recording session start time is shown along the bottom of the page area of the display.

THEORY OF OPERATION - (CONTINUED)

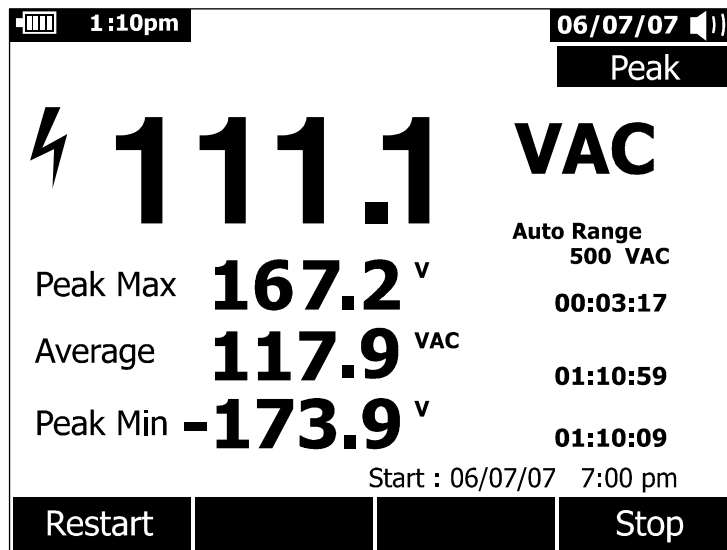


Figure 3. Peak Record Display

When the peak value of the input signal goes below the recorded minimum value or above the recorded maximum value, the multimeter beeps and records the new value. At the same time, the elapsed time since the peak recording session was started is stored as the recorded value's time stamp.

Pressing the softkey labeled Restart (F1) will restart the recording session. Pressing the softkey labeled Stop (F4) ends the peak recording session. The summary information in the display freezes and the softkeys change function to allow saving the collected data. Pressing the softkey labeled Close (F4) exits the peak recording session without saving the collected data.

NOTE

Turning the rotary switch before saving the peak recording data will cause all the accumulated data to be lost.

To save peak screen data, the peak capture session must be ended by pressing the softkey labeled Stop (F4). Next press the softkey labeled Save (F2). A dialog box opens where the default saved name can be selected or another name assigned. Press the softkey labeled Save (F1) to store the Peak screen data. Peak capture cannot be continued at this point. Press the softkey labeled Close (F4) to exit the Peak capture mode.

Pressing the softkey labeled Restart (F1) while the peak recording session is running stops the session, discards all peak recorded data, and immediately starts a new peak record session.

To extend battery life during peak record, the multimeter enters a battery-saver mode after a period of time set for the Auto Off feature. See the "Setting Backlight and Auto Off Timeouts" section for more information on the battery saver mode.

CHANGING MULTIMETER SETUP OPTIONS

The multimeter has a number of preset features such as date and time formats, backlight and battery-saver mode timeouts, and the displayed language. These variables are referred to as multimeter setup options. Many setup options affect general multimeter operations and are active in all functions. Others are limited to one function or group of functions.

Access to the setup options is always available through the softkey labeled Setup (F4). Use the arrow softkeys to navigate through the Setup options. Information about the multimeter, such as serial number and model, is also accessed through the setup menu.

THEORY OF OPERATION - (CONTINUED)**Resetting Multimeter Setup Options**

The multimeter's setup options can be reset to default values through the setup menu. Open the setup menu by pressing the softkey labeled Setup (F4). Using the arrow softkeys, position the menu selector next to the menu item labeled Reset and press the softkey labeled Setup (F2). A message will appear asking to confirm the reset action. Press the softkey labeled OK (F1) to perform the reset.

NOTE

A setup reset also resets the temperature offset and dBm references to their default value.

To clear all saved measurement screens, MIN MAX screens, peak screens, and recording records, open the setup menu by pressing the softkey labeled Setup (F4). Using the arrow softkeys, position the menu selector next to the menu item labeled Reset and press the softkey labeled Meter (F3). A message will appear asking to confirm the reset action. Press the softkey labeled OK (F1) to perform the reset.

Setting Display Contrast

Multimeter display contrast can be adjusted through the multimeter's setup menu. Open the setup menu by pressing the softkey labeled Setup (F4) and position the menu selector next to the menu item labeled Contrast. Pressing the softkey labeled + (F1) increases display contrast, while the softkey labeled - (F2) decreases contrast. When contrast has been set to desired level, press the softkey labeled Close (F4).

Contrast can also be set through the up and down arrow softkeys when not being used to move between menu selections.

Setting the Multimeter's Language**NOTE**

Only the text found within the info function of the multimeter is affected by the language setting on the multimeter. The multimeter display will continue to show English no matter what the setting of the language.

The multimeter comes from the factory with the display language set to English. To select another language, open the setup menu by pressing the softkey labeled Setup (F4). Using the arrow softkeys, move the menu selector next to the menu item labeled Display. Next, press the softkey labeled Format (F2) to open the format menu. If not already selected, move the menu selector to the left of the menu item labeled Language and press the softkey labeled Edit (F1). The currently selected language becomes highlighted. Use the up and down arrow softkeys to scroll through the available languages, then press the softkey labeled OK (F1) to set the multimeter's display language. Press the softkey labeled Close (F4) to return to normal multimeter operation.

Setting Backlight and Auto Off Timeouts

The multimeter's backlight and auto off features use timers to determine when to turn off the backlight, when to automatically turn the multimeter off, or enable the battery saver-mode. To set these timeouts, press the softkey labeled Setup (F4). Using the arrow softkeys, position the menu selector next to the menu item labeled Instrument. Press the softkey labeled Instrument (F1). Use the up and down arrow softkeys to position the menu selector next to the menu item labeled Auto Backlight Timeout, or Auto Power Off, and then press the softkey labeled Edit (F1). Use the up and down arrow softkeys to adjust the time to one of the preset values. Select Off to disable the timeout feature. Press the softkey labeled OK (F1) to set the selected time. Press the softkey labeled Close (F4) to return to normal multimeter operation.

The battery-saver mode is used when the multimeter is performing a recording session or during MIN MAX, Peak record and AutoHold. The battery-saver mode powers down circuits that are not involved in the operation of these recording sessions, including the display. For the record mode, the timeout period is set to five minutes and is enabled only when the Auto Power Off timeout is set to a value other than Off. For MIN MAX, Peak, and AutoHold, the timeout is the time period set for Auto Off.

THEORY OF OPERATION - (CONTINUED)

Disabling and Enabling the Beeper

The multimeter's beeper alerts users to the presence of messages, operator errors such as incorrect lead connections for the selected function, and newly sensed values for MIN MAX and Peak recording. Although the beeper is also used for the continuity function, controlling the beeper for that function is not done through this setup option. See the "Current Measurement Modes" section (WP 0004) for information on the continuity beeper.

To disable/enable the beeper, press the softkey labeled Setup (F4). Using the arrow softkeys, position the menu selector next to the menu item labeled Instrument. Press the softkey labeled Instrument (F1). Using the arrow softkeys, position the menu selector next to the menu item labeled Beeper. Press the softkey labeled Edit (F1) and the beeper status will light up. Use the up or down arrow softkeys to switch the beeper on or off. Once selected, press the softkey labeled OK (F1) to select the beeper mode. Press the softkey labeled Close (F4) to return to the main multimeter display. The status of the beeper is indicated in the display's status bar (see Figure 4., Beeper Status).

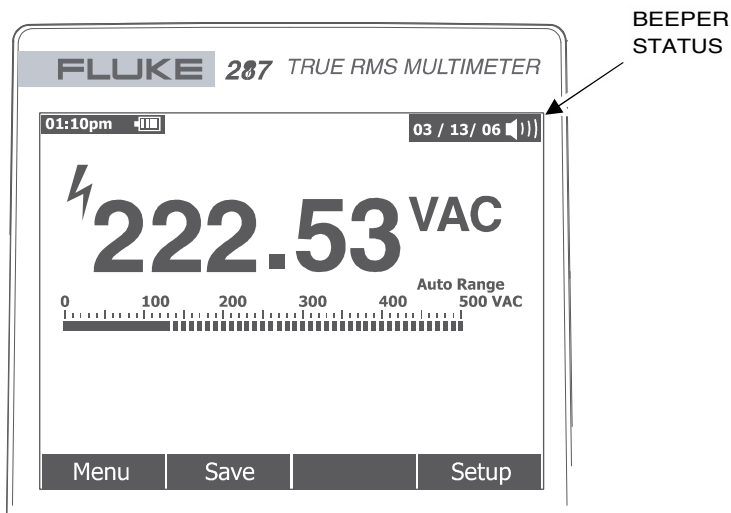


Figure 4. Beeper Status

Enabling and Disabling the Smoothing Mode

When an AC input signal is noisy or changes rapidly, the smoothing mode may display a steadier reading. To enable or disable the smoothing mode, press the softkey labeled Setup (F4). Using the arrow softkeys, position the menu selector next to the menu labeled Instrument. Press the softkey labeled Instrument (F1). Using the arrow softkeys, position the menu selector next to the menu item labeled Smoothing. Press the softkey labeled Edit (F1) and the smoothing mode status will light up. Use the up and down arrow softkeys to switch the smoothing mode on or off. Once selected, press the softkey labeled OK (F1) to select the smoothing mode. Press the softkey labeled Close (F4) to return to normal multimeter operation.

USING MEMORY

The multimeter has memory for storing individual measurements, measurements collected over a specified duration, and measurement events.

All stored data can be viewed on the multimeter.

Storing Individual Measurement Data

For all measurement functions, a snapshot of the screen data is saved by pressing the softkey labeled Save (F2). Except for the mini-measurement in the status bar, the display freezes and the Save menu appears. Two choices allow either saving the data under a previously selected name or choosing another name by pressing the softkey

THEORY OF OPERATION - (CONTINUED)

labeled +Name (F1). See the “Naming Saved Data” section below. The displayed data is stored along with the date and time the save was performed.

For MIN MAX and Peak, the displayed summary data can be stored at any time by pressing the softkey labeled Save (F2), thus preserving a snapshot of the session at that moment.

Naming Saved Data

The multimeter has a list of eight preset names under which measurement data is saved. Multiple records can be saved using the same name. For example, one preset name is Save. The first time a save operation is performed with that name, Save-1 is used to name the record in memory. The next time the Save name is used, the number increments to 2 and the record is saved under the name of Save-2. The auto-incrementing number can be reset to 1 by positioning the menu selector next to the save name and then pressing the softkey labeled Reset #.

To save a screen shot, a recording session, or MIN MAX or Peak record session, press the softkey labeled Save (F2).

To save to the same name as before, but with the next number, press the softkey labeled Save (F2). This method makes it easy to save a series of measurements simply by pressing the Save softkey (F2) twice for each save operation.

To select the name from the preset list, press the softkey labeled +Name (F1). Position the menu selector next to the desired name using the cursor buttons. Next press the softkey labeled Save (F1).

Viewing Memory Data

Viewing data stored in the multimeter’s memory is performed through the save menu. Press the softkey labeled Save (F2). Position the menu selector next to the menu item labeled View Memory and press the softkey labeled View (F1).

NOTE

To view data stored in memory, the multimeter must not be recording or performing a MIN MAX or peak record session.

The multimeter separates stored data into four different categories: Measurement, MIN MAX, Peak, and Recording. Use the cursor buttons to position the menu selector next to the desired saved data category and then press the softkey labeled View (F1). The multimeter displays the last record saved for the selected data category.

If there are previously stored records, press the softkey labeled Prev (1) or left arrow softkey to page back through previously stored records. Press the softkey labeled Next (F2) or right arrow softkey to page in the other direction. Press Close (F4) to return to normal multimeter operation.

Viewing Snapshot and Summary Data

After selecting the MIN MAX, Peak, or Measurement category described in the Viewing Memory Data section above, pressing View (F1) only displays the information stored at the time a Save was performed. The display is reconstructed from this data when viewed.

Viewing Trend Data

For the Recording category, the interval and event data stored during a recording session are viewed on the multimeter through a trend-plot view, similar to a strip-chart recorder. See the “Recording Measurement Data” section later in this manual for an explanation of interval and event data.

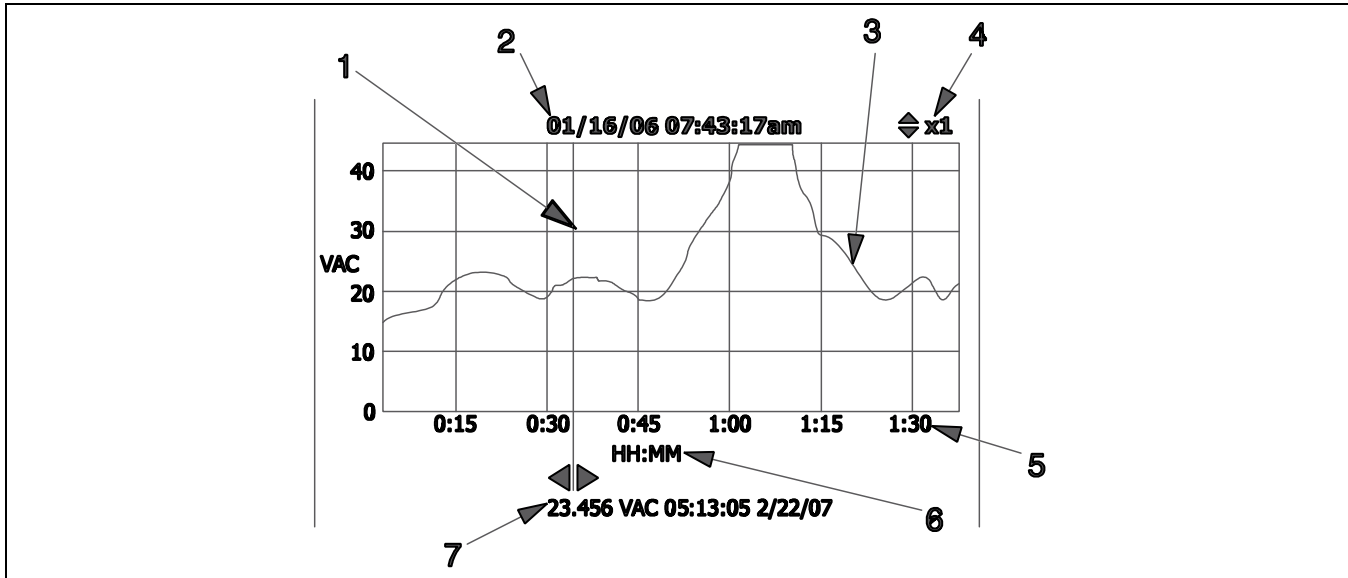
After selecting the recording category described in the Viewing Memory Data section above and pressing softkey labeled View (F1), the recording session’s summary screen is displayed (See Table 2, Trend Data Display). Press the softkey labeled Trend (F3) to display the recorded data in a trend-plot view. Table 2 shows the trend view along with a description of each of its components.

To look at data stored in the individual records that make up the trend, move the cursor to any point along the plot by pressing the left or right arrow softkey. The value and timestamp of the minimum, maximum, and end-of-record

THEORY OF OPERATION - (CONTINUED)

values of the selected record are displayed at the bottom of the cursor. All data contained in a record can only be viewed on a PC running FlukeView Forms.

Table 2. Trend Data Display



| Item | Description |
|------|--|
| 1 | Cursor |
| 2 | Start date and time |
| 3 | Trend line |
| 4 | Zoom level |
| 5 | Elapsed time. (units in hours and minutes, or minutes and seconds) |
| 6 | Time scale legend (HH:MM or MM:SS) |
| 7 | Measured value and timestamp of selected record |

Zooming in on Trend Data

While viewing trend data, pressing the up or down arrow softkeys zooms in or out respectively on the data around the cursor. Each press of the up arrow softkey reduces the x-axis time period by one-half to reveal more details. Each press of the down arrow softkey doubles the time period until all the recorded data is displayed. The zoom level is displayed in the upper right-hand corner of the display. X1 indicates that the trend of the complete recording period is displayed. X2 is one-half the recording time. X3 is one-fourth the recording time. This magnification can continue until the x-axis time period is one second.

Deleting Stored Measurement Data

Deleting data stored in the multimeter’s memory is performed through the save menu.

Press the softkey labeled Save (F2). Use the cursor buttons to position the menu selector next to Delete, then press the softkey labeled Open (F1).

The multimeter separates stored data into four categories: Measurement, MIN MAX, Peak, and Recording. Use the cursor buttons to position the menu selector next to a saved data category.

To delete individual stored data, press the softkey labeled View (F1). If there is stored data for the category selected, the multimeter will beep twice if the multimeter is active. Use the softkeys labeled Prev (F1) and Next (F2) to select an item for deletion. Next, press the softkey labeled Delete (F3).

To delete all stored data, press the softkey labeled Delete All (F3). Once the “Delete all Measurement Data?” confirmation message is displayed, press the softkey labeled OK (F1). This will delete all the multimeter’s stored data.

THEORY OF OPERATION - (CONTINUED)**RECORDING MEASUREMENT DATA**

The multimeter's record feature collects measurement information over a user-specified duration. This collection of information is called a recording session. A recording session is made up of one or more measurement records. Each record contains measurement summary information covering the duration of the record.

Each record contains the minimum, maximum, and average value detected over the record's duration. In addition to measurement values, timestamps are also captured and saved with each record. The timestamps consist of the record start time, the time the maximum value was detected, the time the minimum value was detected, and the record end time.

NOTE

This IS will not be connected to any system or network without the express written consent of the Information Assurance Manager (IAM) and the CCB or CMB. See WP 0020 for additional Information Assurance Guidance.

Some of a record's data can be viewed through the multimeter's Viewing Trend Data function. Viewing all the data that makes up a record can only be viewed on a PC running FlukeView Forms software.

There are two measurement record types that are captured during a recording session: interval and event. An interval record covers a user-specified interval. An event record has a duration determined by the activity of the measured signal and can interrupt an interval record. Even if an interval record is interrupted, a record will end and a new interval record will begin when the scheduled interval time expires.

Event records are triggered by the measured signal varying more than an adjustable percentage of the value measured at the start of the record. This adjustable percent is called the Event Threshold for recording. In addition to the values and timestamps mentioned above, an event record also stores whether the signal was stable or unstable during the event record duration. To be classified as stable, the measured signal's value must stay within the selected percentage of the start value for at least one second. Measured signals that exceed the percentage threshold in less than one second are classified as unstable. See the "Setting the Event Threshold Value" in this section.

NOTE

For temperature measurements, the AutoHold threshold is a percent of 100 degrees. The default AutoHold threshold is 4% of 100 degrees, or 4 degrees Fahrenheit or Celsius.

A record ends when one of the following occurs:

- The start of a new interval record.
- A range overload, causing the multimeter to change range.
- A non-ranging overload, when in manual range or the highest range.
- The measured value changes more than 4% of the measured value at the start of the record.
- The recording session terminates.

A recording session termination can be caused by one of the following:

- Recording session duration expiring.
- Manually stopping the recording session.

Setting up a Recording Session

A typical recording display can be seen in Table 3. The table also describes each section of the display as related to the recording session.

Before starting a recording session, set up the multimeter for the measurements to be recorded. If needed, change the event threshold value (see "Setting the Event Threshold Value" in this section). Press the softkey labeled Save

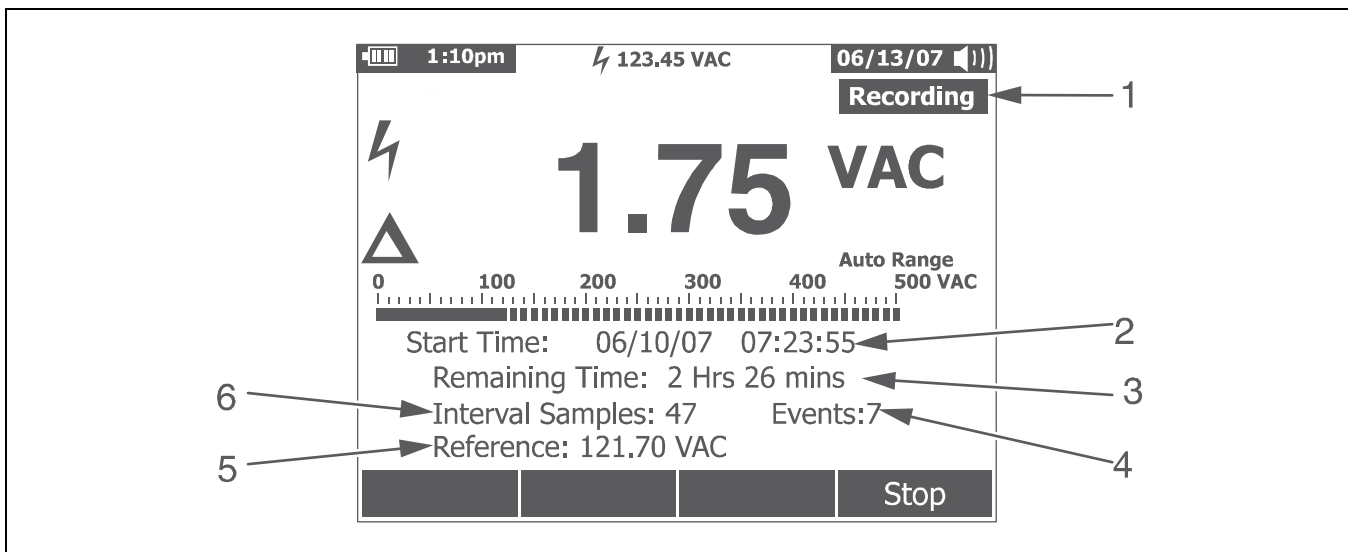
THEORY OF OPERATION - (CONTINUED)

(F2) to open the save menu. Using the cursor softkeys, move the menu selector next to the menu item labeled Record and press the softkey labeled Record (F1) to open the configuration display.

There are two variables in setting up a recording session: recording session duration and sample interval duration. Both variables affect the recording length and number of intervals recorded. These two variables may interact, in that setting one variable may adjust the other variable to fit the recording session within the available memory. The percentage of memory available at the beginning of a recording session is displayed below the duration and sample interval settings. Option values can be adjusted as follows:

The sample interval can be set from one second to 99 minutes, 59 seconds. Recording session duration can be set from one minute to 99 days, 23 hours, 59 minutes.

Table 3. Recording Display



| Item | Description |
|------|---|
| 1 | “Recording” session in progress. |
| 2 | Date and time when recording session started. |
| 3 | Time remaining until recording session stops. |
| 4 | Total number of event records recorded so far. |
| 5 | Reference value for relative measurements. |
| 6 | Total number of interval records recorded so far. |

The multimeter allocates memory in such a way as to guarantee capturing all user-specified sample intervals. Event records will also be captured until the multimeter detects that the allocated memory has been used up. At this point, events are not recorded, but the event counter continues to advance to indicate the total number of events that occurred. A plus (+) sign appears after the event count to indicate this condition.

NOTE

The maximum number of recorded sample intervals is 10,000. The maximum number of recorded events is 15,000 minus the number of sample intervals. These maximum numbers are proportionally decreased when the available memory is low.

To change either of the two recording variables, use the cursor softkeys to position the menu selector next to the desired menu item and press the softkey labeled Edit (F1). Use arrow softkeys to move between and set each digit of the selected variable.

If the battery level is anything but full, a message appears at the bottom of the record menu reminding you of the battery level before you start the recording session.

THEORY OF OPERATION - (CONTINUED)

Setting the Event Threshold Value

Press the softkey labeled Setup (F4) to access the setup menu. Using the cursor softkeys, move the menu selector next to the menu item labeled Recording and press the softkey labeled Recording (F1) to open the recording setup screen. Using the cursor softkeys, move the menu selector next to the menu item labeled Event Threshold for Recording and then press the softkey labeled Edit (F1). Press the up or down arrow key to scroll through the event threshold values. With the desired value selected, press the softkey labeled OK (F1), then press the softkey labeled Close (F4).

Starting a Recording Session

Once the variables are set, press the softkey labeled Start (F2), at which point Recording appears in the display and the green LED surrounding the power button flashes. Table 3 shows the recording display and describes the information displayed.

The Menu, Setup, Reference, and Temperature Offset softkey functions are not available while the multimeter is recording. This ensures that measurements within a recording session are consistent.

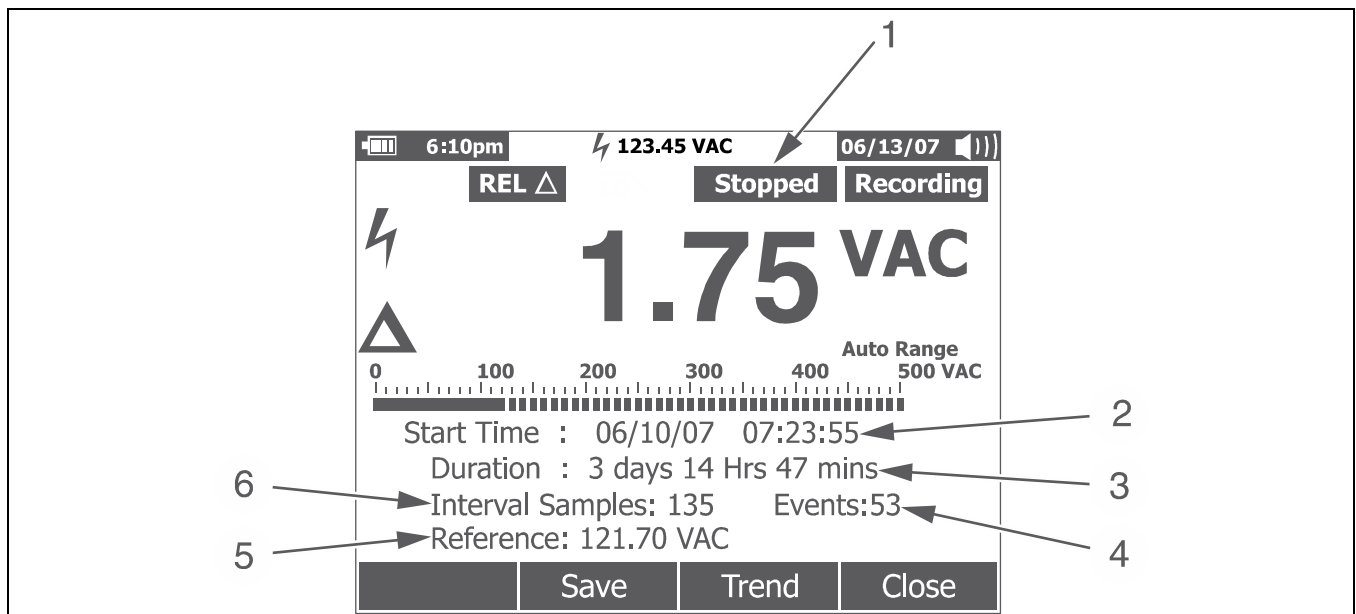
To extend battery life while recording, the multimeter may enter a battery-saver mode five minutes after a softkey/button is pressed or IR communications activity ends. If the Auto Power-Off timeout is set to Never, the battery-saver mode is disabled.

Stopping a Recording Session

The recording session will continue until the allocated memory is used, the batteries expire, the rotary switch is moved, a probe is inserted or removed from the A or mA/μA jacks, or the session is terminated by pressing the softkey labeled Stop (F4).

Table 4 shows the stopped display and describes the displayed information after stopping a recording session.

Table 4. Stopped Recording Display



| Item | Description |
|------|--|
| 1 | “Stopped” indicates the recording session has been stopped. |
| 2 | Date and time when the recording began. |
| 3 | Length (duration) of time recording session was in progress. |
| 4 | Number of event records detected. |

THEORY OF OPERATION - (CONTINUED)

| | |
|---|--|
| 5 | Reference value for relative measurements. |
| 6 | Number of interval records detected. |

END OF WORK PACKAGE

CHAPTER 2
OPERATOR INSTRUCTIONS
FOR
AN/GSM-437 MULTIMETER SET

CHAPTER 2
OPERATOR INSTRUCTIONS

WORK PACKAGE INDEX

| Title | WP Sequence No. |
|---|------------------------|
| DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS | 0004 |
| OPERATION UNDER USUAL CONDITIONS | 0005 |
| OPERATION UNDER UNUSUAL CONDITIONS | 0006 |

OPERATOR INSTRUCTIONS

DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS

INTRODUCTION

The following section will cover description of the multimeter's controls, indicators, and terminals. The user should become familiar with the controls and indicators of this multimeter prior to taking measurements.

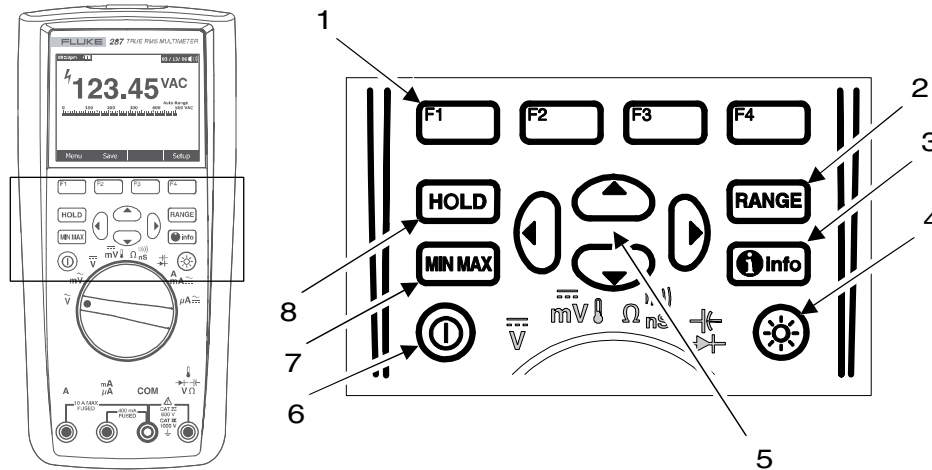


Figure 1. Softkeys/Buttons Functions

Table 1. Softkeys/Buttons Functions

| ITEM # | SOFTKEYS/BUTTON | FUNCTION |
|--------|-------------------|--|
| 1 | Function softkeys | Four softkeys (F1–F4) are used to select sub-functions and modes related to the rotary switch function. |
| 2 | RANGE button | Switches the multimeter range mode to manual and then cycles through all ranges. To return to autoranging, press the button for one second. |
| 3 | info button | Displays information about the present function or items on the display at the moment the button is pressed. The information is displayed in the language selected (English is default setting). |
| 4 | Backlight button | Switches the display backlight between off, low, and high. |
| 5 | Cursor softkeys | Four cursor softkeys (up, down, left, and right) are used to select an item in a menu, adjust display contrast, scroll through information, and perform data entry. |
| 6 | On/Off button | Turns the multimeter power on or off. Illuminates to green when the multimeter is on and blinks when the multimeter is recording. |
| 7 | MIN MAX button | Starts and stops MIN MAX recording. |
| 8 | HOLD button | Freezes the present reading in the display and allows the display to be saved. Also accesses AutoHold. |

DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS - (CONTINUED)

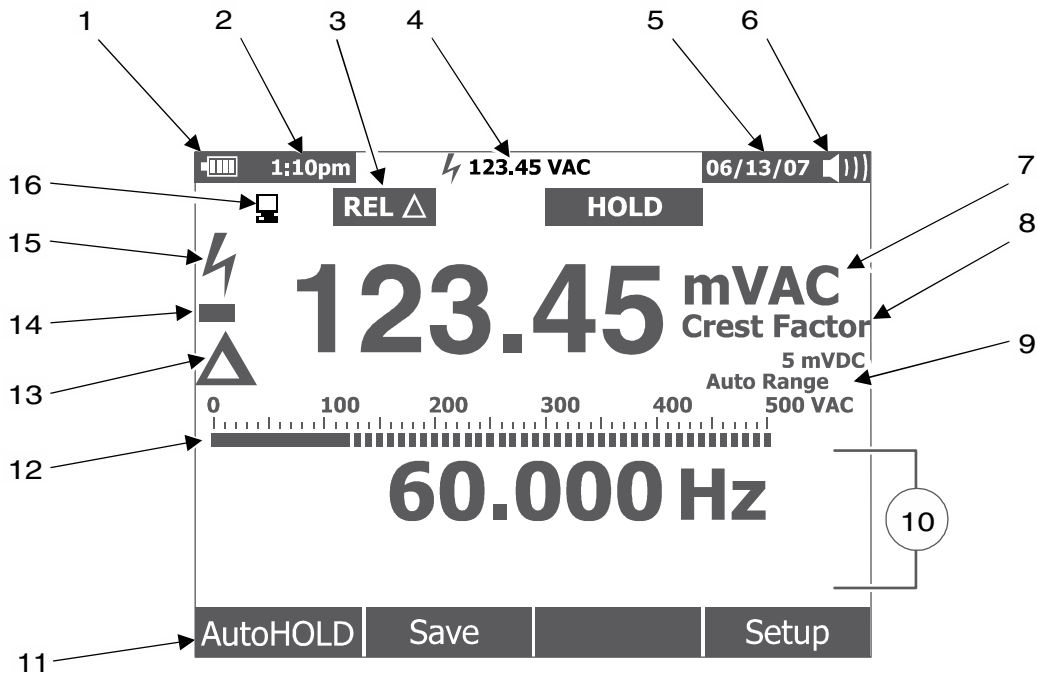


Figure 2. Display Indicators

Table 2. Display Indicators

| KEY | CONTROL OR INDICATOR | FUNCTION |
|-----|----------------------|---|
| 1 | Battery level | Indicates the charge level of the six AA batteries. |
| 2 | Time | Indicates the time set in the internal clock. |
| 3 | Mode annunciators | Indicates the multimeter's mode. |
| 4 | Mini-measurement | Displays the lightning bolt (when necessary) and the input value when the primary and secondary displays are covered by a menu or pop-up message. |
| 5 | Date | Indicates that the date set in the internal clock. |
| 6 | Beeper | Indicates the multimeter's beeper is enabled/disabled (shown in enabled mode) (not associated with the continuity beeper). |
| 7 | Units | Indicates the units of measure. |
| 8 | Auxiliary units | Indicates unitless measurements like Crest Factor. |
| 9 | Range indicator | Indicates the range the multimeter is in and the ranging mode (auto or manual). |
| 10 | Secondary display | Displays secondary measurement information about the input signal. |
| 11 | Softkey labels | Indicates the function of the softkey function (F1–F4) located just below the displayed label. |
| 12 | Bar graph | Displays an analog version of the input signal. |
| 13 | Relative | Indicates the displayed value is relative to a reference value. |
| 14 | Minus sign (-) | Indicates a negative reading. |

DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS - (CONTINUED)

| KEY | CONTROL OR INDICATOR | FUNCTION |
|-----|----------------------|--|
| 15 | Lightning bolt | Indicates hazardous voltage present at the multimeter's input. |
| 16 | Remote communication | Indicates activity over the communication link. |

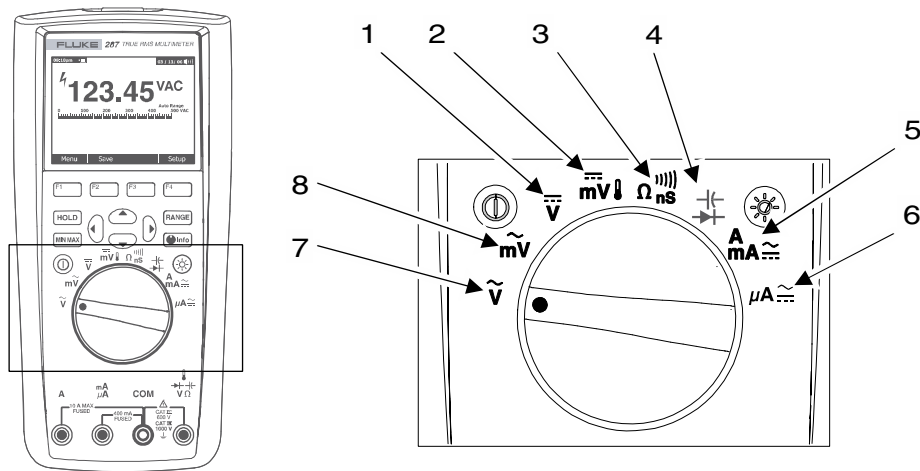


Figure 3. Rotary Switch

Table 3. Rotary Switch

| KEY | MODE SETTING | FUNCTION |
|-----|---------------------------|---|
| 1 | Volts DC | Places multimeter in DC and AC+DC voltage measurement modes. |
| 2 | milliVolts DC/Temperature | Places multimeter in DC millivolts, AC+DC millivolts, and temperature measurement mode. |
| 3 | Ohms/Beeper | Places multimeter in resistance, continuity, and conductance measurement modes. |
| 4 | diode/capacitor | Places multimeter in diode test and capacitance measurement modes. |
| 5 | Amp mA AC/DC | Places multimeter in AC, DC and AC+DC amperes and milliamperes measurement modes. |
| 6 | microAmp AC/DC | Places multimeter in AC, DC and AC+DC microampere measurements up to 5,000 μ A. |
| 7 | Volts AC | Places multimeter in AC voltage measurement mode. |
| 8 | milliVolts AC | Places multimeter in AC millivolts measurement mode. |

DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS - (CONTINUED)

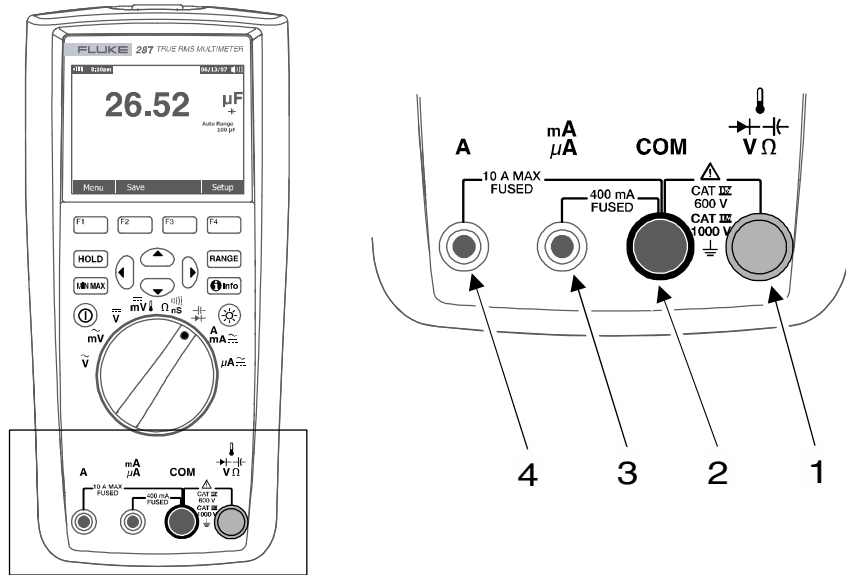


Figure 4. Input Terminals

Table 4. Multimeter Terminals

| ITEM # | CONTROL OR INDICATOR | FUNCTION |
|--------|----------------------|---|
| 1 | Input | Input for voltage, continuity, resistance, diode test, conductance, capacitance, frequency, temperature, period, and duty-cycle measurements. |
| 2 | Common | Common terminal for all measurements. |
| 3 | Input | Input for 0 A to 400 mA current measurements, frequency, and duty cycle. |
| 4 | Input | Input for 0 A to 10.00 A current (20 VA overload for 30 seconds on, 10 minutes off), frequency, and duty-cycle measurements. |

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS

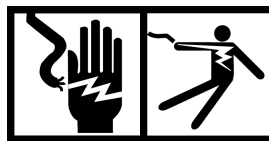
OPERATION UNDER USUAL CONDITIONS

INITIAL SETUP:

NOT APPLICABLE

The procedures for setting up the multimeter to take measurements and other various functions are listed below and are covered in this section:

ALTERNATING CURRENT (AC) VOLTAGE SETUP
DIRECT CURRENT (DC) VOLTAGE SETUP
AC or DC HIGH VOLTAGE SETUP (above 1,00 volts peak)
DECIBELS (dBm) SETUP
DECIBELS 1 Volt (dBV) SETUP
SETTING A CUSTOM dBm REFERENCE
AC AND DC VOLTAGE/CURRENT AT SAME TIME
TEMPERATURE SETUP
RESISTANCE SETUP
CAPACITANCE SETUP
DIODE SETUP
CURRENT (AC or DC) SETUP
CAPTURE MINIMUM AND MAXIMUM VALUES
SET DATE/TIME
FUSE TEST

ALTERNATING CURRENT (AC) VOLTAGE SETUP**WARNING**

Remove all jewelry such as rings, ID tags, bracelets, etc. prior to working on or around electronic equipment. Jewelry and tools can contact active electrical circuits and cause a direct short, severe burns, or electrical shock. Failure to comply with this warning may result in injury or death to personnel.

NOTE

- The multimeter displays AC voltage measurements as rms (root mean square) readings.
 - True-rms readings are accurate for sine waves and other waveforms (with no DC offset) such as square waves, triangle waves, and staircase waves.
 - For AC with DC offset, refer to the “AC AND DC VOLTAGE/CURRENT AT SAME TIME” after setting up the multimeter.
1. Insert the black test lead into the COM terminal (Figure 1., Item 3).
 2. Insert the red test lead into the volts/resistance terminal (Figure 1., Item 2).
 3. Press the On/Off button (Figure 1., Item 4) to turn the multimeter on.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

NOTE

Multimeter rotary switch shown in V~ position.

- Position the rotary switch (Figure 1., Item 1) to the V~ (regular voltage checks) or to the mV~ (very low voltage checks) position. The multimeter is now ready for standard AC voltage measurements.

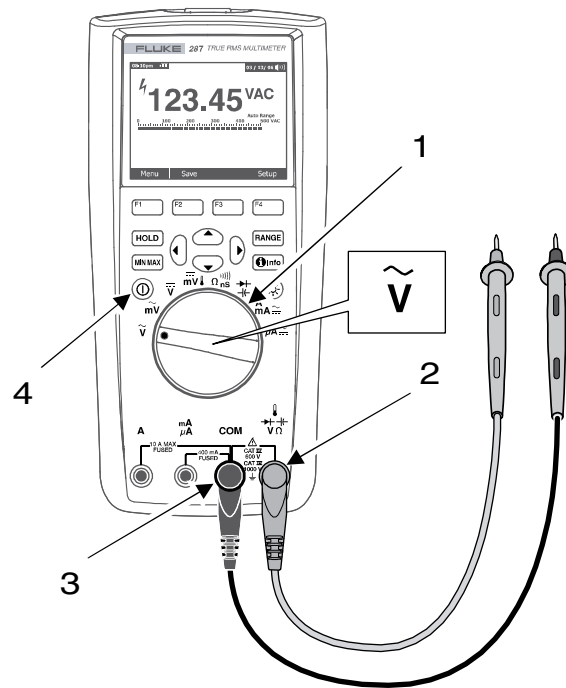


Figure 1. AC Voltage Mode

NOTE

The multimeter's AC volts function offers a number of modes to provide more details about an AC signal.

Refer to the appropriate section to learn more about each menu item.

To clear all modes and return to the basic volts AC measurement, perform steps 5 through 7.

- Press the softkey labeled Menu (F1).
- Using the arrow softkeys, move the menu selector to the item labeled VAC.
- Press the softkey labeled VAC (F1) to clear all functions and modes.

END OF TASK

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

DIRECT CURRENT (DC) VOLTAGE SETUP

WARNING



Remove all jewelry such as rings, ID tags, bracelets, etc. prior to working on or around electronic equipment. Jewelry and tools can contact active electrical circuits and cause a direct short, severe burns, or electrical shock. Failure to comply with this warning may result in injury or death to personnel.

NOTE

- The multimeter displays DC voltage values as well as their polarity.
 - The bar graph for DC voltage measurements is a zero-centered bar graph.
 - Positive DC voltages cause the bar graph to fill to the right of center, while negative DC voltages fill to the left of center.
1. Insert the black test lead into the COM terminal (Figure 2., Item 3).
 2. Insert the red test lead into the volts/resistance terminal (Figure 2., Item 2).
 3. Press the On/Off button (Figure 2., Item 4) to turn the multimeter on.

NOTE

Multimeter rotary switch shown in $\overline{\text{V}}$ position.

4. Position the rotary switch (Figure 2., Item 1) to the $\overline{\text{V}}$ (regular voltage checks) or $\overline{\text{mV}}$ (very low voltage checks) position. The multimeter is ready to take standard DC voltage readings.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

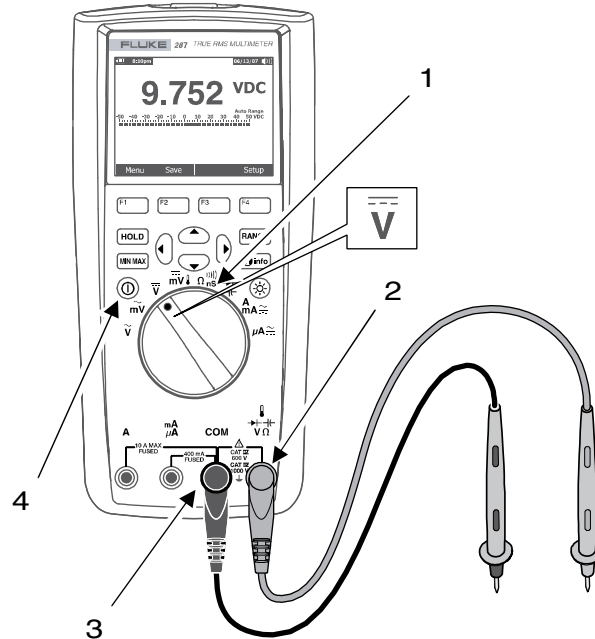


Figure 2. DC Voltage Mode

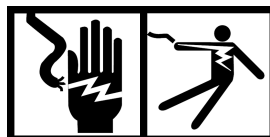
NOTE

The multimeter's DC volts function offers a number of modes to provide more details about a DC signal.

Refer to the appropriate section to learn more about each menu item.

To clear all modes and return to the basic volts DC measurement, perform steps 5 through 7.

5. Press the softkey labeled Menu (F1).
6. Using the arrow softkeys, move the menu selector to the item labeled VDC.
7. Press the softkey labeled VDC (F1) to clear all functions and modes.

END OF TASK**AC OR DC HIGH VOLTAGE SETUP (ABOVE 1K VOLTS PEAK)****WARNING**

- Remove all jewelry such as rings, ID tags, bracelets, etc. prior to working on or around electronic equipment. Jewelry and tools can contact active electrical circuits and cause a direct short, severe burns, or electrical shock.
- Avoid wet, damp conditions when using high voltage probe to avoid electric shock.
- Never make body contact with the high voltage probe tip or the red portion of the probe to avoid electric shock.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

- Always hold the high voltage probe by its black handle to avoid electric shock.
- Always attach the grounding strap (clip lead) to a known good ground source before taking a measurement.
- Failure to comply with these warnings may result in injury or death to personnel.

NOTE

- The high voltage probe is designed to extend the voltage measuring capability to 6,000 volts peak AC or DC Overvoltage Category I. This means the probe can only be used to make measurements on energy-limited circuits within equipment. Examples include high voltage within televisions or photocopy machines. This probe should not be used to measure high voltages on power distribution systems.
 - Use the high voltage probe when measured voltage is expected to exceed 1,000 peak AC or DC Overvoltage Category I.
 - A 1 volt reading displayed on the multimeter is equal to a 1,000 V measurement.
1. Insert the high voltage probe male banana connector (Figure 3., Item 1) into the COM and V/Ω female terminals (Figure 3., Item 4) on the multimeter. Ensure that the high voltage probe male banana connector that is marked "GND" is placed in the COM multimeter terminal.
 2. Press the On/Off button (Figure 3., Item 5) to turn the multimeter on.

NOTE

Rotary switch shown in V~ position.

3. Position the rotary switch (Figure 3., Item 3) to the \bar{V} (DC high voltage checks) or V~ (AC high voltage checks) position. The multimeter is ready to take high voltage AC peak readings up to 6,000 volts.
4. Attach the high voltage probe grounding clip (Figure 3 Item 2) to known good ground source prior to making any measurements.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

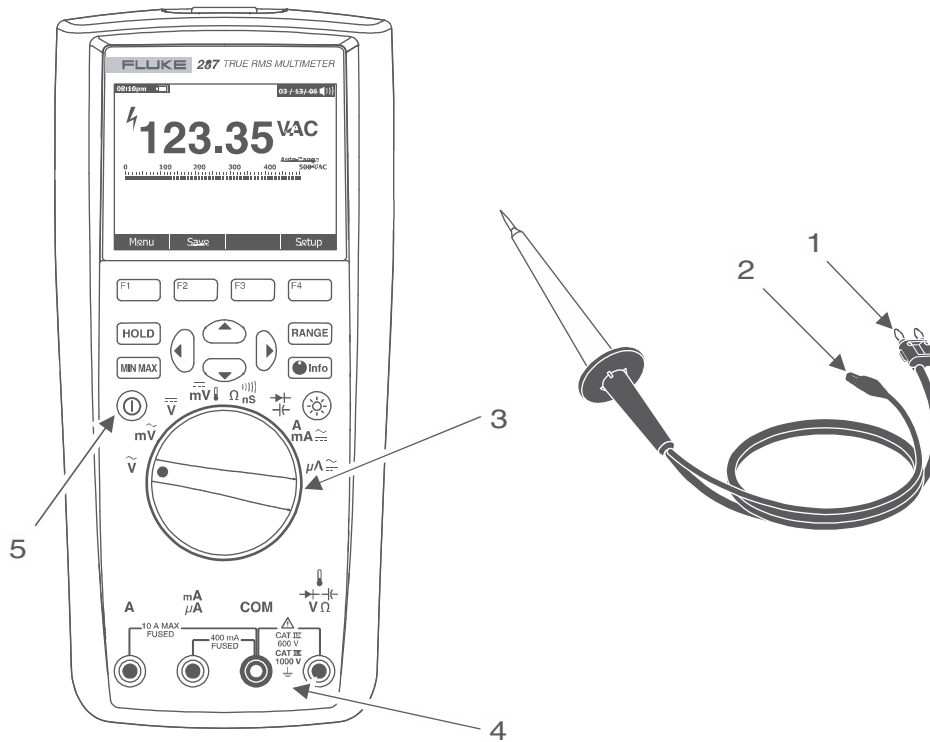
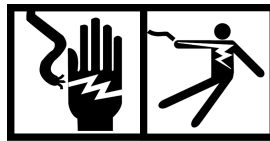


Figure 3. AC Voltage Mode Shown

END OF TASK

DECIBELS (DBM) SETUP

WARNING



Remove all jewelry such as rings, ID tags, bracelets, etc. prior to working on or around electronic equipment. Jewelry and tools can contact active electrical circuits and cause a direct short, severe burns, or electrical shock. Failure to comply may result in injury or death to personnel.

NOTE

- The multimeter is capable of displaying voltage as a dB value relative to 1 milliwatt (dBm), a reference voltage of 1 volt (dBV), or a user-selectable reference value.
 - See the “Setting a Custom dBm Reference” section below.
1. Insert the black test lead into the COM terminal (Figure 4., Item 3).
 2. Insert the red test lead into volts/resistance terminal (Figure 4., Item 2).
 3. Press the On/Off button (Figure 4., Item 4) to turn the multimeter on.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

NOTE

Rotary switch shown in V~ position.

- Rotate the rotary switch (Figure 4., Item 1) to the V~ (regular voltage checks) or to the mV~ (very low voltage checks) position.

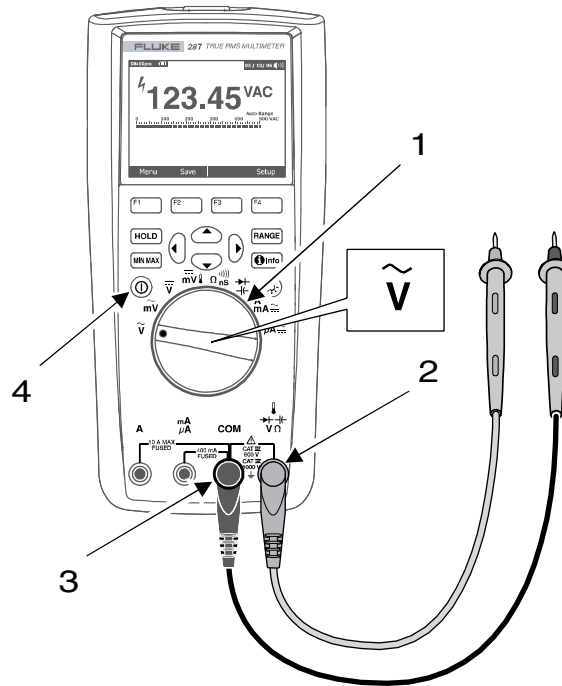


Figure 4. Multimeter Shown in AC Voltage Mode

- Press the softkey labeled Menu (F1).
- Using the arrow softkeys, move the menu selector to the item labeled dBm.

NOTE

See Figure 5. below for typical dB display with a reference setting indicated.

- Press the softkey labeled dBm,Hz (F2). The multimeter is ready for standard decibels measurements.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

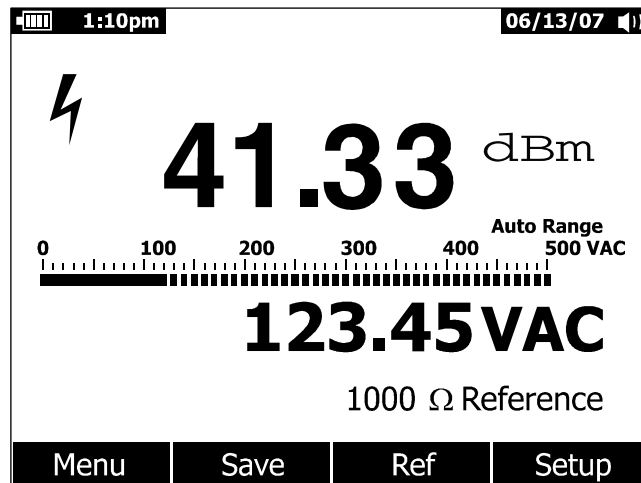


Figure 5. dBm Display

NOTE

All voltage measurements are displayed as a dBm value.

A dBm measurement must use a reference impedance (resistance) to calculate a dB value based on 1 milliwatt. When set to 600 Ω (default), the reference impedance is not displayed during a dBm measurement. When set to something other than 600 Ω , the reference impedance is displayed just above the softkey labels.

To select another reference value, perform steps 8 and 9.

8. Press the softkey labeled Ref (F3).

NOTE

There are nine predefined references: 4, 8, 16, 25, 32, 50, 75, 600, and 1000.

9. Using the arrow softkeys, scroll through the references until the desired reference is displayed.

NOTE

Once step 10 is performed, the reference value selected will be displayed just below the Hz reading.

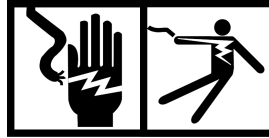
10. Press the softkey labeled Close (F4). The multimeter is ready for redefined reference decibels measurements.
11. To exit the dBm function, press the softkey labeled Menu (F1), followed by the softkey labeled dBm, Hz (F2). Selecting one of the other modifiers such as ms, %, or CF also cancels dBm.

END OF TASK

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

DECIBELS 1 VOLT (DBV) SETUP

WARNING



Remove all jewelry such as rings, ID tags, bracelets, etc. prior to working on or around electronic equipment. Jewelry and tools can contact active electrical circuits and cause a direct short, severe burns, or electrical shock. Failure to comply may result in injury or death to personnel.

NOTE

- The multimeter is capable of displaying voltage as a dB value relative to one milliwatt (dBm), a reference voltage of one volt (dBV) or a user-selectable reference value.
 - A dBV measurement uses a one volt reference voltage to compare the present measurement against. The difference between the two AC signals is displayed as a dBV value. The reference impedance setting is not part of a dBV measurement.
1. Insert the black test lead into the COM terminal (Figure 6., Item 3).
 2. Insert the red test lead into the volts/resistance terminal (Figure 6., Item 2).
 3. Press the On/Off button (Figure 6., Item 4) to turn the multimeter on.

NOTE

Rotary switch shown in V~ position.

4. Position the rotary switch (Figure 6., Item 1) to the V~ (regular AC voltage checks) or to the mV~ (very low AC voltage checks) position.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

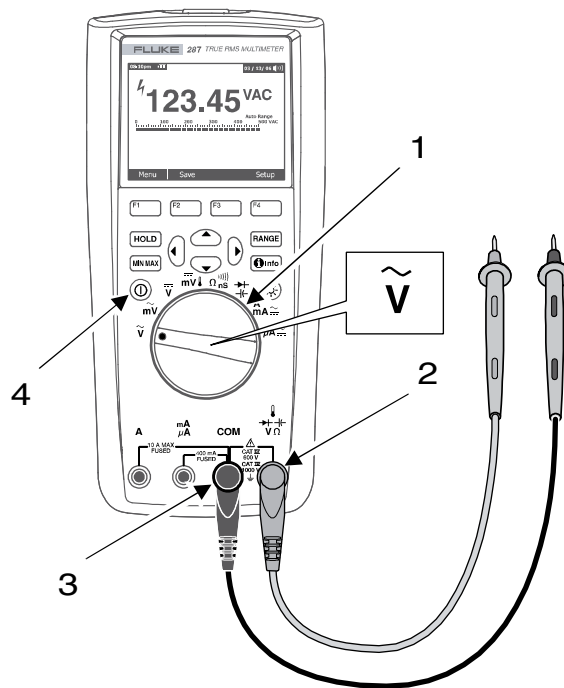


Figure 6. Decibels (dBV) Mode

5. Press the softkey labeled Menu (F1).
6. Using the arrow softkeys, move the menu selector to the item labeled dBV.

NOTE

See Figure 7. below for typical dBV display with a reference setting indicated.

7. Press the softkey labeled dBV,Hz (F2). The multimeter is ready for standard decibels measurements.

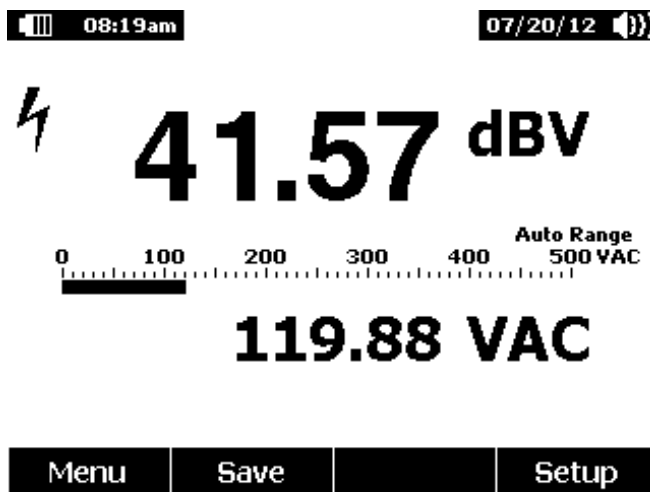


Figure 7. Decibels (dBV) Measurements Display

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

- To exit the dBV function, press the softkey labeled Menu (F1), followed by the softkey labeled dBV (F1). Selecting one of the other modifiers such as ms, %, or CF also cancels dBV.

END OF TASK**SETTING A CUSTOM DBM REFERENCE****NOTE**

The multimeter must be set up to read decibels in either dBm mode.

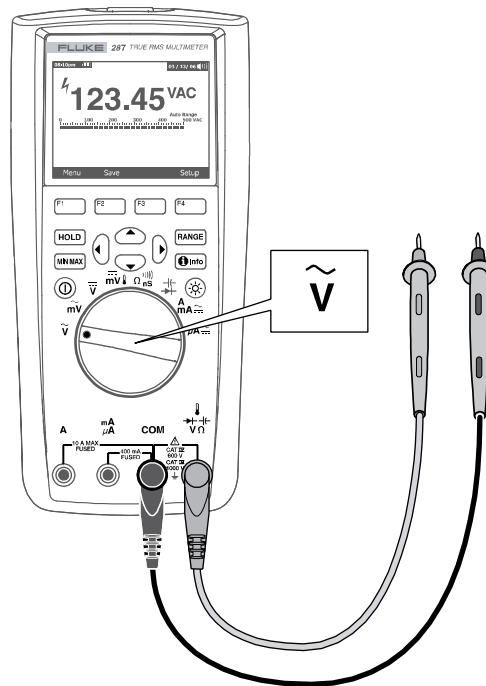


Figure 8. Decibels (dBm) Measurements

- Press the softkey labeled Setup (F4).
- Using the arrow softkeys, move the menu selector to the item labeled Instrument.
- Press the softkey labeled Instrument (F1).
- Using the arrow softkeys, move the menu selector to the item labeled dBm Reference.
- Press the softkey labeled Edit (F1).

NOTE

Pressing on the left and right arrow softkeys will move the cursor to each of the numbers.

Pressing on the up and down arrow softkeys will increase or decrease the selected number.

- Using the appropriate arrow softkeys, set the desired value of the reference offset.
- Press the softkey labeled OK (F1).

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

NOTE

Once the Close (F4) softkey has been pressed, the custom Reference is added to the Reference list and can be selected as needed.

Only one custom Reference value may be added to the list at a time.

8. Press the softkey labeled Close (F4).

END OF TASK**AC AND DC VOLTAGE/CURRENT AT SAME TIME****NOTE**

Multimeter set up to read either V-, mV-, or either current mode.

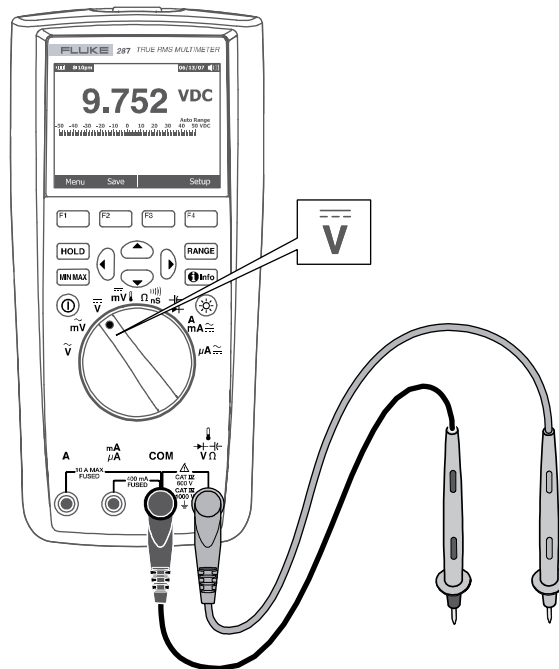


Figure 9. Multimeter Shown in DC Voltage Mode

1. Press the softkey labeled Menu (F1).
2. Using the arrow softkeys, move the menu selector to the item labeled AC+DC.

NOTE

Sample Duel Displays for each selection is show in Figure 10..

3. Select the desired display setup by selecting one of the following:
 - AC+DC (F1) - AC combined with DC displayed.
 - AC, DC (F2) - AC over DC displayed.
 - DC, AC (F3) - DC over AC displayed.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

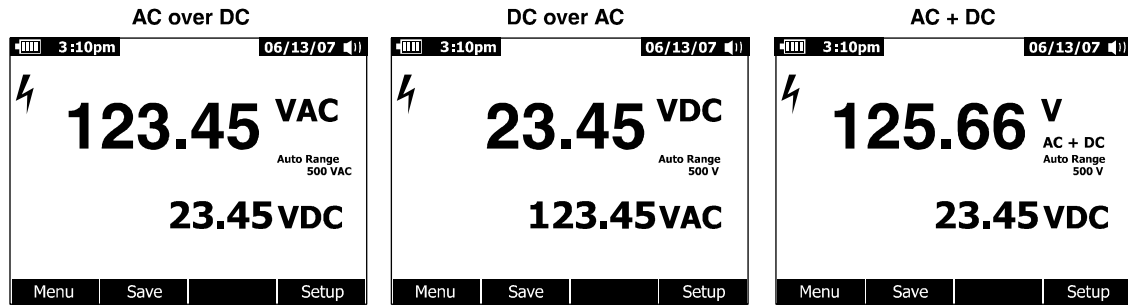


Figure 10. Sample Duel Reading Displays

NOTE

Perform the following steps to exit dual mode.

4. Press the softkey labeled Menu (F1).
5. If in VDC mode, use the arrow softkeys and move the menu selector to the item labeled VDC, then press the softkey labeled VDC (F1).
6. If in either current mode, use the arrow softkeys and move the menu selector to the item labeled AC,DC, then press the softkey labeled AC (F1) or DC (F2), depending on which reading is desired.

END OF TASK**TEMPERATURE SETUP****WARNING**

Remove all jewelry such as rings, ID tags, bracelets, etc. prior to working on or around electronic equipment. Jewelry and tools can contact active electrical circuits and cause a direct short, severe burns, or electrical shock.

To avoid the potential for fire or electrical shock, do not connect the thermocouple to electrically live circuits.

Failure to comply with this warning may result in injury or death to personnel.

NOTE

When installing the adapter into the multimeter terminals, make sure to match the adapter black lead (-) with the COM terminal on the multimeter.

1. Insert the adapter (Figure 11., Item 4) negative lead (black) into the COM (Figure 11., Item 2) and positive lead (red) into volts/resistance (Figure 11., Item 3) terminals at the same time.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

NOTE

Temperature probe terminals are different sizes, so the probe will only plug into the adapter one way.

2. Insert the temperature probe connector (Figure 11., Item 5) into the adapter (Figure 11., Item 4).
3. Press the On/Off button (Figure 11., Item 6) to turn the multimeter on.
4. Position the rotary switch (Figure 11., Item 1) to the mV- position.

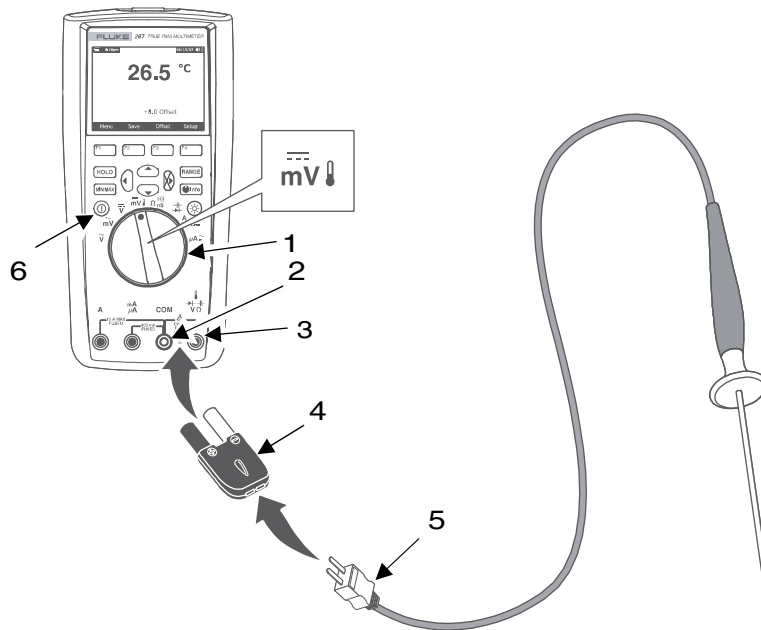


Figure 11. Temperature Measurements

5. Press the softkey labeled Menu (F1).
6. Using the arrow softkeys, move the menu selector to the item labeled Temp.

NOTE

The RANGE softkey is disabled when the multimeter is in the Temperature mode.

7. Press the softkey labeled F (F1) to display readings in Fahrenheit or press the softkey labeled C (F2) to display readings in Celsius. The temperature probe is ready for standard temperature use.

NOTE

To input a temperature offset value, perform steps 8 and 9.

8. Press the softkey labeled Offset (F3).

NOTE

Pressing on the left and right arrow softkeys will move the cursor to each of the numbers.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

Pressing on the up and down arrow softkeys will increase or decrease the selected number.

9. Using the appropriate arrow softkeys, set the desired value of the temperature offset.

NOTE

Once the offset value is set (other than 0.0) and the Close (F4) softkey has been pressed, the display will show the Offset value.

10. Once the proper offset value has been set, press the softkey labeled Close (F4).
11. To exit the temperature mode, position the rotary switch (Figure 11., Item 1) to any other mode.

END OF TASK**RESISTANCE SETUP****WARNING**

Remove all jewelry such as rings, ID tags, bracelets, etc. prior to working on or around electronic equipment. Jewelry and tools can contact active electrical circuits and cause a direct short, severe burns, or electrical shock.

Never measure resistance on a live circuit. Ensure that all power has been removed from the component being measured.

Failure to comply with this warning may result in fire, injury, or death to personnel.

CAUTION

Disconnect circuit power and discharge all high-voltage capacitors before measuring resistance. Failure to follow this caution could cause damage to the multimeter or to the equipment under test.

1. Insert the black test lead into the COM terminal (Figure 12., Item 3).
2. Insert the red test lead into the volts/resistance terminal (Figure 12., Item 2).
3. Press the On/Off button (Figure 12., Item 4) to turn the multimeter on.
4. Position the rotary switch (Figure 12., Item 1) to the Ω position. The multimeter is ready for standard resistance measurements.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

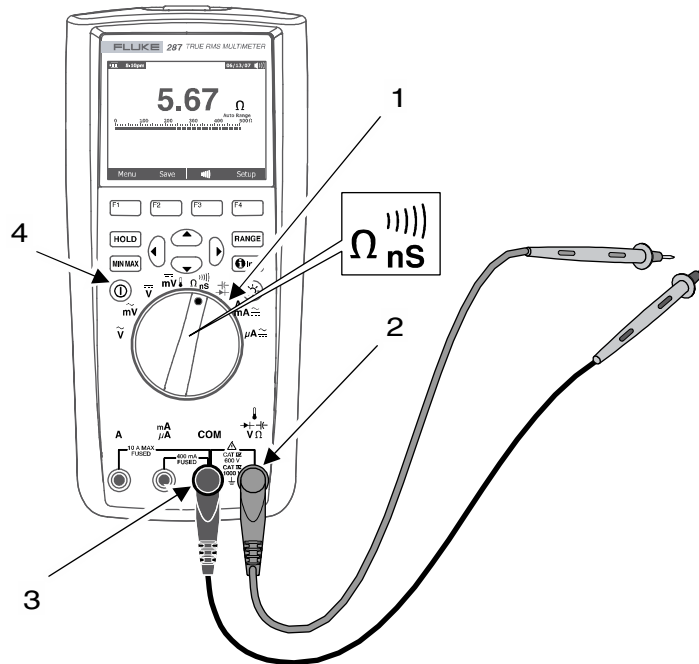


Figure 12. Resistance Mode

NOTE

When the Beeper option is enabled in the Ω mode, the beeper will sound when a short circuit is measured. This mode is normally used when checking for continuity.

Perform step 5 to enable/disable the Beeper function when in Ω mode.

5. Press the softkey with the beeper symbol (F3). The symbol will change to the Ω symbol and the secondary display will show a Beep on SHORT message. To turn the beeper off, press the softkey labeled Ω (F3).

NOTE

The test leads can add 0.1 Ω to 0.2 Ω of error to resistance measurements. If precise resistance measurements must be made, it may be necessary to NULL (zero) the multimeter leads).

Perform steps 6 through 8 to remove test lead resistance (zeroing the multimeter leads and multimeter).

6. Press the softkey labeled Menu (F1).
7. Using the arrow softkeys, move the menu selector to the item labeled REL.
8. Touch the test leads together and keep together for the next step.

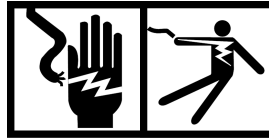
NOTE

The Offset in this step is not saved when the multimeter is turned off or if another multimeter function is selected.

9. While holding the test leads together, press the softkey labeled REL (F1). The multimeter will show the offset Reference value in the secondary window.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

10. To exit the resistance mode, move the multimeter rotary switch (Figure 12., Item 1) to any other mode.

END OF TASK**CAPACITANCE SETUP****WARNING**

Remove all jewelry such as rings, ID tags, bracelets, etc. prior to working on or around electronic equipment. Jewelry and tools can contact active electrical circuits and cause a direct short, severe burns, or electrical shock. Failure to comply may result in injury or death to personnel.

1. Insert the black test lead into the COM terminal (Figure 13., Item 3).
2. Insert the red test lead into the volts/resistance terminal (Figure 13., Item 2).
3. Press the On/Off button (Figure 13., Item 4) to turn the multimeter on.
4. Position the rotary switch (Figure 13., Item 1) to the diode/capacitance position.

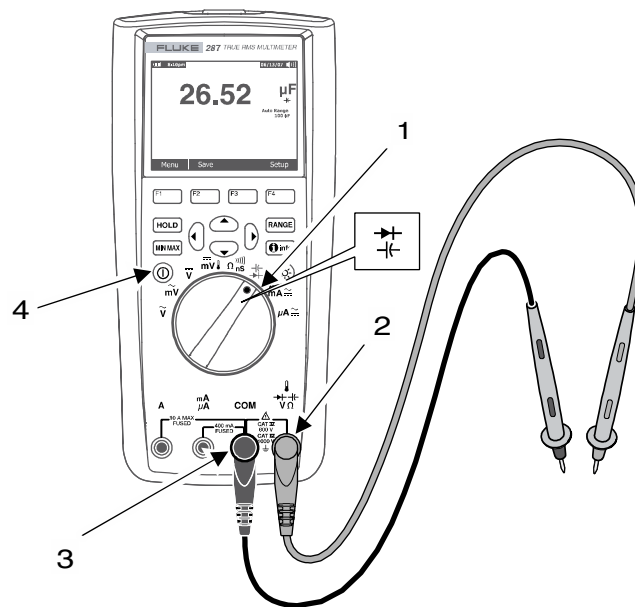


Figure 13. Capacitance Mode

5. Press the softkey labeled Menu (F1).
6. Using the arrow softkeys, move the menu selector to the item labeled Diode,Cap.
7. Press the softkey labeled Cap (F2). The multimeter is ready for standard capacitance measurements.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)**NOTE**

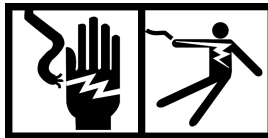
Perform steps 8 through 10 to improve measurement accuracy of small-value capacitors.

8. Press the softkey labeled Menu (F1).
9. Using the arrow softkeys, move the menu selector to the item labeled REL.

NOTE

The Offset in this step is not saved when the multimeter is turned off or if another multimeter function is selected.

10. With the test leads separated, press the softkey labeled REL (F1). The multimeter will show the offset capacitance value in the secondary window.
11. To exit the capacitance mode, position the rotary switch (Figure 13., Item 1) to any other mode.

END OF TASK**DIODE SETUP****WARNING**

Remove all jewelry such as rings, ID tags, bracelets, etc. prior to working on or around electronic equipment. Jewelry and tools can contact active electrical circuits and cause a direct short, severe burns, or electrical shock. Failure to comply may result in injury or death to personnel.

CAUTION

Disconnect circuit power and discharge all high-voltage capacitors before measuring resistance. Failure to follow this caution could cause damage to the multimeter or to the equipment under test.

1. Insert the black test lead into the COM terminal (Figure 14., Item 3).
2. Insert the red test lead into the volts/resistance terminal (Figure 14., Item 2).
3. Press the On/Off button (Figure 14., Item 4) to turn the multimeter on.
4. Position the rotary switch (Figure 14., Item 1) to the diode/capacitance position.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

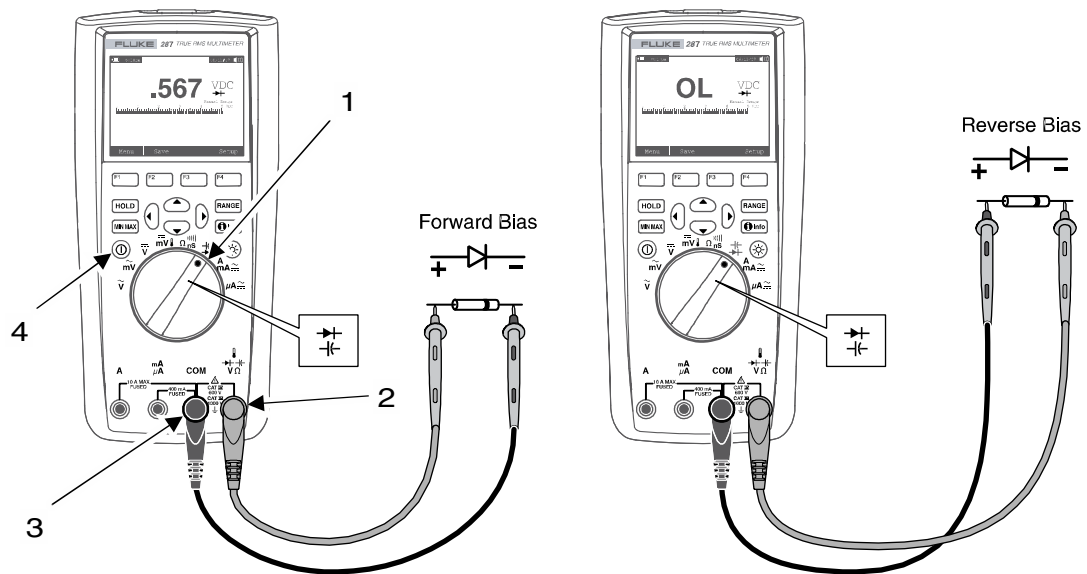


Figure 14. Diode Modes

5. Press the softkey labeled Menu (F1).
6. Using the arrow softkeys, move the menu selector to the item labeled Diode, Cap.

NOTE

RANGE and MIN MAX are disabled when the multimeter is set up for a diode test.

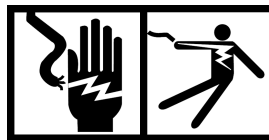
If the beeper is enabled during a diode test, it will beep briefly for a normal junction and sound continuously for a shorted junction (below 0.1 V.) See the “Disabling and Enabling the Beeper” in this section to disable the beeper.

7. Press the softkey labeled Diode (F1). The multimeter is ready for standard diode testing.
8. To exit the diode mode, position the rotary switch (Figure 11., Item 1) to any other mode.

END OF TASK

CURRENT (AC OR DC) SETUP

WARNING



Remove all jewelry such as rings, ID tags, bracelets, etc. prior to working on or around electronic equipment. Jewelry and tools can contact active electrical circuits and cause a direct short, severe burns, or electrical shock.

Never attempt an in-circuit current measurement where the open-circuit potential to earth is greater than 1,000 V.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

Failure to comply may result in injury or death to personnel.

CAUTION

Check the multimeter's fuses before measuring current (WP 0005, FUSE TEST).

Use the proper terminals, function, and range for your measurement.

Never place the probes across (in parallel with) any circuit or component when the leads are plugged into the current terminals.

Failure to comply may result in damage to the multimeter or the equipment under test.

1. Insert the black test lead into the COM terminal (Figure 15., Item 4).

CAUTION

Position with the rotary switch in the A/mA position if you are unsure of the current being measured. Failure to comply may result in damage to the multimeter or the equipment under test.

NOTE

For measurements less than 5 μ A, perform step 2.

For measurements greater than 5 μ A but less than 400 mA, perform step 3.

For measurements greater than 400mA or if current is not known, perform step 4.

2. For measurements less than 5 μ A, insert the red test lead into the mA/ μ A terminal (Figure 15., Item 3) and position the rotary switch to μ AuA position (Figure 15., Item 2). Go to step 5.
3. For measurements greater than 5 μ A but less than 400 mA, insert the red test lead into the mA/ μ A terminal (Figure 15., Item 3) and position the rotary switch to A/mA position (Figure 15., Item 1). Go to step 5.
4. For measurements greater than 400mA, insert the red test lead into the A terminal (Figure 15., Item 5) and position the rotary switch to A/mA position (Figure 15., Item 1).

CAUTION

If the rotary switch is in the μ A position and the read test lead is in the A terminal, the multimeter will display the following message: "WARNING Leads connected incorrectly". Either the rotary switch needs to be positioned to the μ A position or the read lead needs to be moved to the mA/ μ A terminal.

If the rotary switch is positioned on any other mode other than A/mA or μ A and a test lead is inserted into either of the current terminals, the multimeter will beep (if the Beeper is enabled) and the display will show the following message: "WARNING Leads connected incorrectly". Positioning the rotary switch and/or the test leads to the proper positions will resolve the issue.

If the above error messages are not correct prior to the multimeter use, damage to the equipment being tested or the multimeter may occur.

5. Press the On/Off button (Figure 15., Item 6) to turn the multimeter on.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

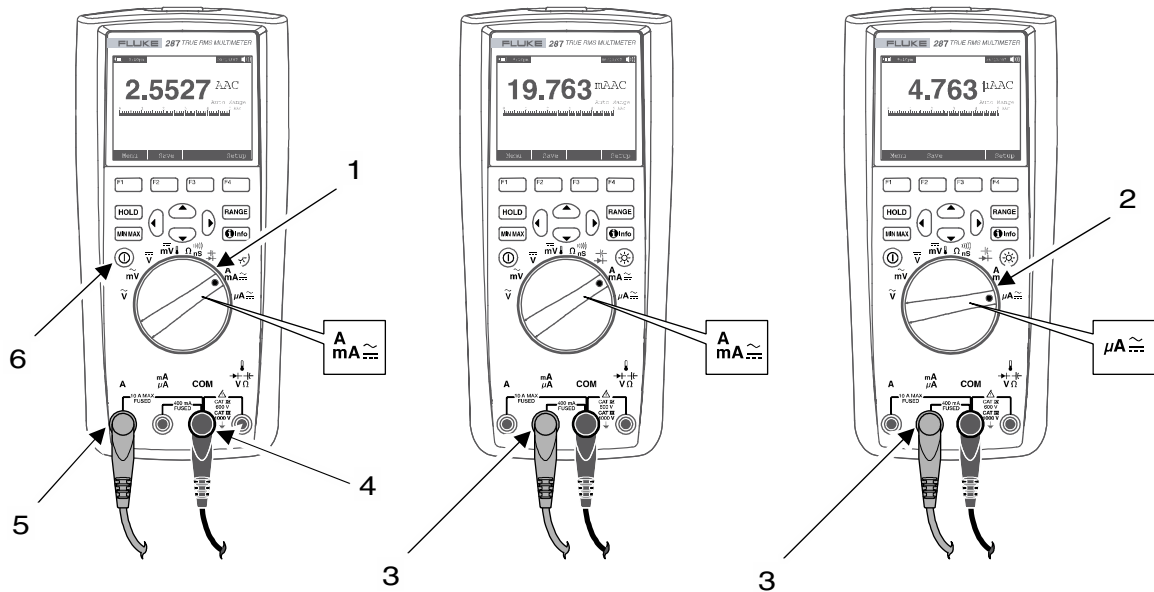


Figure 15. Current Measurement Modes

NOTE

The multimeter will default to the previous current measurement setting for either AC or DC current measurements.

If the multimeter is set to read AC current, the display will show AC at the end of the setting (Figure 16., Item 1).

If the multimeter is set to read DC current, the display will show DC at the end of the setting (Figure 16., Item 2).

If the desired current setting is not seen, perform step 6 to select the desired current setting.

6. Press the softkey labeled Menu (F1).

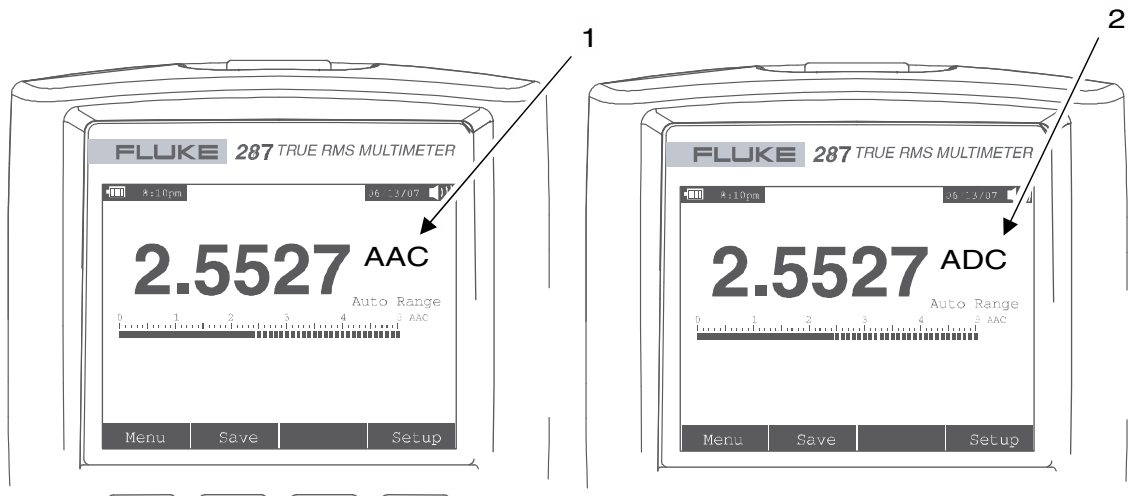


Figure 16. AC or DC Mode Displays

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

7. Press the softkey labeled AC (F1) to read AC current or press the softkey labeled DC (F2) to read DC current. The multimeter is now set to read current.
8. To exit the any current mode, move the multimeter rotary switch (Figure 15., Item 1) to any other mode.

END OF TASK**CAPTURE MINIMUM AND MAXIMUM VALUES****NOTE**

Multimeter needs to be configured in desired multimeter reading function.

The MIN MAX Record mode captures minimum, average, and maximum input values. When the input goes below the recorded minimum value or above the recorded maximum value, the multimeter beeps and records the new value. The multimeter stores the elapsed time since the recording session was started at the same time. The MIN MAX mode also calculates an average of all readings taken since the MIN MAX mode was activated.

This mode is for capturing intermittent readings, recording minimum and maximum readings unattended, or recording readings while equipment operation precludes watching the multimeter. The MIN MAX mode is best for recording power supply surges, inrush currents, and finding intermittent failures.

Response time is the length of time an input must stay at a new value to be captured as a possible new minimum or maximum value. The multimeter has a 100 millisecond MIN MAX response time. For example, a surge lasting 100 milliseconds would be captured but one lasting only 50 milliseconds may not be captured at its actual peak value. See the MIN MAX specification for more information.

The true average value displayed is the arithmetic mean of all readings taken since the start of recording (overloads are discarded). The average reading is useful for smoothing out unstable inputs, calculating power consumption, or estimating the percentage of time a circuit is active.

To extend battery life during MIN MAX recording, the multimeter will enter a battery-saver mode. See the "Setting Backlight and Auto Off Timeouts" section for more information on the battery-saver mode.

1. Connect the test leads to the signal to be measured.
2. Press the MIN MAX (Figure 17., Item 1) button to select the MIN MAX mode. This will start the MIN MAX recording session.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

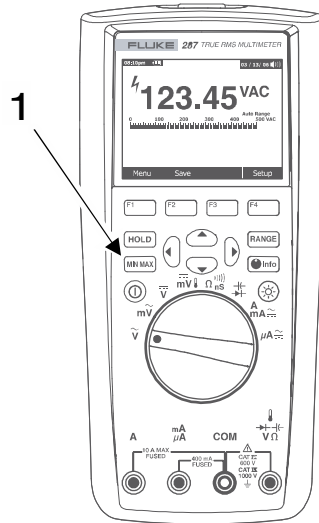


Figure 17. MIN MAX Button

NOTE

A typical MIN MAX display is shown in Figure 18..

3. Press the softkey labeled Stop (F4) or the MIN MAX button to stop the recording session.

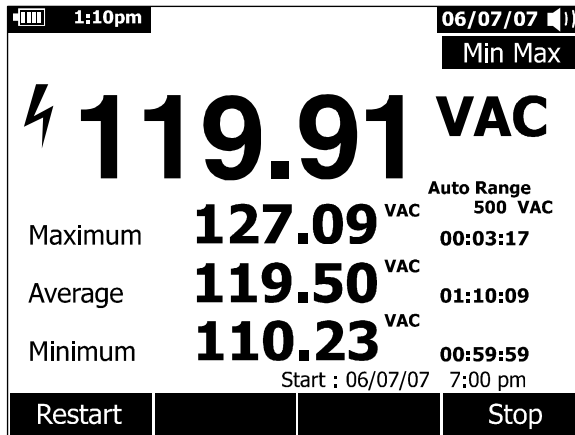


Figure 18. Typical MIN MAX Display

NOTE

Turning the rotary switch before saving the MIN MAX recording data will cause all the accumulated data to be lost.

Perform step 4 to restart the recording session.

Perform step 5 to save MIN MAX display data.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

Perform step 6 to close MIN MAX display without saving the displayed information.

4. Press the softkey labeled Restart (F1) to restart the recording session.

NOTE

Do not disconnect the test leads from the signal being measured before saving the recording or noting the low value.

Recording must be stopped before saving the MIN MAX data option is available.

5. Press the softkey labeled Save (F2). A dialog box opens where the default saved name can be selected or another name assigned. Press the softkey labeled Save (F2) to store the MIN MAX screen data. MIN MAX cannot be continued at this point.
6. To exit the recording session, press the MIN MAX (Figure 17., Item 1) button again or the softkey labeled Close (F4).

END OF TASK**SET DATE/TIME**

The multimeter's internal clock is used in the display and for timestamping recorded measurements. If the batteries go dead or are disconnected from the multimeter for maintenance, the multimeter will lose its date/time setting. Changing the date/time may also be required if location is changed or a time change has occurred.

1. Press the On/Off button (Figure 19., Item 1) to turn the multimeter on.

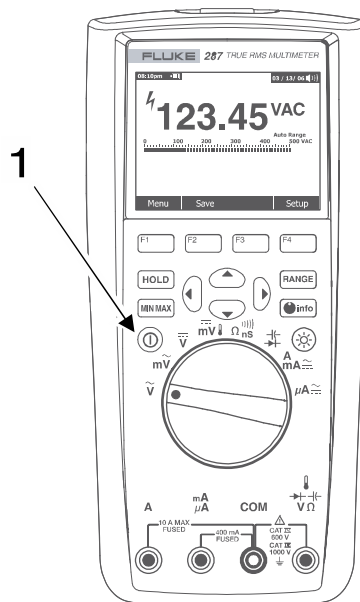


Figure 19. Multimeter On/Off Button

NOTE

Start with step 2 if the following error message is displayed: "Error: Date and Time need to be reset."

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

Start with step 3 if the multimeter time is present but needs adjustment.

2. Press the softkey labeled Set Time (F1). Skip to step 5.
3. Press the softkey labeled Setup (F4).
4. Using the arrow softkeys, move the menu selector to the item labeled Display.
5. Press the softkey labeled Date/Time (F1).
6. Using the arrow softkeys, move the menu selector to the item labeled Set Date.
7. Press the softkey labeled Edit (F1). The cursor will be moved to the month area.
8. Using the up and down arrow softkeys, select the desired month.
9. Use the right arrow softkey to move to the date area. Set each digit to the proper year by using the up and down arrow softkeys.

NOTE

Only the last two digits of the year can be set.

10. Use the right arrow softkey to move to the year area. Set each digit to the proper year by using the up and down arrow softkeys.
11. Once the date has been set, press the softkey labeled OK (F1).
12. Using the arrow softkeys, move the menu selector to the item labeled Set Time.
13. Press the softkey labeled Edit (F1). The cursor will be moved to the hour area.
14. Using the arrow softkeys, select each section and set to the desired time, setting the hours-minutes-am/pm sections.
15. Once the time has been set, press the softkey labeled OK (F1).
16. Press the softkey labeled Close (F4) to return to the main display.

END OF TASK**FUSE TEST**

1. Position the rotary switch (Figure 20., Item 1) to the ohms (Ω) position.
2. Insert a test lead into the volts/resistance terminal (Figure 20., Item 2).
3. Press the On/Off button (Figure 20., Item 5) to turn the multimeter on.

NOTE

If the "Leads Connected Incorrectly" message appears, the probe tip has been inserted too far into the amps input jack. Back the lead out a bit until the message disappears and either OL or a resistance reading appears in the multimeter's display.

The resistance reading should be 10.00 ± 0.05 k ohms for the mA/ μ A terminal.

4. Insert the test lead tip into the 400 mA/FUSED terminal (Figure 20., Item 4). Ensure that the test lead tip is touching the multimeter terminal. Note resistance reading.

CAUTION

Do not put incorrect fuses into fuse brackets. Fuses are different sizes and installing an incorrect fuse may spread the fuse brackets, causing damage to the circuit board. Failure to follow this caution can cause damage to the multimeter.

5. Replace 0.44A fuse (WP 0014) if reading is not correct.

OPERATION UNDER USUAL CONDITIONS - (CONTINUED)

NOTE

If the “Leads Connected Incorrectly” message appears, the probe tip has been inserted too far into the amps input jack. Back the lead out a bit until the message disappears and either OL or a resistance reading appears in the multimeter’s display.

The resistance reading should be between 0.00 and 0.50 ohms for the A terminal.

6. Insert the test lead tip into the 10 A MAX/FUSED terminal (Figure 20., Item 3). Ensure that the test lead tip is touching the multimeter terminal. Note resistance reading.

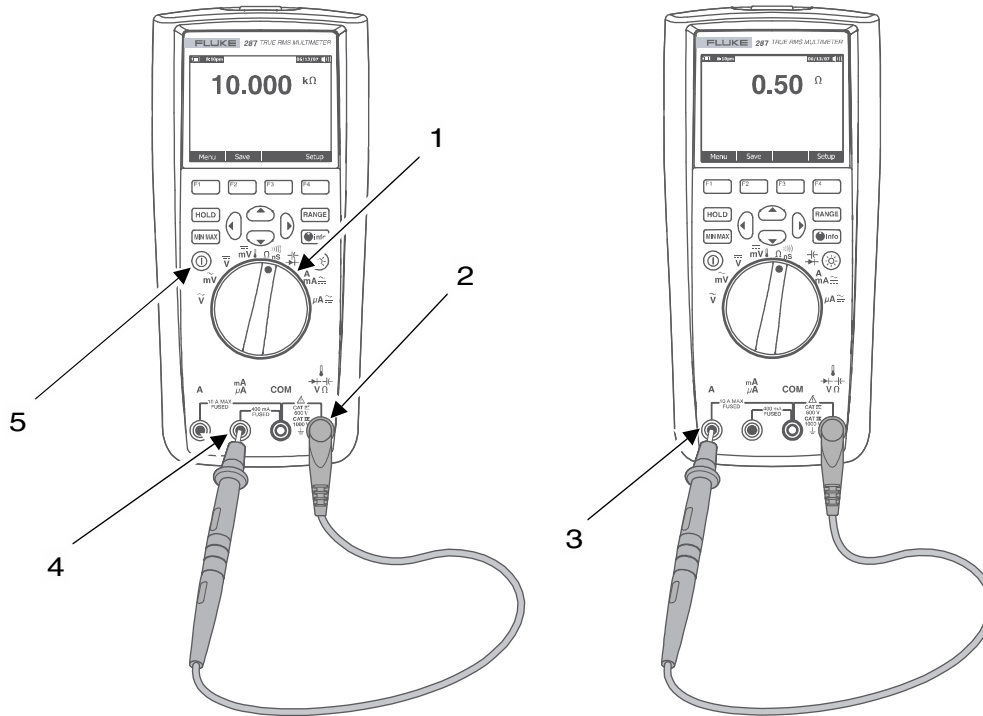


Figure 20. Fuse Test Points

CAUTION

Do not put incorrect fuses into fuse brackets. Fuses are not the same size. Installing an incorrect fuse may spread the fuse brackets causing damage to the circuit board. Failure to follow this caution can cause damage to the multimeter.

7. Replace 10A fuse (WP 0014) if reading is not correct.

END OF TASK

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS

OPERATION UNDER UNUSUAL CONDITIONS

INITIAL SETUP:

NOT APPLICABLE

EXTREME SUNLIGHT

NOTE

The following procedure should be used if the operator is having problems reading the multimeter display in extreme sunlight.

1. Turn the multimeter on (Figure 1., Item 3) and set to the desired multimeter function (WP 0005).

NOTE

Do not attempt to select items on a menu or input data while performing the following steps.

2. Press the up arrow softkey (Figure 1., Item 1) while observing the display. The display content should become more defined. Continue to press the up arrow softkey until the desired display contrast is achieved or until the multimeter display no longer changes.
3. If the display becomes too bright (too much contrast), press the down arrow softkey to decrease the contrast.
4. If the display is still not readable, adjust the backlight by depressing the Backlight button (Figure 1., Item 2).

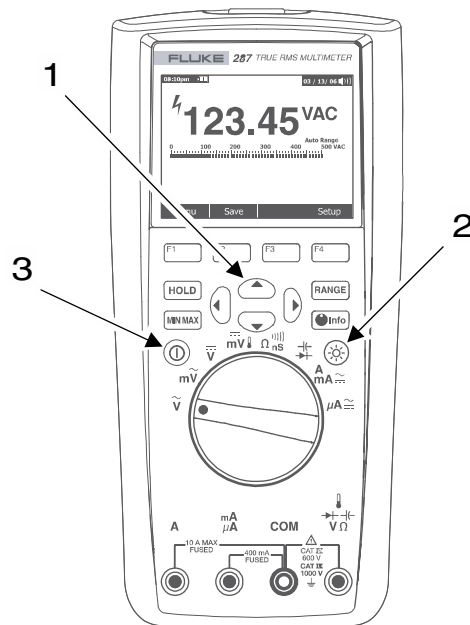


Figure 1. Multimeter Extreme Light Settings

OPERATION UNDER UNUSUAL CONDITIONS - (CONTINUED)

5. If the display is still not readable, attempt to shield the multimeter display from the sun by using your body or some sort of cover.

END OF TASK

END OF WORK PACKAGE

CHAPTER 3
TROUBLESHOOTING PROCEDURES
FOR
AN/GSM-437 MULTIMETER SET

CHAPTER 3
TROUBLESHOOTING PROCEDURES

WORK PACKAGE INDEX

| Title | WP Sequence No. |
|--|------------------------|
| TRUBLESHOOTING INDEX | 0007 |
| ERROR MESSAGE/SYMPTOM TROUBLESHOOTING. | 0008 |

OPERATOR INSTRUCTIONS

TROUBLESHOOTING INDEX

Malfunction

Troubleshooting Procedure

- | | |
|---|---------|
| 1. ERROR MESSAGE: WARNING: "Leads not connected correctly." | WP 0008 |
| 2. ERROR MESSAGE: ATTENTION "Open Thermocouple." | WP 0008 |
| 3. ERROR MESSAGE: "Batteries low - function unavailable". | WP 0008 |
| 4. ERROR MESSAGE: "CAUTION: Batteries critically low, replace now." | WP 0008 |
| 5. MULTIMETER FAILS TO TURN ON | WP 0008 |
| 6. AUDIBLE ALARM CHIRPS WHEN MULTIMETER IS ON | WP 0008 |
| 7. CURRENT MEASUREMENT(S) NOT DISPLAYING | WP 0008 |
| 8. DISPLAY TURNS ON BUT METER DOES NOT RESPOND TO INPUT | WP 0008 |
| 9. PROBLEM USING HIGH VOLTAGE PROBE | WP 0008 |
| 10. PROBLEM USING TEMPERATURE PROBE. | WP 0008 |

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS
ERROR MESSAGE/SYMPTOM TROUBLESHOOTING

INITIAL SETUP:

| | |
|--------------------------------|---------|
| Tools and Special Tools | WP 0009 |
| Screwdriver, Flat | WP 0010 |
| References | WP 0014 |
| WP 0005 | WP 0015 |

Introduction**NOTE**

Always troubleshoot Error Messages first.

The AN/GSM-437 Multimeter Set troubleshooting contains both Error Message and Symptom malfunctions.

ERROR MESSAGE: If the multimeter detects an error with its operation, an "ERROR MESSAGE" will be shown on the multimeter's display. If an error message is displayed, look for the message below and perform that troubleshooting procedure. Error Messages should be troubleshot first.

SYMPTOM: When an operator notices that the multimeter is not operating properly and there is no Error Message on the display, the operator should find the symptom and perform that troubleshooting procedure.

TROUBLESHOOTING PROCEDURE**SYMPTOM**

The following error message is displayed on the multimeter: **WARNING: "Leads not connected correctly."**

MALFUNCTION

Leads installed incorrectly for mode chosen on rotary switch.

CORRECTIVE ACTION

STEP 1. Check test leads to ensure that they are properly inserted into the proper multimeter terminals and match the mode selected on the rotary switch (see WP 0005 for proper setup instructions).

STEP 2. If setup is not proper, adjust the rotary switch to the proper mode selection and insert multimeter test leads into the proper multimeter terminals (see WP 0005 for proper setup instructions).

STEP 3. If the error message is still present, go to the next malfunction.

MALFUNCTION

Dirty multimeter terminals/test leads

CORRECTIVE ACTION

STEP 1. Remove test leads from multimeter terminals; check for dirt and corrosion in multimeter terminals and on test lead connectors.

STEP 2. If test leads and/or multimeter terminals are dirty or corroded, clean as needed (see WP 0011 for proper cleaning instructions).

STEP 3. If the error message is still present, go to the next malfunction.

MALFUNCTION

Test leads bad.

CORRECTIVE ACTION

STEP 1. Set multimeter up in the resistance mode (see WP 0005 for proper setup instructions).

 ERROR MESSAGE/SYMPTOM TROUBLESHOOTING - (CONTINUED)
NOTE

The multimeter should display should read continuity (near 0 ohms (Ω)).

STEP 2. Touch the test lead tips together. Note reading.

STEP 3. If the multimeter does not display the near 0 ohms, replace the test leads.

STEP 4. If the error message is still present, notify next level of maintenance.

TROUBLESHOOTING PROCEDURE**SYMPTOM**

The following error message is displayed on the multimeter: **ATTENTION: "Open Thermocouple."**

MALFUNCTION

Open in the temperature probe.

CORRECTIVE ACTION**NOTE**

This error message should only display when the multimeter is in one of the temperature modes. If this error message appears in any other multimeter mode, notify next level of maintenance.

STEP 1. Check adaptor leads to ensure they are properly inserted into the proper multimeter terminals and that the temperature probe is properly inserted into the adaptor. Ensure that the multimeter is in one of the temperature modes (see WP 0005 for proper setup instructions).

STEP 2. If setup is not proper, set the multimeter to the proper temperature mode selection and insert adaptor into proper multimeter terminals and temperature probe into the adaptor (see WP 0005 for proper setup instructions).

STEP 3. If the error message is still present, go to the next malfunction.

MALFUNCTION

Dirty multimeter terminals/test probe leads/adaptor leads.

CORRECTIVE ACTION

STEP 1. Remove adaptor from multimeter terminals and disconnect the temperature probe from the adaptor. Check for dirt and corrosion.

STEP 2. If temperature probe leads, adaptor terminals/leads, and/or multimeter terminals are dirty or corroded, clean as needed (see WP 0011 for proper cleaning instructions).

STEP 3. If the error message is still present, troubleshoot the temperature probe (WP 0008).

TROUBLESHOOTING PROCEDURE**SYMPTOM**

The following error message is displayed on the multimeter: **Batteries low – function unavailable.**

MALFUNCTION

Bad batteries.

CORRECTIVE ACTION

STEP 1. Remove old batteries (WP 0012) and replace with new batteries (WP 0013).

STEP 2. If the error message is still present, notify next level of maintenance.

TROUBLESHOOTING PROCEDURE**SYMPTOM**

ERROR MESSAGE/SYMPTOM TROUBLESHOOTING - (CONTINUED)

The following error message is displayed on the multimeter: **CAUTION: Batteries critically low, replace now.**

MALFUNCTION

Bad batteries.

CORRECTIVE ACTION

STEP 1. Removed old batteries (WP 0012) and replace with new batteries (WP 0013).

STEP 2. If the problem still exists, notify next level of maintenance.

TROUBLESHOOTING PROCEDURE**SYMPTOM**

MULTIMETER FAILS TO TURN ON

MALFUNCTION

Multimeter rear cover not properly seated.

CORRECTIVE ACTION

STEP 1. Check multimeter rear cover to ensure it is locked to multimeter body (WP 0012).

STEP 2. If multimeter rear cover feels loose or looks as if it is not seated properly, remove the rear cover (WP 0012) and reattach to the multimeter body (WP 0013).

STEP 3. If the problem still exists, go to the next malfunction.

MALFUNCTION

Bad batteries.

CORRECTIVE ACTION

STEP 1. Press the On/Off button and observe the button.

STEP 2. If the On/Off button illuminates (lights up green), notify next level of maintenance.

STEP 3. If the On/Off button does not illuminate, remove old batteries (WP 0012) and replace with new batteries (WP 0013).

STEP 4. If the problem still exists, notify next level of maintenance.

TROUBLESHOOTING PROCEDURE**SYMPTOM**

AUDIBLE ALARM CHIRPS WHEN MULTIMETER IS ON

MALFUNCTION

Tests leads installed improperly.

CORRECTIVE ACTION**NOTE**

Audible alarm will only chirp when the multimeter beeper function is turned on.

STEP 1. Check test leads to ensure they are inserted properly and match the mode selected on the rotary switch (WP 0005).

STEP 2. If the test leads are not inserted properly for the mode indicated by the rotary switch, reset the multimeter to the desired mode (WP 0005).

STEP 3. If the problem still exists, go to the next malfunction.

MALFUNCTION

ERROR MESSAGE/SYMPTOM TROUBLESHOOTING - (CONTINUED)

Tests leads bad.

CORRECTIVE ACTION

STEP 1. Set multimeter up in the resistance mode (WP 0005).

NOTE

The multimeter should display should read continuity (near 0 ohms (Ω)).

STEP 2. Touch the test lead tips together. Note reading.

STEP 3. If the multimeter does not display a near 0 ohms reading (continuity), replace the test leads.

STEP 4. If the problem still exists, notify next level of maintenance.

TROUBLESHOOTING PROCEDURE**SYMPTOM**

CURRENT MEASUREMENT(S) NOT DISPLAYING

MALFUNCTION

Leads installed incorrectly for current mode chosen on rotary switch.

CORRECTIVE ACTION

STEP 1. Check test leads to ensure they are properly inserted into the proper multimeter terminals and match the current mode selected on the rotary switch (see WP 0005 for proper setup instructions).

STEP 2. If setup is not proper, adjust the rotary switch to the proper current mode selection and insert multimeter test leads into the proper multimeter terminals (see WP 0005 for proper setup instructions).

STEP 3. If the problem still exists, go to the next malfunction.

MALFUNCTION

Dirty multimeter terminals/test leads.

CORRECTIVE ACTION

STEP 1. Remove test leads from multimeter terminals; check for dirt and corrosion in multimeter terminals and on test lead connectors.

STEP 2. If test leads and/or multimeter terminals are dirty or corroded, clean as needed (see WP 0011 for proper cleaning instructions).

STEP 3. If the problem still exists, go to the next malfunction.

MALFUNCTION

Test leads bad.

CORRECTIVE ACTION

STEP 1. Set multimeter up in the resistance mode (see WP 0005 for proper setup instructions).

NOTE

The multimeter should display should read continuity (near 0 ohms (Ω)).

STEP 2. Touch the test lead tips together. Note reading.

STEP 3. If the multimeter does not display the near 0 ohms, replace the test leads.

STEP 4. If the error message is still present, go to the next malfunction.

MALFUNCTION

 ERROR MESSAGE/SYMPTOM TROUBLESHOOTING - (CONTINUED)

Bad fuse(s).

CORRECTIVE ACTION

- STEP 1. Perform Fuse Test on each fuse (WP 0005).
- STEP 2. If either fuse is bad, replace bad fuse (WP 0011).
- STEP 3. If the problem still exists, notify next level of maintenance.

TROUBLESHOOTING PROCEDURE

NOTE

This troubleshooting task does not cover measurements when using the high voltage probe or temperature probe. Troubleshooting for these probes is covered in another troubleshooting task.

SYMPTOM

DISPLAY TURNS ON BUT METER DOES NOT RESPOND TO INPUT

MALFUNCTION

Dirty multimeter terminals/test leads

CORRECTIVE ACTION

- STEP 1. Remove test leads from multimeter terminals; check for dirt and corrosion in multimeter terminals and on test lead connectors.
- STEP 2. If test leads and/or multimeter terminals are dirty or corroded, clean as needed (see WP 0011 for proper cleaning instructions).
- STEP 3. If the problem still exists, go to the next malfunction.

MALFUNCTION

Test leads bad.

CORRECTIVE ACTION

- STEP 1. Set multimeter up in the resistance mode (see WP 0005 for proper setup instructions).

NOTE

The multimeter should display should read continuity (near 0 ohms (Ω)).

- STEP 2. Touch the test lead tips together. Note reading.
- STEP 3. If the multimeter does not display the near 0 ohms, replace the test leads.
- STEP 4. If the error message is still present, notify next level of maintenance.

TROUBLESHOOTING PROCEDURE

NOTE

This troubleshooting task only covers problems when using the high voltage probe.

SYMPTOM

PROBLEM USING HIGH VOLTAGE PROBE

MALFUNCTION

ERROR MESSAGE/SYMPTOM TROUBLESHOOTING - (CONTINUED)

Multimeter not set up properly.

CORRECTIVE ACTION

STEP 1. Check high voltage probe to ensure it is inserted properly and that the proper voltage mode is selected on the rotary switch (WP 0005).

STEP 2. If the high voltage probe is not inserted properly or the multimeter is not in the proper voltage mode, reset the multimeter to read high voltage (see WP 0005 for proper setup instructions).

STEP 3. If the problem still exists, go to the next malfunction.

MALFUNCTION

Dirty multimeter terminals/test leads.

CORRECTIVE ACTION

STEP 1. Remove test leads from multimeter terminals; check for dirt and corrosion in multimeter terminals and on test lead connectors.

STEP 2. If test leads and/or multimeter terminals are dirty or corroded, clean as needed (see WP 0011 for proper cleaning instructions).

STEP 3. If the problem still exists, go to the next malfunction.

MALFUNCTION

Internal probe fault

CORRECTIVE ACTION**NOTE**

A resistance reading between 40K–80K ohms is normal for this measurement.

STEP 1. With the multimeter on and the high voltage probe properly inserted, move the multimeter rotary switch to the Ω (ohms) position. Note the reading on the display.

STEP 2. If the reading is not between 40K-80K ohms, replace the high voltage probe.

STEP 3. If the problem still exists, go to the next malfunction.

MALFUNCTION

Probe strap fault.

CORRECTIVE ACTION**NOTE**

This configuration is for testing the high voltage probe only.

STEP 1. Turn the multimeter off and remove the high voltage probe from the multimeter. Turning the high voltage probe connector slightly, insert just the positive leg of the banana connector (the one opposite the leg marked GND) into the V/ Ω terminal. This means that the grounding leg is not connected to the multimeter.

STEP 2. Insert the black lead of the standard probe kit into the COM terminal on the multimeter.

STEP 3. Move the multimeter rotary switch to the Ω (ohms) position and turn on the multimeter (WP 0005).

ERROR MESSAGE/SYMPTOM TROUBLESHOOTING - (CONTINUED)**NOTE**

A resistance reading between 40K–80K ohms is normal for this measurement.

STEP 4. Touch the tip of the black test lead to the grounding clip on the high voltage probe. Note the reading on the display.

STEP 5. If the reading is not between 40K-80K ohms, replace the high voltage probe.

STEP 6. If the problem still exists, notify next level of maintenance.

TROUBLESHOOTING PROCEDURE**NOTE**

This troubleshooting task only covers problems when using the temperature probe.

SYMPTOM

PROBLEM USING TEMPERATURE PROBE

MALFUNCTION

Dirty multimeter terminals/test leads.

CORRECTIVE ACTION

STEP 1. Remove adapter from multimeter terminals and disconnect the temperature probe from the adaptor. Check for dirt and corrosion.

STEP 2. If temperature probe leads, adaptor terminals/leads, and/or multimeter terminals are dirty or corroded, clean as needed (see WP 0011 for proper cleaning instructions).

STEP 3. If the problem still exists, go to the next malfunction.

MALFUNCTION

Faulty temperature probe.

CORRECTIVE ACTION**NOTE**

A resistance reading between 4–8 ohms is normal for this measurement.

STEP 1. With the multimeter on and the adapter and temperature probe properly inserted, move the multimeter rotary switch to the Ω (ohms) position. Note the reading on the display.

STEP 2. If the reading is not between 4–8 ohms, replace the temperature probe.

STEP 3. If the problem still exists, notify next level of maintenance.

END OF WORK PACKAGE

CHAPTER 4
MAINTENANCE INSTRUCTIONS
FOR
PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

CHAPTER 4
MAINTENANCE INSTRUCTIONS

WORK PACKAGE INDEX

| Title | WP Sequence No. |
|--|------------------------|
| PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION | 0009 |
| PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) | 0010 |

OPERATOR INSTRUCTIONS

PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION

INTRODUCTION

Preventive Maintenance Checks and Services (PMCS) are performed to keep the equipment in operating condition. The checks are used to find, correct, or report problems. PMCS is done before and after using the multimeter.

When performing any PMCS procedure or routine check, observe all safety warnings and cautions. To prevent damage to sensitive components, observe the electrostatic discharge sensitive device handling procedures provided in the Safety, Care, and Handling.

MAINTENANCE FORMS AND RECORDS

Every mission begins and ends with paperwork. There isn't much of it, but you have to keep it up. The forms and records you fill out have several uses. They are a permanent record of services, repairs, and modifications made on your machine. They are reports to notify next level of maintenance and to your commander. They are also checklists that tell you what is wrong with the equipment after its last use and whether those faults have been repaired. For information on those forms and records, see DA PAM 750-8 (TAMMS).

GENERAL INFORMATION

PMCS is presented in two tables: Table 1 BEFORE PMCS and Table 2 AFTER PMCS.

Safe and efficient multimeter operation requires regular checks of multimeter and its attachments. When performing PMCS, the crew may discover malfunctions that require corrective action to avoid death/injury to personnel or equipment failure.

Always observe the WARNINGS and CAUTIONS appearing in the PMCS table. WARNINGS and CAUTIONS appear before applicable procedures. You must observe these WARNINGS and CAUTIONS to prevent death/injury to personnel or equipment damage.

EXPLANATION OF TABLE ENTRIES

Item Number (Item No.) Column. Numbers in this column are for reference. When completing DA Form 2404 (Equipment Inspection and Maintenance Worksheet), include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must perform checks and services for the intervals listed.

Interval Column. This column tells you when you must perform the procedure listed in the Procedure column. Before procedures must be done before you operate or use the equipment for its intended mission. During procedures must be done during the time you are operating the equipment for the intended mission. After procedures must be done immediately after you have operated the equipment.

Man-Hours Column. This column indicates the man-hours required to complete the prescribed procedure.

Item to Be Checked or Serviced Column. This column indicates the item to be checked or serviced.

Procedures Column. This column gives the procedure you must perform on the item listed in the Check/Service column to know if the equipment is ready or available for its intended mission, or for operation. You must perform the procedure at the time stated in the Interval column.

Equipment Not Ready/Available If: Column. Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If you determine that a fault exists on your multimeter as listed in this column, do not operate the multimeter. Once a malfunction is identified, troubleshoot it using the instructions in this manual. If unable to correct the fault, write it on DA Form 2404 or DA Form 5988-E and notify next level of maintenance immediately.

Other Table Entries. Be sure to observe all special information and notes that appear in the table.

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS
PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

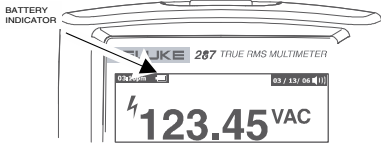
INITIAL SETUP:

Equipment Condition
 Multimeter off.

Table 1. BEFORE PMCS

| ITEM NO. | INTERVAL | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|--------------------------------|--|--|
| | | HARD CASE | | |
| 1 | Before | Exterior | Check the case for cracks, dents, broken latches, missing/damaged automatic purge valve, or damaged handle. | |
| 2 | Before | Interior | Use provided check sheet to check for missing items. Check sheet is found in the upper lid of the hard case. | Replace any missing items that may be mission critical. |
| | | MULTIMETER | | |
| 3 | Before | Calibration Tag | Check appropriate calibration tag for current calibration date. Calibration tag may be found on the multimeter or on the hard case. | Multimeter is out of calibration. |
| 4 | Before | Housing | Check multimeter housing for dirt, cracks and extensive damage. Clean display using cloth (cheesecloth) and mild detergent (WP 0011). | Multimeter housing cracked or extensively damaged. |
| 5 | Before | Display | Check for dirt, cracks, and excessive scratching on viewing display. Clean display using cloth (cheesecloth) and mild detergent (WP 0011). | Display is cracked or excessively scratched making display items unreadable. |
| 6 | Before | Softkeys / Buttons | Check front of multimeter for missing, damaged, or sticking softkey. Softkeys/Buttons should have a firm feel when depressed. Clean softkeys/buttons using cloth (cheesecloth) and mild detergent (WP 0011). | Softkey(s)/ Button(s) missing, damaged, or sticking. |
| 7 | Before | Terminals | Check multimeter terminals for dirt, corrosion, and clogging. Clean terminals using cloth (cheesecloth), foam-tipped swabs, and mild detergent (WP 0011). | Softkey(s)/ Button(s) missing, damaged, or sticking. |
| 8 | Before | Batteries | Turn the multimeter on and check for battery level (WP 0003, Table 1). Battery level should be at a level that will allow you to complete the task. | Battery level is below 25%. |

PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) - (CONTINUED)

| ITEM NO. | INTERVAL | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-------------------------------------|---|---|
| | | |  <p style="text-align: center;">Figure 1. Battery Level Indicator</p> | |
| 9 | Before | Fuses | Turn the multimeter on and check fuses (WP 0005). | Fuse(s) are blown. |
| | | TEST LEADS | | |
| 10 | Before | Standard Test Leads (red and black) | <p>Check standard test leads for damage including cut insulation, bent lead tips, and bent connector pins.</p> <p>Insert the black test lead into the COM terminal on multimeter and the red test lead into the Ω terminal. Turn the rotary switch to the Ω position and turn on the multimeter (see WP 0005 for proper resistance test setup procedure). Connect the red and black test lead tips together and note reading. The multimeter should display a reading near 0.00 ohms.</p> | <p>Either test lead is damaged.</p> <p>Resistance does not read near 0.00 ohms.</p> |
| | | PROBES | | |
| 11 | Before | High Voltage Probe | <p>Check appropriate calibration tag for current calibration date. Calibration tag may be found on the high voltage probe or on the hard case.</p> <p>Check high voltage probe for damage including cut insulation, bent probe tip, and bent connector pins.</p> <p>Connect the high voltage probe to a multimeter (see WP 0005 for proper high voltage probe setup), turn the rotary switch to the Ω position, and turn on the multimeter. The multimeter should display a high resistance value (40K-80K ohms).</p> | <p>High voltage probe is out of calibration.</p> <p>High voltage probe is damaged.</p> <p>Resistance reads either OL (indicating an open in the probe) or near 0.00 ohms (indicating a short in the probe).</p> |
| 12 | Before | Temperature Probe | <p>Check appropriate calibration tag for current calibration date. Calibration tag may be found on the temperature probe or on the hard case.</p> <p>Check temperature probe for damage, including cut insulation, bent probe tip, and bent connector pins.</p> <p>Connect the temperate probe and adaptor to a multimeter (see WP 0005 for proper temperature probe setup), turn the rotary switch to the Ω position, and turn on the</p> | <p>Temperature probe is out of calibration.</p> <p>Temperature probe is damaged.</p> <p>Resistance reads either OL (indicating an open in the probe)</p> |

PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) - (CONTINUED)

| ITEM NO. | INTERVAL | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|--------------------------------|--|--|
| | | | multimeter. The multimeter should display a resistance value (4-8 ohms). | or near 0.00 ohms (indicating a short in the probe). |

Table 2. AFTER PMCS

| ITEM NO. | INTERVAL | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|--------------------------------|---|------------------------------------|
| | | MULTIMETER | | |
| 1 | After | Batteries | If multimeter is to be stored or not used for three months, remove the batteries (WP 0012). | |
| | | HARD CASE | | |
| 2 | After | Interior | Use provided checklist card to check for missing items. Check sheet is found in the upper lid of the hard case. | Replace any missing items. |
| 3 | After | Interior | Stow all components into the hard case and secure the case lid. | |

END OF WORK PACKAGE

CHAPTER 5
MAINTENANCE INSTRUCTIONS
FOR
AN/GSM-437 MULTIMETER SET

CHAPTER 5
MAINTENANCE INSTRUCTIONS

WORK PACKAGE INDEX

| Title | WP Sequence No. |
|--------------------------------|------------------------|
| GENERAL MAINTENANCE | 0011 |
| BATTERY REMOVAL | 0012 |
| BATTERY INSTALLATION | 0013 |
| FUSE(S) REMOVAL | 0014 |
| FUSE(S) INSTALLATION | 0015 |

OPERATOR INSTRUCTIONS**GENERAL MAINTENANCE**

INITIAL SETUP:**Materials/Parts**

Brush, Dusting - as required
Cloth, Cheesecloth - 1
Detergent Mild, Liquid - as required
Dust Remover, Compressed - 1
Swab, Foam Tip - as required

Personnel Required

- One

Equipment Condition

Multimeter turned off.
Test leads removed from multimeter terminals.

CLEANING**WARNING**

Remove the test leads and any input signals before cleaning the multimeter to prevent electrical shock and personal injury.

Failure to follow this warning can result in death, injury and/or equipment damage.

CAUTION

Do not use abrasives, isopropyl alcohol, or solvents. Use of any of these can cause damage to the equipment.

1. Shake out any dirt that may be in the terminals.
2. If fine dust and/or sand is still present on the multimeter, use a dusting brush (WP 0019 Item 2) to remove fine particles from around the multimeter display, keyboard, and rotary switch. Use compressed dust remover (WP 0019 Item 5) to remove any remaining particles.
3. Wipe the multimeter case, including display window, with a damp cloth (cheesecloth) (WP 0019 Item 3) and mild detergent (WP 0019 Item 4).
4. Soak a clean swab (WP 0019 Item 6) with mild detergent (WP 0019 Item 4) and water. Work the swab around in each terminal. Dry each terminal using compressed dust remover (WP 0019 Item 5) to force the water and detergent out of the terminals.
5. Wipe the temperature probe with a damp cloth (cheesecloth) (WP 0019 Item 3) and mild detergent (WP 0019 Item 4), as needed.
6. Wipe the high voltage probe with a damp cloth (cheesecloth) (WP 0019 Item 3) and mild detergent (WP 0019 Item 4), as needed.
7. Wipe the hard black case with a damp cloth (cheesecloth) (WP 0019 Item 3) and mild detergent (WP 0019 Item 4), as needed.

END OF TASK**END OF WORK PACKAGE**

OPERATOR INSTRUCTIONS**BATTERY REMOVAL**

INITIAL SETUP:**Tools and Special Tools**

Screwdriver, Flat

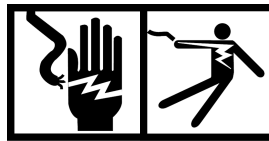
Personnel Required

- One

Equipment Condition

Multimeter turned off.

Test leads removed from multimeter terminals.

REMOVE BATTERIES**WARNING**

Remove the test leads and any input signals before removing the batteries to prevent electrical shock and personal injury.

Failure to follow this warning can result in death, injury and/or equipment damage.

CAUTION

Do not remove batteries while the multimeter is turned on or a signal is applied to the multimeter's input jacks. Failure to comply with this caution could result in damage to the multimeter.

NOTE

Ensure that the multimeter is placed face down on a clean surface for this procedure.

1. Raise the multimeter stand to gain access to the multimeter rear cover locking device located on the multimeter rear panel (Figure 1., Item 1).
2. Turn the multimeter rear cover locking device (Figure 1., Item 2) counter-clockwise until the "unlock" symbol on the locking device aligns with the arrow on the rear multimeter cover. This will unlock the multimeter rear cover.

BATTERY REMOVAL - (CONTINUED)

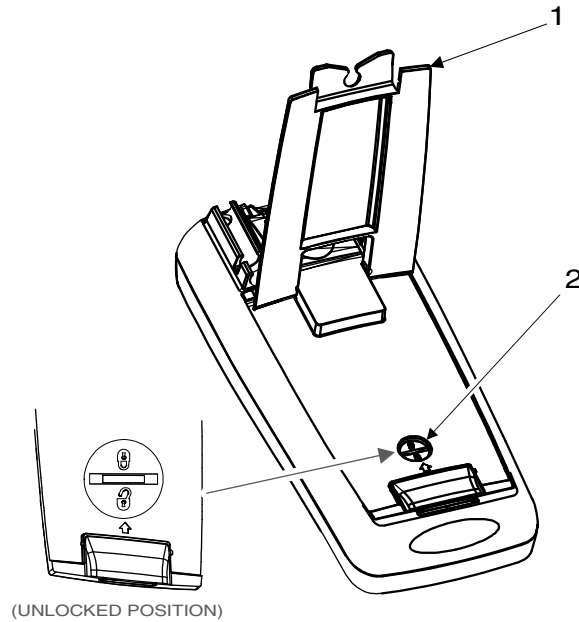


Figure 1. Multimeter Rear Cover Locking Device

CAUTION

Do not pry the multimeter rear cover away from the multimeter body. Damage to the equipment may result.

NOTE

Rear cover should lift easily from the body.

If the rear cover does not lift up easily, try resetting the locking device as described in the above step.

3. Remove multimeter rear cover (Figure 2., Item 2) from the multimeter body (Figure 2., Item 1) by gently lifting the rear multimeter cover tab (Figure 2., Item 3).

BATTERY REMOVAL - (CONTINUED)

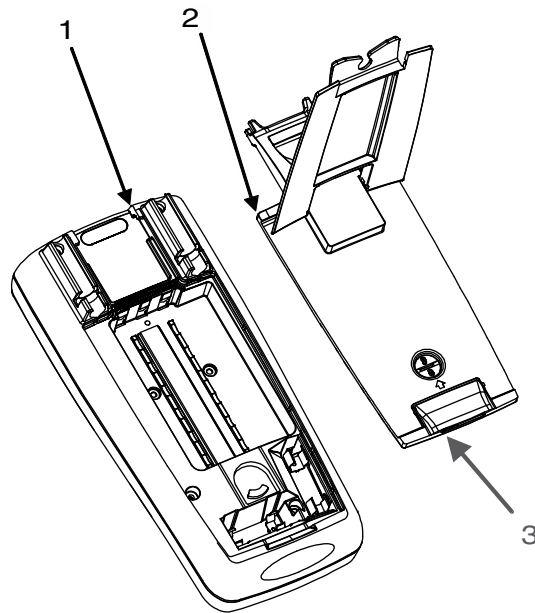


Figure 2. Multimeter Rear Cover

4. Remove the six batteries (Figure 3., Item 2) from the multimeter rear cover (Figure 3., Item 1).

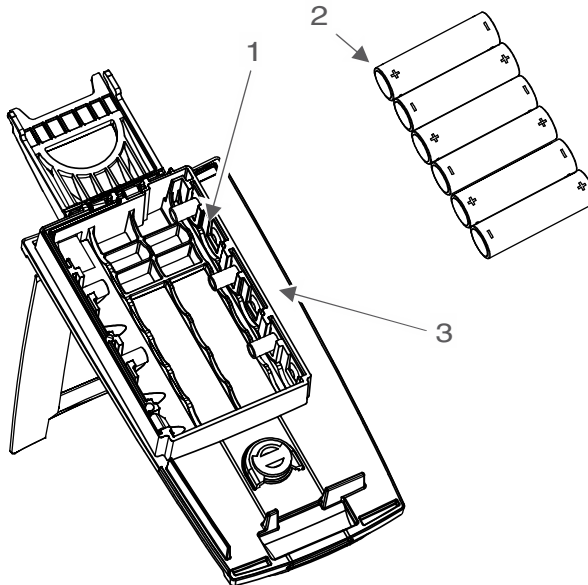


Figure 3. Multimeter Battery Location

END OF TASK

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS**BATTERY INSTALLATION**

INITIAL SETUP:**Tools and Special Tools**

Screwdriver, Flat

Equipment Condition

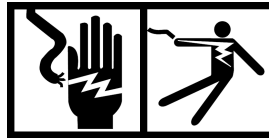
Multimeter turned off.

Test leads removed from multimeter terminals.

Materials/Parts

Batteries, Nonrechargeable - (6)

Personnel Required- One

INSTALL BATTERIES**WARNING**

Remove the test leads and any input signals before removing the batteries to prevent electrical shock and personal injury.

Failure to follow this warning can result in death, injury and/or equipment damage.

NOTE

Ensure that the meter rear cover stand is out and meter rear cover is facing up to allow access to battery cradle.

Ensure that the batteries are installed following proper polarity. Polarity symbols can be found on rear cover (Figure 1., Item 3.)

1. Install six new batteries (Figure 1., Item 2) into the multimeter rear cover (Figure 1., Item 1).

BATTERY INSTALLATION - (CONTINUED)

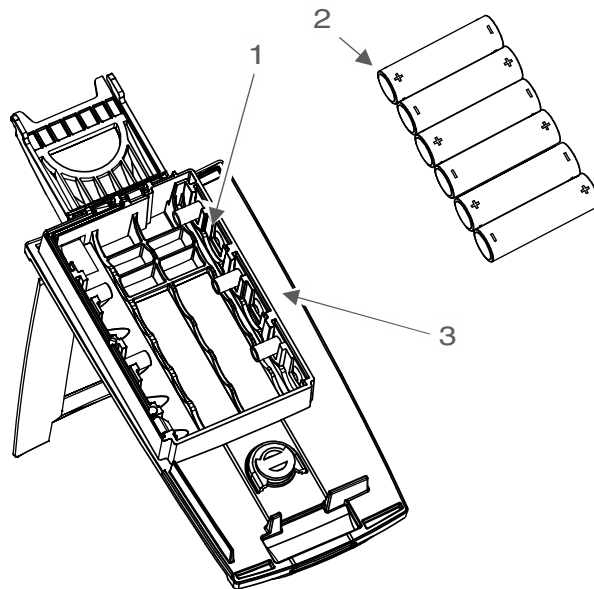


Figure 1. Multimeter Battery Location

NOTE

Ensure that the multimeter is placed face down on a clean working surface for this procedure.

Guides are located in the upper rear portion of the main multimeter body.

2. Guide the upper portion of the multimeter rear cover (Figure 2., Item 2) into the slots of the multimeter body (Figure 2., Item 1). Lower rear cover into place. Ensure that the multimeter rear cover is flush with the multimeter body.

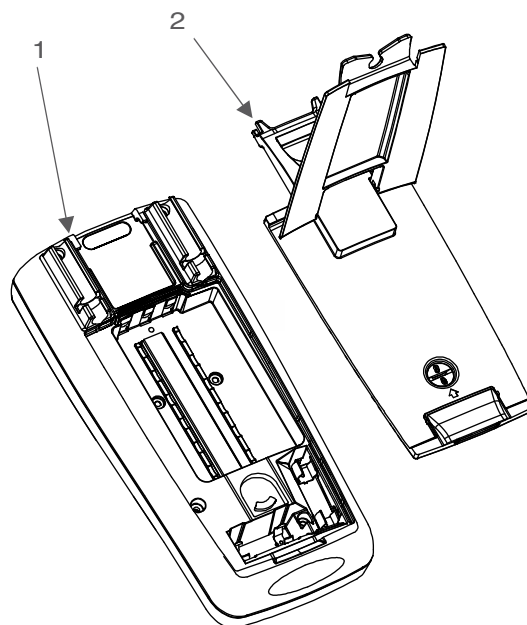


Figure 2. Multimeter Rear Cover

BATTERY INSTALLATION - (CONTINUED)

CAUTION

Ensure that the rear cover is locked and flush against the multimeter body. If the multimeter rear cover is not installed properly, sand, dust, or moisture could work its way into the electronics of the multimeter. This can cause damage to the equipment.

3. Raise multimeter stand (Figure 3., Item 1) and turn multimeter rear cover locking device (Figure 3., Item 2) clockwise until the lock symbol on the locking device aligns with the arrow on the rear multimeter cover. This will "lock" the multimeter rear cover. Lower multimeter stand (Figure 3., Item 1).

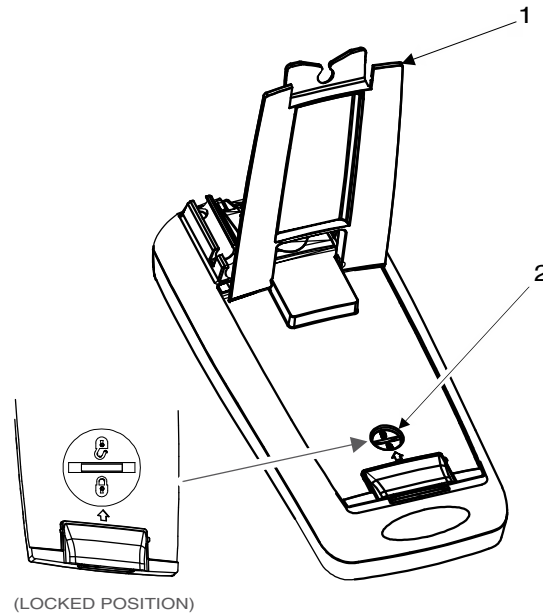


Figure 3. Multimeter Locking Device Location

END OF TASK

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS**FUSE(S) REMOVAL**

INITIAL SETUP:**Tools and Special Tools**

Screwdriver, Flat

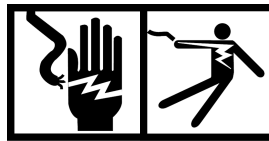
Personnel Required

- One

Equipment Condition

Multimeter turned off.

Test leads removed from multimeter terminals.

REMOVE FUSE(S)**WARNING**

Remove the test leads and any input signals before replacing the fuses to prevent electrical shock and personal injury.

Use only approved fuses when replacing a blown fuse. Installing the wrong fuse could cause excess current in multimeter.

Failure to follow this warning can result in death, injury to personnel and/or equipment damage.

NOTE

Ensure that the multimeter is placed face down on a clean working surface for this procedure.

1. Raise the multimeter stand to gain access to the multimeter rear cover locking device located on the multimeter rear panel (Figure 1., Item 1).
2. Turn multimeter rear cover locking device (Figure 1., Item 2) counter-clockwise until the "unlock" symbol on the locking device aligns with the arrow on the rear multimeter cover. This will unlock the multimeter rear cover.

FUSE(S) REMOVAL - (CONTINUED)

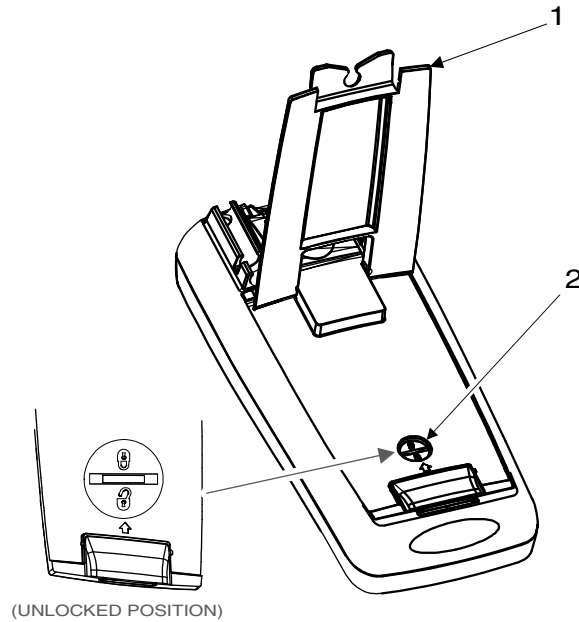


Figure 1. Multimeter Rear Cover Locking Device

CAUTION

Do not pry the multimeter rear cover away from the multimeter body. Damage to the equipment may result.

NOTE

Rear cover should lift easily from the body.

If the rear cover does not lift up easily, try resetting the locking device as described in the above step.

3. Remove multimeter rear cover (Figure 2., Item 2) from the multimeter body (Figure 2., Item 1) by gently lifting the rear multimeter cover tab (Figure 2., Item 3).

FUSE(S) REMOVAL - (CONTINUED)

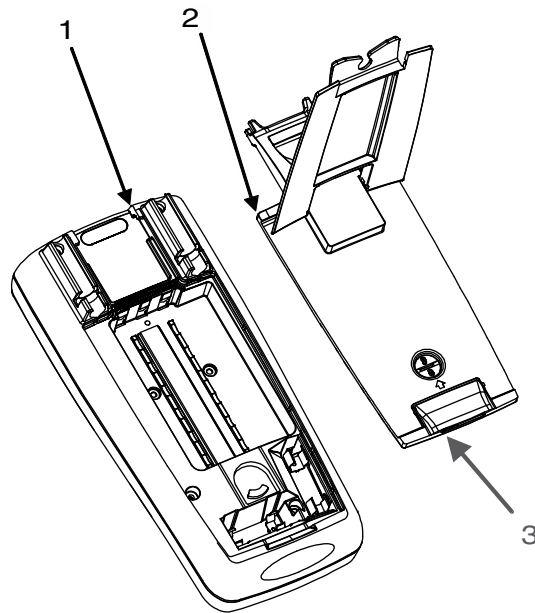


Figure 2. Multimeter Rear Cover

CAUTION

Care should be taken not to damage the fuse retaining brackets when removing a fuse. A damaged bracket can lead to a loose fuse connection, causing damage to the equipment.

NOTE

Perform step 4 if 11A fuse (F2) must be removed.

Perform step 5 if 0.44A fuse (F1) must be removed.

4. Gently pry one end of the fuse (F2) (Figure 3., Item 1) loose, then remove the fuse out of its brackets.
5. Gently pry one end of the fuse (F1) (Figure 3., Item 2) loose, then remove the fuse out of its brackets.

FUSE(S) REMOVAL - (CONTINUED)

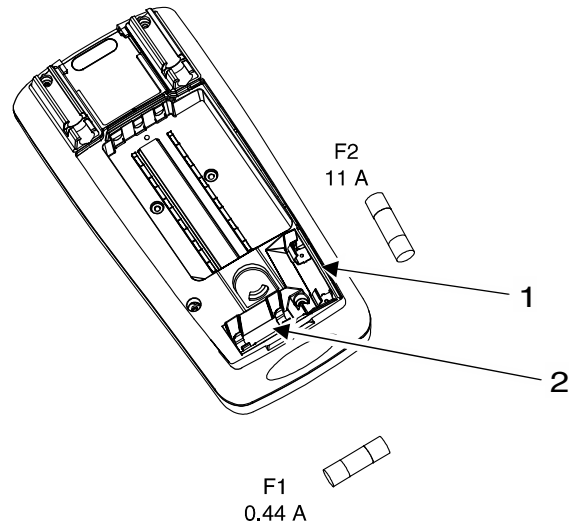


Figure 3. Multimeter Fuses Location

END OF TASK

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS**FUSE(S) INSTALLATION**

INITIAL SETUP:**Tools and Special Tools**

Screwdriver, Flat

Personnel Required

- One

Materials/Parts

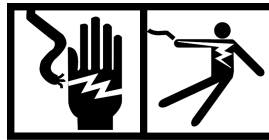
Fuse, Cartridge, 11.0 A - 1

Fuse, Cartridge, 0.44 A - 1

Equipment Condition

Multimeter turned off.

Test leads removed from multimeter terminals.

INSTALL FUSE(S)**WARNING**

Remove the test leads and any input signals before replacing the fuses to prevent electrical shock and personal injury.

Use only approved fuses when replacing a blown fuse. Installing the wrong fuse could cause excess current in multimeter.

Failure to follow this warning can result in death, injury to personnel and/or equipment damage.

CAUTION

Do not put incorrect fuses into fuse brackets. Fuses are different sizes and installing an incorrect fuse may spread the fuse brackets, causing damage to the circuit board. Failure to follow this caution can cause damage to the multimeter.

NOTE

The fuses are almost identical in size but not in rating.

Perform Step 1 if fuse (F1, 0.44 A) must be installed.

Perform Step 2 if fuse (F2, 11.0 A) must be installed.

1. Install a new fuse (F1) (Figure 1., Item 4) into each fuse bracket (Figure 1., Item 3). Gently press down on the fuse and ensure that it snaps into both brackets. Go to Step 3.
2. Install a new fuse (F2) (Figure 1., Item 2) into each fuse bracket (Figure 1., Item 1). Gently press down on the fuse and ensure that it snaps into both brackets.

FUSE(S) INSTALLATION - (CONTINUED)

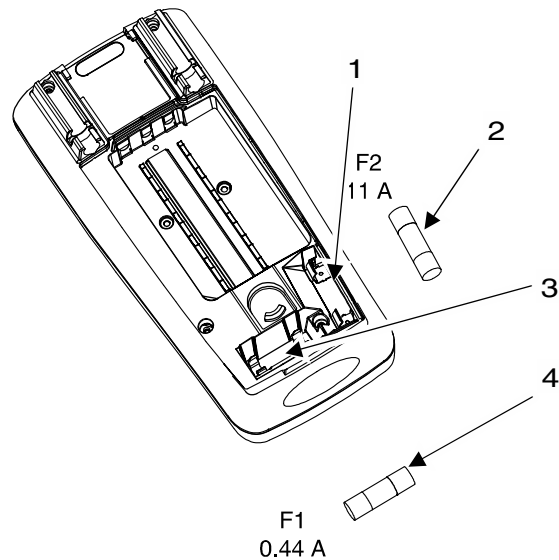


Figure 1. Multimeter Fuses Location

NOTE

Guides are located in the upper rear portion of the main multimeter body.

3. Guide the upper portion of the multimeter rear cover (Figure 2., Item 2) into the slots of the multimeter body (Figure 2., Item 1). Lower multimeter rear cover into place. Ensure that the multimeter rear cover is flush with the multimeter body.

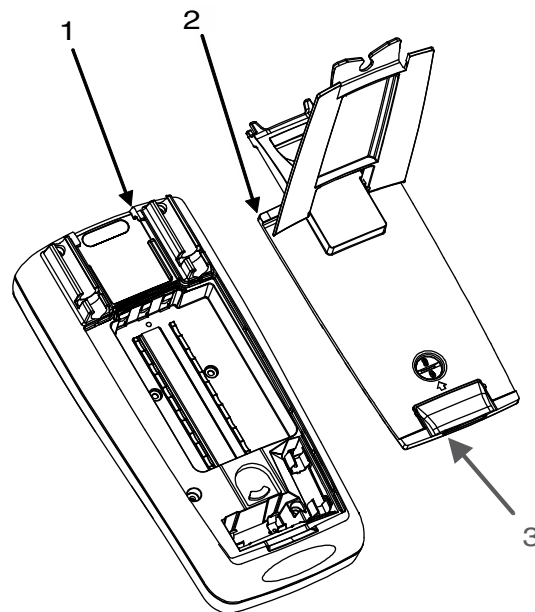


Figure 2. Multimeter Rear Cover

FUSE(S) INSTALLATION - (CONTINUED)

CAUTION

Ensure that the multimeter rear cover is locked and flush against the multimeter body. If the multimeter rear cover is not installed properly, sand, dust, or moisture could work its way into the electronics of the multimeter, causing damage to the equipment.

4. Raise multimeter stand (Figure 3., Item 1) and turn multimeter rear cover locking device (Figure 3., Item 2) clockwise until the "lock" symbol on the locking device aligns with the arrow on the rear multimeter cover. This will "lock" the multimeter rear cover. Lower multimeter stand (Figure 3., Item 1).

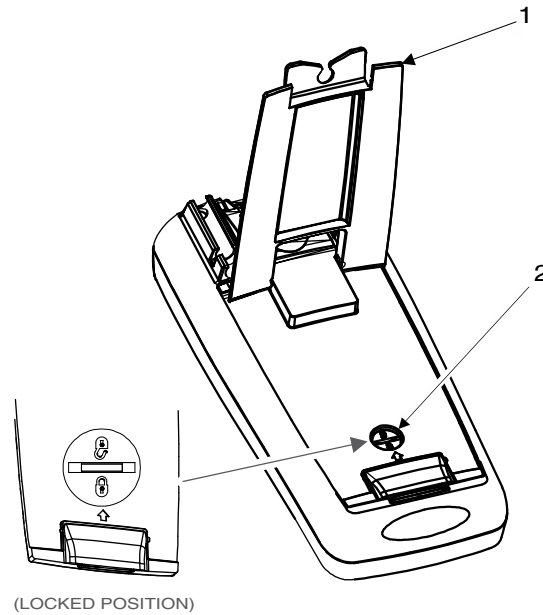


Figure 3. Multimeter Locking Device Location

END OF TASK

END OF WORK PACKAGE

CHAPTER 6
SUPPORTING INFORMATION
FOR
AN/GSM-437 MULTIMETER SET

CHAPTER 6
SUPPORTING INFORMATION

WORK PACKAGE INDEX

| Title | WP Sequence No. |
|---|------------------------|
| REFERENCES | 0016 |
| COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS | 0017 |
| ADDITIONAL AUTHORIZATION LIST (AAL). | 0018 |
| EXPENDABLE AND DURABLE ITEMS. | 0019 |
| INFORMATION ASSURANCE CONSIDERATIONS | 0020 |
| ELECTRONIC 2028 INSTRUCTIONS | 0021 |

OPERATOR INSTRUCTIONS
REFERENCES

SCOPE

This work package lists the publications referenced in this manual which apply to maintainer maintenance of the AN/GSM-437 Multimeter Set.

ARMY REGULATIONS

| | |
|------------|---|
| AR 25-2 | Information Assurance |
| AR 700-138 | Army Logistics Readiness and Sustainability |
| AR 700-139 | Army Warranty Program |

FORMS

| | |
|----------------|--|
| AR 750-1 | Army Material Maintenance Policy |
| DA Form 2062 | Hand Receipt |
| DA Form 2404 | Equipment Inspection and Maintenance Worksheet |
| DA Form 2408-9 | Equipment Control Record |
| DA Form 5988-E | Equipment and Maintenance Inspection |
| DA PAM 738-751 | Functional Users Manual for The Army Maintenance Management Systems - Aviation (TAMMS-A) |
| DA PAM 750-8 | Recommended Changes to Publications and Blank Forms |
| SF Form 368 | Product Quality Deficiency Report |

TECHNICAL BULLETINS

| | |
|-----------|--|
| TB 43-180 | Calibration And Repair Requirements for the Maintenance of Army Material |
|-----------|--|

TECHNICAL PUBLICATIONS

| | |
|--------------------|--|
| CTA 8-100 | Army Medical Department Expendable/Durable Items |
| CTA 50-970 | Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items) |
| DA PAM 750-8 | TAMMS Users Manual |
| TM 11-6625-1753-10 | AN/GSM-437 Multimeter Set Operator's Manual |
| TM 750-244-2 | Procedures for Destruction of Electronic Materiel to Prevent Enemy Use |
| TM 750-244-3 | Procedures for Destruction of Equipment to Prevent Enemy Use |

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS**COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS**

GENERAL INTRODUCTION

This work package lists the COEI for the AN/GSM-437 Multimeter Set to help inventory the items for safe and efficient operation of the equipment. Also provided are stowage locations for the COEI.

INTRODUCTION TO TABLE 1 AND TABLE 2

COEI and BII are presented in the following lists:

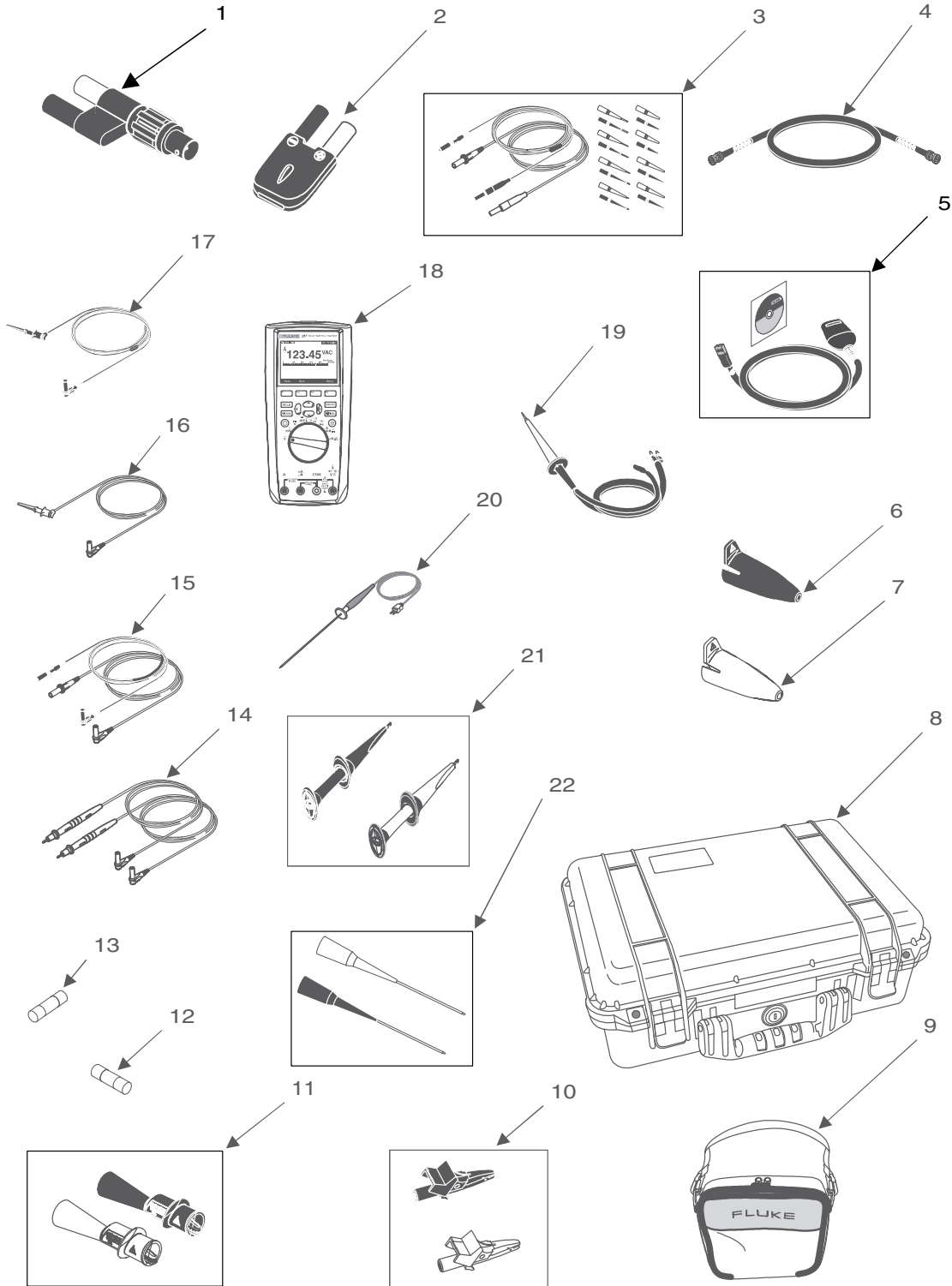
Table 1. COEI. This listing is for information purposes only and does not grant authority to requisition replacements. These items are part of the AN/GSM-437 Multimeter Set and are contained within the hard shipping case. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to help identify the items.

Table 2. BII. These essential items are required to place the AN/GSM-437 Multimeter Set in operation, operate it, and to perform emergency repairs. BII must be with the AN/GSM-437 Multimeter Set during operation and when it is transferred between property accounts. Listing these items is your authority to request/requisition them for replacement based on authorization of the end item by the Table of Organization and Equipment/Modified Table of Organization and Equipment (TOE/MTOE). Illustrations are furnished to help you find and identify the items.

EXPLANATION OF COLUMNS IN COEI AND BII LISTS

- **Column (1) ILLUS NUMBER.** Lists the number of the item illustrated.
- **Column (2) NATIONAL STOCK NUMBER (NSN).** Identifies the stock number of the item to be used for requisitioning purposes.
- **Column (3) DESCRIPTION, PART NUMBER/(CAGEC).** Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The stowage location of COEI and BII is also included in this column. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parentheses).
- **Column (4) USABLE ON CODE.** When applicable, gives you a code if the item you need is not the same for different models of equipment. (The UOC for the AN/GSM-437 Multimeter Set is KAF. If has not been inserted into the tables as there is only one current model.)
- **Column (5) U/I (Unit of Issue).** Indicates the physical measurement or count of the item as issued per the National Stock Number (NSN) shown in Column (2).
- **Column (6) QTY RQD (Quantity Required).** Indicates the quantity required.

COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS - (CONTINUED)



COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS - (CONTINUED)

Table 1. Components of End Item (COEI)

| (1) ILLUS NUMBER | (2) NATIONAL STOCK NUMBER (NSN) | (3) DESCRIPTION, PART NUMBER/(CAGEC) | (4) USABLE ON CODE | (5) U/I | (6) QTY RQR |
|------------------------|---------------------------------------|--|-----------------------------|------------|-------------------|
| 1 | | ADAPTER, DUAL BANANA PLUG to F/BNC (in soft case): PM9081/001 (89536) | | EA | 1 |
| 2 | 5935-01-567-1548 | ADAPTER, CONNECTOR (in soft case): 80AK-A (89536) | | EA | 1 |
| 3 | 5999-01-549-3415 | AUTOMOTIVE TEST SET (in soft case): TL82 (89536) | | EA | 1 |
| 4 | 5995-00-724-4232 | CABLE ASSEMBLY, RADIO FREQUENCY (in soft case): 2249-C-48 (4U744) | | EA | 1 |
| 5 | | CABLE,USB to FLUKE-18X,28X (in soft case): IR189USB (4U744) | | EA | 1 |
| 6 | | CAP, PROBE TIP, BLACK (in soft case lid): 3986568 (4U744) | | EA | 1 |
| 7 | | CAP, PROBE TIP, RED (in soft case lid): 3986579 (4U744) | | EA | 1 |
| 8 | | CASE, BLACK, HARD PLASTIC: 4111093 (4U744) | | EA | 1 |
| 9 | | CASE, BLACK, SOFT/FABRIC: 1545782 (4U744) | | EA | 1 |
| 10 | | CLIP, ALLIGATOR EX-LARGE (in soft case): 6041B (05276) | | EA | 1 |
| 11 | 5999-01-399-4113 | CLIP, ELECTRICAL (in soft case): AC72 (89536) | | EA | 1 |
| 12 | 5920-01-471-5364 | FUSE, CARTRIDGE (in soft case): 943121 (89536) | | EA | 1 |
| 13 | 5920-01-471-5362 | FUSE, CARTRIDGE (in soft case): 803293 (89536) | | EA | 1 |
| 14 | 6625-01-504-4827 | LEAD SET, TEST (in soft case): 5907A (4U744) | | EA | 1 |
| 15 | 6625-01-220-5608 | LEAD, TEST (in soft case): TL71 (89536) | | EA | 1 |
| 16 | | MINI-GBR W/RT ANGLE, (BLACK) (in soft case): 6244-48-0 (05276) | | EA | 1 |
| 17 | | MINI-GBR W/RT ANGLE, (RED) (in soft case): 6244-48-2 (05276) | | EA | 1 |
| 18 | 6625-01-481-6875 | MULTIMETER (in hard case): 13685431 (18876) | | EA | 1 |
| 19 | 6625-01-384-2811 | PROBE, TEST (high-voltage) (in hard case): 80K-6 (89536) | | EA | 1 |
| 20 | 6685-01-548-9494 | PROBE, HUMIDITY-TEMPERATURE (in hard case): 80PK-26 (89536) | | EA | 1 |
| 21 | 6625-01-527-2563 | PROBE, TEST (in soft case): AC280 (89536) | | EA | 1 |
| 22 | 6625-01-504-4206 | TEST LEAD ATTACHMENT (in soft case): 6262-02 (4U744) | | EA | 1 |

COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS - (CONTINUED)

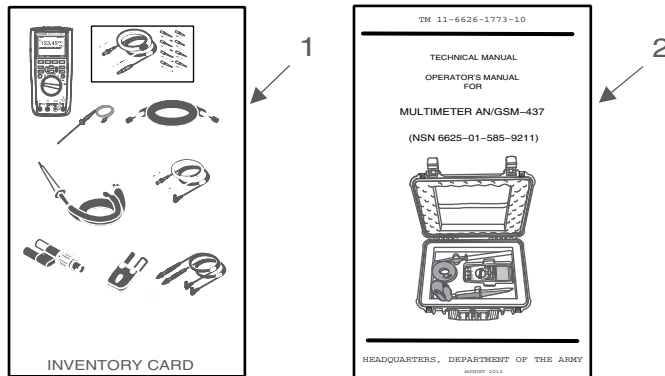


Table 2. Basic Issue Items (BII) List

| (1) ILLUS NUMBER | (2) NATIONAL STOCK NUMBER (NSN) | (3) DESCRIPTION, PART NUMBER/(CAGEC) | (4) USABLE ON CODE | (5) U/I | (6) QTY RQR |
|------------------------|---------------------------------------|---|-----------------------------|------------|-------------------|
| 1 | | CHECKLIST, INVENTORY CARD: 4139341 (4U744) | | EA | 1 |
| 2 | | TECH MANUAL: TM 11-6625-1753-10 | | EA | 1 |

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS
ADDITIONAL AUTHORIZATION LIST (AAL)

INTRODUCTION

Scope This section lists additional items authorized for the support of the AN/GSM-437 Multimeter Set.

General This list identifies items that do not have to accompany the AN/GSM-437 and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

Explanation of Columns in the AAL

- **Column (1) National Stock Number (NSN).** Identifies the stock number of the item to be used for requisitioning purposes.
- **Column (2) Description, Part Number/(CAGEC).** Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the Part Number and Commercial and Government Entity Code (CAGEC) (in parentheses).
- **Column (3) Usable On Code.** When applicable, lists a code if the item you need is not the same for different models of equipment.
- **Column (4) U/I.** Unit of Issue (U/I indicates the physical measurement or count of the item as issued per the National Stock Number (NSN) shown in column (1).
- **Column (5) Qty Recm.** Indicates the quantity recommended.

Table 1. Additional Authorization List

| (1) NATIONAL STOCK NUMBER (NSN) | (2) DESCRIPTION, PART NUMBER/(CAGEC) | (3) USABLE ON CODE | (4) U/I | (5) QTY RECM |
|--|---|--------------------------|------------|--------------------|
| | NET CD, OPERATOR 4139334 (4U774) | KAF | EA | 1 |

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS
EXPENDABLE AND DURABLE ITEMS

SCOPE

This work package lists expendable and durable items you will need to operate and maintain the AN/GSM-437 Multimeter Set. This list is for informational purposes only and is not authority to requisition the listed items. These items are authorized by CTA 50-970, *Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items)*, or CTA 8-100, *Army Medical Department Expendable/Durable Items*.

EXPLANATION OF COLUMNS

- *Column (1) ITEM NUMBER.* This number is assigned to the entry in the list and is referenced in the narrative instructions to identify the item (e.g., Use cloth (WP 0019, Item 1) to wipe down multimeter).
- *Column (2) LEVEL.* This column identifies the lowest level of maintenance that requires the listed item (include as applicable: C = Crew, O = AMC, F = Maintainer or ASB, H = Below Depot or TASMG, D = Depot).
- *Column (3) NATIONAL STOCK NUMBER (NSN).* This is the NSN assigned to the item which you can use to requisition it.
- *Column (4) ITEM NAME, DESCRIPTION, PART NUMBER/(CAGEC).* This column provides the other information you need to identify the item. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parentheses).
- *Column (5) U/I.* Unit of Issue (U/I) code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Table 1. Expendable and Durable Items List

| (1) ITEM NUMBER | (2) LEVEL | (3) NATIONAL STOCK NUMBER (NSN) | (4) ITEM NAME, DESCRIPTION, PART NUMBER AND (CAGEC) | (5) U/I |
|-----------------------|--------------|--|---|------------|
| 1 | C | 6135-00-985-7845 | Battery, Nonrechargeable 376756 (89536) | EA |
| 2 | C | 7920-00-205-0565 | Brush, Dusting, Lens And Photographic Negative 13218E3123 (97403) | EA |
| 3 | C | 8305-00-267-3015 | Cloth, Cheesecloth Cotton, YD Lintless Type II, Class 2 CCC-C-440 (81348) | YD |
| 4 | C | 7930-00-068-1669 | Detergent Mild, Liquid 7930-00-068-1669 (83421) | BX |
| 5 | C | 7930-01-398-2473 | Dust Remover, Compressed Gas 105798-1 (80244) | EA |
| 6 | C | 7920-01-170-8372 | Swab, Foam Tip HT 100 (59898) | BX |

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS
INFORMATION ASSURANCE CONSIDERATIONS

The AN/GSM-437 Multimeter Set is considered an Information System (IS) by the Army and further categorized as a Test and Evaluation (TE) System in accordance with Army Regulation (AR 25-2). A review of this IS must be included in annual Configuration Control Board (CCB) or Configuration Management Board (CMB) in accordance with AR 25-2 if it is to be connected to a host information system.

Operation of this IS shall be in accordance with applicable TMs only. Consult local information assurance support personnel to ensure local Acceptable Use Policy (AUP) includes acceptable use of test and evaluation equipment qualified as IS and that a current, signed copy is completed for each user of this IS in accordance with AR 25-2.

This IS will not be connected to any system or network without the express written consent of the Information Assurance Manager (IAM) and the CCB or CMB. In the absence of a CCB and CMB, the appropriate commander or manager will provide the consent on the advice of the supporting Information Assurance (IA) official.

Connection with the Global Information Grid (GIG), the Defense Information System Network (DISN), or Land War Network (LWN) is prohibited; A Certificate of Networkiness (CON) in addition to the above requirements is required prior to connection to the GIG, DISN, or LWN.

Modifying or reconfiguring the hardware of this IS by the end-user is prohibited. The system owner - Product Director Test, Measurement, and Diagnostics Equipment (PD TMDE) will accommodate required changes through the Engineering Change Proposal (ECP) process.

The AN/GSM-437 is categorized as Platform IT (PIT) in accordance with Army Regulation 25-2. Authorizations, Capabilities, and Procedures identified in this manual are approved for use unless modified or superseded. Proposed changes may require revalidation or re-accreditation of the system's security posture and accreditation approval."

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS
ELECTRONIC 2028 INSTRUCTIONS

These are the instructions for sending an electronic (e-mail) DA Form 2028.

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27 (shown in **BOLD** print).

Subject: DA Form 2028

From: "Whomever" whomever@wherever.army.mil

To: 2028@redstone.army.mil

Subject: Form 2028

1. **From: Joe Smith**
2. Unit: home
3. **Address:** 4300 Park
4. **City:** Hometown
5. **St:** MO
6. **Zip:** 77777
7. **Date Sent:** 22-FEB-13
8. **Pub no:** 11-6625-1753-10
9. **Pub Title:** TM
10. **Publication Date:** 24-JUL-12
11. Change Number: 0
12. Submitter Rank: MSG
13. **Submitter FName:** Joe
14. Submitter MName: T
15. **Submitter LName:** Smith
16. **Submitter Phone:** 123-123-1234
17. **Problem:** 1
18. Page: 2
19. Paragraph: 3
20. Line: 4
21. NSN: 5
22. Reference: 6
23. Figure: 7
24. Table: 8
25. Item: 9
26. Total: 123
27. **Text:** (This is the text for the problem below line 27.)

END OF WORK PACKAGE

By Order of the Secretary of the Army:

RAYMOND T. ODIERNO
General, United States Army
Chief of Staff

Official:



JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army

1305905

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 257983 requirements for TM 11-6625-1753-10.

These are the instructions for sending an electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" whomever@wherever.army.mil

To: 2028@redstone.army.mil

Subject: DA Form 2028

1 **From: Joe Smith**
2 *Unit: home*
3 **Address: 4300 Park**
4 **City:** Hometown
5 **St: MO**
6 **Zip: 77777**
7 **Date Sent:** 19-OCT-93
8 **Pub no:** 55-2840-229-23
9 **Pub Title: TM**
10 **Publication Date:** 04-JUL-85
11 *Change Number: 7*
12 *Submitter Rank:* MSG
13 **Submitter FName:** Joe
14 *Submitter MName:* T
15 **Submitter LName:** Smith
16 **Submitter Phone:** 123-123-1234
17 **Problem: 1**
18 *Page: 2*
19 *Paragraph: 3*
20 *Line: 4*
21 *NSN: 5*
22 *Reference: 6*
23 *Figure: 7*
24 *Table: 8*
25 *Item: 9*
26 *Total: 123*

27 **Text:**

This is the text for the problem below line 27.

| RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS <small>For use of this form, see AR 25-30; the proponent agency is ODISC4.</small> | | | | | | Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/ Supply Manuals (SC/SM) | DATE 8/30/02 |
|--|----------------|------------|------------|------------|---|---|------------------------|
| TO: (Forward to proponent of publication or form)(Include ZIP Code) Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM--MMA--NP Redstone Arsenal, AL 35898 | | | | | | FROM: (Activity and location)(Include ZIP Code) MSG, Jane Q. Doe 1234 Any Street Nowhere Town, AL 34565 | |
| PART 1 - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS | | | | | | | |
| PUBLICATION/FORM NUMBER TM 9-1005-433-24 | | | | | DATE 16 Sep 2002 | TITLE Organizational, Direct Support, And General Support Maintenance Manual for Machine Gun, .50 Caliber M3P and M3P Machine Gun Electrical Test Set Used On Avenger Air Defense Weapon System | |
| ITEM NO. | PAGE NO. | PARA-GRAPH | LINE NO. * | FIGURE NO. | TABLE NO. | RECOMMENDED CHANGES AND REASON | |
| 1 | WP0005 PG 3 | | 2 | | | Test or Corrective Action column should identify a different WP number. | |
| EXAMPLE | | | | | | | |
| <small>* Reference to line numbers within the paragraph or subparagraph.</small> | | | | | | | |
| TYPED NAME, GRADE OR TITLE MSG, Jane Q. Doe, SFC | | | | | TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION 788-1234 | SIGNATURE | |

| | | |
|--|---|------------------------|
| TO: (Forward direct to addressee listed in publication) Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMA-NP Redstone Arsenal, AL 35898 | FROM: (Activity and location) (Include ZIP Code) MSG, Jane Q. Doe 1234 Any Street Nowhere Town, AL 34565 | DATE 8/30/02 |
|--|---|------------------------|

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

| PUBLICATION NUMBER | | | DATE | TITLE | | | | |
|---|----------|----------|-----------------------|---------------|------------|----------|------------------------------------|--------------------|
| PAGE NO. | COLM NO. | LINE NO. | NATIONAL STOCK NUMBER | REFERENCE NO. | FIGURE NO. | ITEM NO. | TOTAL NO. OF MAJOR ITEMS SUPPORTED | RECOMMENDED ACTION |
| <div style="font-size: 100px; opacity: 0.5; transform: rotate(-30deg); pointer-events: none;"> EXAMPLE </div> | | | | | | | | |

PART III - REMARKS (Any general remarks or recommendations or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)

EXAMPLE

| | | |
|--|--|-----------|
| TYPED NAME, GRADE OR TITLE MSG, Jane Q. Doe, SFC | TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION 788-1234 | SIGNATURE |
|--|--|-----------|

| | | | | | | | |
|--|----------|------------|------------|------------|-----------|---|-----------|
| RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25--30; the proponent agency is ODISC4. | | | | | | Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/ Supply Manuals (SC/SM) | DATE |
| TO: (Forward to proponent of publication or form) (Include ZIP Code) Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMA-NP Redstone Arsenal, AL 35898 | | | | | | FROM: (Activity and location) (Include ZIP Code) | |
| PART 1 --ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS | | | | | | | |
| PUBLICATION/FORM NUMBER | | | | | | DATE | TITLE |
| ITEM NO. | PAGE NO. | PARA-GRAPH | LINE NO. * | FIGURE NO. | TABLE NO. | RECOMMENDED CHANGES AND REASON | |
| | | | | | | | |
| * Reference to line numbers within the paragraph or subparagraph. | | | | | | | |
| TYPED NAME, GRADE OR TITLE | | | | | | TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION | SIGNATURE |

| | | |
|--|--|-------------|
| TO: <i>(Forward direct to addressee listed in publication)</i> Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMA-NP Redstone Arsenal, AL 35898 | FROM: <i>(Activity and location) (Include ZIP Code)</i> | DATE |
|--|--|-------------|

PART II --REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

| PUBLICATION NUMBER | | | DATE | TITLE | | | | |
|--------------------|----------|----------|-----------------------|---------------|------------|----------|------------------------------------|--------------------|
| PAGE NO. | COLM NO. | LINE NO. | NATIONAL STOCK NUMBER | REFERENCE NO. | FIGURE NO. | ITEM NO. | TOTAL NO. OF MAJOR ITEMS SUPPORTED | RECOMMENDED ACTION |
| | | | | | | | | |

PART III --REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

| | | |
|----------------------------|--|-----------|
| TYPED NAME, GRADE OR TITLE | TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION | SIGNATURE |
|----------------------------|--|-----------|

| | | | | | | | |
|--|----------|------------|------------|------------|-----------|---|-----------|
| RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25--30; the proponent agency is ODISC4. | | | | | | Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/ Supply Manuals (SC/SM) | DATE |
| TO: (Forward to proponent of publication or form) (Include ZIP Code) Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMA-NP Redstone Arsenal, AL 35898 | | | | | | FROM: (Activity and location) (Include ZIP Code) | |
| PART 1 --ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS | | | | | | | |
| PUBLICATION/FORM NUMBER | | | | | | DATE | TITLE |
| ITEM NO. | PAGE NO. | PARA-GRAPH | LINE NO. * | FIGURE NO. | TABLE NO. | RECOMMENDED CHANGES AND REASON | |
| | | | | | | | |
| * Reference to line numbers within the paragraph or subparagraph. | | | | | | | |
| TYPED NAME, GRADE OR TITLE | | | | | | TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION | SIGNATURE |

| | | |
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| | | | | | | | | |

PART III --REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

| | | |
|----------------------------|--|-----------|
| TYPED NAME, GRADE OR TITLE | TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION | SIGNATURE |
|----------------------------|--|-----------|

The Metric System and Equivalents

Linear Measure

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

Weights

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

Liquid Measure

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

Square Measure

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

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. Inch
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. Inches
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

| To change | To | Multiply by | To change | To | Multiply by |
|---------------|--------------------|-------------|--------------------|---------------|-------------|
| inches | centimeters | 2.540 | ounce-inches | Newton-meters | .007062 |
| feet | meters | .305 | centimeters | inches | .394 |
| yards | meters | .914 | meters | feet | 3.280 |
| miles | kilometers | 1.609 | meters | yards | 1.094 |
| square inches | square centimeters | 6.451 | kilometers | miles | .621 |
| square feet | square meters | .093 | square centimeters | square inches | .155 |
| square yards | square meters | .836 | square meters | square feet | 10.764 |
| square miles | square kilometers | 2.590 | square meters | square yards | 1.196 |
| acres | square hectometers | .405 | square kilometers | square miles | .386 |
| cubic feet | cubic meters | .028 | square hectometers | acres | 2.471 |
| cubic yards | cubic meters | .765 | cubic meters | cubic feet | 35.315 |
| fluid ounces | milliliters | 29.573 | cubic meters | cubic yards | 1.308 |
| pints | liters | .473 | milliliters | fluid ounces | .034 |
| quarts | liters | .946 | liters | pints | 2.113 |
| gallons | liters | 3.785 | liters | quarts | 1.057 |
| ounces | grams | 28.349 | liters | gallons | .264 |
| pounds | kilograms | .454 | grams | ounces | .035 |
| short tons | metric tons | .907 | kilograms | pounds | 2.205 |
| pound-feet | Newton-meters | 1.356 | metric tons | short tons | 1.102 |
| pound-inches | Newton-meters | .11296 | | | |

Temperature (Exact)

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

PIN: 087385-000