OPERATING INSTRUCTIONS

MODEL DM-6150

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Table of contents

SAFETY

" ⚠ Warning" and " ⚠ Caution" Alert Symbol Statement:

	**" ⚠ Warning" Alert Symbol**
	A **"Warning"** statement identifies hazardous conditions and actions that could cause **BOLIDY HARM** or **DEATH.**

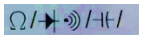
	**" ⚠ Caution" Alert Symbol**
	A **"Caution"** Statement: Identifies conditions and actions that could **DAMAGE** the meter or the equipment under test**.**

" ⚠ Warnings" and " ⚠ Cautions":

	**⚠ Warnings**

- When using test leads or probes, keep your fingers behind the finger guards.
- Remove test lead from meter before opening the battery door or Meter case.
- Use the meter only as specified in this manual or the protection by the meter might be impaired.
- Always use proper terminals, switch position, and range for measurements.
- Never attempt a voltage measurement with the test lead inserted into the mA input terminal.
- Verify the Meter's operation by measuring a known voltage. If in doubt, have the Meter serviced.
- Do not apply more than the rated voltage, as marked on Meter, between terminals or between any terminal and earth ground.
- Use caution with voltages above 30 Vac rms, 42 Vac peak, or 60 Vdc. These voltages pose a shock hazard.
- To avoid false readings that can lead to electric shock and injury, replace battery as soon as low battery indicator ⊟ appears.
- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.
- Do not use Meter around explosive gas or vapor.
- To reduce the risk of fire or electric shock do not expose this product to rain or moisture.

⚠ CAUTIONS

- Disconnect the test leads from the test points before changing the position of the function rotary switch.
- Never connect a source of voltage with the function rotary switch in  Hz position.
- Do not expose meter to extremes in temperature or high humidity.

Symbols as Marked on The Meter:

 : AC (Alternating Current)

 : DC (Direct Current)

 : Caution, **Risk of Electric shock.** To alert you to the presence of a potentially hazardous voltage.

 : Caution, **Risk of Danger.** Refer to  Warnings and  Cautions in the manual.

 : **Double Insulation** protection against electric shock.

 : Conforms to **European** Union directives.

Symbols and Terms in The Manual Symbols:

 : **Caution, Risk of Danger.**

 **Warning:** Identifies hazardous conditions and actions that could cause **BOLIDY HARM** or **DEATH**

 **Caution:** Identifies conditions and actions that could **DAMAGE** the meter or equipment under test.

 : **Fuse**

Terms:
CAT Level: Over Voltage Category Level, indicates measurement can be performed at which measuring circuit level. The difference level measuring circuit has different high transient stresses voltage.

PER IEC 1010 OVERVOLTAGE INSTALLATION CATEGORY OVERVOLTAGE CATEGORY I Equipment of **OVERVOLTAGE CATEGORY I** is equipment for connection to circuits in which measurements are taken to limit the transient overvoltage to an appropriate low level. Note examples include protected electronic circuits.

OVERVOLTAGE CATEGORY II Equipment of **OVERVOLTAGE CATEGORY II** is energy consuming equipment to be supplied from this fixed installation.

OVERVOLTAGE CATEGORY III Equipment of **OVERVOLTAGE CATEGORY III** is equipment in fixed installations. Note examples include switches in this fixed installation and some equipment for industrial use with permanent connection to the fixed installation.

PER IEC1010 Pollution degree POLLUTION

Addition of foreign matter, solid, liquid or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity.

POLLUTION degree

For the purpose of evaluating spacing of this product, the following degrees of POLLUTION in the microenvironment are defined.

POLLUTION DEGREE 1

No POLLUTION or only dry, non-conductive POLLUTION occurs. The POLLUTION has no influence.

POLLUTION DEGREE 2

Normal POLLUTION only non-conductive POLLUTION occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

POLLUTION DEGREE 3

Conductive POLLUTION occurs, or dry, non-conductive POLLUTION occurs which becomes conductive due to condensation, which is expected.

NOTE: In such conditions equipment is normally protected against exposure to direct sunlight, precipitation, and full wind pressure, but neither temperature nor humidity is controlled.

Safety Compliance And Certification

Safety compliance

The meter conform to CENELEC **LVD (Low-Voltage reactive)** 73/23/EEC and EMC **(Electromagnetic Compatibility directive)** 89/336/EEC

The meter meet the requirements to IEC 61010-1 (2001), EN 61010-1 (2001), UL 3111-1 (Jan. 1994), CSA C22.2 NO. 1010-1-92 +A2: Feb. 1997

Safety Certification:

Introduction

Unpacking and Inspection

Upon removing your new Digital Multimeter from its packing, you should have the following items.

1. Digital Multimeter
2. Test lead set (one black, one red)
3. User manual
4. Protective holster

Environmental Conditions

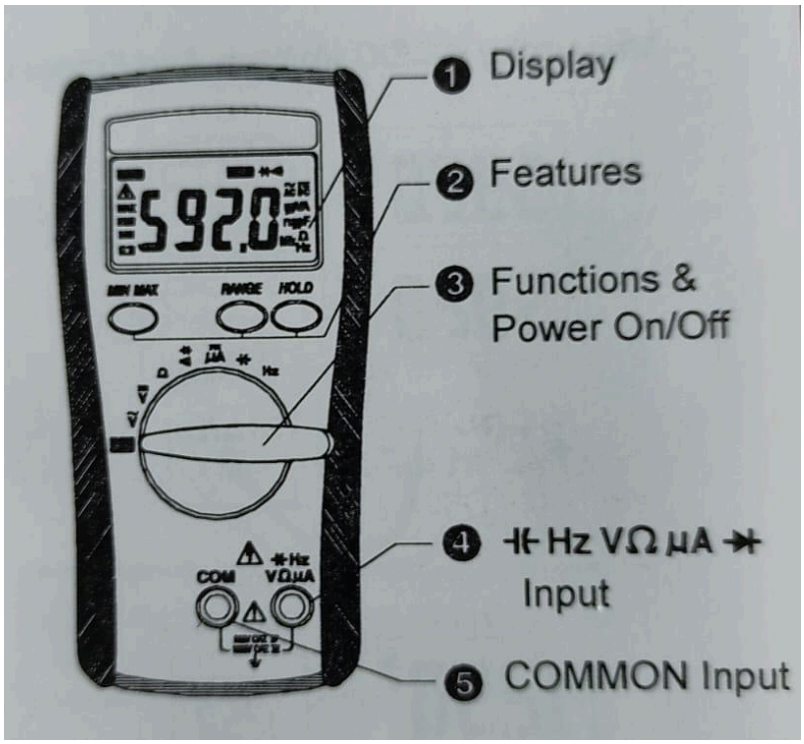
This product is safe at least under the following conditions:

1. Indoor Use
2. Altitude up to 2000 meter
3. Operating Temperature and Relative Humidity Non-condensing ≤ 10°C, 11°C – 30°C (≤80% RH), 31°C – 40°C (≤75% RH), 41°C – 50°C (≤45% RH)
4. Storage Temperature and Relative Humidity: -20°C – 60°C (0-80% RH) when battery removed from Meter.
5. Pollution degree 2
6. Installation category: The standard 320 series models meet the requirements for double insulation to IEC 61010-(2001), EN61010 (2001), UL 3111-1 (6.1994), CSA C22.2 NO. 1010-1-92 to terminals:
   V/Ω/μA: Category III 100 Volts
   mA: Category II 600 Volts

The Meter Description

Front Panel Illustration

1. 600 counts LCD display.
2. Push-buttons for features.
3. Rotary switch to turn the Power On or Off and to select a function.
4. Input terminal for all functions
5. Common (Ground reference) Input Terminal for all functions.



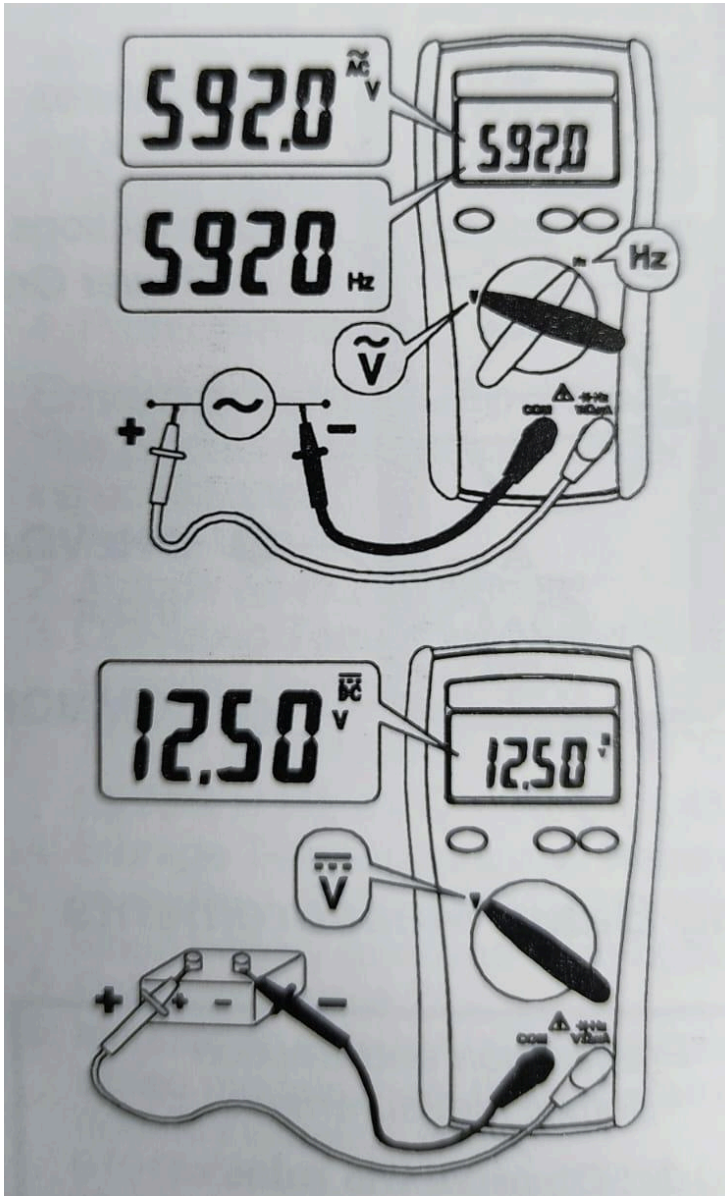
Making Basic Measurements

Preparation and Caution Before Measurement : **Observe the rules** of Warnings and Cautions.

When connecting the test leads to the **DUT (Device Under Test) connect the common (COM) test lead before connecting the live lead, when removing the test leads removing the test live lead before removing the common test lead.**

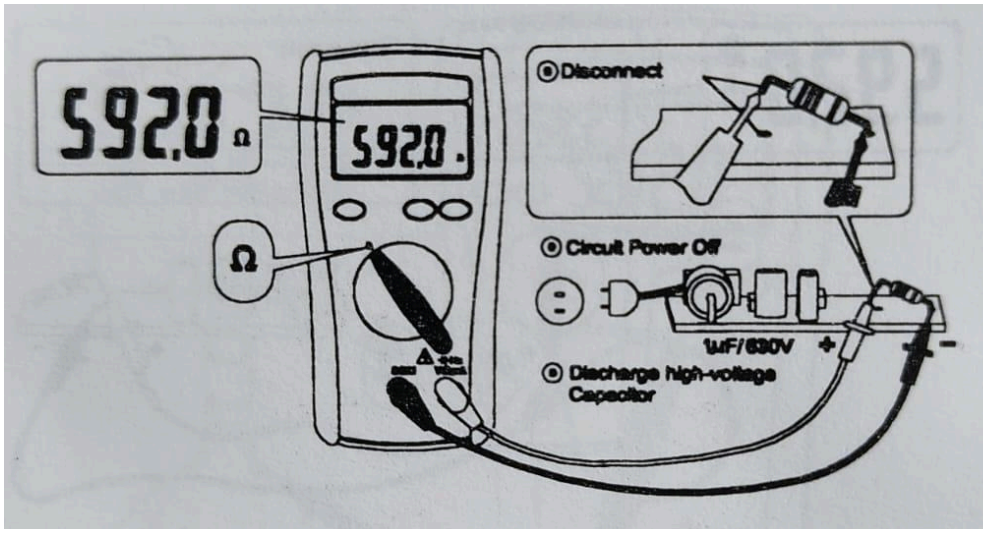
The figures on the following pages show how to make basic measurements.

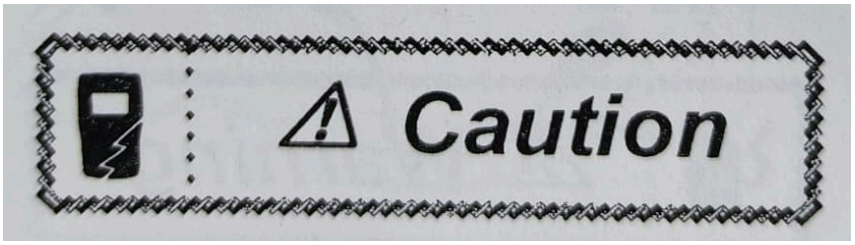
Measuring AC/DC Voltage and Frequency



The non-zero display reading is normal when the meter test leads are open, which will not affect actual measurement accuracy. The meter will show zero or close to reading when the test leads are shorted. In reading AC voltages or current, reading-settling time increases to several seconds at the low end of AC voltage and current ranges in rms models.

Measuring Resistance





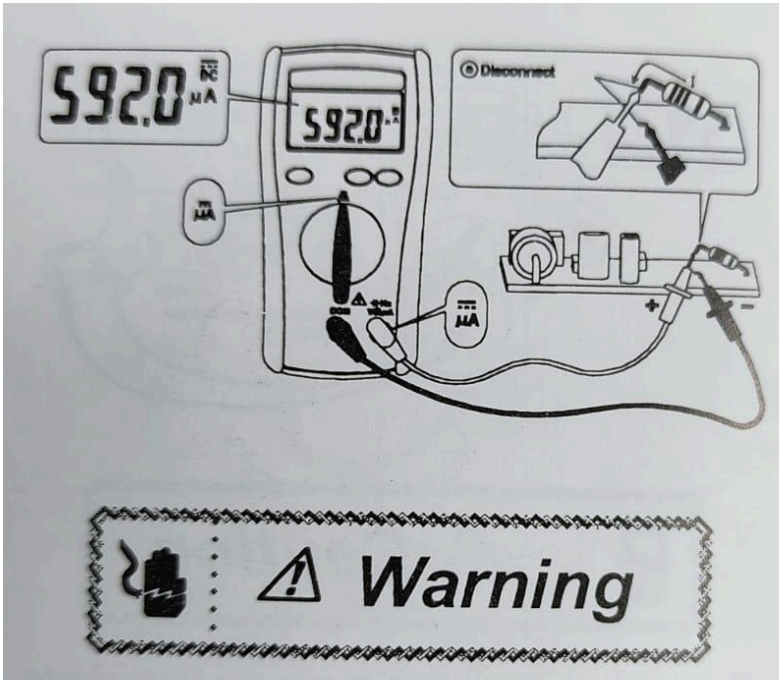
To avoid possible damage to the meter or to the equipment under test, disconnect circuit power and discharge *all high-voltage capacitors before measuring resistance.*

Note – The Meter provides an open voltage ≤ -1.5V to the circuit under test that causes the diode, transistor junction to conduct so *it is better to disconnect the resistance from the circuit to get a correct measurement.*

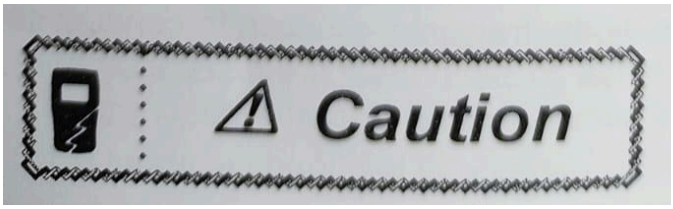
The resistance of test leads is about 0.1Ω - 0.2Ω. To test the leads resistance, touch the probe tips together, for accuracy measurement in low resistance.

$$R_{unkown} = R_{measurement} - R_{test\ lead}$$

Measuring DC µA



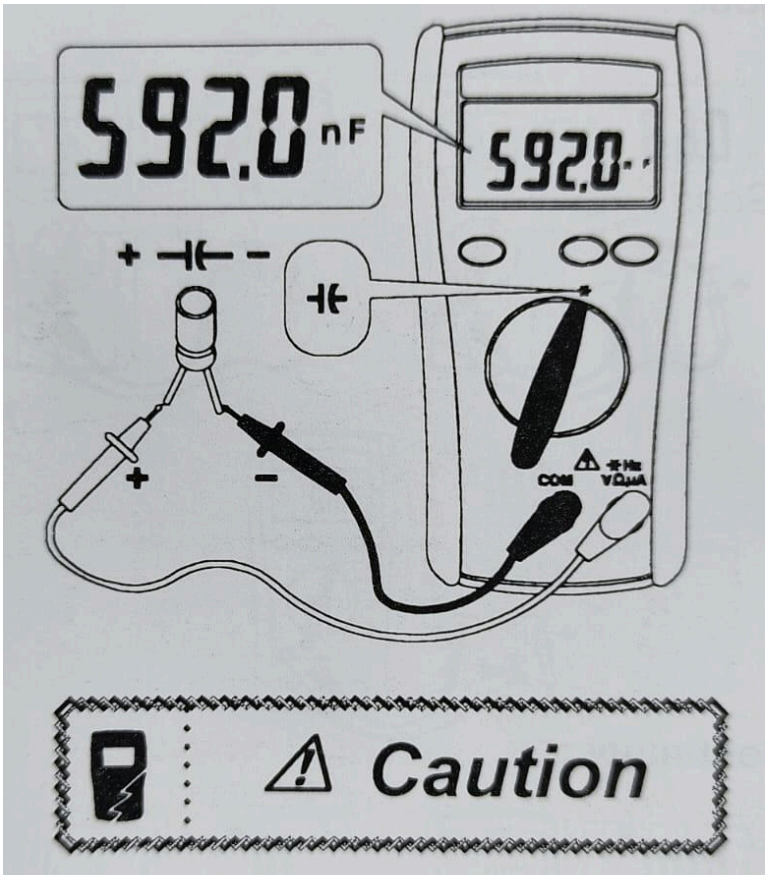
Never attempt an in-circuit measurement where the open-circuit potential to earth potential is greater than 500V for example a 3-phase system measurement, you may damage the Meter or be injured.



To avoid possible damage to the meter or to the equipment under test, check the Meter's fuses before measuring current. 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.

Measuring Capacitance

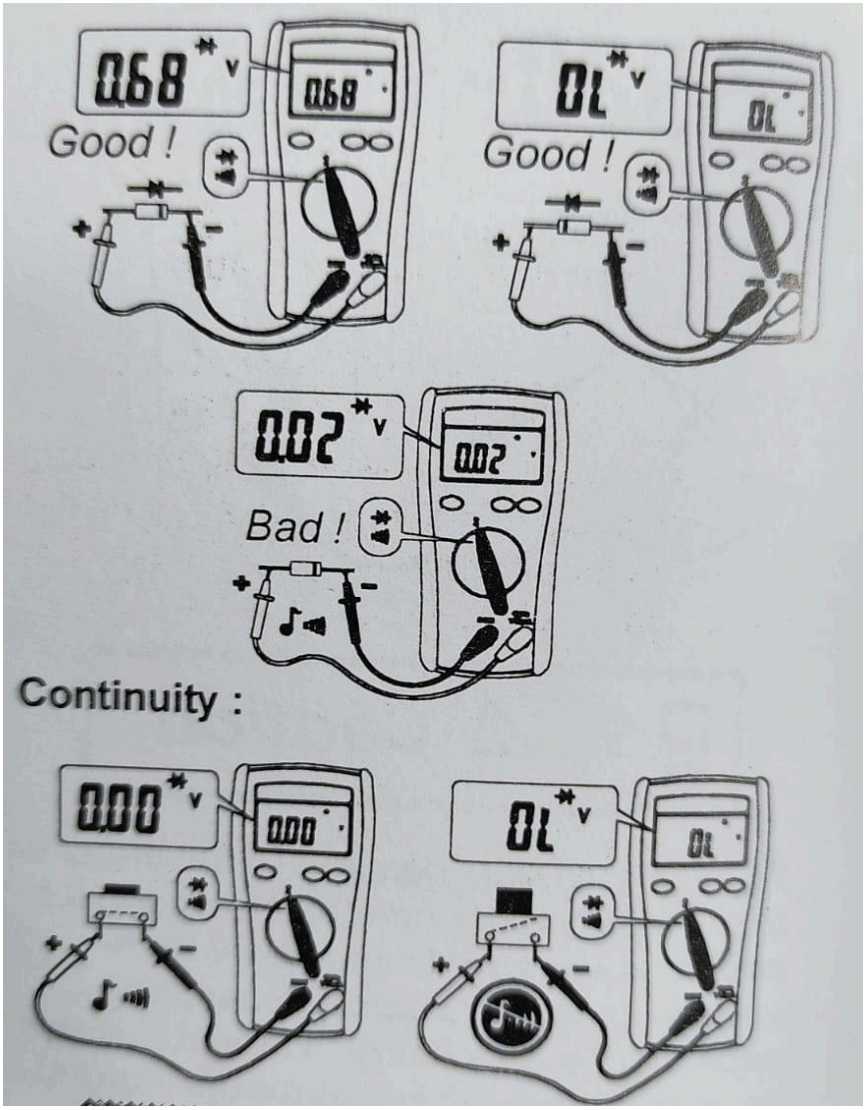


To avoid possible damage to the meter or to the equipment under test, disconnect circuit power and discharge all high-voltage capacitors before measuring capacitance. Use the DC voltage function to confirm that the capacitor discharged.

Note – To improve the measurement accuracy of small value capacitor, record the reading with the test leads open then subtract the residual capacitance of the meter and leads from measurement.

$$\mathbf{C}_{unknown} = \mathbf{C}_{measurement} - \mathbf{C}_{residual}$$

Testing for Diode and Continuity Diode



For in-circuit test, turn circuit power off and discharge the high-voltage capacitors through an appropriate resistance load.

Note – Use the diode test to check if the semiconductor junction is good or bad. The meter sent a current through the semiconductor junction to measure the voltage drop across the junction. A good junction drops between 0.4V to 0.9V

Features

Feature Description

The meter has features:

Display Hold – Freezes the display.

Min Max Hold – Record the Max or Min reading of the display.

Range – Selects the manual ranging mode. The default mode is Automatic Range.

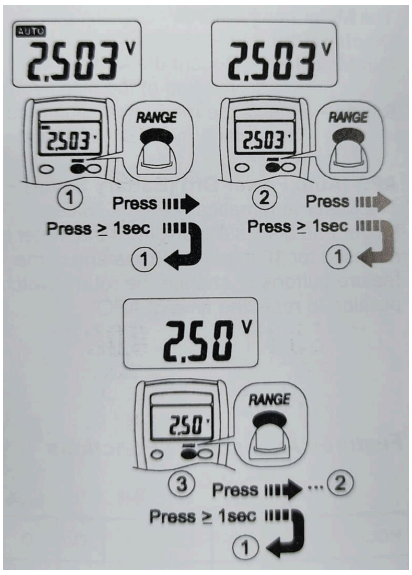
APO (Auto Power Off) (Battery Saver) – The meter automatically enters “sleep mode” and blanks the display if the meter is not used for 10 minutes. Press any of the feature buttons or change the rotary switch position to reset the time of APO.

Features Available vs Functions.

	~V ⎓V	Ω		||	~µA
HOLD	O	O	O	O	O
MIN MAX HOLD	O	O	O	O	O
RANGE	O	O	X	O	O
APO	O	O	O	O	O

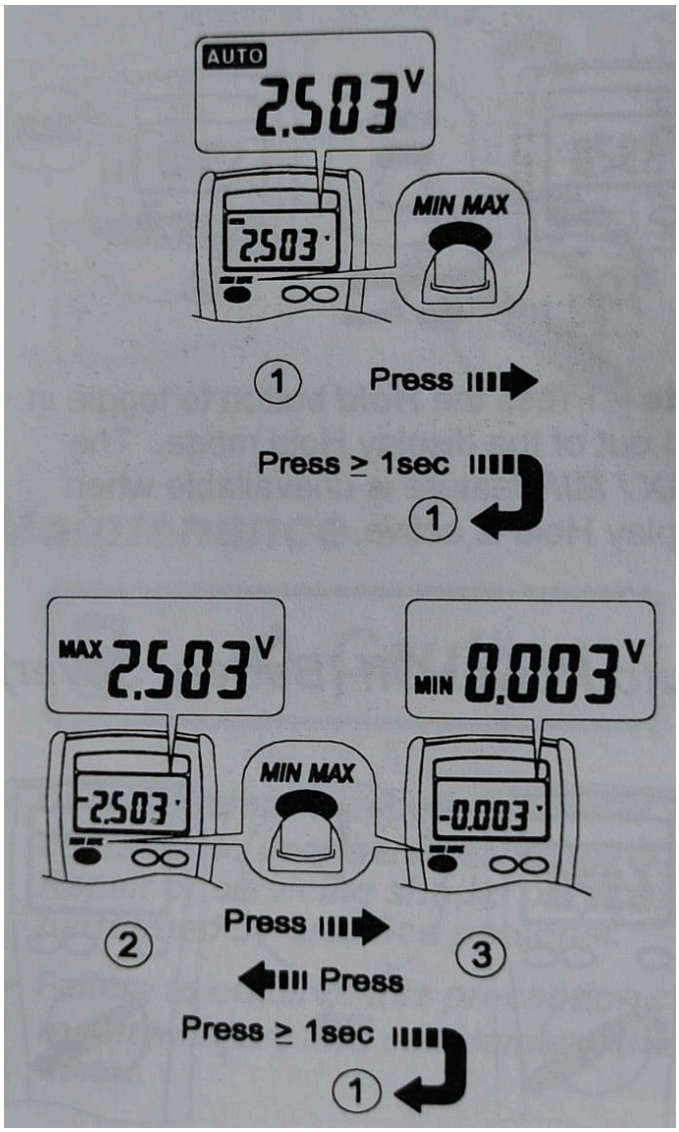
Using the Features

Manual Ranging and Auto Ranging



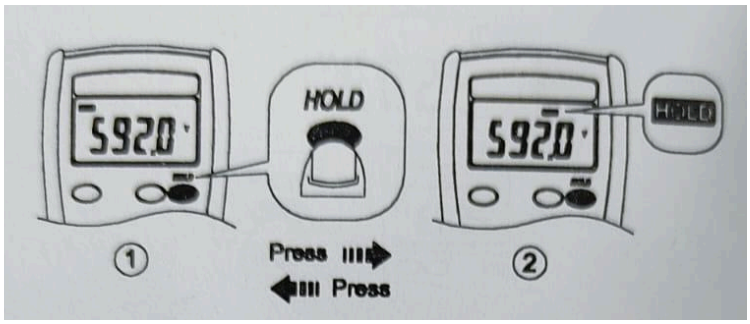
Note – The range button is pressed to select manual ranging and to change ranges. When the range button is pressed once, the **AUTO** indicator turns off. Press Range Button to select the appropriate range for measurement you want to make. Press Range button and hold for 1 second to return to Autorange.

Min Max Record



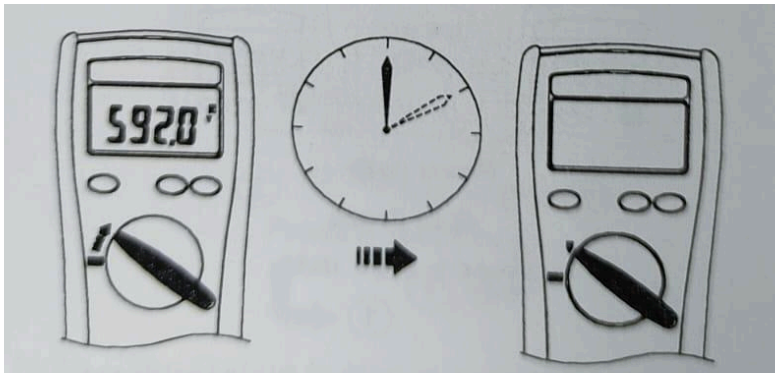
Note – Press **HOLD** button in ***MIN MAX*** mode to make the Meter stop updating the maximum and minimum value. When display ***Hold*** mode is nested in ***MIN MAX*** mode, the ***MIN MAX*** mode must be released before the display Hold.

Display Hold



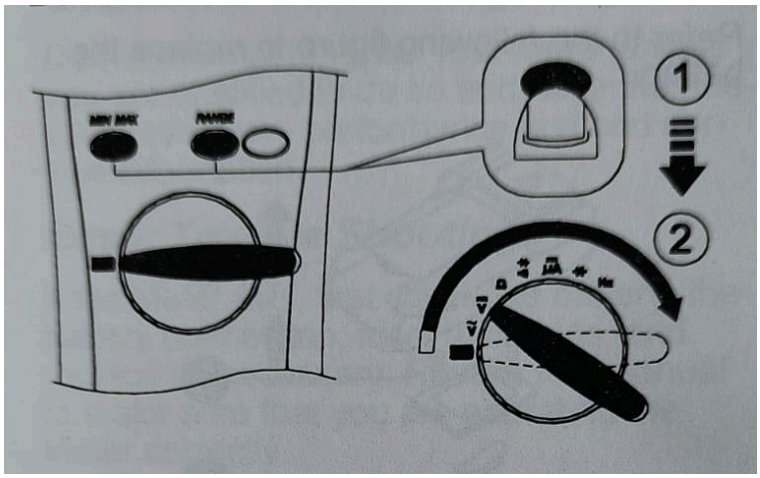
Note – Press the ***Hold*** button to toggle in and out of the display Hold mode. The ***MAX / MIN*** feature is unavailable when display Hold is active.

Auto Power Off (Battery Saver)



Note – If the meter idles for more than 10 minutes, the Meter automatically turns the power off. When this happens, the LCD displaying-state of the meter is saved. The Meter can be turned back on by pushing any button, the LCD displays the saved state. Pushing ***Hold*** button to disables the hold state. Any button pressed or rotary change resets the time of Auto-Power-OFF.

Disable Auto-Power Off



Maintenance

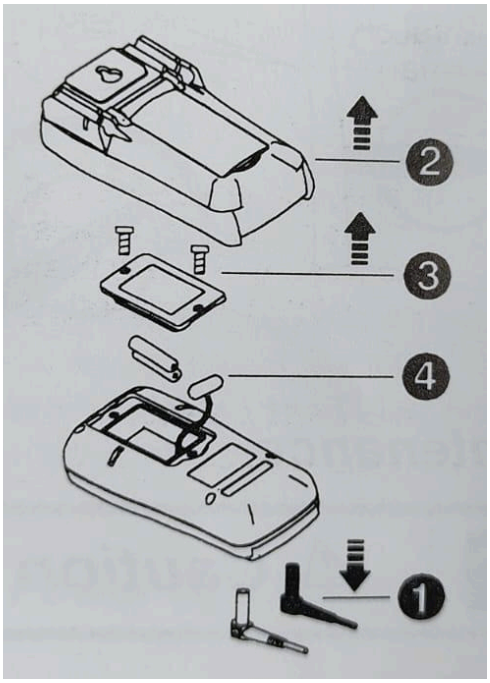
- **Do not attempt to repair this meter. It contains no user-serviceable parts. Repair or servicing should only be performed by qualified personal.**
- **Failure to observe this precaution can result in injury and can damage the meter.**

Cleaning and storage

Periodically wipe the housing with a damp cloth and mild detergent. Dirt or moisture in the terminals can affect readings. If the meter is not to be used for a long period, more than 60 days, ***remove the battery and store it separately.***

Battery Replacement

Refer to the following figure to replace the battery:



- Replace the battery as soon as the low battery indicator "⊟" appears, to avoid false reading.
- Battery 1.5V X 2

Trouble Shooting

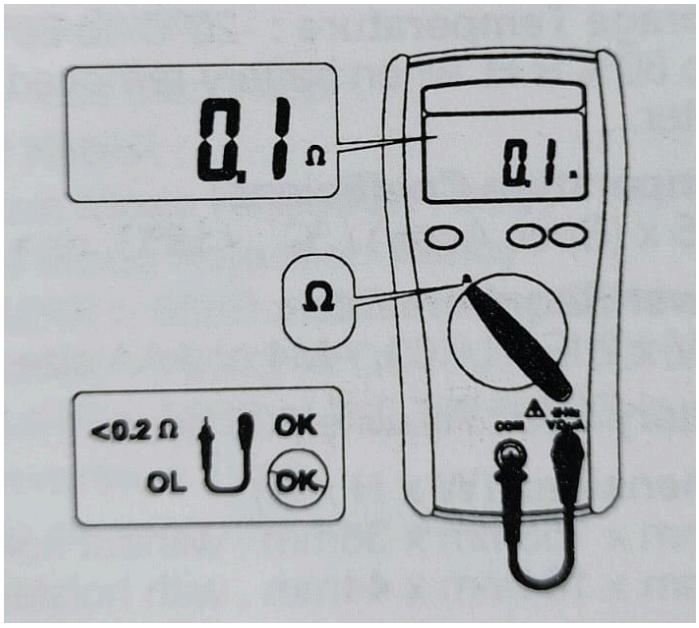
Do not attempt to repair your meter unless you are qualified to do so and have the relevant calibration, performance test and service information.

Basic Trouble Shooting

If the meter fails, first check the battery, the battery connection, fuse, test leads, and replace as necessary. Review this manual to make sure that you are operating the meter correctly.

Testing the Test Leads

Testing the fuse and test leads as shown below.



Specification

General Specification

Display: 6000 counts updates 1.5/sec

Polarity Indication: Automatic, positive implied, negative indicated.

Overrange Indication: "OL" or "-OL"

Low Battery Indication: "[+ -]" is displayed when the battery voltage drops below operating voltage.

Auto Power Off: Approx. 10 minutes.

Operating Ambient: Non-condensing ≤ 10°C, 11°C – 30°C (≤80% RH) 31°C – 40°C (≤75% RH), 41°C – 50°C (≤45% RH)

Storage Temperature: -20°C to 60°C, 0 to 80% RH when battery removed from Meter.

Temperature Coefficient: 0.15 x (spec. accy) / °C, <18°C or >28°C

Power Requirements: 1.5V x 2 IEC LR03, AM4 or AAA size

Battery Life: Alkaline 300 hours.

Dimensions (W X H X D):

76mm x 158mm x 38mm, without holster

82mm x 164mm x 44mm, with holster

Accessories: Battery (installed), Test leads and User Manual.

Electrical Specifications

Accuracy is ± (% reading + number of digits) at 23°C ± 5°C, less than 80% RH.

(1) **DC/AC Volts**

Range	**DC Accuracy**	**AC Accuracy**
600,0mV	±(0,5%+2dgt)	Unspecified
6,000V		±(0,9%+5dgt) 50Hz-500Hz
60,00V		
600,0V		
DC1000V AC750V		

Over voltage protection: 1000V rms

Input Impedance:

10MΩ // less than 100Pf

CMRR/NMRR:

(Common Mode Rejection Ratio)

(Normal Mode Rejection Ratio)

V_{AC}: CMRR > 60dB at DC, 50Hz / 60Hz

V_{DC}: CMRR > 100dB at DC, 50Hz / 60Hz

NMRR > 50dB at DC, 50Hz / 60Hz

AC Conversion Type:

Average sensing rms indication.

(2) DC Current

Range	**DC Accuracy**
600,0µA	±(1,0%+2dgt)
6000µA	

Overload Protection:

A input: 1A (600V) fast blow fuse

µA input: 600V rms

Voltage Burden:

µA: <4Mv / µA

mA: 2V max.

* **AC Conversion Type:** Conversion type and additional specification are same as DC/AC Voltage.

(3) Resistance

Range	Accuracy	Overload protection
600,0 Ω	±(0,7%+2dgt)	600V rms
6,000K Ω		
60,00K Ω		
600,0K Ω		
6,000M Ω	±(1,0%+2dgt)	
60,00M Ω*	±(1,5%+2dgt)	

Open circuit voltage: -1.3V approx. * <2% of reading rolling.

(4) Diode Check and Continuity

Range	Resolution	Accuracy
	10mV	±(1,5% + 5dgt)

***** For 0.4V – 0.8V

Max. Test Current: 1.5mA

Max. Open Circuit Voltage: 3V

Overload Protection: 600V rms

Continuity: Built-in buzzer sounds when resistance is less than approximately 100Ω. Response time is approximately 100 msec.

(5) Frequency

Range	Sensitivity	Accuracy
6000Hz	100mV rms *	Frequency: 0,01% ±1dgt
60,00K Hz		
600,0K Hz		
6,000M Hz	250mV rms	
60,00M Hz	1V rms	

Overload Protection: 600V rms

* Less than 20Hz, the sensitivity is 1.5V rms

(6) Capacitance

Range	Accuracy
6,000nF	±(1,9% + 8dgt)
60,00nF	
600,0nF	
6,000µF	
60,00µF	
600,0µF	
6,000mF	

Overload Protection: 600V rms.

* < 100 dgt of reading rolling.

(7) Auto Power Off (APO)

If the meter idles for more than 10 minutes, the meter automatically turns the power off.

Terms in the specification

CMRR (Common Mode Rejection Ratio):

The CMRR is the ability of a multimeter to reject the Common Mode Voltage **Vcm** (The voltage presents on both the **COM** and **VOLTAGE** *input terminal* with respect to earth ground). The Vcm normally comes from the electromagnetic interference of high voltage power source line of generators.

NMRR (Normal Mode Rejection Ratio):

The NMRR is the ability of a multimeter to reject the unwanted AC noise, V_{NM}, in DC measurement.

ONE YEAR LIMITED WARRANTY

A.W. Sperry Instruments, Inc. warrants that this AWS instrument has been carefully tested, inspected, and warranted for one (1) year from the date of purchase by the original end user purchaser, provided the instrument has not been misused, damaged due to negligence, neglect or the operating instructions. Instruments and proof of purchase in the form of a legible copy or original of sales receipt clearly identifying the distributor, model number and date or purchase must be returned to A.W. Sperry Instruments, Inc. Attention: Customer Service Center, 245 Marcus Boulevard, Hauppauge, NY 11788, postage prepaid, for examination of verification of manufacturing defect under warranty. A.W. Sperry Instruments, Inc. shall be the sole judge of such defect. Liability of A.W. Sperry Instruments, Inc. shall be limited to the repair or replacement at its sole option of any defective product.