

ROBIN

**ADVANCE RANGE
4000 SERIES
DIGITAL MULTIMETER
AR4002**

USERS MANUAL

Please read carefully before using this equipment.

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Measurement limits

- DC Voltage : 0.1mV to 1000V
- AC Voltage : 1mV to 750V
- DC amperes : 0.1 μ A to 10A
- AC amperes : 0.1 μ A to 10A
- Resistance : 0.1 Ω to 32.6M Ω
- Continuity check : Beep sounds at approx. <20 Ω
on the 326 Ω range



WARNING!

READ "SAFE TESTING" BEFORE USING THIS METER.

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1. INTRODUCTION

This instrument is hand held and battery operated. It is designed and tested according to IEC Publication 1010-1 (BSEN 61010-1) the EMC Directive (EN 50081-1 and EN 50082-1) and other safety standards (see "Specifications").

Features:

- 3 3/4 digit 3260 count display with 34 segment bar graph
- Auto/manual ranging
- Safety shutter to prevent incorrect connections to current terminals.
- Fused 10A range
- DC voltage basic accuracy within 0.5%
- Data hold
- Continuity beeper and diode test
- Sleep mode
- Display hold and low battery annunciators
- Large LCD display (68.5mm x 32.7mm)
- Protective Holster

7.3 General specifications

| | |
|-------------------------|---|
| Display (LCD) | |
| Digital | : Counts – 3,260 Updates 3 times/sec |
| Analog | : 34 segments Updates 10 times/sec |
| Fuse Protection | |
| mA or μ A ranges | : 1A 600V HIGH ENERGY/FAST FUSE |
| A range | : 15A 600V HIGH ENERGY/FAST FUSE |
| Storage Temperature | : –20°C to 60°C (–4°F to 140°F) |
| Operating Temperature | : 0°C to 45°C (32°F to 113°F) |
| Relative Humidity | : 0% to 80% (0°C to 35°C; 32°F to 95°F) 0% to 70% (35°C to 45°C; 95°F to 113°F) |
| Temperature Coefficient | : 0.10 x (Specified Accuracy)/°C (<18°C or >28°C; <64°F or >82°F) |
| Battery Type | : 1.5V x 2, AA or R6 |
| Battery Life | : 2000 hrs typical (alkaline) |
| Size (H x W x L) | |
| Meter Only | : 4.0cm x 8.5cm x 19.0cm |
| With Holster | : 5.4cm x 10.3cm x 20.8cm |
| Weight | |
| Meter Only | : 380g |
| With Holster | : 655g |
| Vibration & Shock | : Designed to MIL-T-28800 for a Class II instrument |
| Safety Standards | : Designed to both IEC 1010-1, and the EMC Directive, UL 1244, CSA C22.2 No. 231 and ISA-DS82 |

Robin Electronics reserves the right to change specifications and design without notice and without obligation.

7.2 Maximum inputs

| FUNCTION | INPUT TERMINALS | | MAXIMUM INPUT |
|---------------------------|-----------------|------------|---------------|
| | RED LEAD | BLACK LEAD | |
| \overline{V} | V Ω | COM | 1000V |
| \tilde{V} | V Ω | COM | 750V |
| Ω | V Ω | COM | 600V |
| $\cdot \gg \gg \gg$ | V Ω | COM | 600V |
| $\rightarrow \rightarrow$ | V Ω | COM | 600V |
| A \approx | A | COM | 10A/600V |
| mA \approx | mA μ A | COM | 326mA/600V |
| μ A \approx | mA μ A | COM | 326mA/600V |

2. SAFE TESTING

Electricity is dangerous and can cause injury and death. Always treat it with the greatest of respect and care. If you are not quite sure how to proceed, stop and take advice from a qualified person.

1. This instrument must only be used by a competent and trained person and operated in strict accordance with the instructions. Robin Electronics will not accept liability for any damage or injury caused by misuse or non-compliance with the instructions or with the safety procedures.
2. It is essential to read and to understand the safety rules contained in the instructions. They must always be observed when using the instrument.
3. When conducting tests do not touch any exposed metalwork associated with the installation. Such metalwork may become live for the duration of the test.
4. **Never open the instrument case** except for fuse and battery replacement. Only fully trained and competent electrical engineers should open the case. If a fault develops, return the instrument to Robin Electronics for attention.
5. If abnormal conditions of any sort are noted (such as a faulty display, unexpected readings, broken case, cracked test leads, etc.) do not use the tester and return it to Robin Electronics for repair.

6. Users of this equipment or their employers are reminded that Health and Safety Legislation requires them to carry out valid risk assessments of all electrical work so as to identify potential sources of electrical danger and risk of electrical injury such as from inadvertent short circuits. Where assessments show that the risk is significant, then the use of **fused test leads** constructed in accordance with the HSE Guidance Note GS38 (Electrical Test Equipment for use by Electricians) should be used. Robin recommend fused test leads are always used when measuring voltages particularly in high energy circuits.
7. For safety reasons only use accessories (test leads, probes, fuses, cases, etc.) designed to be used with this instrument and recommended by Robin Electronics. The use of other accessories is prohibited as they are unlikely to have the correct safety features.
8. When testing, always be sure to keep your fingers behind the safety barriers on the test leads.
9. During testing it is possible that there may be a momentary degradation of the reading due to the presence of excessive transients or discharges on the supply system. Should this be observed, the test must be repeated to obtain a correct reading. If in doubt, contact Robin Electronics.
10. Always disconnect the live test lead before disconnecting the common test lead.
11. Do not operate the function selector whilst the instrument is connected to a circuit. If, for example, the instrument has just completed a voltage test and a resistance test is to follow, disconnect the test leads from the circuit before moving the selector switch.

| FUNCTION | RANGE | RESOLUTION | ACCURACY | REMARKS |
|-----------------------------|---|---------------|----------------|---------------------------------------|
| AC A (45Hz to 450 Hz) | 326 μ A | 0.1 μ A | 0.75% + 5 dgts | VOLTAGE DROP: 600 μ V/ μ A |
| | 3260 μ A | 1 μ A | | |
| | 32.6mA | 10 μ A | | 5.2mV/mA |
| | 10A | 0.01A | 1.5% + 7 dgts | 56mV/A |
| Ohms | 326 Ω | 0.1 Ω | 0.5% + 3 dgts | OPEN CIRCUIT VOLTAGE: < 1.2V |
| | 3.26k Ω | 1 Ω | | |
| | 32.6k Ω | 10 Ω | | |
| | 326k Ω | 0.1k Ω | | |
| | 3.26M Ω | 1k Ω | | |
| | 32.6M Ω | 10k Ω | 1.0% + 10 dgts | |
| Continuity | OPEN CIRCUIT TEST VOLTAGE: < 1.2V THRESHOLD: Approx. < 20 Ω | | | |
| Diode Check | OPEN CIRCUIT TEST VOLTAGE: < 3V MAX. TEST CURRENT: < 2.5mA | | | |

NOTE:

DC V. NORMAL MODE REJECTION RATIO: > 60dB at 50Hz or 60Hz
COMMON MODE REJECTION RATIO: > 104dB at dc, 50Hz or 60Hz
AC V. COMMON MODE REJECTION RATIO: > 80dB at dc to 60Hz
FUSE PROTECTION. μ A or mA : 1A 600V FAST fuse
A : 15A 600V FAST fuse
with > 10000A interrupt rating

7. SPECIFICATIONS

7.1 Specifications

Accuracy is given as \pm ([% of reading] + [number of least significant digits]) at 18°C to 28°C with relative humidity up to 80%. This instrument is designed for indoor use and at a maximum altitude of 2000m.

Installation category III

Pollution degree 2

| FUNCTION | RANGE | RESOLUTION | ACCURACY | REMARKS |
|----------------------------|--------------|-------------|----------------|---------------------------------------|
| DC V | 326mV | 100 μ V | 0.5% + 2 dgts | INPUT IMPEDANCE: > 100M Ω |
| | 3.26V | 1mV | | 11M Ω |
| | 32.6V | 10mV | | 10M Ω |
| | 326V | 0.1V | | |
| | 1000V | 1V | 0.75% + 3 dgts | |
| AC V (45Hz to 450Hz) | 3.26V | 1mV | 0.75% + 5 dgts | INPUT IMPEDANCE: 11M Ω |
| | 32.6V | 10mV | | 10M Ω |
| | 326V | 0.1mV | | |
| | 750V | 1V | 1.0% + 5 dgts | |
| DC A | 326 μ A | 0.1 μ A | 0.5% + 3dgts | VOLTAGE DROP: 600 μ V/ μ A |
| | 3260 μ A | 1 μ A | | 5.2mV/mA |
| | 32.6mA | 10 μ A | | |
| | 326mA | 0.1mA | | |
| | 10A | 10mA | 1.0% + 5 dgts | 56mV/A |

12. Never try to measure any voltage which exceeds 1000V DC or 750V AC RMS.
13. Remember that any voltage above 40V DC or 25V AC may pose a serious shock hazard.
14. If attempting to measure currents exceeding 10A always use a current clamp.
15. Turn off the power to a circuit under test before carrying out any work on it.

International symbols



Dangerous Voltage (Risk of electric shock)



Alternating Current (AC)



Direct Current (DC)



Either DC or AC



Ground (maximum permitted voltage between terminal and ground).



Caution! Refer to the user's manual before using this Meter.



Double Insulation (Protection Class II)



Fuse



WARNING!

OBSERVE ALL SAFETY PRECAUTIONS WHEN MEASURING HIGH VOLTAGES (AND/OR CURRENTS). TURN OFF POWER TO THE CIRCUIT UNDER TEST, SET THIS METER TO THE DESIRED FUNCTION AND RANGE, CONNECT THE TEST LEADS TO THIS METER AND THEN TO THE CIRCUIT UNDER TEST. REAPPLY POWER. IF AN ERRONEOUS READING IS OBSERVED, DISCONNECT POWER IMMEDIATELY AND RECHECK ALL SETTINGS AND CONNECTIONS.

5.3.2 Fuse replacement

Following these steps to replace either of the internal fuses.

1. Unplug the test leads.
2. Remove the protective holster from the instrument.
3. Remove the screws in the rear of the instrument to allow the separation of the front and rear housings.
4. Replace the faulty fuse with the same type and rating as the one removed.
5. Snap the front and rear housings together and reinstall the fixing screws.
6. Reattach the protective holster.

6. ACCESSORIES

NOTE: *When servicing the Meter, use only the replaceable parts specified.*

| | |
|-----|---|
| BT2 | Battery, 1.5V ("AA") × 2 |
| F1 | Fuse: 1A/600V RMS HRC fast acting ceramic (Dimensions: 10.2 × 10.2 × 34.8mm) |
| F2 | Fuse: 15A/600V RMS HRC fast acting ceramic (Dimensions: 10.4 × 10.4 × 38mm) |

5.2 Battery replacement

Always disconnect the test leads from the instrument first. This instrument uses two $\times 1.5V$ (AA) batteries. To replace the batteries, remove the two screws of the battery compartment cover from the back of the instrument, and remove the cover. Replace the batteries and the cover with its retaining screws.

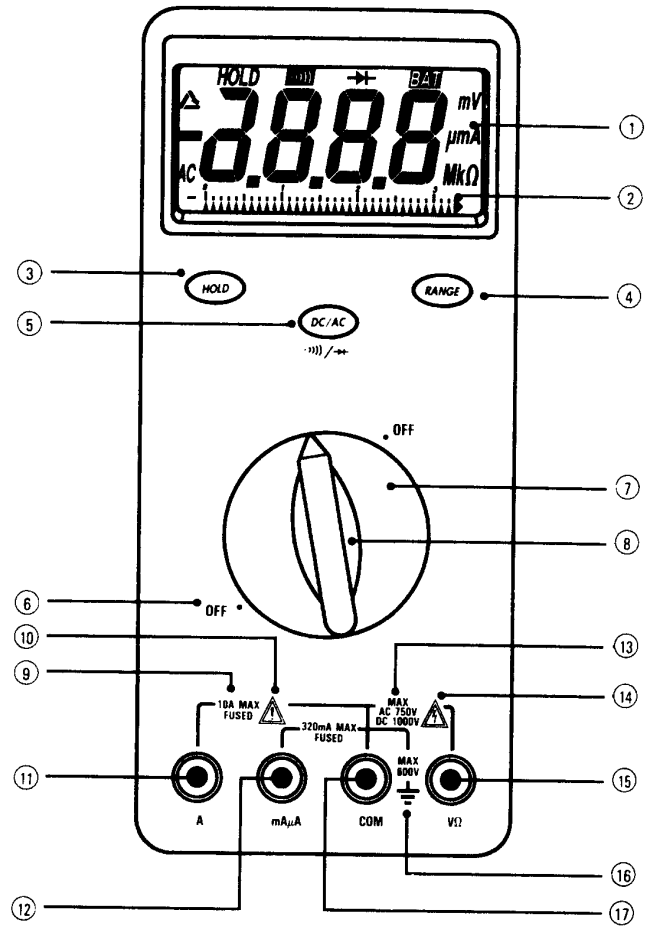
5.3 Fuse replacement









5.3.1 Fuses test

To test the internal fuses of this instrument:

1. Set the rotary switch to the " \rightarrow " position.
2. Turn this instrument on.
3. To test the 15A, 600V fuse (F2), plug a test lead into the $V\Omega$ input terminal and touch the other end onto the A input terminal. The display should read 0.000V if the fuse is good. If the reading is O.L. replace the fuse (see 5.3.2) and test again. If the display shows any other reading, return the instrument to Robin Electronics for servicing.
4. To test 1A, 600V fuse (F1), plug a test lead into the $V\Omega$ input terminal and touch the other end onto the $mA\mu A$ input terminal. The display should read 0.5V to 0.9V if the fuse is good. If the reading is O.L. replace the fuse (see 5.3.2) and test again. If the display shows any other reading, return the instrument to Robin Electronics for servicing.

3. EXPLANATION OF CONTROLS AND INDICATORS



- ① **DIGITAL DISPLAY.** Digital readings are displayed on a 3260 count display with polarity indication and automatic decimal point placement. When this Meter is turned on, all display segments and symbols appear briefly during a selftest. The display updates three times per second.
- ② **ANALOG BAR GRAPH.** The bar graph provides an analog representation of readings and updates 10 times per second. The 34 segment bar graph illuminates from left to right as the input increases. If the input equals or exceeds 3260 counts on the range selected, the bar graph displays an arrow at the far right of the display. When the input signal is negative, the negative indicator (-) at the far left of the bar graph is display.
- ③ **HOLD** . Freezes reading in digital display.
- ④ **RANGE** . Selects the Manual Range mode; the symbol, , is displayed. To exit the Manual Range mode and return to autoranging, press and hold down the RANGE button for 2 seconds. The symbol, , will disappear.
- ⑤ **DC/AC**  /  . Toggles between DC and AC. When AC is selected, the symbol, AC, is displayed. Toggles between continuity () and diode () when checking continuity or diode. When the Meter is in the continuity test function, the symbol,  , is displayed. When the Meter is in the diode test function, the symbol,  , is displayed.
- ⑥ **OFF.** Power to the Meter is turned off.

5. MAINTENANCE AND BATTERY/FUSE REPLACEMENT

5.1 General maintenance

Periodically, wipe the case with a damp cloth. DO NOT use abrasives or solvents. Water, dirt or contamination which is allowed to enter the terminal sockets is likely to damage the meter.

Make sure that this multimeter is recalibrated regularly to maintain its accuracy.

If this multimeter should fail to operate correctly, do not attempt to carry out repairs or investigations. Return it to Robin Electronics stating the exact nature of the fault. Before returning the instrument ensure that:

1. the leads have been checked for continuity and signs of damage,
2. the battery is in good condition.

Please remember to give all the information possible concerning the nature of the fault, as this will mean that the instrument will be serviced and returned to you more quickly.

Return the instrument to: -

Service Department,
Robin Electronics Ltd.,
The Precision Centre,
Dwight Road,
WATFORD,
Herts, WD1 8HG
England.
Telephone 01923 218833
Fax 01923 218898

Follow these steps to measure DC (or AC) current.

1. Set the range switch to the required DC A or AC A range. If you do not know the value of current to be measured, always start with the 10A range and change the setting to a lower range if the reading makes this necessary.
2. When measuring high currents, put the red test lead into the "A" terminal and the black lead into the "COM" terminal of the instrument.
3. When measuring lower currents, put the red test lead into the "mA μ A" terminal and the black lead into the "COM" terminal of the instrument.
4. Disconnect the power from the circuit to be tested.
5. Connect the test leads to the circuit under test.
6. Reapply the power to the circuit, when the measured current will appear on the instrument display.
7. Disconnect the power from the circuit before removing the test leads from it.
8. Always remove the red lead from the circuit under test first, followed by the black lead.

- ⑦ **ROTARY SWITCH.** Describes functions that are selected by setting the rotary switch.

μ A Microamperes dc/ac mA Milliamperes dc/ac

10A Amperes dc/ac $\overline{\overline{mV}}$ Millivolts dc only

Ω Resistance $\overline{\overline{V}}$ Volts dc


\sim Volts ac

\rightarrow \rightarrow) Diode or Continuity test.

- ⑧ **SAFETY SHUTTER.** Prevents user from making inadvertent connections to the current terminals. Always remember to remove test lead plugs before turning the rotary switch.

- ⑨ **10A MAX**

FUSED. The maximum current that you can measure at this terminal 10 Amps DC/AC. This terminal is fuse-protected.

- ⑩  . Refer to the user's manual before using this Meter.


- ⑪ **A (Amperes Input Terminal).** The red test lead is plugged into this terminal for measuring current on the 10A AC or DC current functions.

- ⑫ **mA μ A (Milliamp/Microamp Input Terminal).** The red test lead is plugged into this terminal for measuring mA or μ A on either AC or DC current functions.

- ⑬ **MAX**


AC 750V

DC 1000V. The maximum voltage that this Meter can measure is 1000V DC or 750V AC RMS.

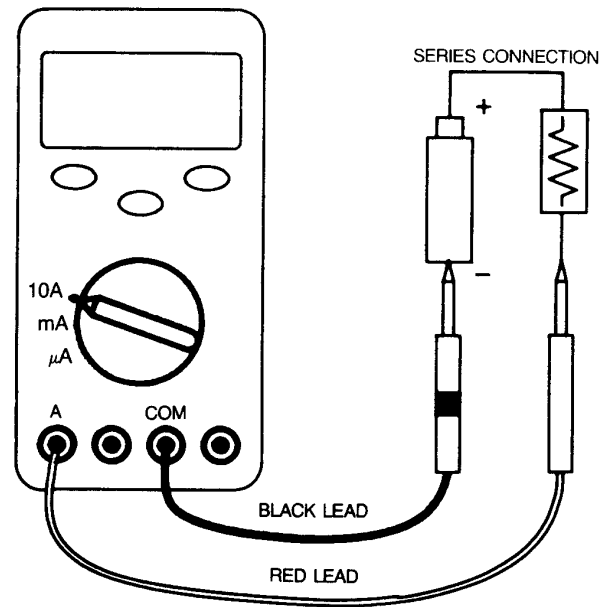
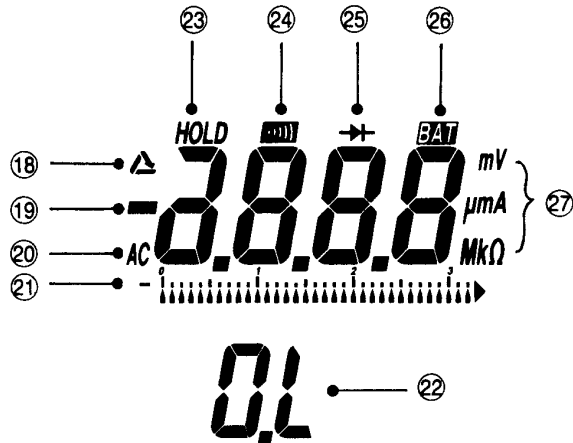
⑭  . Be extremely careful when making high-voltage measurements; DO NOT TOUCH TERMINALS OR TEST LEAD PROBE ENDS.

⑮ **V Ω (Volts, Ohms, Diode Test Input Terminal.)** The red test lead is plugged into this terminal for all AC V, DC V, ohms, continuity test diode test functions.

⑯ **MAX 600V**

 . To avoid electrical shock or instrument damage, do not connect the COM input terminal to any source of more than 600V with respect to earth/ground.

⑰ **COM (Common Terminal).** The black test lead is plugged into this terminal for all measurements.



- To measure current, you must break the circuit and connect the test leads to two circuit connection points. The connection must be in series with the current.
- When undertaking alternating current measurements waveforms other than sine waves will cause reading errors.
- When measuring current, the Meter's internal shunt resistors develop a voltage across the Meter's terminals called "burden voltage". This voltage drop may affect precision circuits or measurements.

4.4 Measuring current (Amps)



CAUTION!

THE CURRENT FUNCTIONS ARE PROTECTED BY A FUSE OF 600 VOLT RATING. TO AVOID DAMAGE TO THE INSTRUMENT, CURRENT SOURCES HAVING OPEN CIRCUIT VOLTAGES GREATER THAN 600 VOLTS DC OR AC MUST NOT BE MEASURED.

NOTE: When taking current measurements, this Meter must be connected in *SERIES* with the circuit (or circuit element) under test. NEVER CONNECT THE TEST LEADS ACROSS A VOLTAGE SOURCE while the rotary switch is set to Amps. This can cause damage to the circuit under test or this Meter.

- ⑮ . Displayed when the Manual Range mode is selected.
- ⑯ (**Negative Polarity**). Automatically indicate negative inputs.
- ⑰ **AC**. Displayed when AC measurement function is selected.
- ⑱ (**Negative Polarity of the Bar Graph**). Automatically displayed when the input signal is negative.
- ⑳ (**Overload Indication**). Displayed on the LCD when input value is outside range selected.
- ㉑ **HOLD**. Displayed when the HOLD button has been pressed.
- ㉒ . Displayed when the Meter is in the continuity test function.
- ㉓ . Displayed when the Meter is in the diode test function.
- ㉔ **BAT** (**Low Battery**). Battery life warning. When **BAT** is first displayed, at least 8 hours of battery life remain. Replace the battery immediately. Never leave a weak or dead battery in the Meter. Even leak-proof types can leak and damage the Meter.
- ㉕ The following symbols indicate the unit of the value displayed.
 - V Volts
 - mV Millivolts (1×10^{-3} Volts)
 - A Amperes (Amps)

| | |
|------------|---|
| mA | Milliamperes (1×10^{-3} Amps) |
| μ A | Microamperes (1×10^{-6} Amps) |
| Ω | Ohms |
| K Ω | Kilohm (1×10^3 Ohms) |
| M Ω | Megohm (1×10^6 Ohms) |

Sleep mode

If this Meter is on and inactive for approximately 10 minutes, it will automatically switch to Sleep Mode. In this mode, the circuit power is reduced to save battery life.

Using test leads

Use only the same type of test leads as are supplied with the Meter.

NOTE: In some DC and AC voltage ranges with test leads not connected to any circuit, the display might show fluctuating readings due to the high input impedance. This is normal. When you connect the test leads to a circuit, a real measurement appears.

Using holster and stand

The Meter comes with a protective holster that absorbs shocks and protects the Meter from rough handling. The holster is equipped with a stand rest.

- Judge the semiconductor device as follows:
If the digital reading in one direction shows a value and the reading in reverse direction shows an overload (Ω), the device is good.

If the digital reading is the same in both directions, the device is probably shorted.


If the display reads Ω in both directions, the device is probably open.

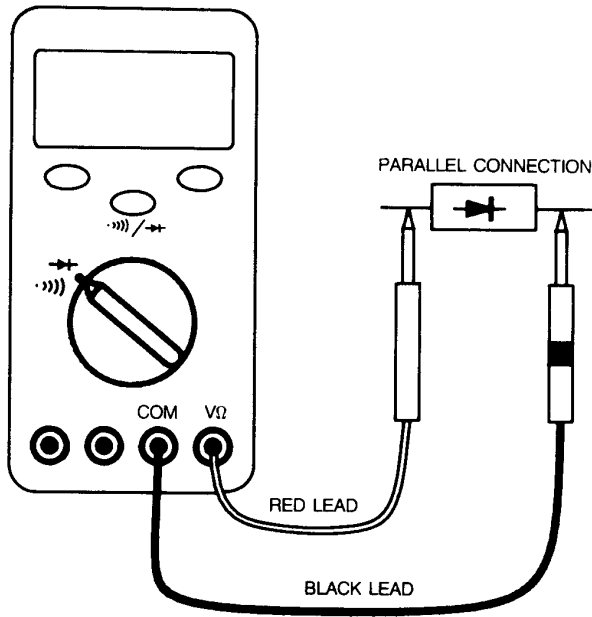
Follow these steps to check a diode.

1. Set the Function switch to the “ \rightarrow \rightarrow \rightarrow ”) ” position.
DC/AC
2. Toggle the \rightarrow)/ \rightarrow button until the “ \rightarrow ” annunciator appears on the LCD.
3. Insert the black test lead into the “COM” input terminal and the red test lead into the “V Ω ” input terminal.
4. Touch the red test lead to the Anode (+ side, non-banded end) and the black test lead to the Cathode (– side, banded end).
5. If the diode is good, the reading should indicate 0.3V to 0.8V on the LCD.
6. Reverse the red and black leads on the diode, if the LCD reads Ω (the overload sign), the diode is good.

NOTE: A defective diode will read Ω (the overload sign) or 0.00 irrespective of how the test leads are connected.

4.3.2 Diode test

Diode test lets you check diodes, transistors, and other semi-conductors for opens, shorts, and normal operation. NEVER CONNECT THE TEST LEADS TO A SOURCE OF VOLTAGE when the rotary switch is set to  .



- In diode test, voltage drop in the forward direction is displayed when diode is connected in the forward direction. For a germanium diode, the typical forward voltage is about 0.4V and in case of a silicon diode, about 0.6V.

4. BASIC ELECTRICAL TESTS AND MEASUREMENTS

4.1 Measuring voltage

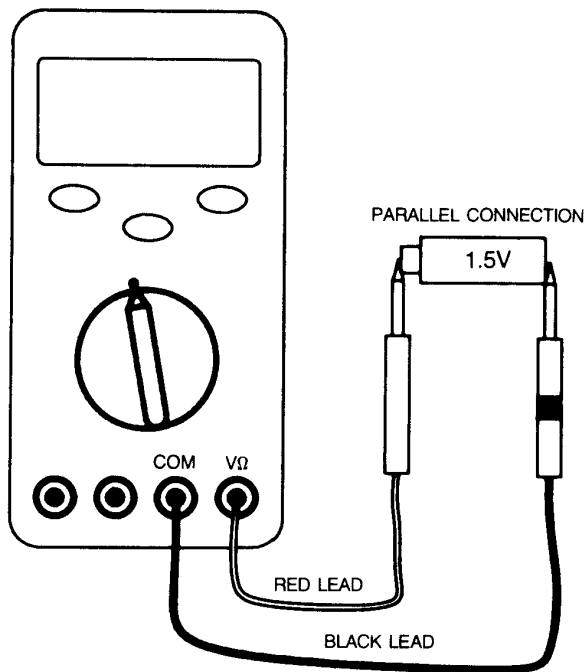


WARNING!

READ "SAFE TESTING" BEFORE USING THIS INSTRUMENT. TO AVOID THE RISK OF ELECTRIC SHOCK AND INSTRUMENT DAMAGE, INPUT VOLTAGES MUST NOT EXCEED 1000V DC OR 750V AC (RMS). DO NOT ATTEMPT TO MEASURE ANY UNKNOWN VOLTAGE THAT MAY BE IN EXCESS OF THESE LEVELS.

THIS INSTRUMENT IS DESIGNED FOR MEASUREMENT IN LOW CURRENT CIRCUITS (UP TO 10A). DO NOT ATTEMPT TO USE IT IN HIGH CURRENT CIRCUITS (SUCH AS MAIN FEEDER SYSTEMS AND THE LIKE) UNLESS A SUITABLE CURRENT CLAMP IS USED. USE IN HEAVY CURRENT CIRCUITS CAN BE DANGEROUS, BOTH TO THE INSTRUMENT AND TO ITS USER.

NOTE: When taking voltage measurements, this instrument must be connected in PARALLEL with the circuit, or circuit element under test.



- In the 326mV range, displayed value may fluctuate when disconnecting input terminals. This is normal.
- The AC voltage measuring circuit in this Meter performs a mean value calculation, consequently when measuring AC waveforms other than sine waves causes error.

4.2.1 Measuring ohms

When measuring resistance, be sure that the contact between the test leads and the circuit under test is good. Dirt, oil, solder flux, or other foreign matter may substantially affect the reading value.

Follow these steps to measure ohms.

1. Set the Function switch to the desired “Ω” position.
2. Insert the black test lead into the “COM” input terminal and the red test lead into the “VΩ” input terminal.
3. Connect the test leads to the circuit to be measured.
4. The measured resistance will be displayed on the LCD.

4.3 Continuity test and diode test

4.3.1 Continuity test

This mode helps you check electrical circuits, such as wiring, speaker cables, connections, switches, or relays for short or open circuits. In continuity test, a measured value of approx. 20Ω or less causes the Meter to emit a continuous tone.

Follow these steps to check continuity.

1. Set the Function switch to the “ ” position.
2. Toggle the button until the “ ” annunciator appears on the LCD.
3. Insert the black test lead into the “COM” input terminal and the red test lead into the “VΩ” input terminal.
4. Touch the test leads to the circuit to be measured.
5. This Meter will emit a continuous tone for resistance of less than 20 ohms.

- For resistance measurements above 1 Megohm, the display may take a few seconds to stabilize. This is normal for high-resistance readings.
- The Meter has a circuit to protect the resistance range from over-voltage (600V AC). However, to prevent accidentally exceeding the protection circuit's rating and to ensure a correct measurement, NEVER CONNECT THE TEST LEADS TO A SOURCE OF VOLTAGE when the rotary switch is set to Ω or \rightarrow functions.
- The current applied during resistance measurements could damage some devices. The table below lists the test voltage and current available for each resistance measurement range. (All values are typical.)

| RANGE | OPEN CIRCUIT VOLTAGE (A) | FULL SCALE VOLTAGE (B) | SHORT CIRCUIT CURRENT (C) |
|-----------------|--------------------------|------------------------|---------------------------|
| 326 Ω | < 1.2V | < 170mV | < 474 μ A |
| 3.26 k Ω | | < 280mV | < 108 μ A |
| 32.6 k Ω | | < 300mV | < 12.4 μ A |
| 326 Ω | | < 300mV | < 1.4 μ A |
| 3.26M Ω | | < 300mV | < 0.2 μ A |
| 32.6M Ω | | < 1V | < 0.2 μ A |

NOTE: (A) is the open circuit test voltage at the input terminals in volts.

(B) is the voltage drop across a resistance equal to full scale value.

(C) is the current through a short circuit at the input terminals.

- To improve the accuracy of DC voltage measurements taken in the presence of AC voltages (such as, measuring the DC offset voltage of an amplifier in the presence of an AC signal), measure the AC voltage first. Note the just measured AC voltage range and select a DC voltage range that is the same or higher than the AC voltage range. This method improves the DC voltage accuracy by preventing the input protection circuits from being activated.

Follow these steps to measure DC (or AC) volts.

1. Set function and range switch to the desired DC V (or AC V) range. If you do not know the value of the voltage to be measured, always start with the highest range and reduce the setting as required to obtain a satisfactory reading.
2. Plug the red test lead into the "V Ω " input terminal and the black lead into the "COM" input terminal of the instrument.
3. Disconnect the power from the circuit to be tested.
4. Connect the test leads to the circuit to be tested.
5. Reapply power to the circuit, the measured voltage will appear on the display of the instrument.
6. If the red test lead is connected to the negative (or lower voltage) side of the circuit, a minus sign will appear on the display, at the left.
7. Disconnect power to the circuit before removing the test leads from the circuit.

Three-phase AC volts

This Meter is designed to primarily measure single phase AC voltage. When measuring THREE-PHASE circuits line-to-line, the value of the voltage is actually higher than the rated line-

to-ground 3-phase voltage. It is very important that you do not exceed the maximum AC (RMS) rating of this Meter, 750V AC. To find the RMS voltage line-to-line on a 3-phase power line, multiply the rated line-to-ground voltage by the square root of 3 (approx. 1.732).

For example, if you connect this Meter to a 480 volts 3-phase line (i.e. 480V line-to-ground), the total available voltage line-to-line is about 832V AC ($\approx 480V \times 1.732$). Severe damage and a dangerous shock hazard could result because this exceeds the rating of this Meter.

4.2 Measuring resistance (Ohms)

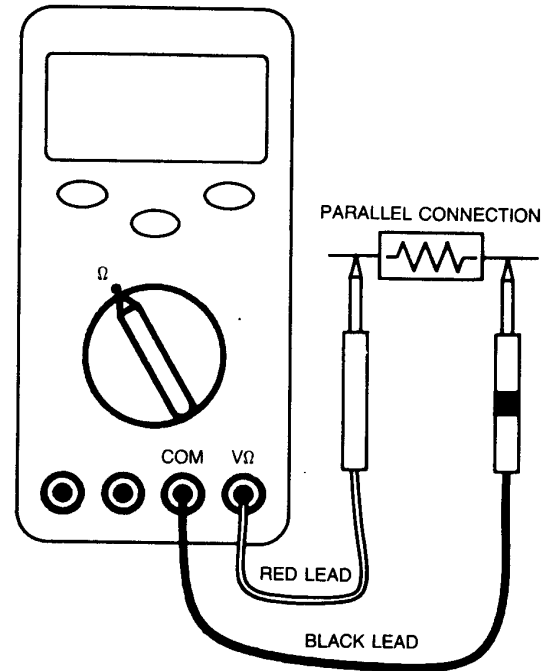


CAUTION!

TURN OFF POWER AND DISCHARGE ALL CAPACITORS ON CIRCUIT TO BE TESTED BEFORE ATTEMPTING INCIRCUIT RESISTANCE MEASUREMENTS. FAILURE TO DO SO MAY RESULT IN CIRCUIT (AND/OR INSTRUMENT) DAMAGE.

THE RESISTANCE MEASURING CIRCUIT APPLIES A KNOWN VALUE OF CONSTANT CURRENT THROUGH THE UNKNOWN RESISTANCE AND THEN MEASURES THE VOLTAGE DEVELOPED ACROSS IT. THEREFORE, REMOVE ALL POWER TO THE CIRCUIT UNDER TEST WHEN MAKING RESISTANCE MEASUREMENT. IF ANY VOLTAGE IS PRESENT IN THE TEST CIRCUIT, AN ERRONEOUS READING WILL RESULT. THIS METER MAY BE DAMAGED IF VOLTAGE IN EXCESS OF 600V AC IS PRESENT.

NOTE: When measuring low ohm values, touch tips of test leads together and record the reading. Subtract this reading from any additional measurement to obtain the most accurate value.



When measuring large resistance, reading may be unstable due to environmentally induced electrical noise. In this case, directly connect the resistor to input terminals of the Meter or shield the resistor at the same voltage or that of the COM input terminal to obtain stable reading.