

OWNER'S MANUAL

DIGITAL MULTIMETER

MRP #93-0187 Rev. A



INNOVA
AUTOMOTIVE MADE EASY

SAFETY PRECAUTIONS/ ⚠ WARNINGS

- This Digital Multimeter is intended for INDOOR USE ONLY.
 - Pay close attention to ⚠ **WARNINGS** stamped on the front and rear of the meter's case. These warnings, as well as all warnings and precautions used throughout this manual, must be followed to avoid electric shock and/or personal injury.
 - The RESPONSIBLE PARTY shall be made aware that, if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- To prevent electrical shock and/or damage to the tester or the equipment under test, observe the following safety precautions:
- DO NOT apply more than the rated voltage, as marked on the meter, between terminals or between any terminal and earth ground.
 - Use caution when working above 30V AC rms, 42 V peak, or 60 V DC. Such voltages pose a shock hazard.
 - To avoid false readings that could lead to possible electric shock or personal injury, replace the batteries as soon as the low battery indicator displays.
 - Use ONLY those test leads or probes provided with the meter. DO NOT use third-party test leads or probes.
 - Always inspect the multimeter, test leads and any other accessories for damage prior to every use. If any damage is found, **do not** use tester until repairs are done.
 - Always consider electrical and electronic equipment to be energized (live). Never assume any equipment is de-energized.
 - Never ground yourself when taking electrical measurements. Isolate yourself from ground by using dry rubber insulating mats to cover all exposed/grounded metal. Stand on rubber mats and wear dry clothing.

SPECIFICATIONS

GENERAL SPECIFICATIONS AND FEATURES

- 3-½ digit LCD display (maximum reading of 2000)
- Manual range control
- Automatic negative (-) polarity indication
- Automatic zero adjustment
- Over range indicator (except 10 A function). Displays "1" on LCD
- Low battery indicator. Displays battery symbol on LCD
- Safety standard: **CE EMC/LVD**. The meter is up to the standards of IEC1010 Pollution Degree 2, over voltage Category 2 (signifies protection against transient impulses at the local level mains electrical supply).
- Equipment marked is protected throughout by Double or Reinforced Insulation.
- Operating environment:
 - Temperature - 32° to 104° F. (0° C to 40° C)
 - Humidity - Less than 80% relative humidity (non-condensing)
 - Altitude - up to 6562 ft (2000 meters)
- Storage environment:
 - Temperature - 4° to 140° F (- 20° to 60° C)
 - Humidity - Less than 90% relative humidity (non-condensing)
- Power Supply: One 9-volt (6F22) battery
- Fuse: 315mA/250V 5X20 mm (Radio Shack, GMA/217 series; #270-1046) fuse
- Dimensions:
 - Height - 5.50 in. (139 mm)
 - Width - 3.50 in. (89 mm)
 - Depth - 1.25 in. (32 mm)
- Weight (including batteries): approximately 5.7 oz (170 g)

ELECTRICAL SPECIFICATIONS

Accuracy of specifications in the following tables are based on an operating temperature of 64°F to 82°F (18°C to 28°C) and a relative humidity of less than 75%.

Maximum voltage from **V ma** socket to **COM** socket is 500V AC/DC; from **COM** socket to ground is 300V AC/DC.

DC VOLTS

Range	Resolution	Accuracy	Overload Protection
200mV	100µV	±(0.8% of reading + 5 digits)	230 Vrms
2V	1mV		500V DC or AC
20V	10mV		
200V	100mV		
500V	1V	±(0.8% of reading + 5 digits)	
Input impedance: 10MΩ for all ranges.			

RESISTANCE (OHMS)

Range	Resolution	Accuracy	Overload Protection
200Ω	0.1Ω	±(1% of reading + 5 digits)	250V DC/AC RMS
2KΩ	1Ω		
20KΩ	10Ω		
200KΩ	100Ω		
20M Ω	10K Ω	±(2% of reading + 5 digits)	
Open Circuit Voltage: Approximately 3V			

DIODE TEST

Function	Range	Resolution	Accuracy	Overload Protection
Diode test		1mV	0.5 ~ 0.8V	250V DC/AC RMS
Open Circuit Voltage: Approximately 2.8V Forward Voltage Drop: Approximately 1mA				

DC AMPS

Range	Resolution	Accuracy	Overload Protection
2000µA	1µA	±(1.5% of reading + 5 digits)	0.315A/250V fuse
20mA	10µA		
200mA	100µA		
10A	10mA	±(2% of reading + 5 digits)	Non-Protected
Measuring time is equal to or less than 15 seconds and time interval is equal to or over 15 minutes.			

BATTERY TEST

Range	Resolution	Overload Protection
1.5V	10mV	0.315A/250V fuse
9V		

AC VOLTS

Range	Resolution	Accuracy	Overload Protection
200V	100mV	±(1.2% of reading + 10 digits)	500V DC or AC
500V	1V		
Frequency: 40-400Hz			

TESTING PROCEDURES

A. AC/DC VOLTAGE MEASUREMENT



To avoid possible electric shock, instrument damage and/or equipment damage, DO NOT attempt to measure voltages ABOVE 500V AC/DC or take measurements if the voltage is unknown. 500V AC/DC between the COM and V jacks is the maximum voltage that this instrument is designed to measure. The "COM" terminal potential should not exceed 300V AC/DC measured to ground.

1. Plug the BLACK test lead into "COM" jack of the multimeter; plug the RED test lead into the "V" jack.
2. Set the meter's Function/Range Selector Switch to the appropriate ACV or DCV position as desired.
3. Place the RED test lead onto the positive (+) side of the item being tested and the BLACK test lead onto the negative (-) (across the source/load) side of the item. **BE CAREFUL** not to touch any energized conductors with any part of your body.
4. Read the results on the display.

B. RESISTANCE MEASUREMENT Ω (OHMS)



Resistance measurements must be made on "de-energized" (dead) circuits ONLY. Impressing a voltage across the multimeter's terminals while set to any resistance range may result in electric shock, instrument damage and/or damage to equipment under test. MAKE SURE equipment is completely de-energized before taking any resistance measurements.

1. Plug the RED test lead into the " Ω " jack of the multimeter; plug the BLACK test lead into the "COM" jack.
2. Set the meter's Function/Range Selector Switch to the OHM " Ω " range function.
3. Place the RED test lead onto one side of the item being tested and the BLACK test lead onto the other side of the item. (Polarity does not matter when checking resistance).
4. Read the results on the display.

C. DIODE TEST



To avoid electrical shock and/or damage to the multimeter, ensure the power is removed from the circuit before any DIODE testing procedure is conducted. Test diodes on de-energized (dead) circuits only, never on live circuits.

1. Plug the RED test lead into the $\rightarrow|$ jack of the multimeter; plug the BLACK test lead into the "COM" jack.
2. Set the meter's Function/Range Selector Switch to the $\rightarrow|$ position.
3. Place the RED test lead onto one side of the diode being tested and the BLACK test lead onto the other side.
4. Read the results on the display.
5. Reverse the test leads and again read the results on the display. Compare the two readings. One reading should indicate a voltage drop value; the other reading should indicate an overrange (1) condition.

D. DC CURRENT MEASUREMENT (AMPS)



To prevent electrical shock when performing current measurements, follow all steps as indicated below DO NOT skip any steps or take any short cuts.

The DC10A range is not fused. To avoid current hazard and/or damage to the tester, DO NOT try to take measurements on circuits that have more than 10 amps. DO NOT take more than 15 seconds to take the reading. A waiting period of AT LEAST 15 MINUTES is necessary between every 15 second testing period.

1. Plug the RED test lead into the "mA" or the "DC10A" jack of the multimeter, as applicable; plug the BLACK test lead to the "COM" jack.
2. Set the meter's Function/Range Selector Switch to the appropriate Amps range position as desired.
 - To measure from 0 to 200mA, set the Selector Switch to the desired "DCmA" position.
 - To measure from 200mA to 10 Amps DC, set the Selector Switch to the "DC10A" position.
3. Disconnect the battery, or shut off the power to the circuit being tested.
4. Disconnect one end of the wire or device, from the circuit where current will be measured.
5. Place the RED test lead on the disconnected wire and place the BLACK test lead at the location from which the wire was disconnected (series connection).
6. Reconnect the battery, or apply power to the circuit being tested.
7. Read the results on the display.

CAUTION: After the test is completed, shut the power off to the circuit before removing the test leads and before reconnecting any disconnected wires or devices.

E. BATTERY TEST

1. Plug the RED test lead into the "BAT." jack of the multimeter; plug the BLACK test lead into the "COM" jack.
2. Determine the voltage rating of the battery to be tested.
3. Set the meter's Function/Range Selector Switch to the desired "Battery Test" range.
4. Place the RED test lead on the positive post of the battery under test; place the BLACK lead on the negative post.
5. Read the results on the display.

MAINTENANCE

1. No periodic maintenance is required other than the replacement of the battery, the fuse, and visual inspection of the meter.
2. Keep the meter clean and dry. DO NOT use solvent to clean, use a damp (not wet) cloth and fully dry after cleaning.

BATTERY AND FUSE REPLACEMENT



When replacing the battery or the fuse, remove only the rear panel. Do not remove or disassemble the circuit board or the front panel, these items are not serviceable and if disassembled there is the possibility of loose metal parts shorting the circuit board and causing an electrocution danger to the user.

1. Turn the Digital Multimeter "OFF" and remove the test leads.
 2. Remove the two screws on the back of the meter and separate the case.
 3. Replace the fuse or battery as necessary:
 - **For battery replacement:** Remove the battery from the battery compartment and replace **only** with one **9-volt alkaline battery**.
 - **For fuse replacement:** Remove the fuse from the fuse holder and replace with a **0.315A/250V - UL Listed Bussmann, GMA Type (Radio Shack GMA/270 series; #270-1046) fuse**.
- NOTE:** Use a **0.315A/250V, 5x20mm** type fuse **ONLY** - Bussmann, GMA Type (Radio Shack #270-1046 or similar). Using an incorrect fuse may result in serious injury and/or damage to the unit.
4. Reassemble the case and secure with the two screws.

LIMITED ONE YEAR WARRANTY

The Manufacturer warrants to the original purchaser that this unit is free of defects in materials and workmanship under normal use and maintenance for a period of one (1) year from the date of original purchase. If the unit fails within the one (1) year period, it will be repaired or replaced, at the Manufacturer's option, at no charge, when returned prepaid to the Service Center with Proof of Purchase. The sales receipt may be used for this purpose. Installation labor is not covered under this warranty. All replacement parts, whether new or remanufactured, assume as their warranty period only the remaining time of this warranty. This warranty does not apply to damage caused by improper use, accident, abuse, improper voltage, service, fire, flood, lightning, or other acts of God, or if the product was altered or repaired by anyone other than the Manufacturer's Service Center. The Manufacturer, under no circumstances shall be liable for any consequential damages for breach of any written warranty of this unit. This warranty gives you specific legal rights, and you may also have rights, which vary from state to state. This manual is copyrighted with all rights reserved. No portion of this document may be copied or reproduced by any means without the express written permission of the Manufacturer. **THIS WARRANTY IS NOT TRANSFERABLE.** For service, send via U.P.S. (if possible) prepaid to Manufacturer. Allow 3-4 weeks for service/repair.