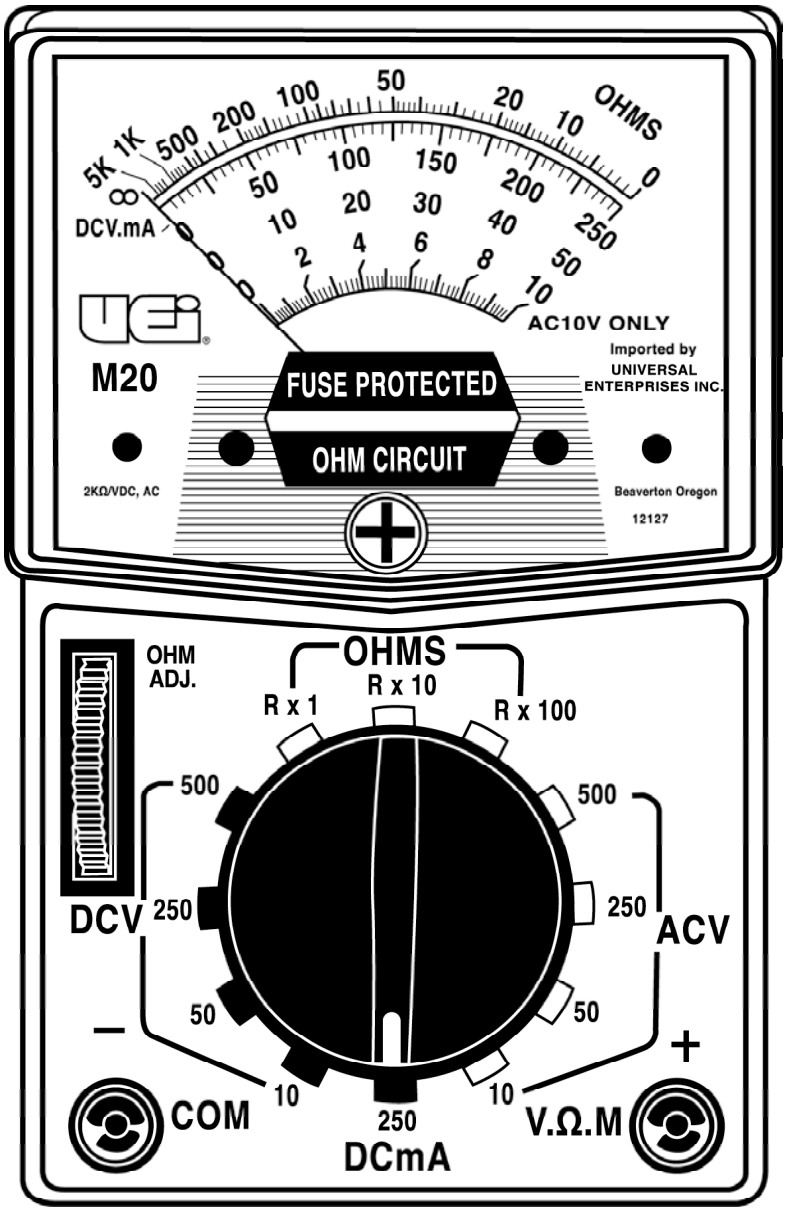
# INSTRUCTION MANUAL

# M20

## Analog Multimeter





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## Introduction

The M20 has features you need for testing residential electrical and HVAC/R systems. With its four AC and four DC voltage scales you can measure typical control and source voltages with high resolution. It also includes a low-ohm scale to test critical connections and a milliamps function to verify many flame safeguard circuits.

**Features include**

- 12 ranges
- 500 Volts AC and DC
- DC milliamps
- Fused ohm circuit
- Resistance to 500 kilohms
- Color-coded and mirrored scale plate

## Safety Notes

Before using this meter, read all safety information carefully. In this manual the word **"WARNING"** is used to indicate conditions or actions that may pose physical hazards to the user. The word **"CAUTION"** is used to indicate conditions or actions that may damage this instrument.

## Operating Instructions

**AC Voltage**

Insert one test lead in the "**+VΩM**" jack. Insert the other test lead in the "**COM**" jack. Set the function switch to the appropriate AC voltage.

***NOTE:*** *Always start with the 500V range if unsure of the magnitude of voltage present.*

**CAUTION!**

*Always remove the test leads from the circuit under test before disconnecting from front panel of M20.*

**DC Voltage**

Insert the black test lead in the "**COM**" jack. Insert the red test lead in to "**+VΩM**" jack. Set the function switch to the appropriate DC voltage. The red test lead is connected to the positive voltage point. The black test lead is connected to the negative voltage point.

***NOTE:*** *Always start with the 500V range if unsure of thee magnitude of voltage present.*

**CAUTION!**

*Always remove the test leads from the circuit under test before disconnecting from front panel of M20.*

**Direct Current**

The M20 may be used to measure direct current up to a maximum of 250 mA (0.250 Amps). To do this, the M20 must be connected **in series** with the wire, or circuit element, in which the current is to be measured. Remove power to the circuit under test before connecting the M20. Set the function switch to the 250 mA position. Insert the black test lead between the "**COM**" jack on the M20 and the ground, or low voltage, side of the circuit test. Insert the red test lead between the "**+VΩM**" jack on the M20 and the high voltage side of the circuit under test. Apply power to the circuit under test.

**Resistance**

**CAUTION!**

*Always remove power to any circuit in which resistance measurements are to be made.*

The M20 uses an internal battery to supply power to the circuit under test. Access to the battery and the protective fuse is provided by removing the single screw on the back of the case and removing the case back. Observe polarity marking on battery.

Set the function switch to the appropriate OHMS setting, **Rx1**, **Rx10**, or **Rx100**. Insert one test lead in the "**COM**" jack and the other test lead in the "**+VΩM**" jack. Touch the free ends of the test leads together and note that pointer will swing to the right side of the scale. (*Note: If the pointer does not move all the way to the right the battery may be weak and need replacing. If no reading can be made, check battery and fuse*) Use the green "**OHM ADJ**" knob to set the pointer to zero on the green meter scale. This completes the calibration of the resistance measuring circuit. This test should be performed each time resistance tests are to be made to assure that the "**OHM ADJ**" knob has not been inadvertently moved.

To make the resistance measurement, connect the free ends of the test leads across the element to be measured. The measured resistance value will be the green numeral on the resistance scale times the resistance multiplier. For example, if the function switch is on Rx100 and the pointer is on the numeral 20, the resistance is 2,000 ohms (100 x 20 = 2000).

**Testing Diodes / Transistors**

A simple check of diode or transistor quality may be made with the M20. Using the same test procedure as for measuring resistance, connect one test lead to one end of the diode and the other test lead to the other end of the diode. Note the resistance reading. Then reverse the test leads and again not the reading.

If the two readings differ by a factor of ten then the diode, (or transistor junction) is probably good. If the two readings are approximately the same then the diode is shorted. If a reading cannot be obtained in either direction, the diode is probably open.

## Maintenance

### Periodic Service

**WARNING!**

*Repair and service of this instrument is to be performed by qualified personnel only. Improper repair or service could result in physical degradation of the meter. This could alter the protection from electrical shock and personal injury this meter provides to the operator. Perform only those maintenance tasks that you are qualified to do.*

These guidelines will help you attain long and reliable service from your meter:

- Calibrate your meter annually to ensure it meets original performance specifications
- Keep your meter dry. If it gets wet, wipe dry immediately. Liquids can degrade electronic circuits
- Whenever practical, keep the meter away from dust and dirt that can cause premature wear
- Although your meter is built to withstand the rigors of daily use, it can be damaged by severe impacts. Use reasonable caution when using and storing the meter

### Cleaning

Periodically clean your meter's case using a damp cloth. **DO NOT** use abrasive, flammable liquids, cleaning solvents, or strong detergents as they may damage the finish, impair safety, or affect the reliability of the structural components.

### Battery Replacement

The internal 1.5V battery affects only the OHMS function. It should be replaced when it is no longer possible to zero the pointer with the "OHM ADJ" control. Remove battery if M20 is not to be used for a long period of time. Remove single-screw in rear of case for access to battery. Observe polarity.

### Fuses

The fuse affects only the OHMS function. Replace fuse only with one of same current rating and internal resistance, 0.15A and 2.0Ω. Use of a fuse with different internal resistance may cause inaccuracy on the OHMS scale. Remove single screw in rear of case for access to fuse.

### Mechanical Zero Adjustment

The pointer should indicate 0 at the left hand edge of the scale with no input and M20 placed face up on a flat surface.

To reset pointer, carefully adjust clear plastic screw located in meter face.

## Specifications

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|---|---|
| AC Voltage | ±4% of full scale 0 - 10, 50, 250, 500 Volts |
| DC Voltage | ±3% of full scale 0 - 10, 50, 250, 500 Volts |
| Direct Current | ±3% of full scale 0 - 250 mA |
| Resistance | ±3% of scale length 0 - 5K, 50K, 500KΩ |
| Internal Battery | 1.5V, size "AA" |
| Fuse | 0.15A, 2Ω |

## Standard Accessories

Test leads (set) . . . . . .ATL3
Alligator clip adapters . . . . . .AAC
Fuse 0.15A, 2Ω . . . . . .AF2
Battery 1.5V, size AA . . . . . .AB1

# M20
## Analog Multimeter

## Limited Warranty

The M20 is warranted to be free from defects in materials and workmanship for a period of three years from the date of purchase. If within the warranty period your instrument should become inoperative from such defects, the unit will be repaired or replaced at UEi's option. This warranty covers normal use and does not cover damage which occurs in shipment or failure which results from alteration, tampering, accident, misuse, abuse, neglect or improper maintenance. Batteries and consequential damage resulting from failed batteries are not covered by warranty.

Any implied warranties, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the express warranty. UEi shall not be liable for loss of use of the instrument or other incidental or consequential damages, expenses, or economic loss, or for any claim or claims for such damage, expenses or economic loss. A purchase receipt or other proof of original purchase date will be required before warranty repairs will be rendered. Instruments out of warranty will be repaired (when repairable) for a service charge. Return the unit postage paid and insured to:

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This warranty gives you specific legal rights. You may also have other rights which vary from state to state.

PLEASE
RECYCLE