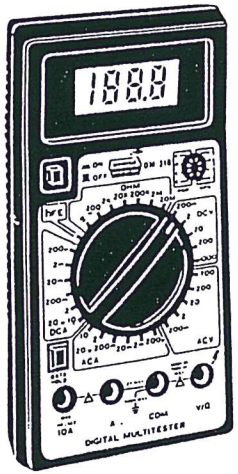
universal enterprises

DM310

DIGITAL MULTIMETER

OPERATING INSTRUCTIONS



UNIVERSAL ENTERPRISES, INC.

8030 SW NIMBUS
BEAVERTON, OR 97008

DM310
OPERATING INSTRUCTIONS

Warning: Observe all safety precautions when measuring higher voltages. Turn off power to the circuit under test, set the DM310 controls, connect the test leads to the meter and then to the circuit under test. Reapply power.

The DM310 is a precision electrical test instrument. Take this opportunity to read these instructions and familiarize yourself with the DM310, its features and its operation.

FEATURES

- The latest IC and display Technology is used to achieve the lowest possible component count. This, in turn, ensures reliability, accuracy, stability, and a rugged, easy-to-handle instrument.
- Low battery voltage is automatically detected and displayed.
- No pointers to bend. No parallax and no zero adjust. Just a high contrast, easy-to-read, 3½ digit, liquid crystal display.
- Effective overload and transient protection on all ranges.
- Over-range indication on each range.
- Full auto-polarity operation.
- Ruggedized construction (can withstand a ten foot drop).

SPECIFICATIONS

Ranges:
DC Voltage:
0-200mV, 2V, 20V, 200V, 1000V
DC Current:
0-20μA, 200μA, 2mA, 20mA, 200mA, 2A, 10A
Resistance:
0-200Ω, 2K, 20K, 200K, 2M, 20M
AC Voltage:
0-200mV, 2V, 20V, 200V, 700V
AC Current:
0-20μA, 200μA, 2mA, 20mA, 200mA, 2A, 10A

Diode Test:
Measures forward voltage drop.
Transistor Test:
Measures hFE
Continuity Buzzer:
Audibly tests continuity of circuits less than 30 ohms.
Data Hold:
Holds the readings on all functions and ranges.

Accuracy:
DC Voltage:
All Ranges: ±0.5% of reading, ±1 digit
DC Current:
200μA, 2mA, 20mA: ±0.5% of reading, ±1 digit
200mA, 2A: ±1.2% of reading, ±1 digit
10A, 20μA: ±2% of reading, ±5 digits
Resistance:
200Ω, 2K, 20K, 200K, 2M: ±0.5% of reading, ±1 digit
20M: ±1% of reading, ±2 digits
AC Voltage:
200mV: ±1.2% of reading, ±3 digits
2V, 20V, 200V, 700V: ±0.8% of reading, ±3 digits
AC Current:
200μA, 2mA, 20mA: ±1% of reading, ±3 digits
200mA, 2A: ±1.8% of reading, ±3 digits
10A, 20μA: ±3% of reading, ±7 digits
Diode Test:
Forward voltage of diode
Transistor Test:
hFE, PNP, NPN-hFE
Continuity Buzzer
30Ω or less
Operating Temperature:
32°F to 104°F (0°C to 40°C)
Storage Temperature:
14°F to 122°F (−10°C to 50°C)
Input Impedance:
DC Voltage:
10 Megohm on each range
AC Voltage:
10 Megohm on each range

Battery:
One 9 volt battery NEDA #1604 or equivalent

Fuse:
2A, 0.2Ω 250V spare fuse included

CONTROLS

POWER SWITCH:

The power switch turns the DM310 on and off. For maximum battery life the DM310 should be switched off when it is not in use.

RANGE AND FUNCTION SWITCH:

The range and function switch determines the highest count value for that range setting, as well as the mode of measurement (DCV, ACV, DC Amps, etc.)

If an input signal is applied which is greater than the maximum limit for the function and range selected, the number "1" will appear at the left hand side of the display. This is the overrange indication and is a sign to the operator to select a higher range.

DATA HOLD SWITCH:

The data hold switch freezes the reading on all functions and ranges. The switch must be in the off position when making measurements.

OPERATIONS

Warning: Observe all safety precautions when measuring higher voltages. Turn off power to the circuit under test, set the DM310 controls, connect the test leads to the meter and then to the circuit under test. Reapply power.

MEASURING DC VOLTAGE:

Warning: To avoid the risk of electrical shock, instrument damage and/or equipment damage, input voltages must not exceed 1000 volts DC. Do not attempt to take any unknown voltage measurements.

1. Set FUNCTION AND RANGE switch to DCV. Plug the red test lead into the V/Ω jack and the black test lead into the COM jack.
2. Set switch as required for the voltage level to be measured. If you don't know the voltage level, start out with the highest range and reduce the setting as required to obtain a satisfactory reading.
3. Connect the probes to the circuit to be tested. The voltage measured will appear on the display.
4. If the voltage exceeds the maximum on the range selected, the display will indicate an overrange "1" Select a higher range.
5. 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.

MEASURING AC VOLTAGE:

Warning: To avoid the risk of electrical shock, instrument damage and/or equipment damage, input voltages must not exceed 700 volts Peak AC. Do not attempt to take any unknown voltage measurements.

1. Set FUNCTION AND RANGE Switch to ACV. Plug the red test lead into the V/Ω jack, and the black test lead into the COM jack.
2. Set the RANGE as required for the voltage level to be measured. If you don't know the voltage level, start out with the Switch set to the highest range and reduce the setting as required to obtain a satisfactory reading.
3. Connect the probes to the circuit to be tested. The voltage measured will appear on the display.
4. If the voltage exceeds the maximum on the range selected, the display will indicate an over-range "1" Select a higher range.

MEASURING RESISTANCE

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 measurements. If any voltage is present in the test circuit an erroneous reading will result. The DM310 may be damaged if voltage in excess of 140 VAC is present.

Caution: Turn test circuit power off and discharge all capacitors before attempting in-circuit resistance measurements.

Note: When measuring critical low ohm values on the 200 range, short tips of test leads together. Record value indicated and deduct from measured value.

1. Set the FUNCTION AND RANGE switch to the OHM position. Plug the red test lead into the V/Ω jack, and the black test lead into the COM jack.
2. Set the RANGE to the desired position.
3. Connect the probes across the circuit to be measured. The resistance measurement will appear on the display.
4. If the resistance value being measured exceeds the maximum value of the range selected, an over-range indication will be displayed "1". Select a higher range.
   Note: An open circuit will indicate "1" on any ohms setting of the RANGE AND FUNCTION switch.

IMPORTANT

Some devices may be damaged by the current applied during resistance measurements. The following table lists the voltage and current available on each range.

Range	A	B	C
200Ω	0.65	0.08	0.44
2K	0.65	0.30	0.27
20K	0.65	0.42	0.06
200K	0.65	0.43	0.007
2M	0.65	0.43	0.001
20M	0.65	0.43	0.0001

A is open circuit voltage at the jacks in volts.
B is voltage in volts across a resistance equal to full scale value.
C is current in milliamperes thru a short circuit at the input jacks. All values are typical.

MEASURING DC CURRENT:

Warning: The 10 amp range on both AC and DC is unfused. Extreme care must be taken when using these ranges.

Caution: The current functions are protected by a fuse of 250 volt rating. To avoid damage to the instrument, current sources having open circuit voltages greater than 250 volts DC or Peak AC must not be connected to the "A" input terminal.

Note: When taking current measurements, the DM310 must be connected in SERIES with the circuit, or circuit element under test. Never connect the test leads across a voltage source. To do so may blow the fuse and damage the circuit under test.

1. Set the FUNCTION AND RANGE switch to the desired range in the DCA position. Plug the red test lead into the "A" jack and the black test lead into the COM jack. (If the current to be measured is more than 2 amps, insert the red test lead into the 10A jack.)
2. Always set the switch to the highest range if you do not know the amount of current to be measured.
3. Remove power from the circuit under test and circuit at the appropriate point.
4. Connect probes to the circuit.
5. Apply power. The current measured will appear on the display.
6. If the magnitude of the current being measured exceeds the selected range, the over-range circuitry will operate, displaying "1". When this occurs, immediately remove power from the circuit under test and select a higher current range.
7. 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.

Note: The current ranges (2 amps or less) are fuse-protected. If inoperative check the fuse.

MEASURING AC CURRENT:

Warning: The 10 amp range on both AC and DC is unfused. Extreme care must be taken when using these ranges.

Caution: The current functions are protected by a fuse of 250 volt rating. To avoid damage to the instrument, current sources having open circuit voltages greater than 250 volts DC or Peak AC must not be connected to the "A" input terminal.

Note: When taking current measurements, the DM310 must be connected in SERIES with the circuit or circuit element under test. Never connect the test leads across a voltage source. To do so may blow the fuse and damage the circuit under test.

1. Set the FUNCTION AND RANGE switch to the desired range in ACA position. Plug the red test lead into the A input jack and the black test lead into the COM jack. (If the current to be measured is more than 2 amps, insert the red test lead into the 10A jack).
2. Always set the switch to the highest range if you do not know the amount of current to be measured.
3. Remove power from the circuit under test and then break the circuit at the appropriate point.
4. Connect probes to the circuit.
5. Apply power. The current measured will appear on the display.
6. If the magnitude of the current being measured exceeds the selected range, the over-range circuitry will operate, display "1". When this occurs, immediately remove power from the circuit under test and select a higher current range.

Note: The current ranges (2 amps or less) are fuse-protected. If inoperative check the fuse.

MEASURING DIODES—OUT OF CIRCUIT

1. Plug the red test lead into the V/Ω jack and the black test lead into the COM jack. (**Note:** The polarity of the red test lead is "+".)
2. Set the FUNCTION AND RANGE switch to the ♫ ⊣⊢ and connect the test leads across the diode under measurement (**Note:** The banded end of the diode is the "−" side in the forward condition.)
3. The meter displays the forward voltage drop in millivolts and the "1" on the left of the display when the diode is reversed.

TRANSISTOR TEST:

1. Set the FUNCTION AND RANGE switch to the hFE position.
2. Determine whether the transistor is NPN or PNP and locate the Emitter, Base and Collector leads.

3. Insert the leads into the proper holes in the socket on the front panel of the DM310.
4. The DM310 measures 0-1000 hFE.

CONTINUITY BUZZER:

Caution: Turn test circuit power off and discharge all capacitors before attempting in-circuit resistance measurements.

1. Set the FUNCTION AND RANGE switch to the ♫ ⊣⊢ position.
2. Insert the black test lead into the "COM" jack and the red test lead into the V/Ω jack on the DM310.
3. Touch the other ends of the test leads together. An audible tone will be heard. This indicates continuity.
4. Continuity buzzer tests can only be made on circuits of less than 30 ohms.

ACCESSORIES

	STOCK NO.
Battery: 9V	AB9
Fuse: 2A, 0.2Ω	AF60
Test Leads: Rubber (set)	ATL50
Alligator Clip Adapters (insulated pair)	AAC
Carrying Case	AC310

MAINTENANCE

Warning: Before attempting to replace the battery and/or fuse, first disconnect the test leads from the circuit, then disconnect the test leads from the instrument.

BATTERY:

The internal 9V battery provides operating power for the DM310. Eventually the terminal voltage of the battery will drop to a level at which it must be replaced. When this happens the reminder "LOBAT" will appear at the lower left portion of the LCD display.

To replace the battery, remove the battery cover of the DM310 and unsnap the battery connector. Replace the battery.

It is advisable to remove the battery if the DM310 is to be stored or not used for long periods of time. This will prevent damage in the event that the battery leaks.

FUSE:

The fuse is in series with the "A" input jack. If the fuse is open the amp functions will not operate. The display will always indicate 000 on the "A" functions. The OHMS, DCV, and ACV functions are not affected by an open fuse.

Should the fuse need replacement, use only 2 amp fuses identical in physical size to the original or use the spare fuse in the storage compartment adjacent to the main fuse in the Case (top cover).

RETURNING FOR REPAIR

Before returning your instrument for repair, please make a quick check to ensure the failure is not due to one or more of the following:

1. Low or dead batteries
2. Open test lead(s)
3. Open fuse

LIMITED TWO YEAR WARRANTY

This product is warranted to the purchaser against defects in material and workmanship for two years from the date of purchase.

What is covered: Repair parts and labor, or replacement at the company's option. Transportation charges to the purchaser.

What is not covered. Transportation charges to the company. Damages from abuse or improper maintenance, see operating instructions. Any other expense. Consequential damages, incidental damages, or incidental expenses, including damages to property. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

How to Obtain Warranty Performance: Attach to the product your name, address, description of problem, phone number and proof of date of purchase. Package and return to:

Service Center

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Implied Warranties: Any implied warranties, including implied warranties of merchantability and fitness for a particular purpose, are limited in duration to two year from date of purchase. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

To the extent any provision of this warranty is prohibited by federal and state law and cannot be preempted, it shall not be applicable. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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