Getting the most out of the digital multimeter

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Your digital multimeter can be used in many more ways than the function switch on the front panel indicates. When it is set to measure resistance, the digital multimeter can be thought of as a precision current source plus a digital voltmeter, a combination that can be used for measurements other than determining resistance values.

To do these other jobs with your multimeter, you must first "calibrate" its ohms range settings. As an example, consider the Fluke model 8000A—its "calibration" table is:

Ohms range setting	Current	Full-scale voltage
200Ω	5 mA	0.2 V
2 kΩ	5 mA	2 V
20 kΩ	0.1 mA	2 V
200 kΩ	1 μA	0.2 V
2 MΩ	1 μA	2 V
20 MΩ	0.1 μA	2 V

The meter's precision current source can now be used to check current meters or to bias a circuit. Also, the forward voltage through a pn junction can be measured at various currents. This is useful for determining whether a device is silicon or germanium, or to match the junction voltages of two or more transistors, or to match diodes, or to compute the effective series resistance of a junction from two readings.

You can even measure capacitance, including very large values. First connect the meter across the capacitor (observe polarity) and then short the capacitor with a jumper. When the meter reading goes to zero, remove the short and time the reading with a stopwatch. Stop the watch when the reading reaches 1,000. For the Fluke 8000A:

Ohms range setting	Each second is equal to:
200 Ω	10,000 μF
2 kΩ	1,000 μF
20 kΩ	100 μF
200 kΩ	10 μF
2 MΩ	1 μF
20 MΩ	0.1 μF

Additionally, you can use your multimeter to determine the internal resistance of a battery, one that supplies under 2 v, by computing the difference between two readings. Simply subtract the battery's no-load voltage from the voltage reading obtained on the 2-kilohm ohms range setting. This yields the battery resistance in kilohms. For instance, suppose the no-load voltage measures 1.533 v and the "2-kilohm" reading is 1.563:

$$1.563 - 1.553 = 0.010 \text{ kilohms} = 10 \text{ ohms}$$

Furthermore, you can take data for plotting a battery's charge/discharge curve. □

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