4-wire milliohm tester for DMMs

Based on a Maxim IC application note, this simple battery-powered adaptor converts an ordinary digital multimeter (DMM) into a 4-wire milliohmeter that accurately measures the resistance of wiring, motor coils, solenoids, high current inductors and meter shunts. It could also be used to locate shorts on a PC board.

The circuit is essentially a constant current source which applies 1A, 100mA or 10mA to the unknown resistance via two test leads, according to the range switch (S2) setting. In use, you set your DMM to the 2V range and connect it across the resistance being measured. This forms a 4-wire connection to the resistance being measured. This method of connection avoids the problems of resistance of the test leads.

Pressing switch S1 passes the selected current through the resistance being measured. With 1A selected, the DMM reading will be in Ohms. A 1# resistance, for example, will read 1.000#.

With 100mA selected by range switch S2, you have to multiply the multimeter readings by 10 to get a value in Ohms or by switching the DMM to 200mV, the reading will once again be in Ohms. Finally, if the 10mA range is selected, the DMM should be set at 200mV and the reading will need to be multiplied by 10 to give the correct value in Ohms.

The overall accuracy will depend on that of the DMM, the op amp's input offset voltage ([pm] 70uV maximum) and the tolerances of resistors R1, R2, R3, R4, R5 & R6. These resistors could be trimmed to improve the accuracy if you have suitable standards.

The constant current source works as follows: The LM-336 provides a 2.5V reference to the non-inverting input (pin 3) of op amp IC2 and this is compared with the voltage developed by the Mosfet (Q1) current through resistors R4, R5 and R6.

Note that S1 disconnects the 9V battery when it is not pressed and this means that there is no current drain from the 1.5V battery either. If you use a D cell here it should produce thousands of measurements. The current drain from the 9V battery when S1 is pressed is only about 30µA so it should last for years.