

LA9IHA Milli-ohm meter

Wheatstone-bridge

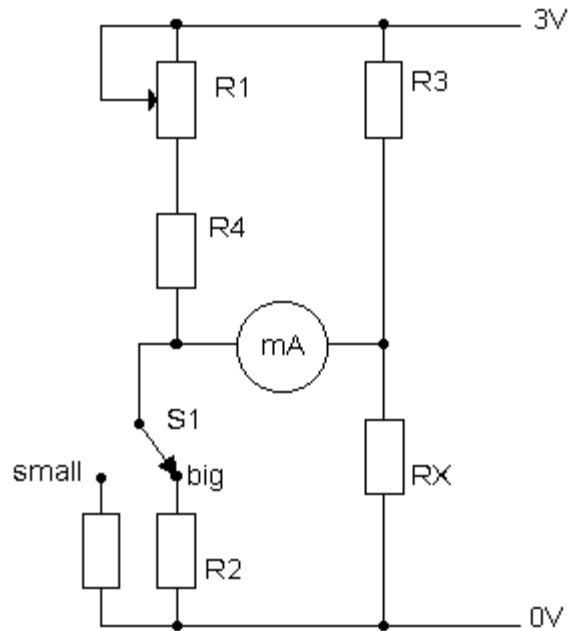
A little handy meter for PSU designers

When making power supply units or measuring large currents you often need a small resistor capable of dissipating several Watts. Instead of trailing the town in search for 0.1 Ohm 50 W you take some thick string measure 0.1 Ohm, cut and place it in your circuit. But, then you need an instrument to measure for you. Here you find the description of how to build your own instrument at a high accuracy and a low cost. My meter will measure from about 0.04 Ohm to about 1.5 Ohm.



Surely, there are many other ways of measuring small resistances. Some includes your digital multimeter or have their own meter. As we say in Norway - there are many ways to kill a cat! This description is by far the most efficient way to measure those tiny resistances.

The concept is based on the well known Wheatstone principle. Charles Wheatstone (1802-1875) was the inventor of lots of things, among them the famous five needle telegraph and an early relay - but not the resistance bridge. This was first time described by Samuel Hunter Christie in 1833. Well, let's leave history behind and look at the circuit diagram:



You need these components:

R1 Potmeter, 200 Ohm lin.

R2 10 Ohm and 12 Ohm in parallel for big

R2 100 Ohm and 120 Ohm in parallel for small

R3 3 times 12 Ohm and one times 18 Ohm, all in parallel

R4 12 Ohm

S1 Switch, I used a 4 times 3 way switch for OFF-SMALL-BIG

mA I used a 0-at-centre 50 uA meter

Rx is ofcourse the unknown resistor. I also put in a resistor and LED in paralell with the battery switch so I get a red LED when the gadget is on. It saves my batteries.

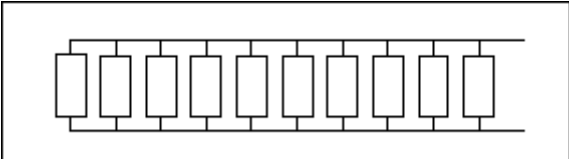
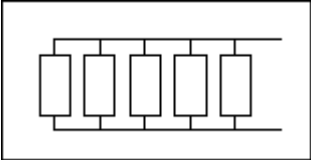
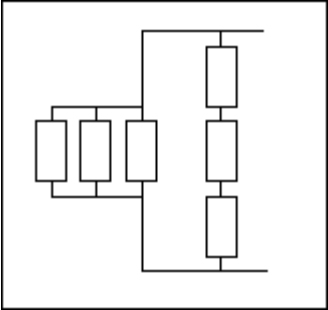
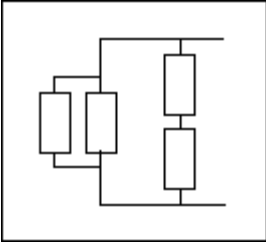
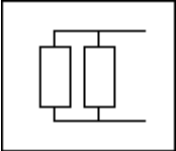
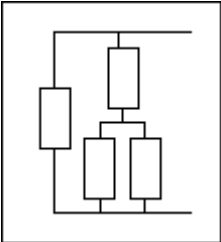
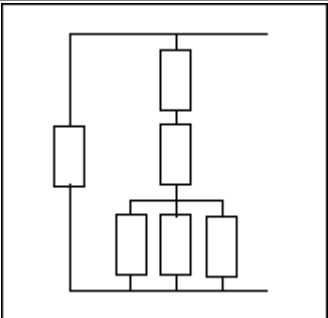
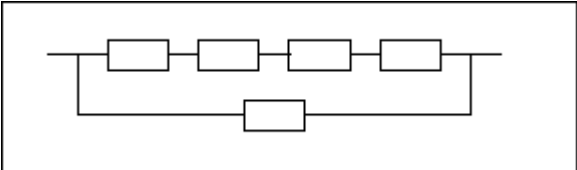
I enclosed it in a box, got ready a lot of resistors and calibrated it. The design inside is a rat-nest. It is such a simple design that no PCB should be necessary.

Calibration

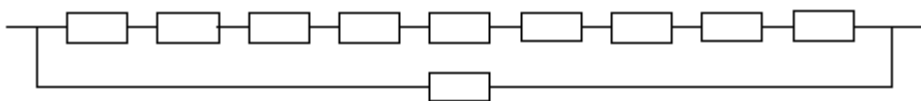
Take a known resistance, e.g 1 Ohm. Connect it to the terminals as Rx. Turn the thing on to 'big' and turn the potentiometer until the current in the micro Ampere meter shows zero. Mark the position and write 1. Repeat the procedure for all resistors from 0.1 Ohm an onwards. Then continue at 'small'.

Known resistors

One problem with the calibration is to find known resistors less than 1 Ohm. Therefore go to your component supplier and get a number of 1Ohm resistors, as accurate as you can get. Then you'll have to connect serial and paralell. If you don't get the kick from your calculator, here is the key:

Ohm	Circuit, all resistors = 1.0 Ohm
0.1	
0.2	
0.3	
0.4	
0.5	
0.6	
0.7	
0.8	

0.9



For resistances less than 0.1 Ohm you cut up some strings of wire to 0.1 Ohm and repeat the exercise.
