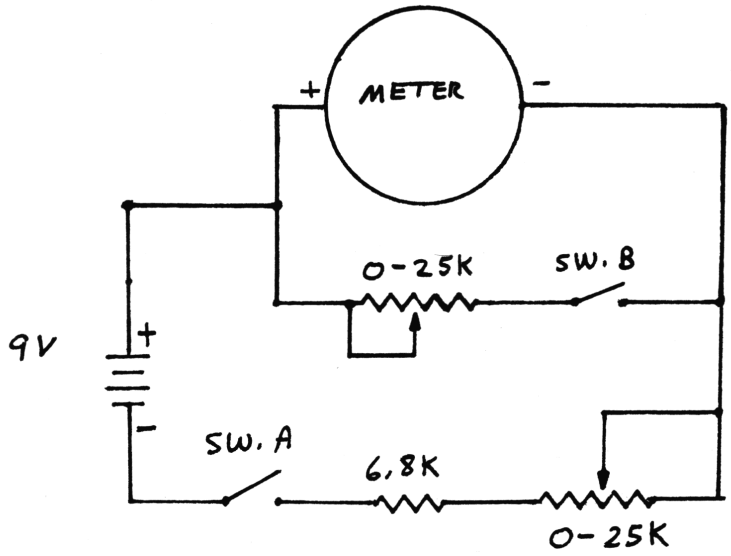
HIGH CURRENT METER

A low-cost milliammeter can be easily converted to read high current by using a shunt across the meter movement. As you know currents in parallel resistors divide, the lower resistance getting the heaviest current flow. The shunt is an extremely low resistance, usually consists of a copper or brass bar across the meter terminals. It must be accurate if your meter is going to read correct.

1. Determine internal resistance of the meter.
2. Calculate the "SHUNT RESISTANCE".

HOW TO FIND THE INTERNAL RESISTANCE:

Wire up a test circuit as shown below:



A. Leaving switch B open, close switch A.
B. Adjust VR1 to get a full scale deflection on the meter.
C. Close switch B and adjust VR2 for a half scale reading on the meter.

Since I = E/R and R = E/I and the currents are the same through the meter and VR2, the resistance of VR2 equals the internal meter resistance. Measure VR2 with an ohmmeter (with switch B open). This is the internal meter resistance.

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HIGH CURRENT METER Continued:

NEXT we will calculate the required shunt. The easiest way to explain this is with an actual example.

In our example, our VR2, and hence our meter resistance, turned out to 358 ohms. The voltage drop across R_L was 3.7V, so I = 3.7/6.8K = 544 uA for full scale meter current. Now lets suppose we want the 544 uA meter to read 0-10 amps. So for 10 amps to flow, 9.999456 amps will be diverted by the shunt. R = .0194798 ohms.

E = I x R = 544 uA (358 ohm) = .1947878.

$$R \text{ shunt} = \frac{E}{I} = \frac{.1947878}{9.999456} = .0194798 \text{ ohm.}$$

So, for a full scale reading of 10 amps we need a .019 ohm shunt across the meter coil. Custom meters can now be designed for what ever purpose you desire. The only hard part is making the precision resistor required for an accurate reading. Use wire tables which give resistance per foot for custom shunts. A "low ohms adapter" for a digital multimeter works well for measuring these low resistance accurately.

"EL CHEEP-O" TEST LEADS

O.K., So--- they were cheap to start with! But not worth a d——. Replace the wire with good 22 gauge insulated wire. Those skinny little wires won't hold up. Nothing is more frustrating than an open test lead when jumpering for PLL logic checking!