Errata for Shunt Circuit Article

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In the recent Mike and Key Relay article, the information on how to make shunt resistor circuits for metering is technically correct, however there is a better way to do the same thing.

The "better way" is to use whole resistor values and not fractional resistance values.

The schematic changes slightly to do this, but to review: The shunt resistor for a 1mA meter to read 0-1A is based on the formula:

$$R_{\text{shunt}} = \frac{R_{\text{meter}}}{n-1}$$

Where n is the scale to read. For example, to read 0-1A (0-1000mA), the formula is:

$$R_{\text{shunt}} = \frac{R_{\text{meter}}}{1000-1}$$

PROBLEM: Solve for R_{shunt}. The value depends on the meter internal resistance. If the meter internal resistance is less than 999 Ohms, R_{shunt} is less than one - fractional.

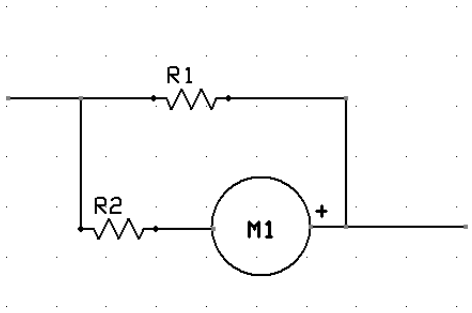
The problem with this is that the value for R_{shunt} can be really small.

SOLUTION: Add a limiting resistor in series with the meter, and shunt the meter and limiting resistor with the shunt resistor.

$$R_{\text{shunt}} = \frac{R_{\text{limit}} + R_{\text{meter}}}{n-1}$$

For measuring plate current, an ideal meter limit resistor is 1 k Ohms.

$$R_{\text{shunt}} = \frac{1000\text{Ohms} + R_{\text{meter}}}{1000-1}$$



R1 is the shunt resistor. **R2** is the limit resistor.

Assume the bypass capacitor and protection diodes are still in the circuit.

Depending on the internal resistance the R_{shunt} becomes a whole number resistance. The ratio is still critical for accuracy.

If the R_{shunt} is not *close enough* to the value in the formula that will cause the meter needle to deflect more or less than it should.