Nano-Ampere Meter

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This circuit can measure currents down into the nano-ampere range. It is useful when building, testing and experimenting with low-power circuits, especially those operating off batteries.

The circuit is built around commonly available JFET input op-amp TL081 and a few precision resistors. It has a wide operating range from 0-10 nA to 0-1 A in steps of multiplicative decades. the range can be eas 10 A and 100 A by including additional range resistors of 100 ohms respectively.

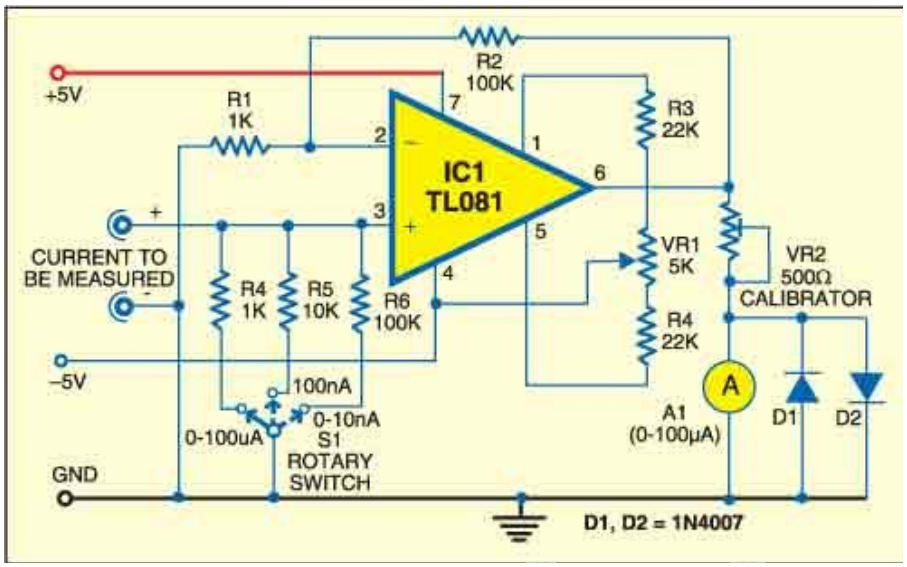

Fig. 1: Circuit of nano-ampere meter

The +\-5V supply (not shown in the circuit) may be obtained from standard regulators to power the circuit. IC TL081 is wired as a high-gain non-invertir with a gain of Rf /R1+1=100. The current to be measured is passed through resistor. The voltage drop across this resistor is applied to the amplifier 100xImxR (where Im is the current to be measured). The range can be control R (1 kohms, 10 kohms and 100 kohms) appropriately.

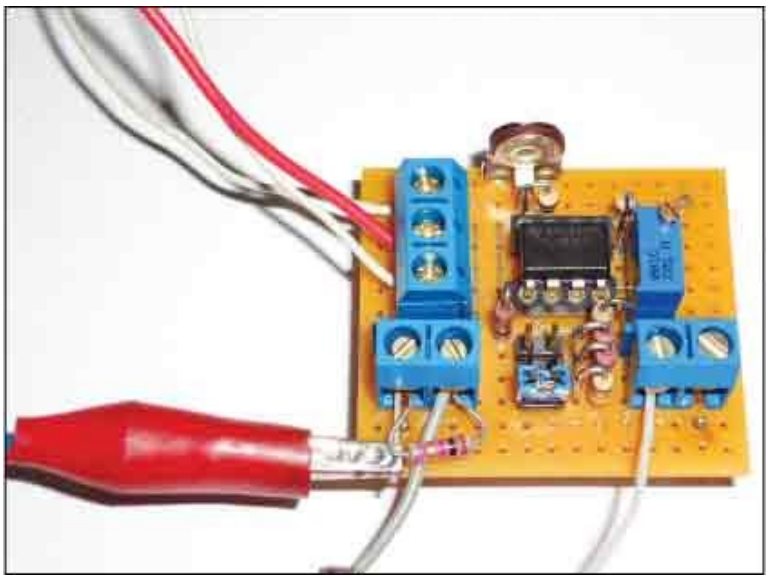

Fig. 2: Author's prototype

The diode in parallel with the meter protects the circuit against high currents due to improper range selection. Further, the range resistors do not have effect on the current to be measured. For instance, to produce a current of 1 source, it is necessary to include a 500-mega-ohm resistor in the circuit. Since being used to sample this current, it is very small as compared to the large valı

Any meter can be used to calibrate the output, provided the gain of the changed appropriately. That is, a meter with full-scale deflection of 150A woul of 150 and vice-versa. Using a commonly available digital multimeter, adjus (preset VR2) such that the resistance of the calibrator and 100 A meter (typica resistance of 700 ohms) in series is exactly 1 kilo-ohm. Now wire the entire ci the set-zero trimpot to get zero deflection in any range of the multimeter. ampere meter is ready for use.

Assemble the circuit on a general-purpose PCB and enclose in a small ammeter on the front panel. Provide three terminals for the power supply

GND) on the rear panel and two terminals on the front panel for the current tc