

TEST INSTRUMENTS

Test Instruments

There are many instruments in the electrical workshop, and each has its own correct method of operation.

The most common instruments that you will be using are as follows:-

Multimeter.

Insulation Resistance Tester.

Clip-on Ammeter.

Voltage Indicator.



Safety Precautions

When using any test instrument there are a number of guidelines that should be observed to ensure maximum personal safety. These are listed on the next few slides.

Please read, remember and follow them,

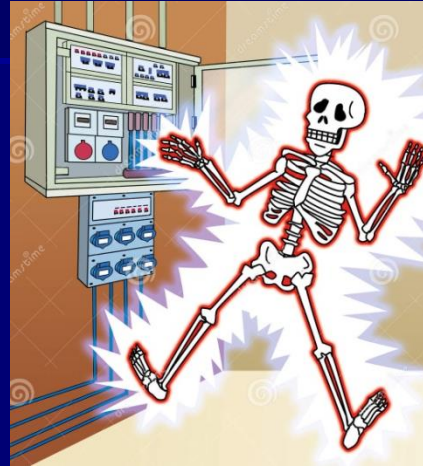
They are there for your safety!

Safety Precautions

Do not use the test equipment if it, or the test leads, are damaged, or if you suspect that the equipment is not functioning correctly.



Safety Precautions



Avoid grounding yourself when taking live measurements do not touch exposed metal objects such as pipes, outlets, fixtures, equipment chassis or cases etc, which may be at ground potential.

Keep your body insulated from ground by wearing rubber-soled footwear or standing on a mat made from an approved insulating material. Wear insulating gloves.

Safety Precautions



Turn off the power to an item before cutting, de-soldering or breaking into a circuit.
Even small amounts of current can be dangerous.

Safety Precautions

Use caution when working on equipment that contains voltages that pose a shock hazard, i.e. above 50v AC Or 120v DC.

When using probes, keep your fingers behind the guards.

DANGER*

Measuring voltages which exceed the limits of the test equipment may damage the equipment and expose the operator to a shock hazard.

Never exceed the voltage or current limits shown on the front of the equipment.

Safety Precautions

Ensure that the correct function and the correct terminals have been selected before using the instrument to avoid causing any damage to it.

Before measuring for resistance, ensure that the circuit under test has been isolated.

Where possible, use fused leads to protect both the instrument and yourself from any potential shock hazard.

Safety Precautions

All test equipment is sensitive and, in order to maintain their accuracy and reliability, they should be handled with care.

Check calibration stickers to ensure equipment has been checked for accuracy.

CALIBRATED	
BY _____	DATE _____
DUE _____	

Instrument Display

Analogue:



Moving Coil

Digital:



LCD

Instrument Display

Analogue:

This type of display gets its name from the physical movement of a variable quantity we wish to measure.

Many modern indicating devices use the movement of an indicator across a scale to represent a quantity.

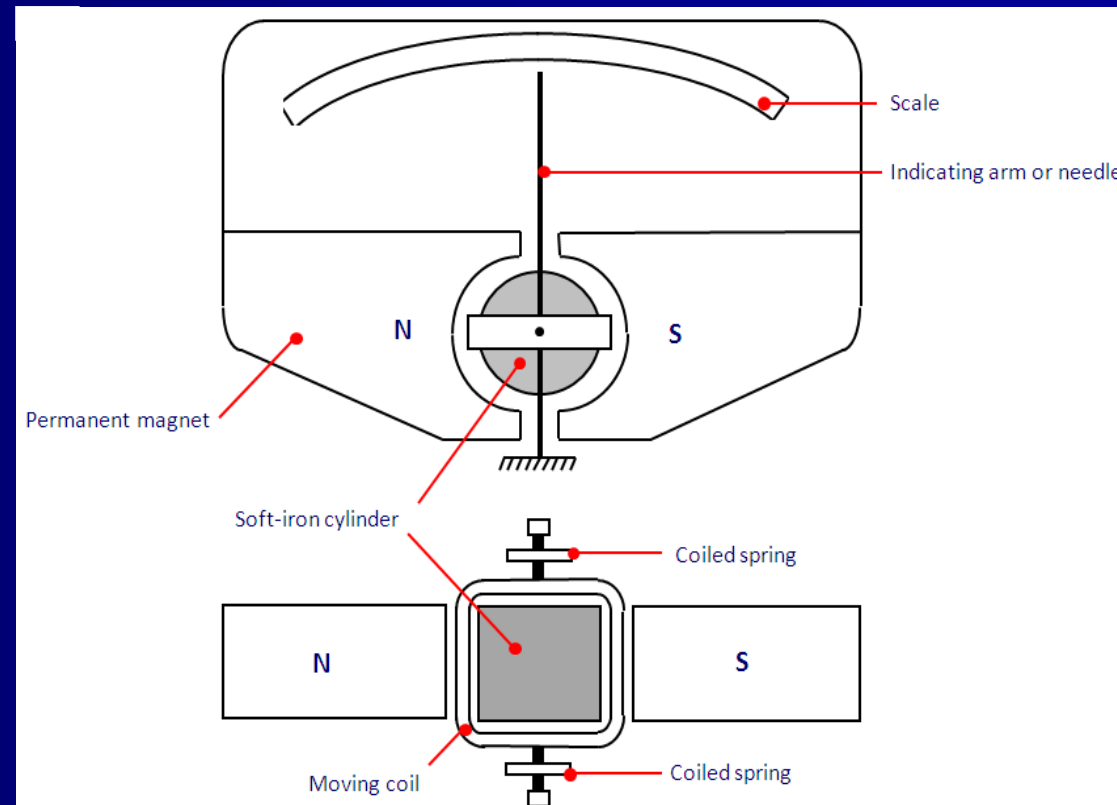
(for example, the engine rev counter and speedometer in a car),

They are generally cheaper than digital, and some people still often prefer an analogue display to a digital one.

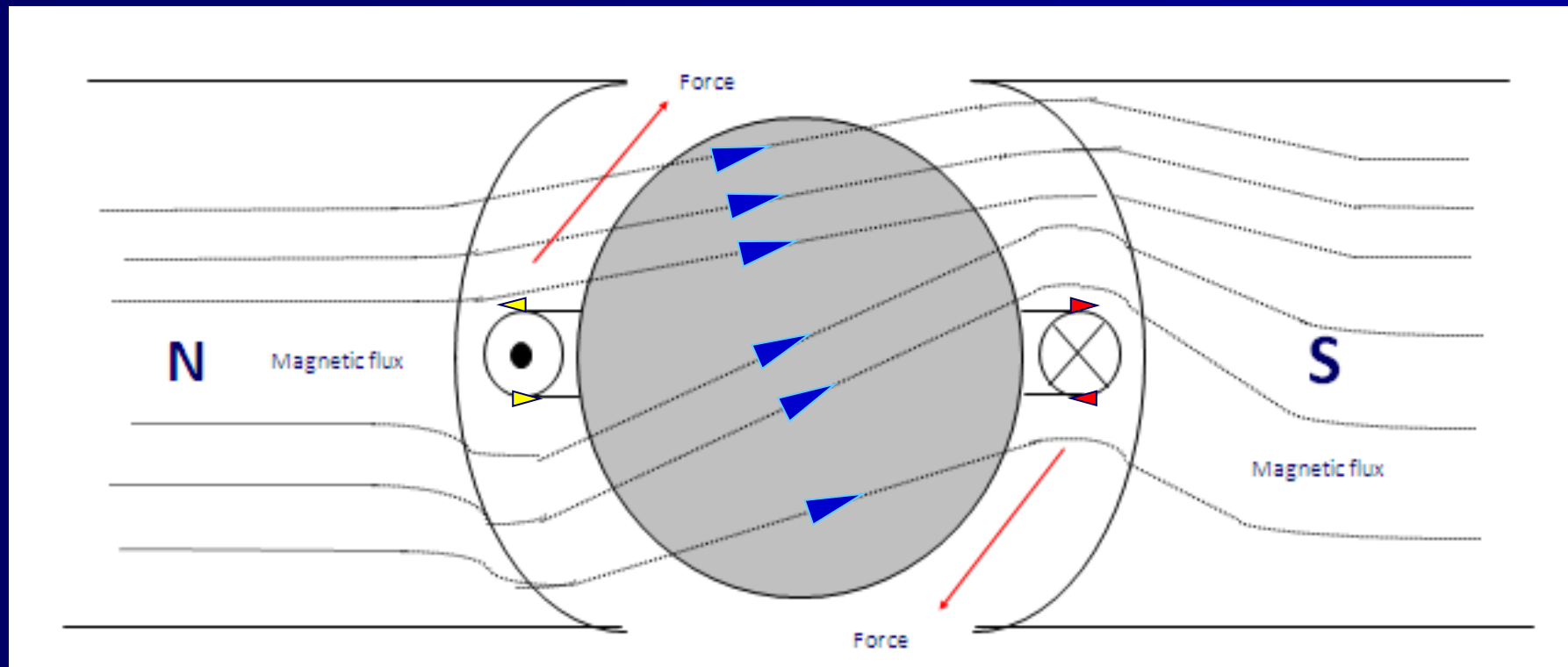
Construction

Analogue:

The movement system of an analogue instrument is usually in the form of a permanent-magnet and moving-coil. The diagram opposite shows the front and plan section elevation views of this arrangement.



Movement



Advantages (Analogue)

High stability.

Uniform scale.

Well shielded from stray magnetic fields.

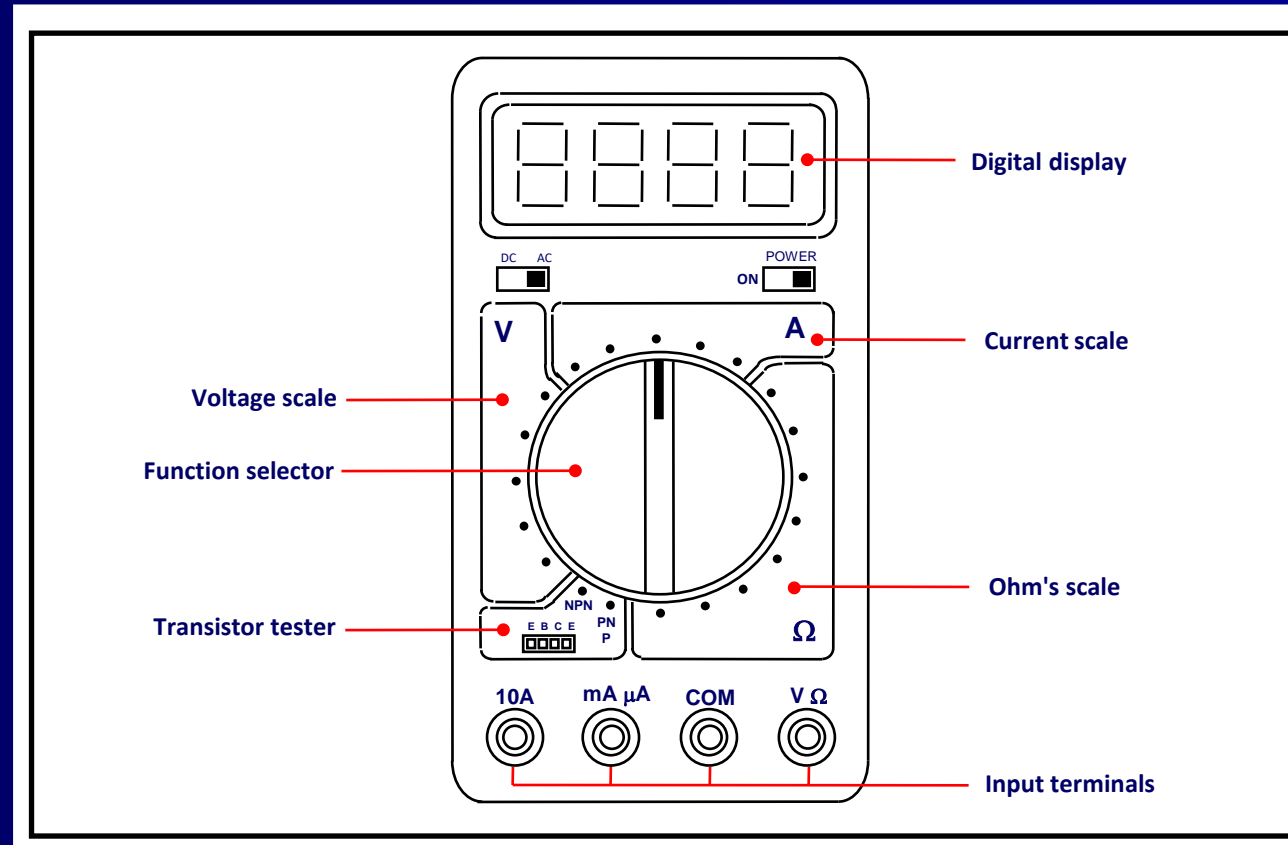
The Digital Multimeter

The technological developments of the basic circuitry for these instruments, has led to them becoming much more readily available in terms of cost and efficiency.

They are compact and lightweight
(in comparison to the analogue meter)
and their cost is small considering their capabilities.

Construction

Digital:



The Digital Multimeter

There are many types of digital multimeter available and it is important that, before using any instrument, you fully understand its functions and how to correctly operate it. Failure to do so could be the major contributory factor towards an accident.

Dead testing????????????

The main advantages of the digital instrument are:-

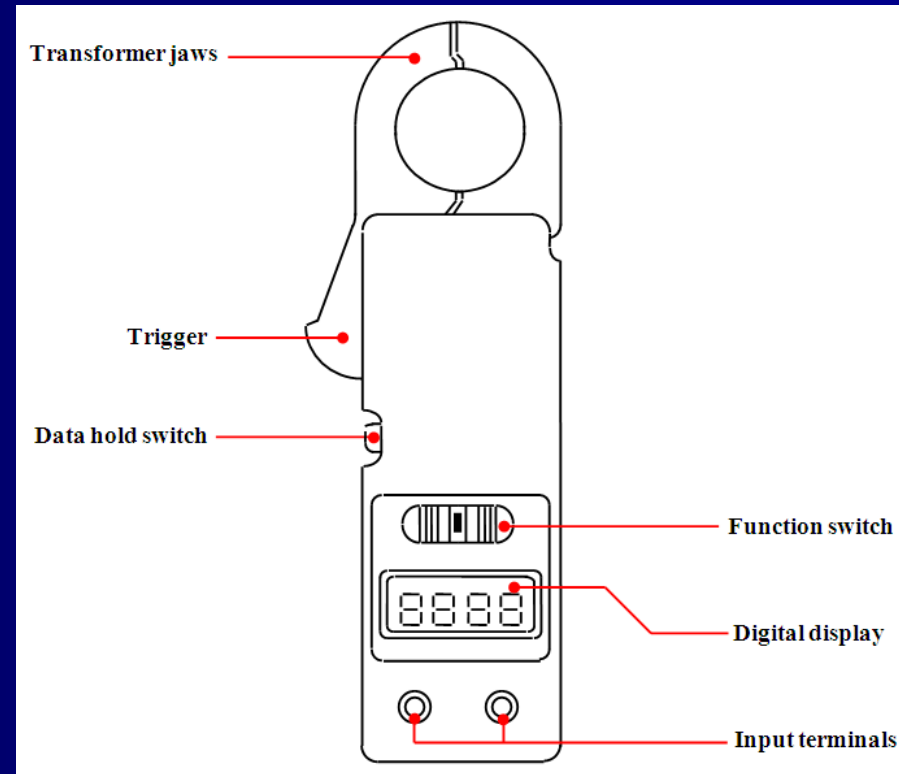
- Easy to read display

- Compact size

- More functions than its analogue counterpart.

The Clip-on Ammeter

There are both analogue and digital versions of this instrument available. Both operate on the same principle; that is one of current induced in the transformer coil, or clamp, by the magnetic flux that surrounds the current-carrying conductor under test.



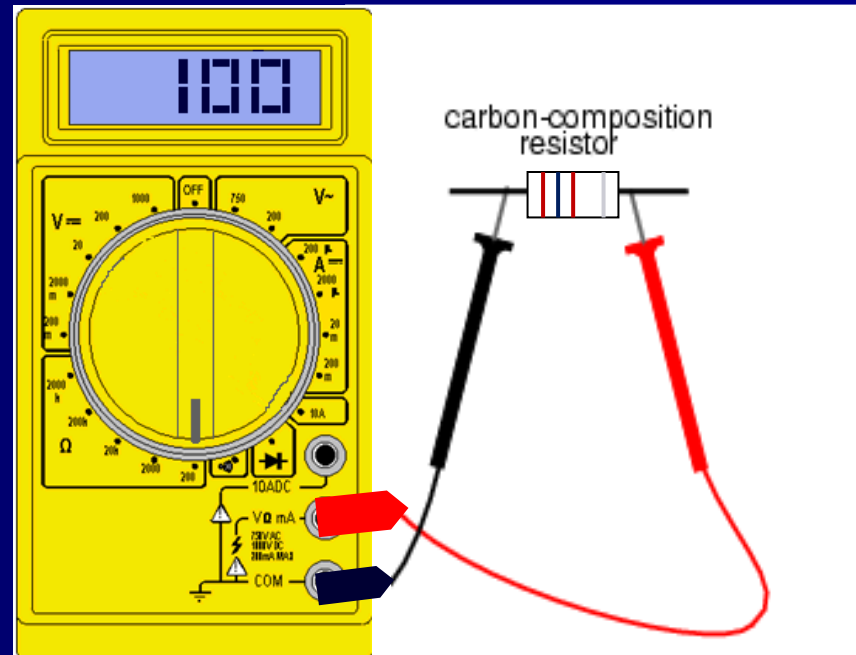
The Clip-on Ammeter

Advantages:

The advantage that this type of meter has over a standard multimeter is that, to measure current, the conductors of the circuit under test, do not need to be isolated or disconnected.

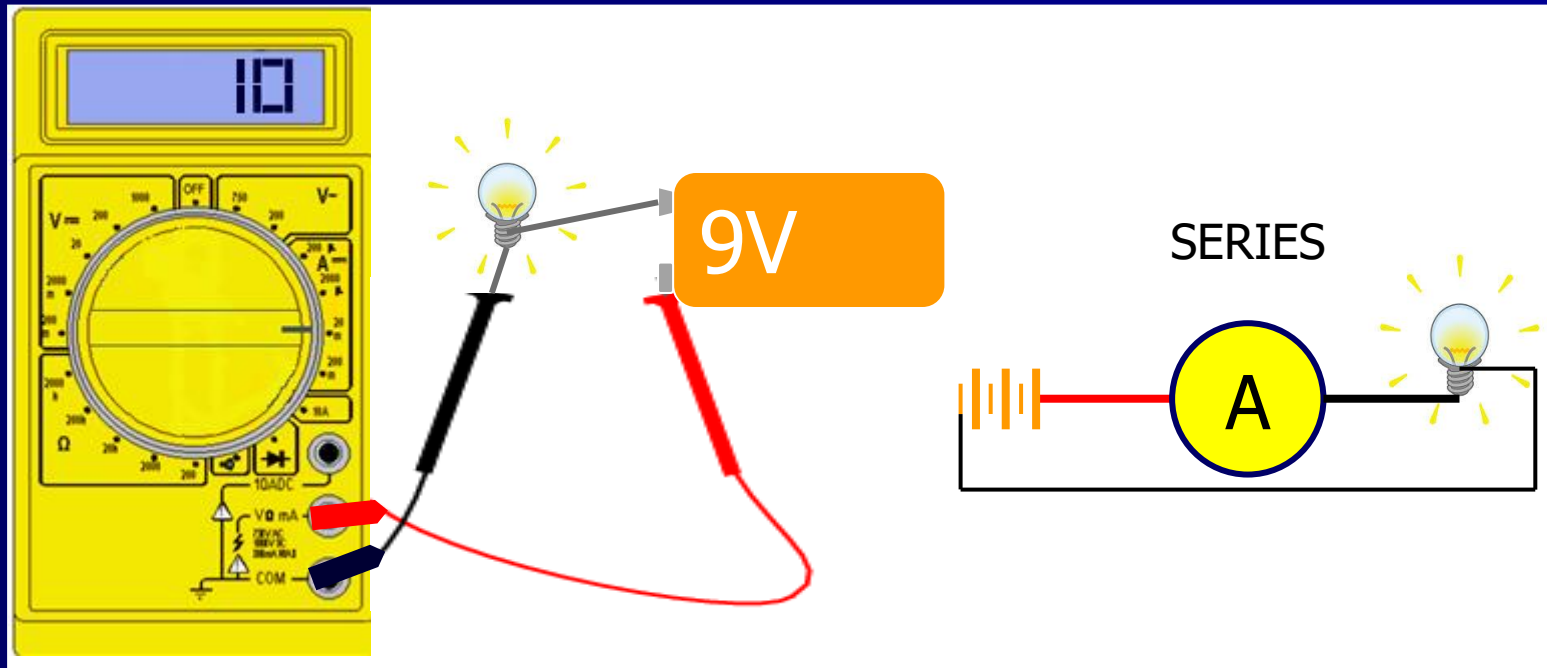
To measure current the transformer jaws are opened via the trigger, placed around the phase conductor of the circuit under test, and then closed by releasing the trigger. The magnetic field surrounding the current carrying conductor induces a current into the transformer jaws which is then shown on the display via the calibrated circuitry inside the instrument.

Connections



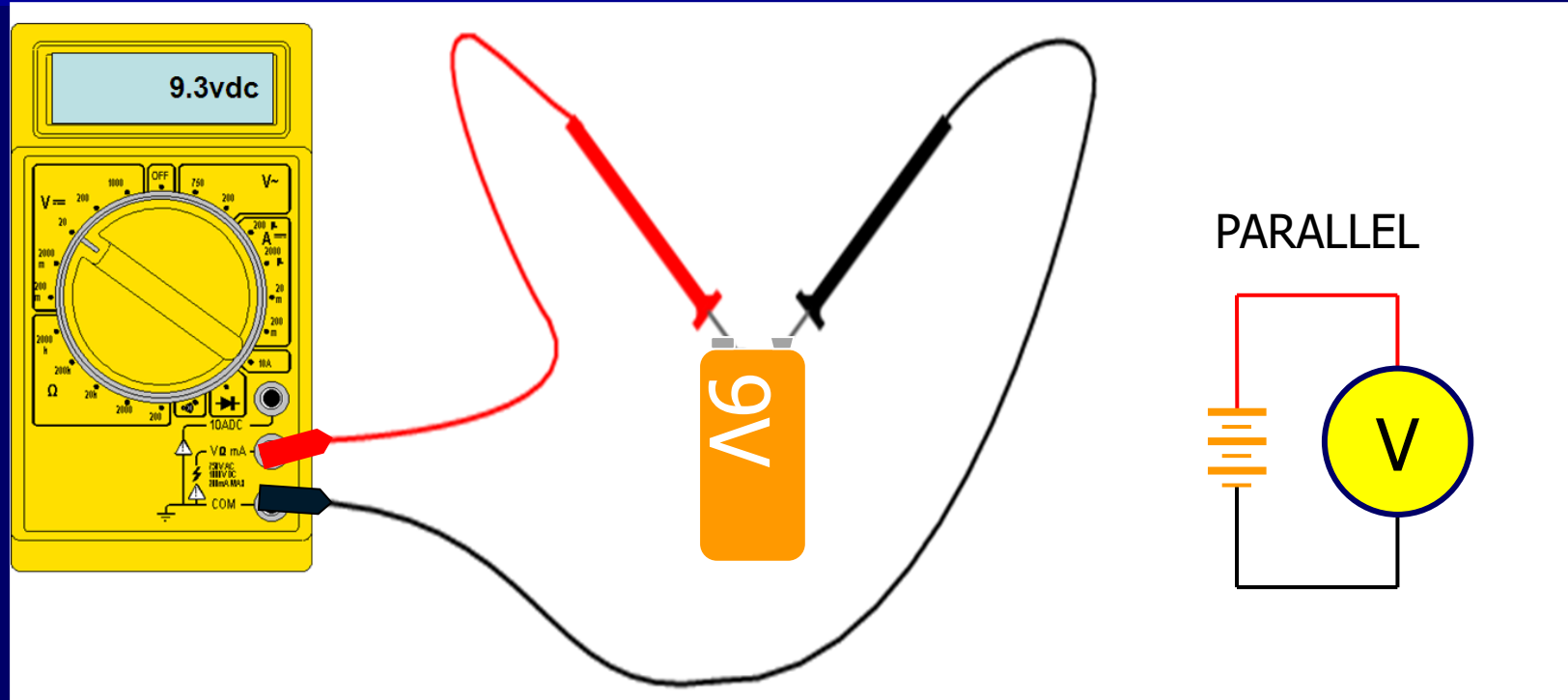
To measure resistance, ensure component or circuit to be measured is isolated and disconnected from the energy source.

Connections



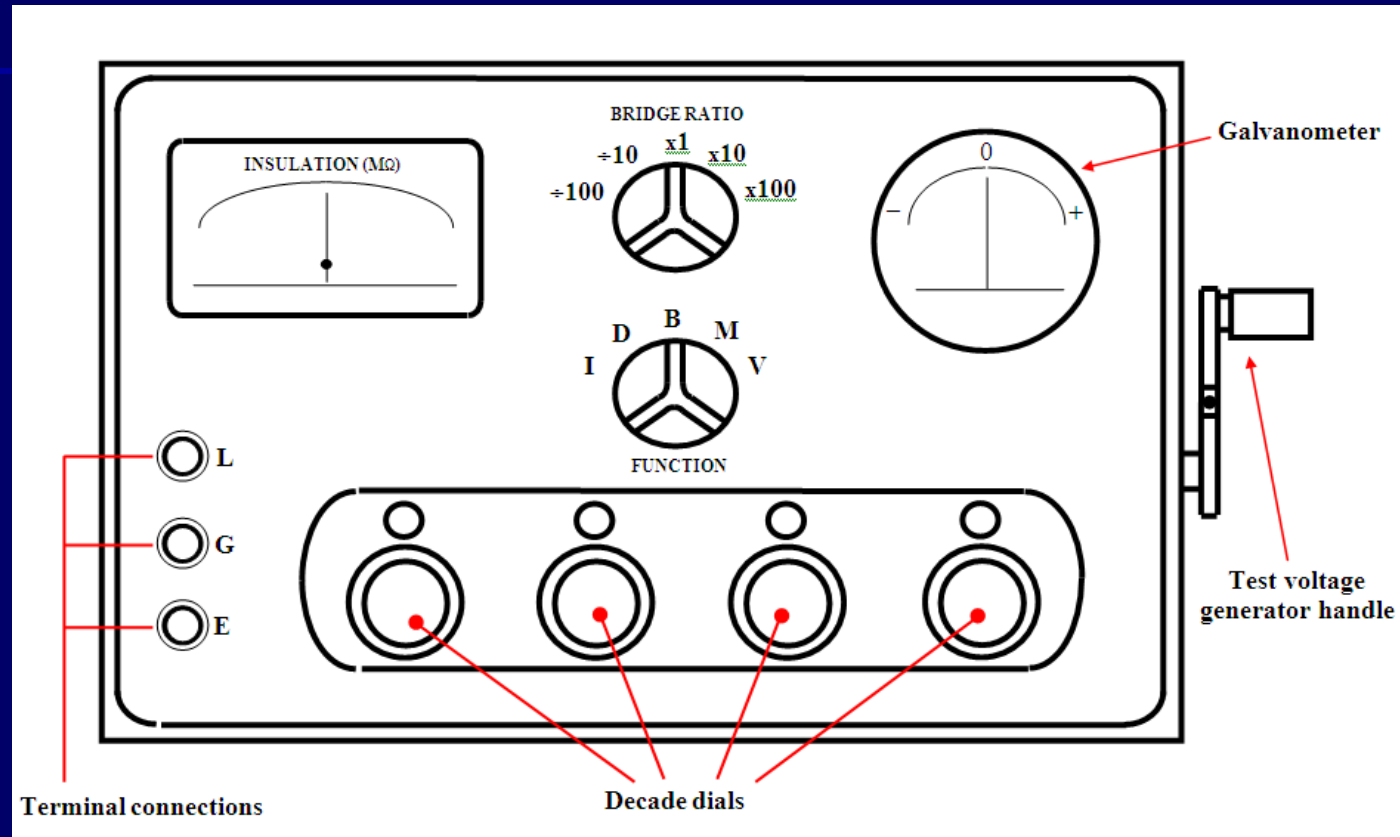
To measure Current, ensure meter is connected in series with the circuit or component to be measured.

Connections



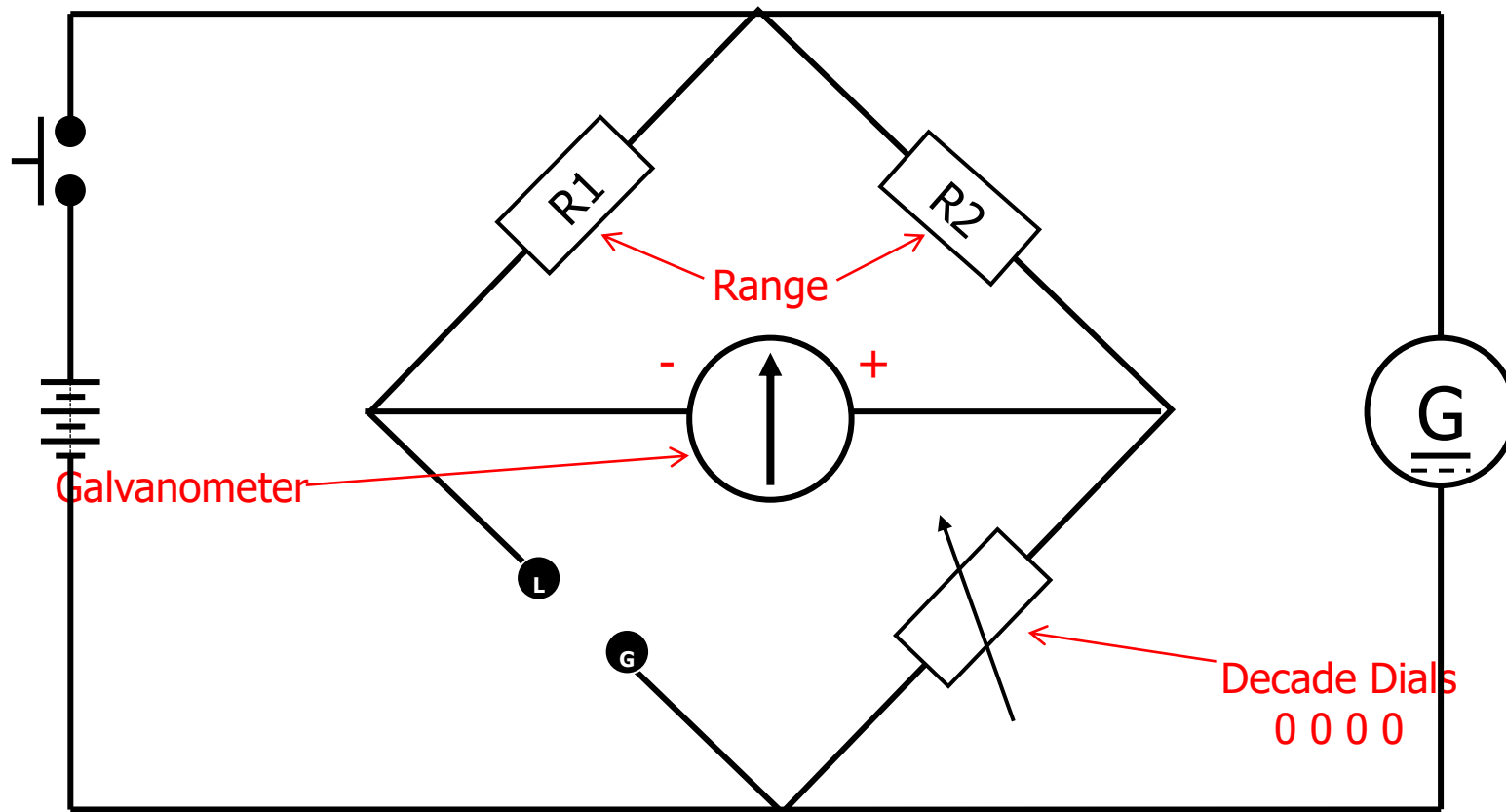
To measure Voltage, ensure meter is connected in parallel with the circuit or component to be measured.

Bridge Megger

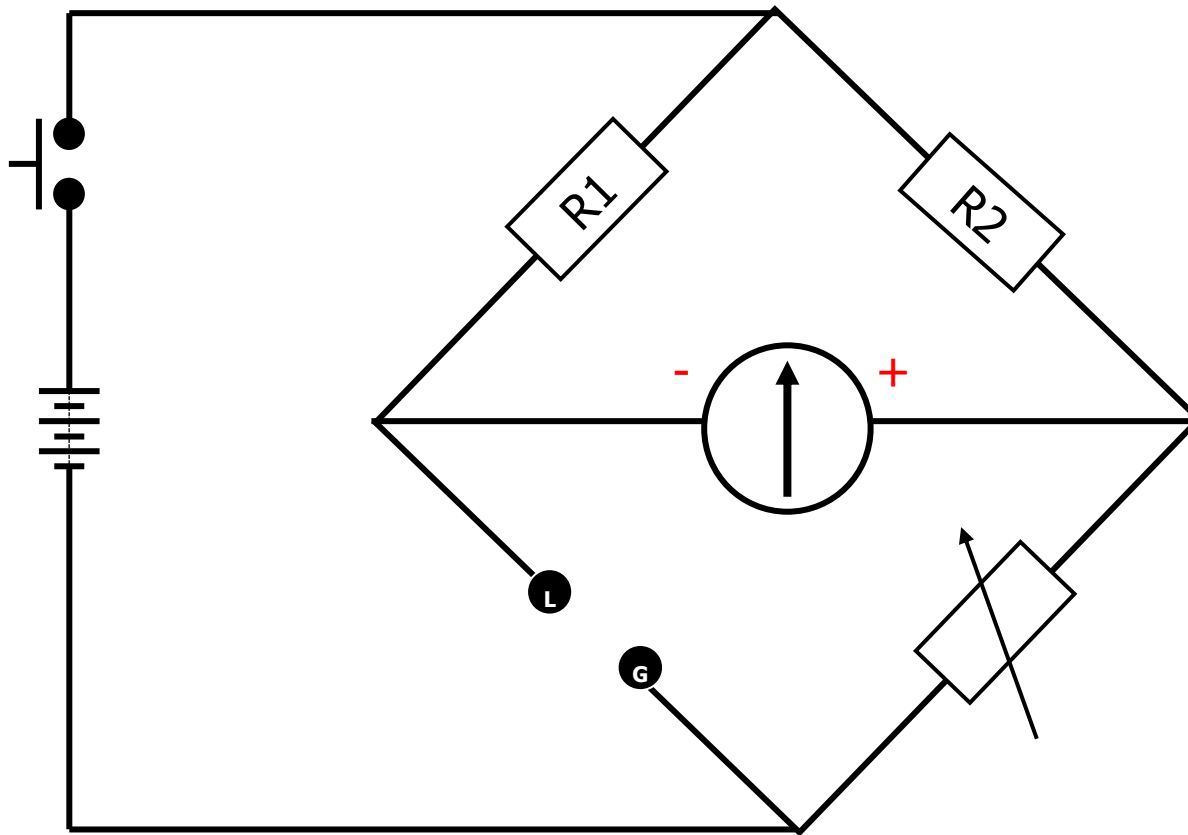


This instrument is used for several electrical tests, namely Insulation, Bridge, Murray and Varley. All tests are for resistance values. The test voltage generated by this instrument is approximately 1,000V dc.

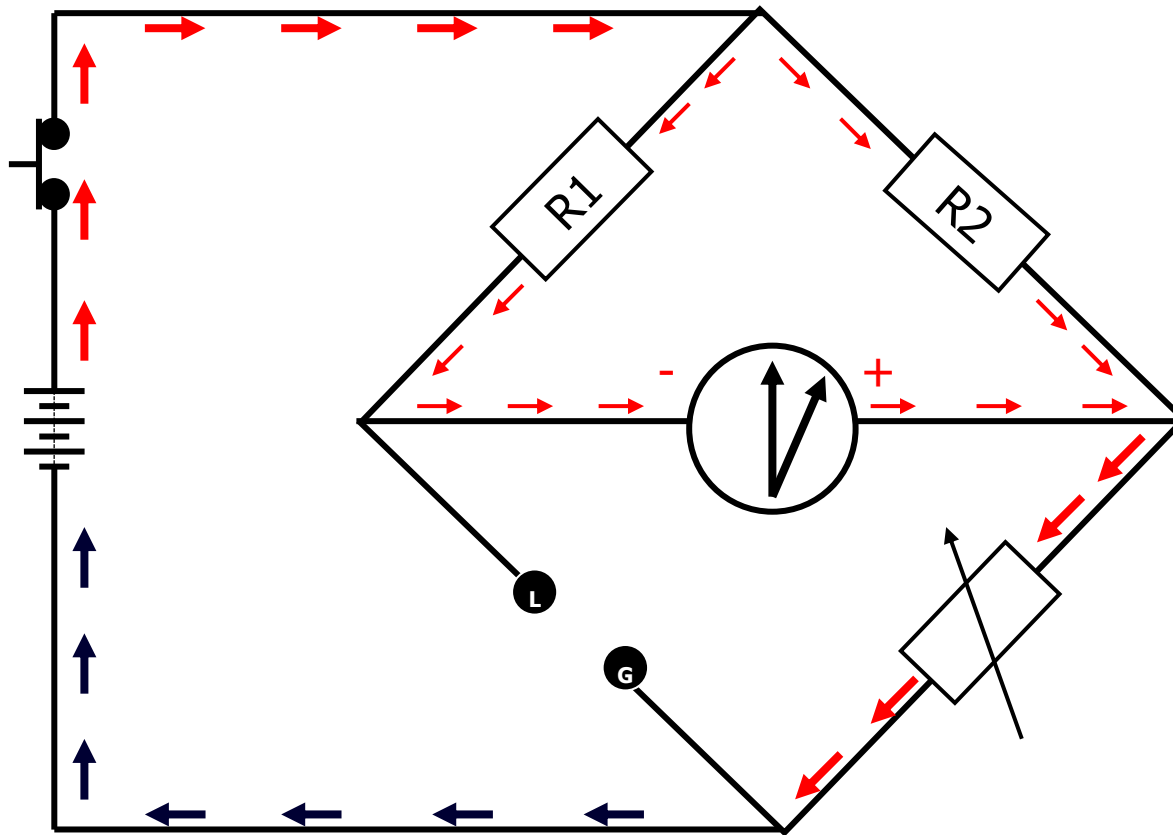
Bridge Theory



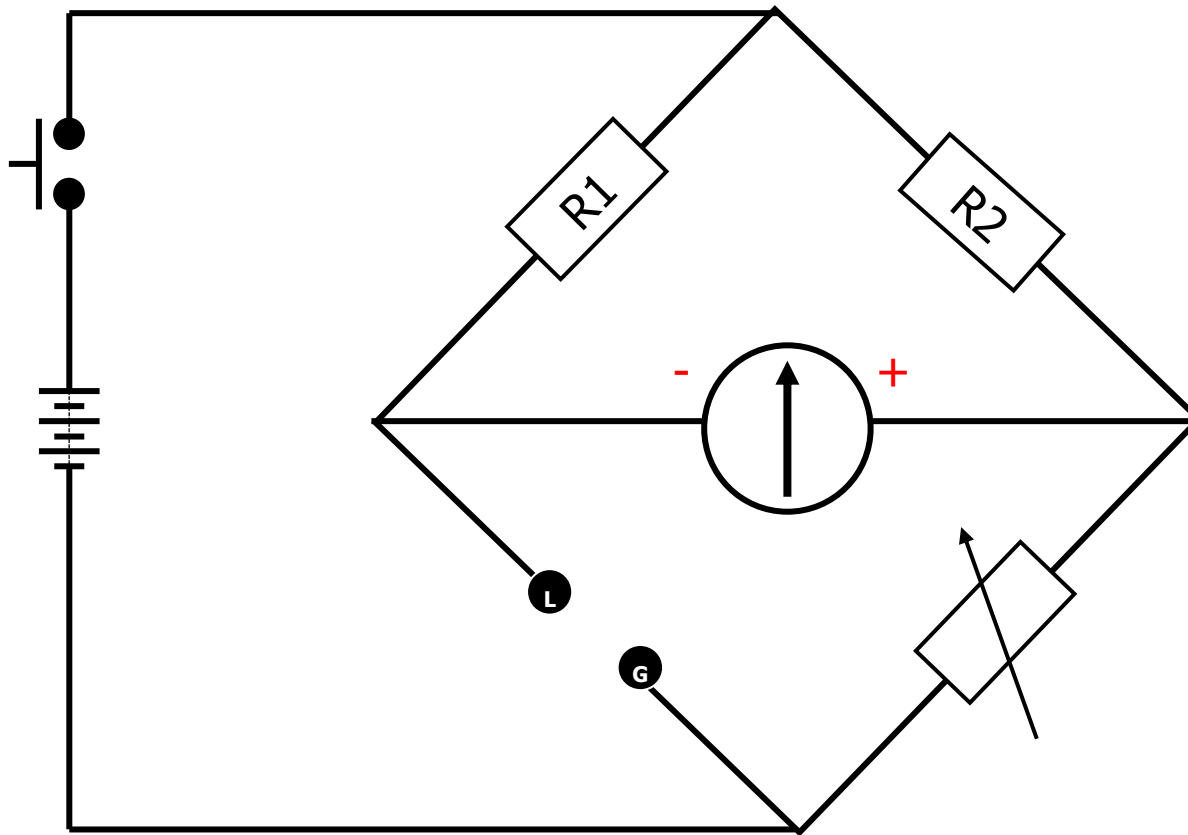
Bridge Theory



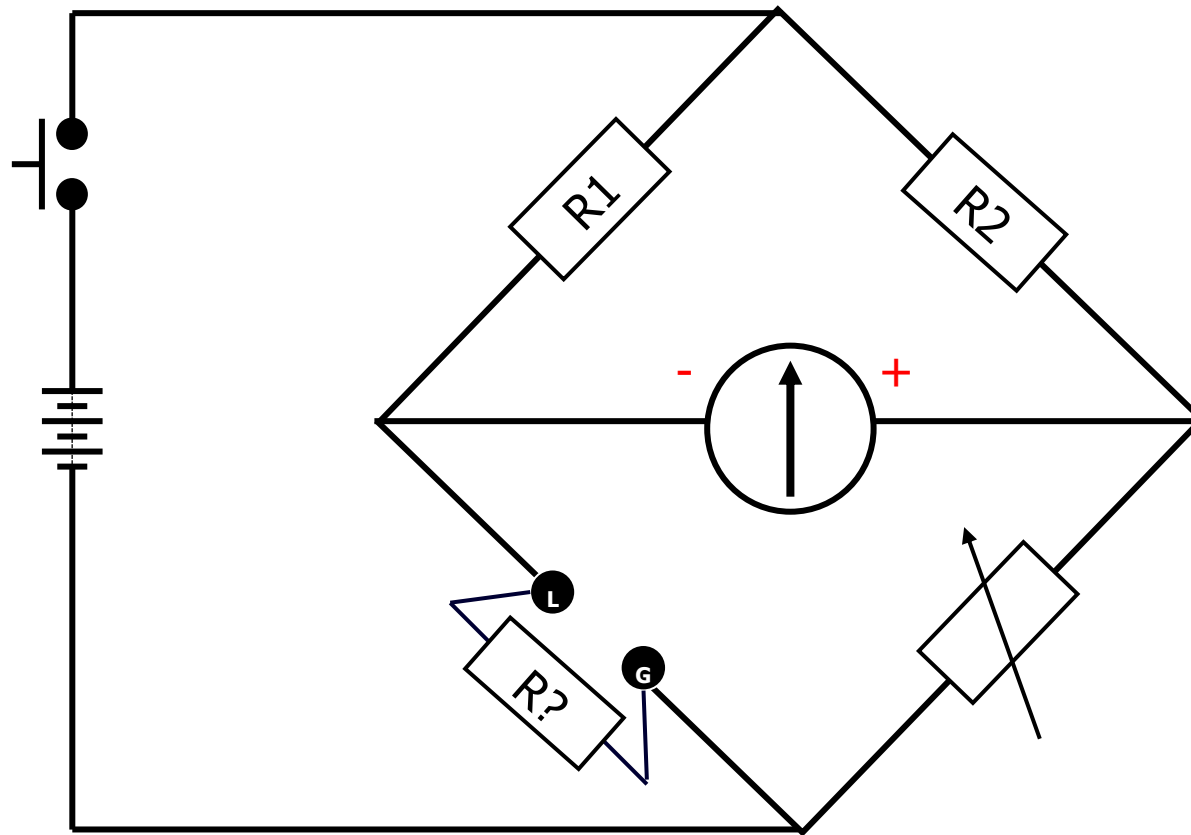
Bridge Theory



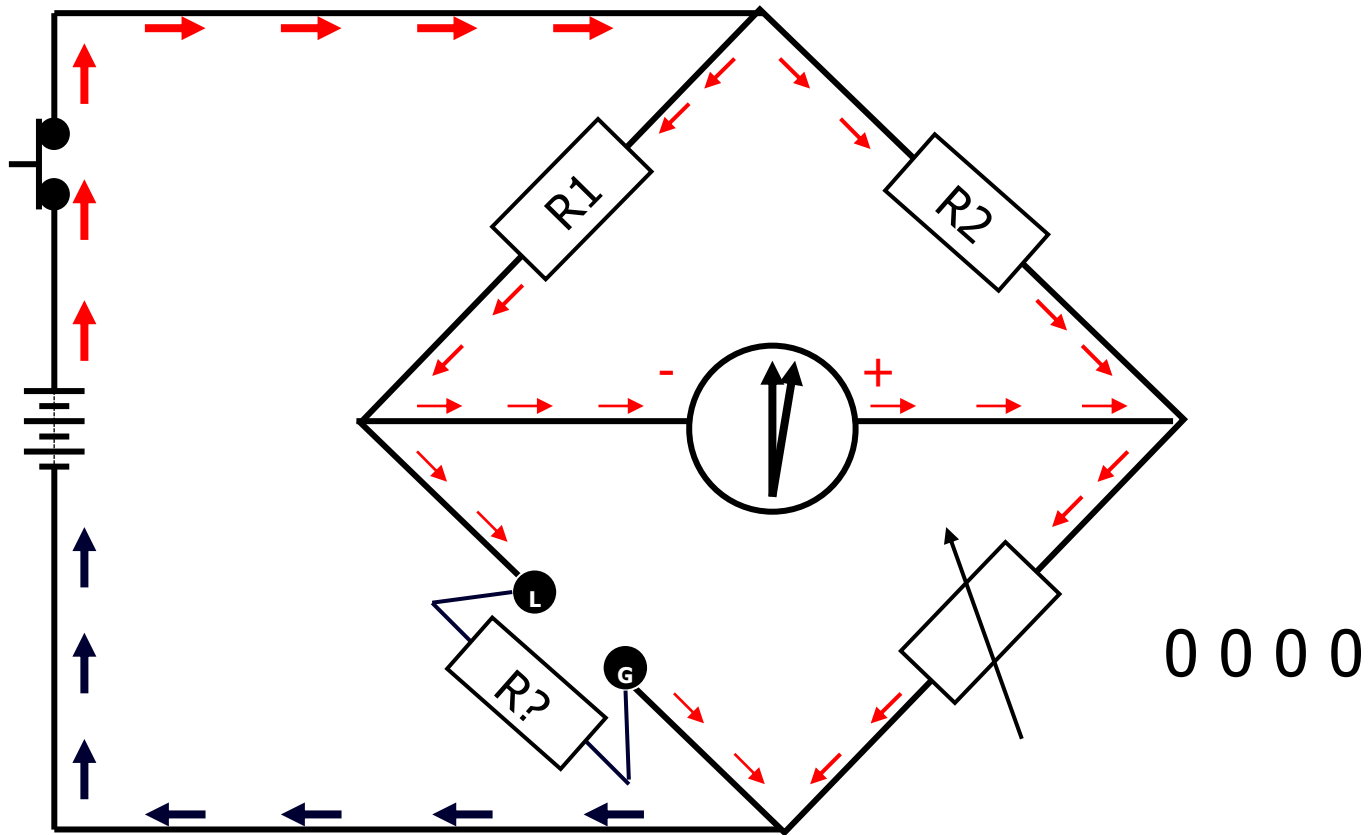
Bridge Theory



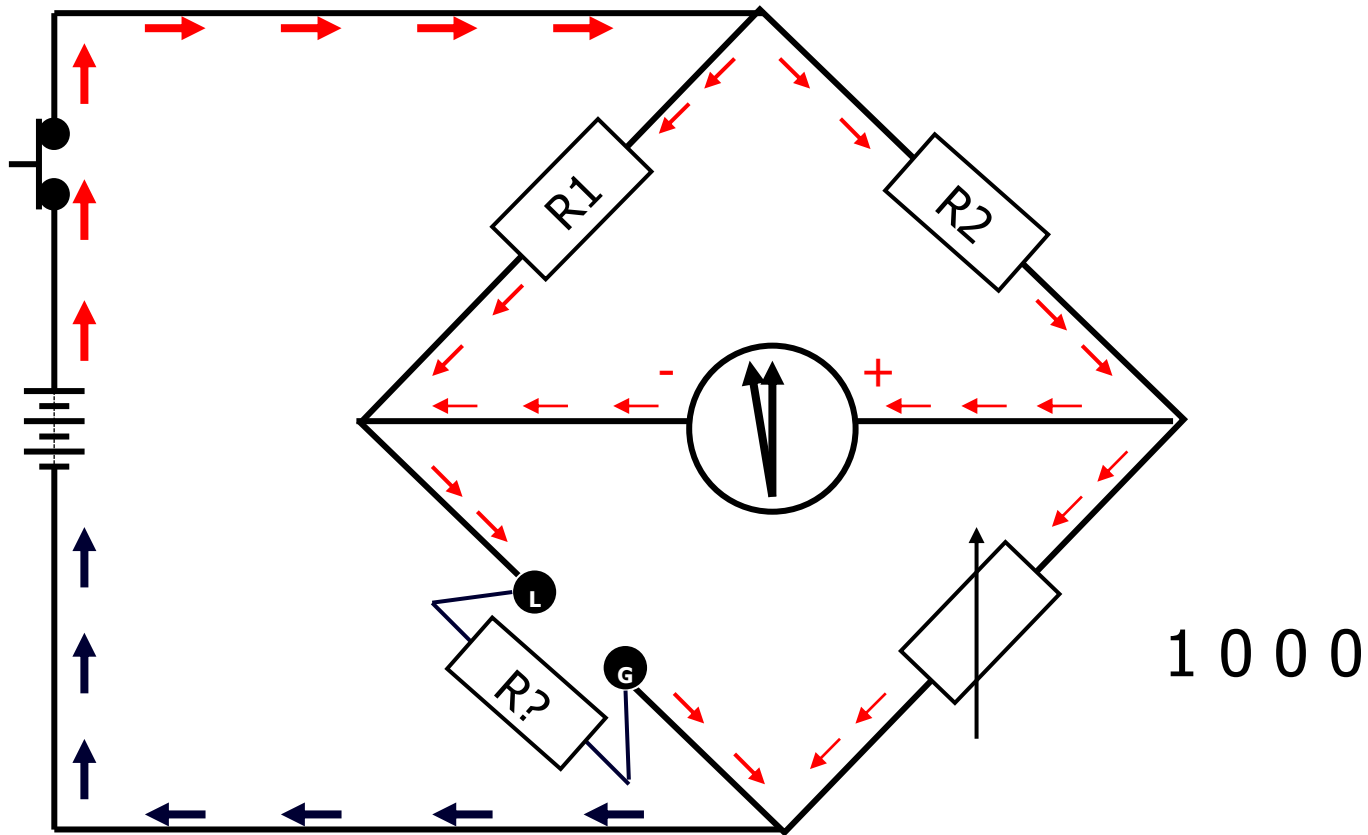
Bridge Theory



Bridge Theory



Bridge Theory



Bridge Theory

