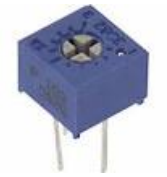
How to Build a Moisture Meter

Now, for this project, we will build a moisture meter. This is a meter that measures the moisture of a content, mostly used for reading the moisture of soil content. Meters like this have application when a gardener or a farmer wants to see how moist soil is a few feet down into the soil, to check to see if his crops need watering.

This project serves to teach you about the construction of a moisture meter, how it operates, and the electrical properties of water which allows a moisture meter to work as it does.

Parts for Moisture Meter

- **100KΩ Potentiometer**



- **NPN 3904 Transistor**

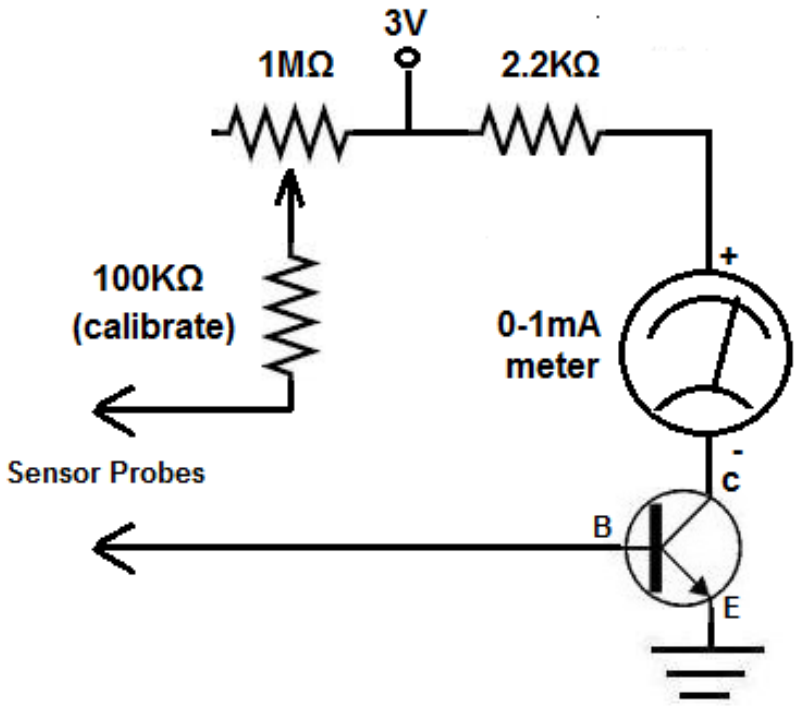
- **1MΩ Potentiometer**

- **2.2KΩ Resistor**

- **Galvanometer**

- **Sensor probes**

Circuit for Moisture Meter



Operation of Circuit

Now it will be explained in detail how this circuit operates.

The circuit operates on the function of the electrical properties that water exhibits. When a medium, such as soil, has a high-moisture content, it conducts electricity better, because water is a conductor. When a medium has a high water content, its resistance lowers, and, thus, it is able to conduct electricity easier. When a medium has a lower water content (compared with a high one), its resistance is much greater; thus, it is not able to conduct electricity as easily. This shows up in the ammeter connected to this circuit. When a soil has high moisture, the meter (if calibrated correctly (explained below)) will swing far right, because the high-moisture soil has will conduct more current. When a soil has low moisture, the meter will not deflect much, because the low-moisture soil does not conduct current as well.

The bipolar transistor is in the circuit to allow for circuit amplification, because the signal, alone, would be weak.

The circuit needs 3V in order to function, because without a power source, there can be no current flowing through the circuit. The 3V is the power source, which can be from a power supply or 2 ‘AA’ batteries in series. The current now, through the circuit, again, depends on the resistance of the soil (which depends on it moisture level).

The sensor probes used for this meter should be clean nail or wire, since impurities could alter the resistance reading.

Note: The calibrator will now be discussed as it is very important aspect of the circuit. The calibrator allows you to set the level that the meter deflects at different readings. When the moisture level is high, you want the ammeter to deflect far right, indicating a high moisture level. To do this, adjust the 1MΩ potentiometer so that it deflects far right when the probes are in high-moisture soil. Then when you put the probes in low-moisture soil, the ammeter will deflect less. This is a correct calibration.

To show you how calibration can go wrong, imagine putting the sensor probes in very high-moisture soil and the meter barely deflects at all. This could occur if the resistance of the potentiometer is set too high. This will make the meter a useless device. Calibration is key to get good readings.