



MULTIMETER SIMPLIFIED

A Complete DIY Step by Step Guide On How To Use Multimeter To Measure

CHANDAN SINGH

Chandan singh

HOW TO USE A MULTIMETER SIMPLIFIED

A Complete DIY Step by Step Guide On How To Use a
Multimeter To Measure

Voltage ,Current ,Resistance ,Continuity And In
Troubleshooting Circuits



Shawn Corbett

How To Use A Multimeter

Simplified

A Complete DIY Step by Step Guide On How To Use a Multimeter To Measure Voltage ,Current ,Resistance ,Continuity And In Troubleshooting Circuits

Chandan singh

TABLE OF CONTENTS

[INTRODUCTION](#)

[CHAPTER ONE](#)

[WHAT'S A MULTIMETER](#)

[CHAPTER 2](#)

[HOW TO UTILISE IT IN MEASURING VOLTAGE](#)

[CHAPTER 3](#)

[HOW TO UTILISE IT IN MEASURING CURRENT](#)

[CHAPTER 4](#)

[HOW TO UTILISE IT IN TESTING CONTINUITY](#)

[THE END](#)

INTRODUCTION



Checking your vehicle battery life, troubleshooting circuits, and finding that

annoying short are for the most part too valuable capacities that should be possible with only one magnificent device: the multimeter!

This guide will show you how to use multimeter to measure voltage ,resistance ,current and also check for continuity while trying to troubleshoot a circuit.

CHAPTER ONE

WHAT'S A MULTIMETER

As a matter of first importance, what the hell is a multimeter?? Amazing arrangement question! It's a handheld gadget with pack of various electrical meters - henceforth, multi-meter!

Estimating voltage, resistance, current, and continuity are the most widely recognized application of a multimeter. Peruse on (as well as look at the recordings) to realize what this implies, how to do it without anyone's help, and how to pick your own one of a kind multimeter.

A multimeter is has three sections:

- * Ports

- * Selection

- Knob * Display

The Display for the most part has four digits and the capacity to show a negative sign. A couple of multimeters have lit up shows for better review in low light circumstances.



The Selection Knob permits the client to

set the multimeter to peruse various things, for example, milliamps (mA) of current, voltage (V) and resistance (Ω).

Two Probes are connected to two of the ports on the facade of the unit. COM represents normal and is quite often associated with Ground or '-' of a circuit. The COM probe is traditionally dark however there is no difference between the red probe and dark probe other than shading. 10A is the exceptional port utilized when estimating huge flows (more prominent than 200mA).

mAV Ω is the port that the red test is expectedly connected to. This port permits the estimation of current (up to 200mA), voltage (V), and obstruction

(Ω). The tests have a banana type connector on the end that connects to the multimeter. Any test with a banana attachment will work with this meter.

This takes into consideration various sorts of tests to be utilized.

WHAT MAKES A GOOD MULTIMETERS

There are a couple of key contrasts between multimeters, the fundamental one being simple versus computerized:

Simple multimeters show ongoing changes in voltage and current, yet can be hard to peruse and log information.

Advanced Multimeters are simpler to peruse, however may set aside some effort to settle.

There are additionally auto-extending multimeters, that naturally recognize the estimation range, and manual going multimeters where you need to pick a range yourself (or start with the most noteworthy setting and work down).

Other than those two fundamental contrasts, you'll need a multimeter that has separate ports for current and voltage estimations (this is a wellbeing issue, both for the meter and for yourself).

All multimeters have voltage and current meters (else they'd simply be called voltmeters and ammeters!), and most additionally measure obstruction. There are an assortment of other "extra" highlights relying upon producer and cost (for example coherence, capacitance, recurrence, and so on.).

there are a huge amount of various kinds of probe leads, including croc cuts, IC snares, and test probes.

In conclusion, consistently check the multimeter most extreme voltage and current appraisals to be certain that it can deal with what you need to utilize it for.

CHAPTER 2

HOW TO UTILISE IT IN MEASURING VOLTAGE

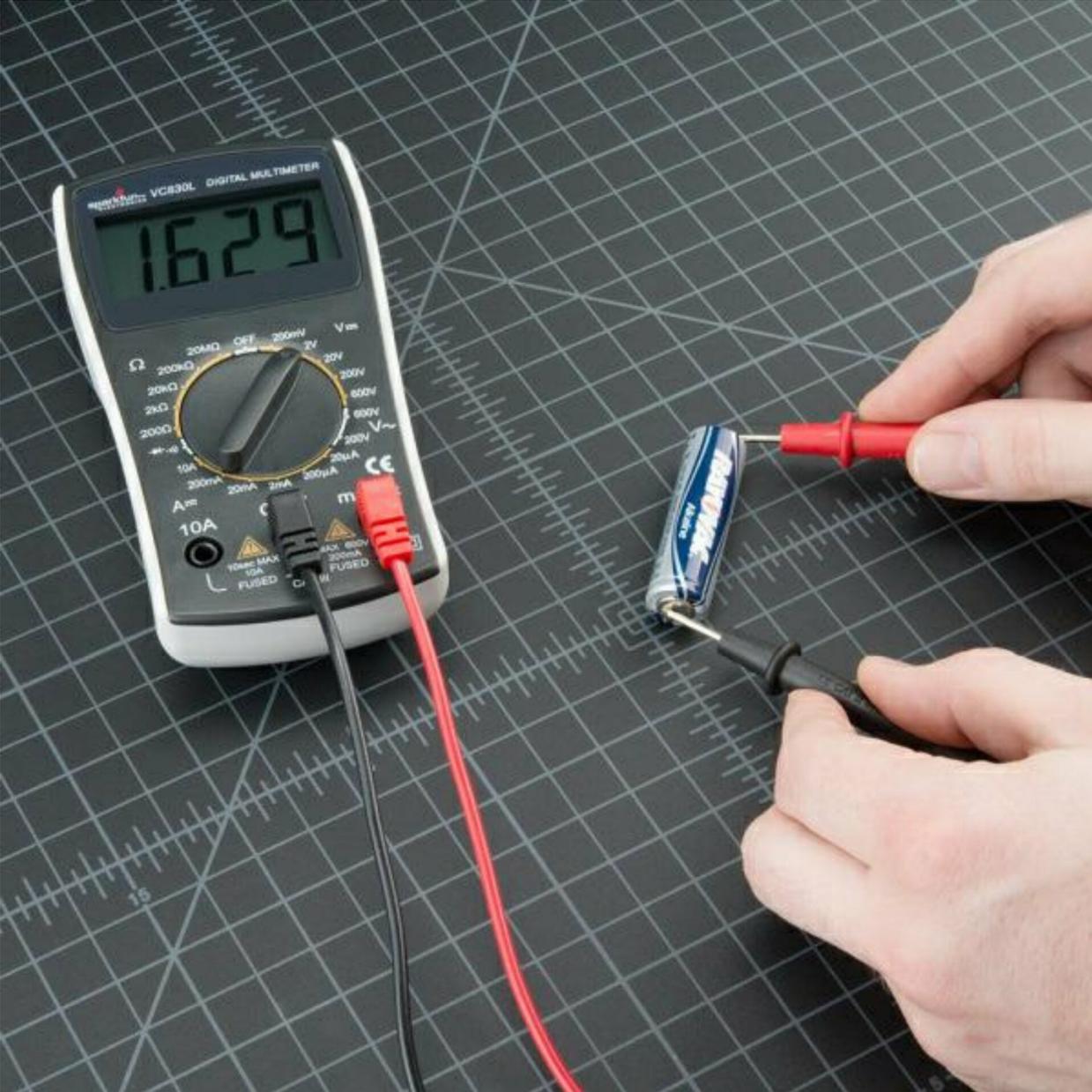
A voltage estimation discloses to us the electrical potential, or weight, over a specific part.

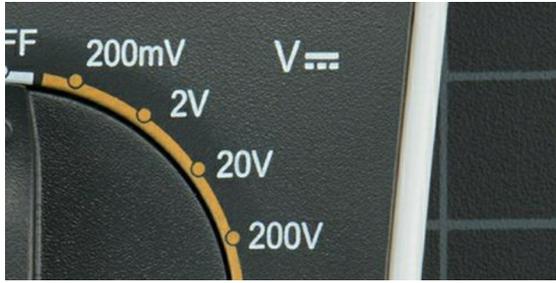
Voltage is essentially the "oomph" in our circuit, so we need to abstain from drawing any force from the circuit when we take a voltage estimation. This implies we have to gauge voltage in corresponding with a specific segment utilizing vast (or outrageously high) resistance.

Utilizing a multimeter to gauge voltage over a segment (or battery):

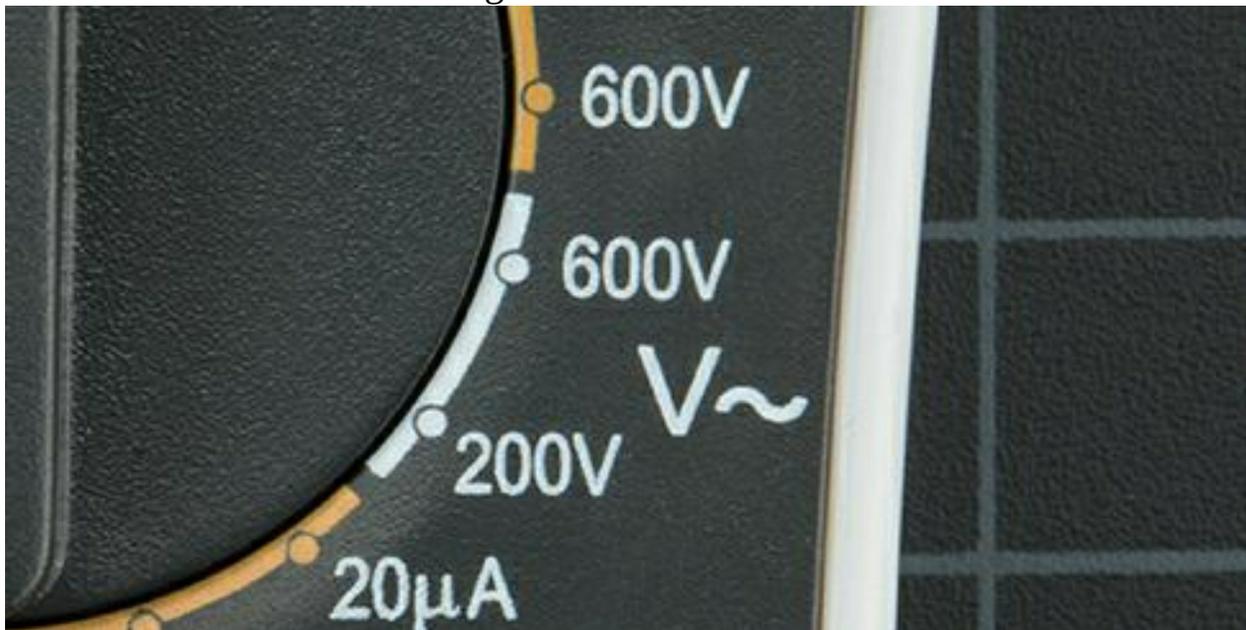
To begin, we should quantify voltage on an AA battery:

Plug the dark probe into COM and the red probe into mAV Ω . Set the multimeter to "2V" in the DC (direct current) run. Practically all convenient gadgets utilize direct current), not the alternating current. Interface the dark probe to the battery's ground or '-' and the red probe to control or '+'. Crush the probe with a little weight against the positive and negative terminals of the AA battery. On the off chance that you have a new battery, you should see around 1.5V on the display (this battery is shiny new, so its voltage is somewhat higher than 1.5V).





In case you're estimating DC voltage, (for example, a battery or a sensor snared to an Arduino) you need to set the handle where the V has a straight line.



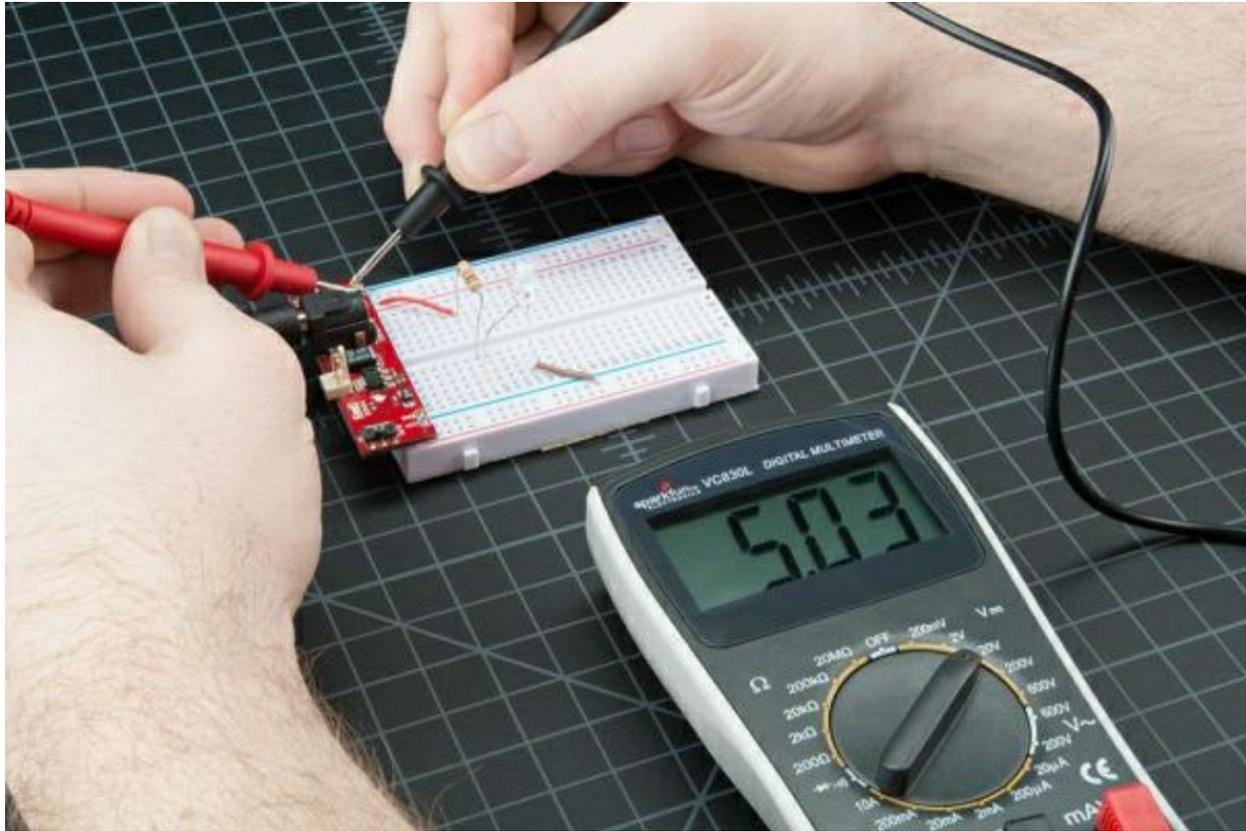
Air conditioning voltage (like what comes out of the divider) can be hazardous, so we seldom need to utilize the AC voltage setting (the V with a wavy line close to it). In case you're playing with AC, we suggest you get a non-contact analyzer as opposed to utilize an advanced multimeter.



What Happens When I Switch The Probe

What occurs in the event that you switch the red and dark probe? The result on the display of the

multimeter is essentially negative. Nothing awful occurs! The multimeter measures voltage comparable to the regular test. What amount of voltage is there on the '+' of the battery contrasted with normal or the negative pin? 1.5V. On the off chance that we switch the tests, we characterize '+' as the normal or zero point. What amount of voltage is there on the '-' of the battery contrasted with our new zero? -1.5V!



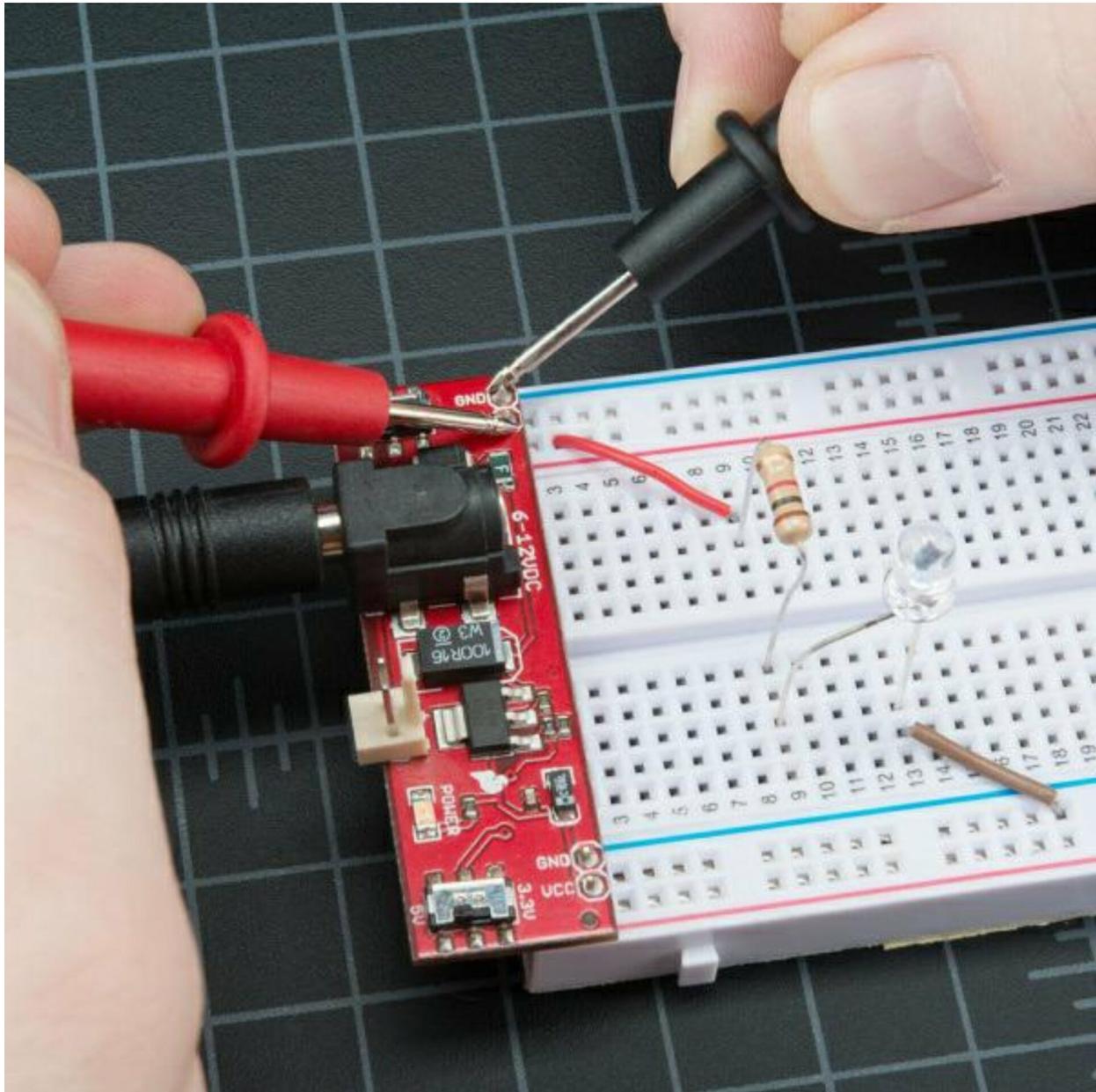
Circuit Scenario

Presently we should develop a straightforward circuit to exhibit how to quantify voltage in a genuine situation. The circuit is essentially a $1k\omega$ and a Blue shiny LED controlled with a Breadboard Power Supply Stick. To start, we should ensure the circuit you are taking a shot at is controlled up accurately. In the event that your task(or project) ought to be at 5V however is under 4.5V or more than that let say 5.5V, this would rapidly give you a sign that something isn't right and you may need to check the wiring of your circuit or the power connection.

In order to measure voltage coming off the power supply stick,the first time you have to do is to Set the handle to "20V" in the DC go (the DC Voltage extend has a V with a straight line close to it). Multimeters are by and large not autoranging. You need to set the multimeter to a range that it can gauge. For instance, 2V measures voltages up to 2 volts, and 20V estimates voltages up to 20 volts. So

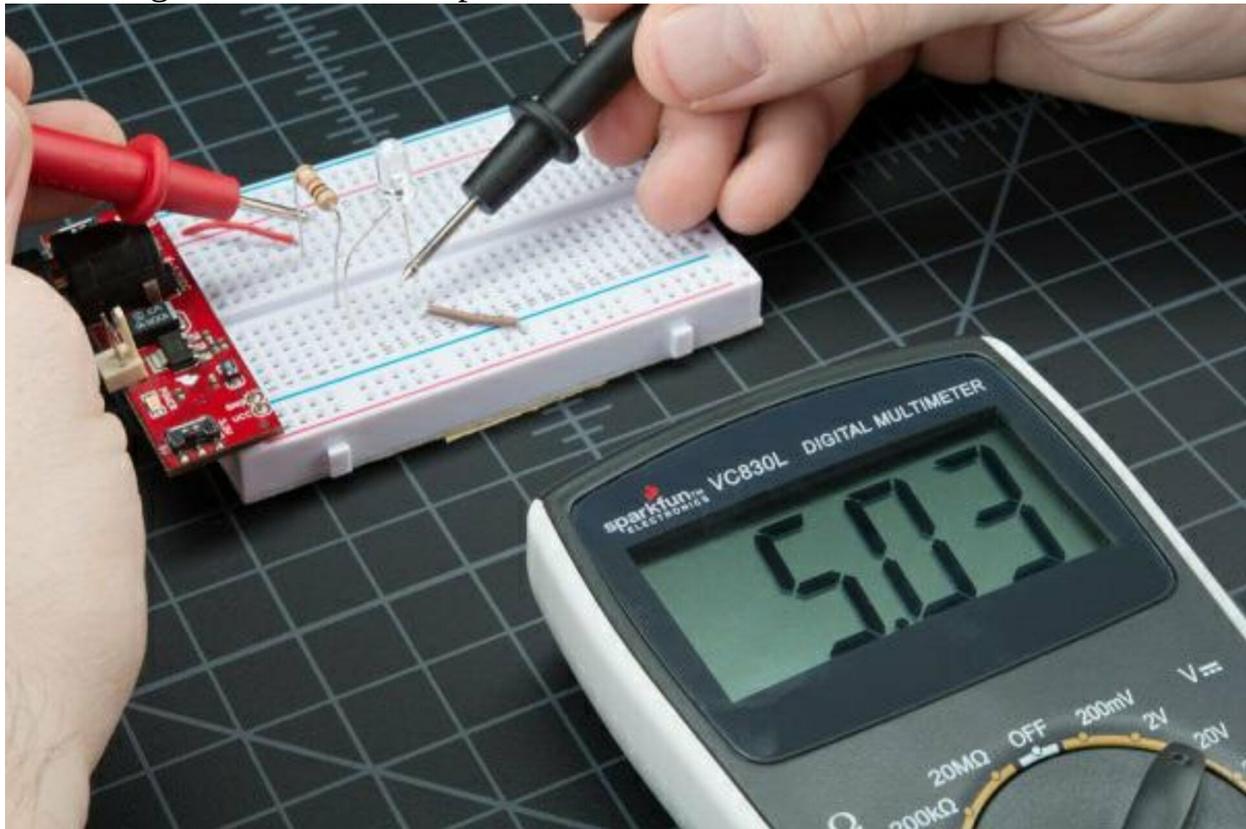
in the event that you've estimating a 12V battery, utilize the

20V setting. 5V framework? Utilize the 20V setting. In the event that you set it inaccurately, you will likely observe the meter screen change and afterward read '1'.



With some power (envison sticking a fork into a bit of cooked meat), push the probe onto two uncovered bits of metal. One probe should contact a GND association while the other probe should contact the 5V or VCC contact .

We can test various pieces of the circuit also. By estimating the voltage over the circuit we can perceive how much voltage every part requires. We should quantify the entire circuit first. Estimating from where the voltage is going in to the resistor and afterward where ground is on the LED, we should see the full voltage of the circuit, expected to be around 5V.



We would then be able to perceive how much voltage the LED is utilizing. This is what is alluded to as the voltage drop over the LED. In the event that that doesn't bode well currently, fear not. It will as you investigate the universe of hardware more. The significant thing to remove is that various pieces of a circuit can be estimated to break down the circuit all in all.

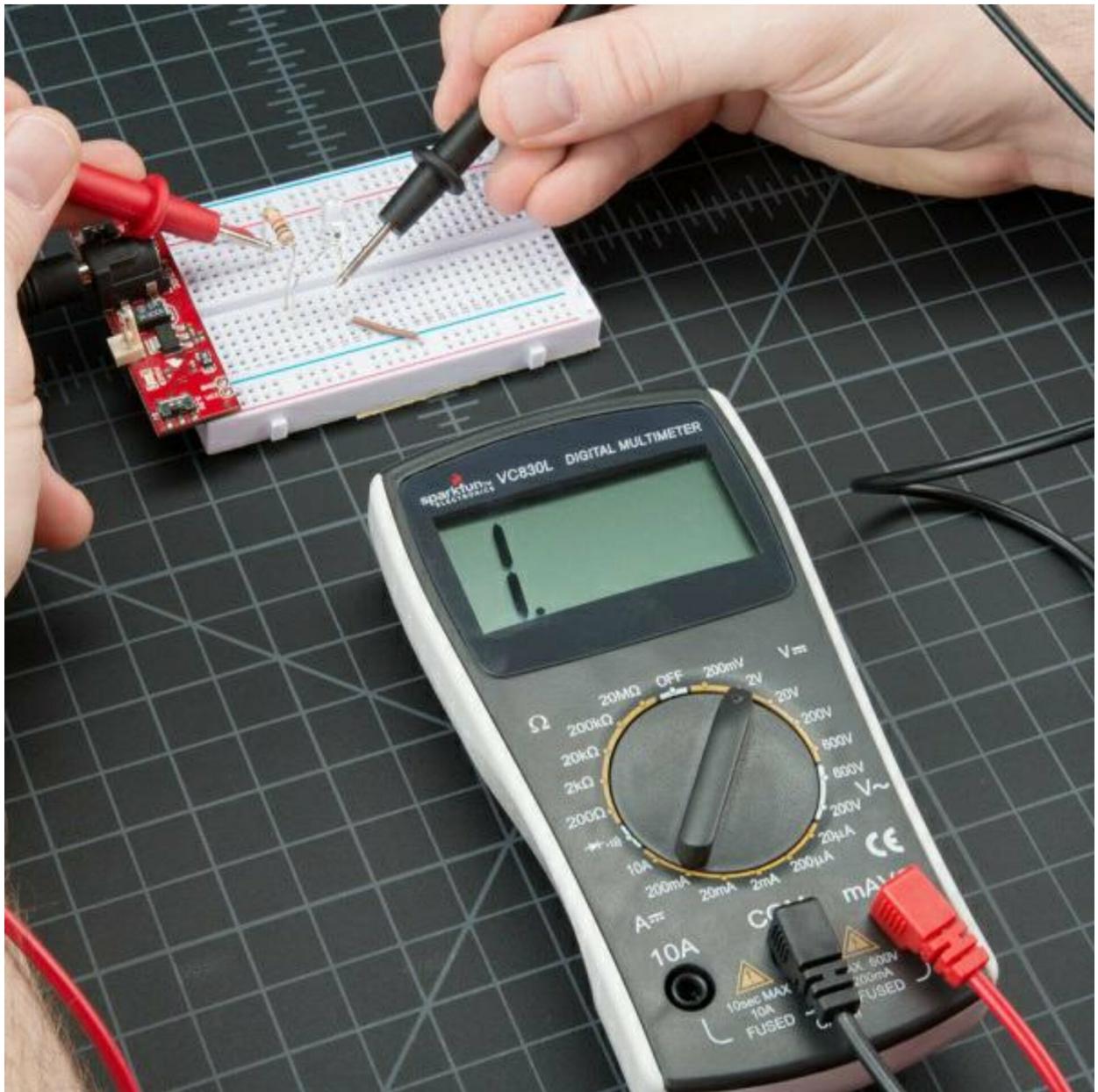


Considering the circuit in the picture below :

This LED is utilizing 2.66V of the accessible 5V gracefully to light up. This is lower than the forward voltage expressed in the datasheet because of the circuit just having modest quantity of current running however it, yet more on that in a piece.

What occurs in the event that you select a voltage setting that is

unreasonably low for the voltage you're attempting to gauge?



Not much. The meter will essentially show a 1. This is the meter attempting to reveal to you that it is over-burden or out-of-extend. Whatever you're attempting to peruse is a lot for that specific setting. Take a stab at changing

the multimeter handle to a the following most elevated setting.



CHAPTER 3

HOW TO UTILISE IT IN MEASURING CURRENT

Taking a current estimation discloses to us the measure of power moving through a given segment or part of a circuit.

To quantify current, we need to gauge the entirety of the electrons streaming in our circuit. This implies we measure current in arrangement with a part utilizing zero (or unimportant) obstruction.

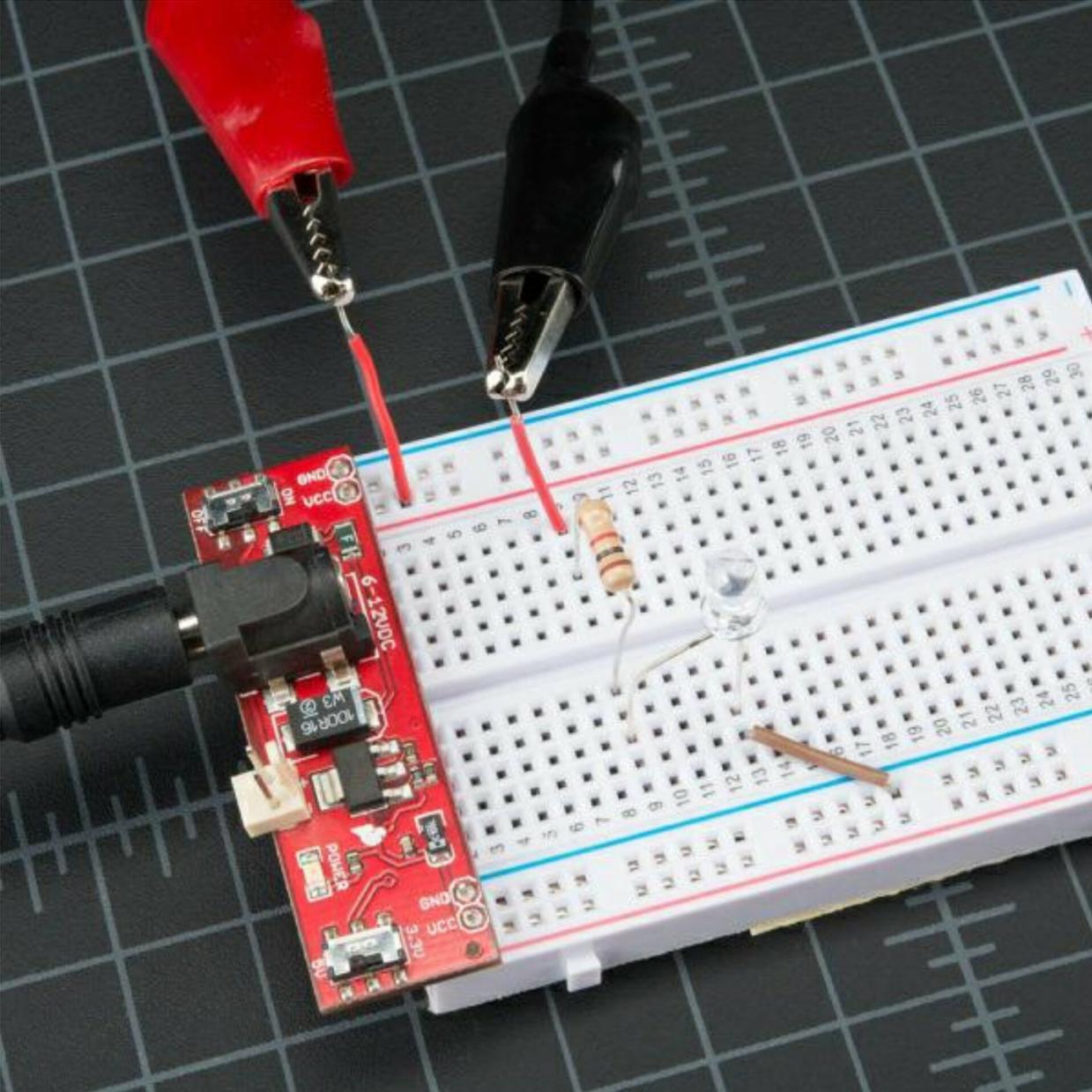
Utilizing a multimeter to quantify current through a segment:

Perusing current is one of the trickiest and most canny readings in the realm of installed hardware. It's dubious on the grounds that you need to quantify

current in arrangement. Where voltage is measure by jabbing at VCC and GND (in equal), to quantify current you need to truly interfere with the progression of current and put the meter in-line. To show this, we'll utilize a similar circuit we utilized in the estimating voltage area.

The main thing we'll require is an additional bit of wire. As referenced, we'll have to truly intrude on the circuit to gauge the current. Said another way, pull out the VCC wire setting off to the resistor, include a wire where that wire was associated, and afterward test from the force nail to the force gracefully to the resistor. This successfully "breaks" capacity to the circuit. We at that point embed the multimeter in-line with the goal that it can gauge the present as it "streams" through to the multimeter into the bread load up.

For these photos, we utilized alligator clips. When estimating current, it's frequently acceptable to watch what your framework does after some time, for a couple of moments or minutes. While you should remain there and hold the tests to the framework, now and again it's simpler to let loose your hands. These gator cut tests can prove to be useful. Note that practically all multimeters have the equivalent estimated jacks (they're designated "banana plugs") so in case you're when there's no other option, you can utilize your companion's probes.

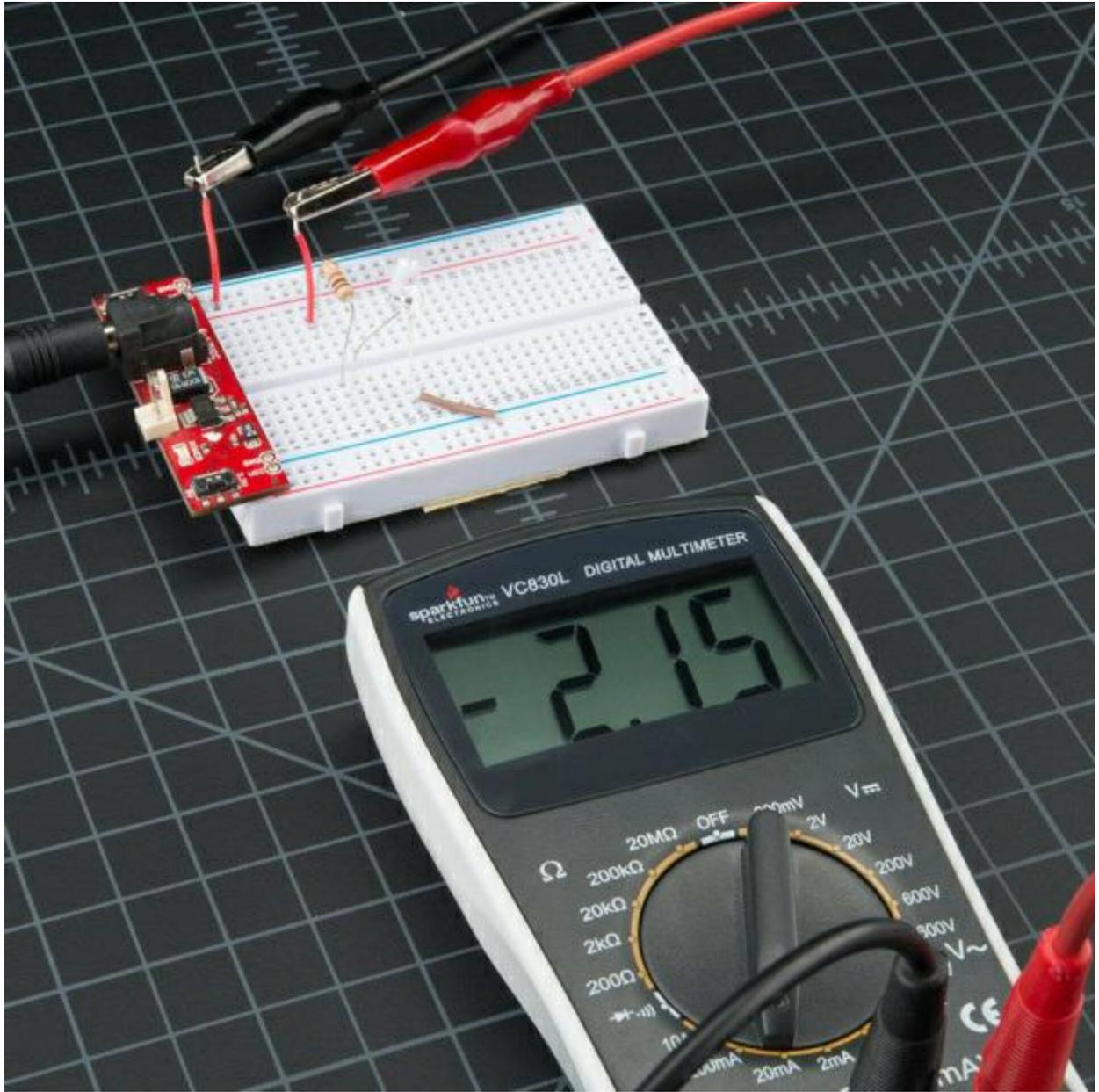


With the multimeter associated, we would now be able to set the dial to the correct setting and measure some current. Estimating current works equivalent to voltage and opposition - you need to get the right range. Set the multimeter to 200mA, and work from that point. The present utilization for some, breadboard ventures is for the most part under 200mA. Ensure the red test is connected to the 200mA melded port. On our most loved multimeter, the 200mA opening is a similar port/gap as voltage and obstruction perusing (the port is marked mAV Ω). This implies you can keep the red test in a similar port to quantify current, voltage, or obstruction. In any case, in the event that you speculate that your circuit will utilize near or more than 200mA, change your test to the 10A side, as a sanity check. Over-burdening the current can bring about a blown wire as opposed to only an over-burden show. More on that in a piece.



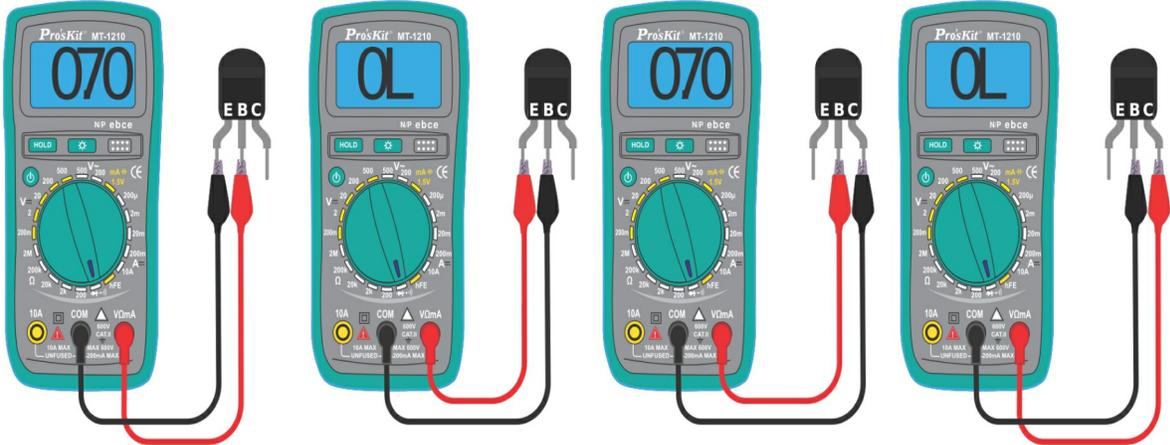
Understand that the multimeter is going about as a bit of wire - you've currently finished the circuit, and the circuit resolution on. This is significant in light of the fact that over the long haul the LED, microcontroller, sensor, or whatever gadget being estimated may change its capacity utilization, (for example, turning on a LED can bring about a 20mA increment for a second, at that point decline for a second when it kills). On the multimeter show you should see the quick current perusing. All multimeters take readings after some time and afterward give you the normal, so anticipate that the perusing should vacillate. By and large, less expensive meters will average all the more cruelly and react all the more gradually, so think about each perusing while taking other factors into consideration. In your mind, take a normal range, for example, 7 to 8mA under typical 5V conditions (not 7.48mA).

Like different estimations, when estimating current, the shade of the tests doesn't make a difference. What occurs in the event that we switch probes? Nothing awful occurs! It basically motivations the present perusing to get negative:



CHAPTER 4

HOW TO UTILISE IT IN TESTING CONTINUITY



continuity testing is the demonstration of testing the obstruction between two focuses. On the off chance that there is extremely low opposition (not exactly a couple Ω s), the two focuses are associated electrically, and a tone is produced. On the off chance that there is in excess of a couple Ω s of obstruction, than the circuit is open, and no tone is radiated. This test safeguards that associations are made accurately between two focuses. This test likewise causes us recognize if two focuses are associated that ought not be.



Continuity is conceivably the absolute most significant capacity for inserted equipment masters. This component permits us to test for conductivity of materials and to follow where electrical associations have been made or not made.

Set the multimeter to 'Continuity' mode. It might shift among DMMs, however search for a diode image with proliferation waves around it (like sound originating from a speaker).

Presently contact the probes together. The multimeter ought to emanate a tone (Note: Not all multimeters have a coherence setting, yet most should). This shows an extremely modest quantity of current is permitted to stream without opposition (or if nothing else an incredibly little obstruction) between tests.

Caution! As a rule, turn OFF the framework before checking for congruity.

On a breadboard that isn't fueled, utilize the tests to jab at two separate ground pins. You ought to hear a tone demonstrating that they are associated. Jab the tests from the VCC nail to a microcontroller to VCC on your capacity gracefully. It ought to discharge a tone demonstrating that force is allowed to spill out of the VCC pin to the miniaturized scale. In the event that it doesn't transmit a tone, at that point you can start to follow the course that copper follow takes and tell if there are breaks in the line, wire, breadboard, or PCB.

Coherence is an extraordinary method to test if two SMD pins are contacting. On the off chance that your eyes can't see it, the multimeter is typically an incredible second testing asset.

At the point when a framework isn't working, progression is one more thing to help investigate the framework. Here are the means to take:

In the event that the framework is on, cautiously check VCC and GND with

the voltage setting to ensure the voltage is the right level. In the event that the 5V framework is running at 4.2V check your controller cautiously, it could be hot showing the framework is pulling a lot of current.

Force the framework down and check congruity among VCC and GND. In the event that there is congruity (on the off chance that you hear a signal), at that point you have a short some place.

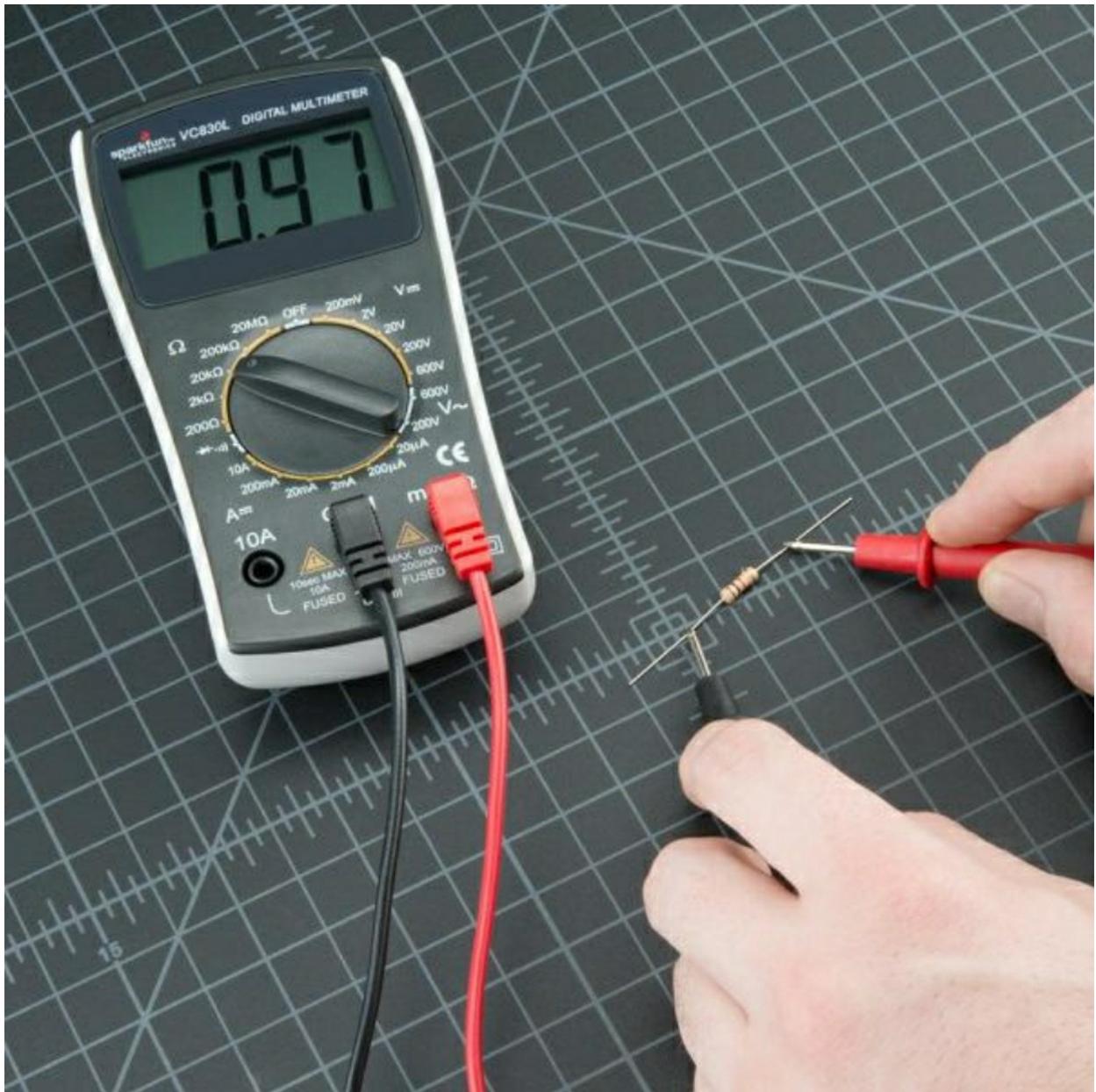
Force the framework down. With congruity, watch that VCC and GND are accurately wired to the pins on the microcontroller and different gadgets. The framework might be fueling up, yet the individual ICs might be wired wrong.

Accepting you can get the microcontroller running, put the multimeter in a safe spot, and proceed onward to sequential troubleshooting or utilize a rationale analyzer to examine the computerized signals.

CHAPTER 5

HOW TO UTILISE IT IN MEASURING RESISTANCE

Ordinary resistors have shading codes on them. In the event that you don't have the foggiest idea what they mean, that is alright! There are a lot of online number crunchers that are anything but difficult to utilize. Be that as it may, on the off chance that you ever wind up without web get to, a multimeter is exceptionally convenient at estimating obstruction.



Select an irregular resistor and set the

multimeter to the 20k ω setting. At that point hold the tests against the resistor legs with a similar measure of weight you when squeezing a key on a console.

The meter will peruse one of three things, 0.00, 1, or the real resistor rating or value.

For this situation, the meter peruses 0.97, which means this resistor has an estimation of 970 ω , or about 1k ω (recall you are in the 20k ω or 20,000 Ohm mode so you have to move the decimal three spots to one side or 970 Ohms).

On the off chance that the multimeter understands 1 or presentations OL, it's over-burden. You should attempt a higher mode, for example, 200k ω mode

or $2\text{M}\Omega$ (megaohm) mode. There is no mischief if this occur, it just methods the range handle should be balanced.

In the event that the multimeter peruses 0.00 or almost zero, at that point you have to bring down the mode to $2\text{k}\omega$ or 200ω .

Recall that numerous resistors have a 5% resilience. This implies the shading codes may demonstrate 10,000 Ohms ($10\text{k}\omega$), but since of inconsistencies in the assembling procedure a $10\text{k}\omega$ resistor could be as low as $9.5\text{k}\omega$ or as high as $10.5\text{k}\omega$. Try not to stress, it'll stir fine and dandy as a draw up or general resistor.



How about we drop the meter down to the following most minimal setting, $2\text{K}\Omega$. What occurs?

Not a mess changed. Since this resistor (a $1\text{K}\Omega$) is under $2\text{K}\Omega$, it despite everything appears on the showcase. Nonetheless, you'll notice that there is one more digit after the decimal point giving us a somewhat higher goals in our perusing. Shouldn't something be said about the following most reduced setting?



Presently, since $1k\omega$ is more noteworthy than 200ω , we've maximized the meter, and it is disclosing to you that it is over-burden and that you have to attempt a higher worth setting.

As a general guideline, it's uncommon to see a resistor under 1 Ohm. Recall that estimating obstruction isn't great. Temperature can influence the perusing a great deal. Additionally, estimating obstruction of a gadget while it is genuinely introduced in a circuit can be extremely dubious. The encompassing parts on a circuit board can enormously influence the perusing.

THE END