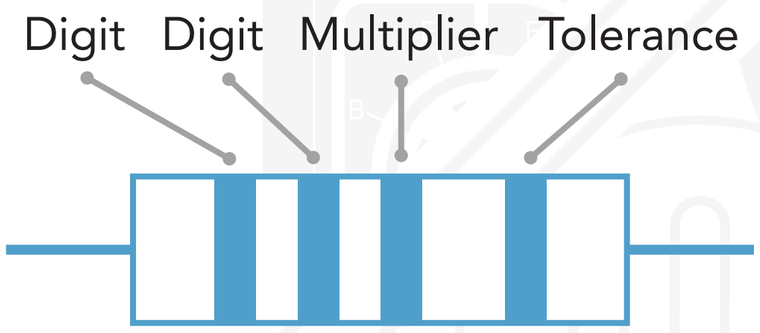
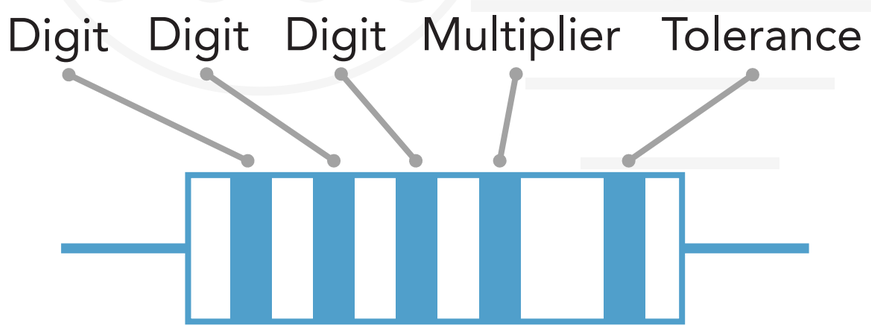
Color		Digit	Multiplier	Tolerance
Black		0	1	
Brown		1	10	±1%
Red		2	10^2	±2%
Orange		3	10^3	
Yellow		4	10^4	
Green		5	10^5	±0.5%
Blue		6	10^6	±0.25%
Violet		7	10^7	±0.10%
Grey		8	10^8	±0.05%
White		9	10^9	
Gold			10^{-1}	±5%
Silver			10^{-2}	±10%

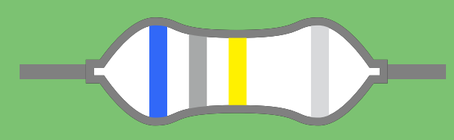


4-band

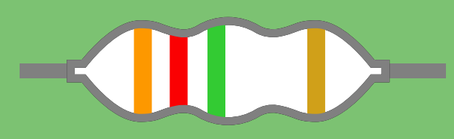


5-band

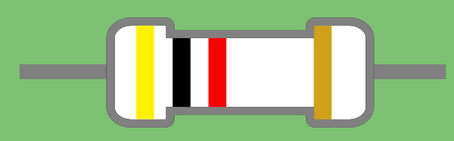
D1	2
D2	2
MX	10
%	5
220 Ω±5%	



D1	6
D2	8
MX	10^4
%	10
680 KΩ±10%	



D1	3
D2	2
MX	10^5
%	5
3.2 MΩ±5%	



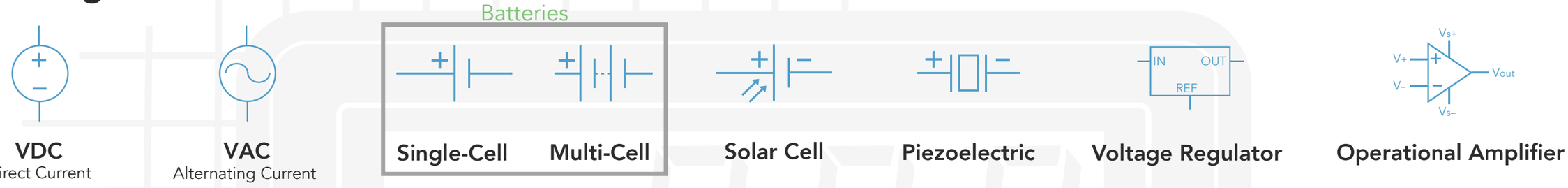
D1	4
D2	0
MX	10^2
%	5
4.0 KΩ±5%	

D1	7
D2	1
MX	10^8
%	10
7.1 GΩ±10%	

RESISTOR DECODER

ELECTRONICS FOUNDATIONS

Voltage Sources



VDC
Direct Current

VAC
Alternating Current

Single-Cell **Multi-Cell**

Solar Cell

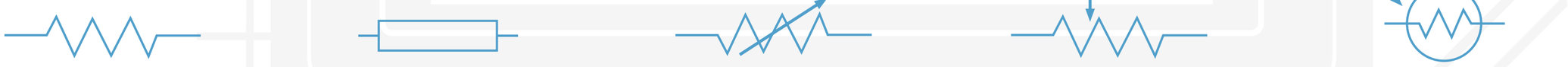
Piezoelectric

Voltage Regulator

Operational Amplifier

Resistors

Resist and reduce the flow of current in an electrical circuit.



US

International

Rheostat
Variable

Potentiometer

LDR/Photoresistor
Light Dependent Resistor

Switches

Make and break connections in an electric circuit.

SPST
Single Pole, Single Throw

SPDT
Single Pole, Double Throw

SP3T
Single Pole, Triple Throw

DPDT
Double Pole, Double Throw

DPST
Double Pole, Single Throw

Push Button

Diodes

Allow current to pass in one direction.

Diode

LED
Light Emitting Diode

Photodiode

Schottky

Zener

Capacitors

Temporarily store electrical energy in an electric field.

Non-Polarized

Polarized

Voltage Nodes

Indicate a connection back to power or ground.

Reference Grounds
AGND - Analog Ground
VGND - Virtual Ground

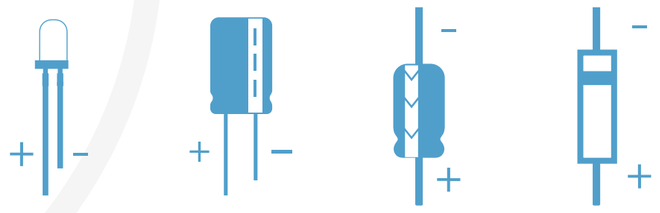
Vcc, 5V, V+
Positive Supply Voltage

Vee, V-
Negative Supply Voltage

Earth Ground

Chassis Ground

Identifying Polarity



Inductors

Oppose changes in electric current.

US

International

Prefixes

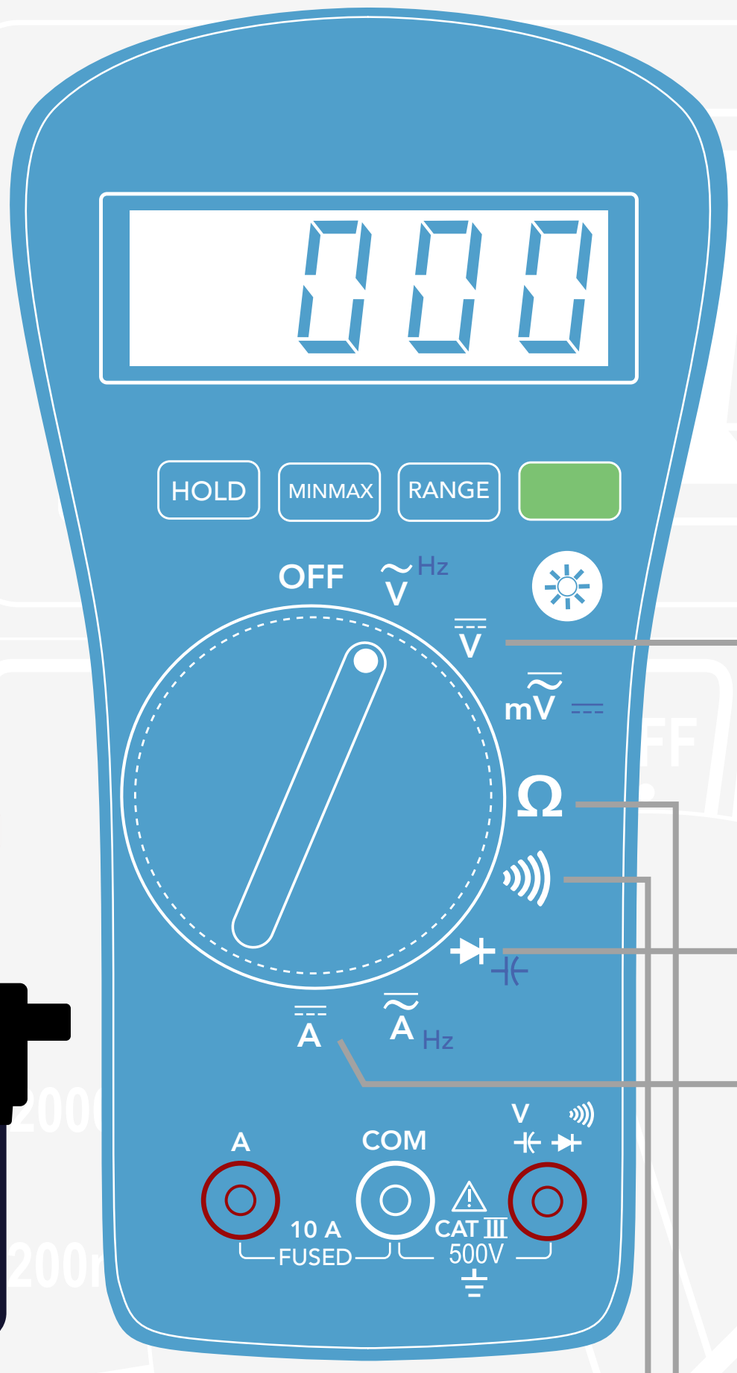
G	Giga	1,000,000,000
M	Mega	1,000,000
k	Kilo	1,000
m	Milli	0.001
µ	Micro	0.000001
n	Nano	0.000000001
p	Pico	0.000000000001

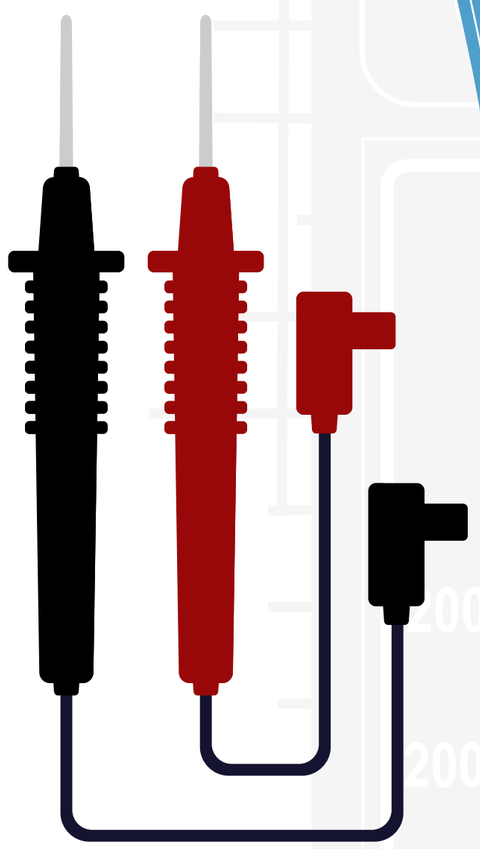
Unit	Measurement
Volt	Electric potential
Ampere	Current
Ohm	Resistance
Watt	Power
Farad	Capacitance
Henry	Inductance
Hertz	Frequency

SCHEMATIC LEGEND

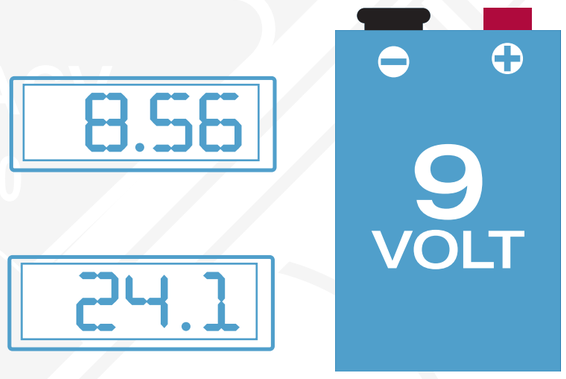
ELECTRONICS FOUNDATIONS

Auto-Ranging

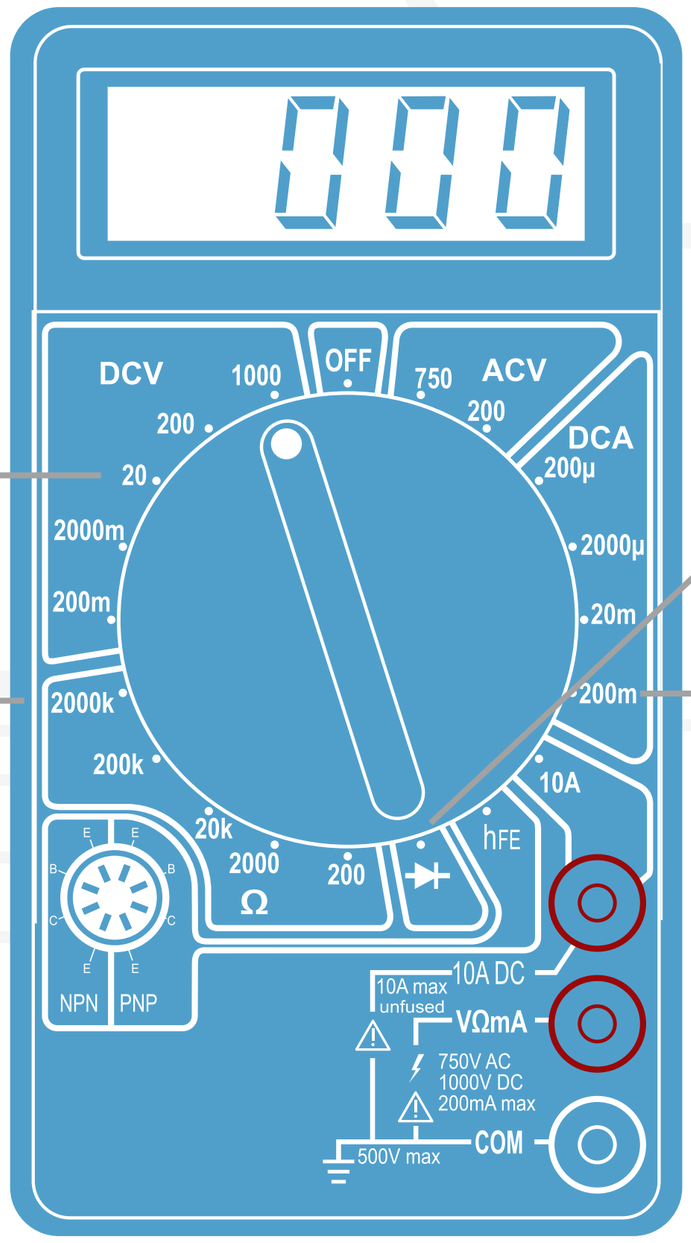




Variable	Symbol	Unit	Symbol
Voltage	V	Volts	V
Current	I	Ampere	A
Resistance	R	Ohm	Ω



Manual-Ranging



MULTIMETER BASICS

ELECTRONICS FOUNDATIONS