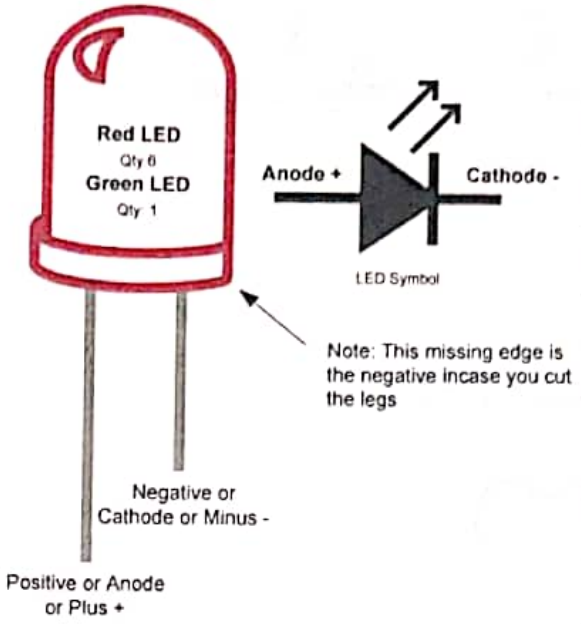
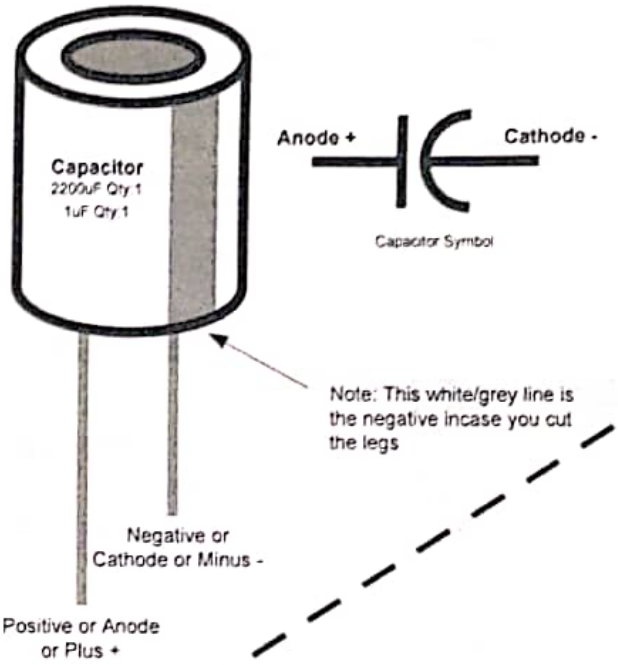
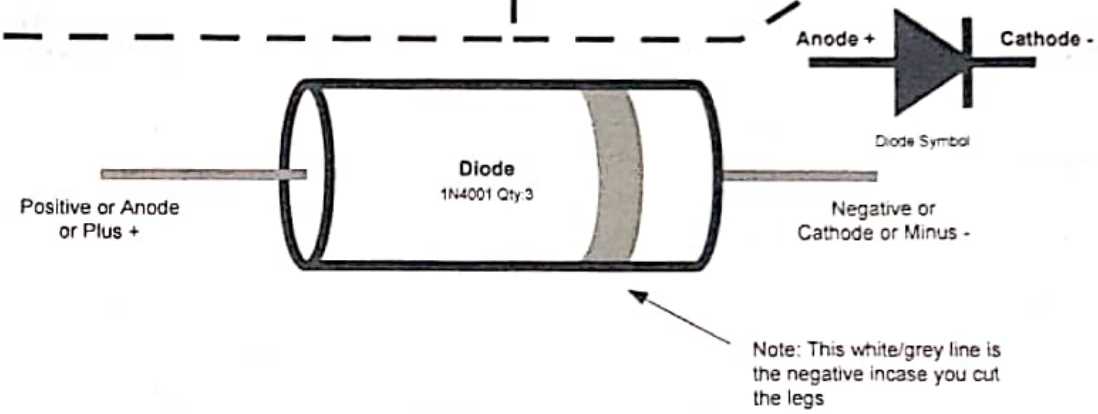
Electronic Components Polarity

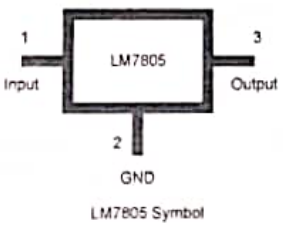
-Positive/Plus has the longer leg of the two and is also called anode.

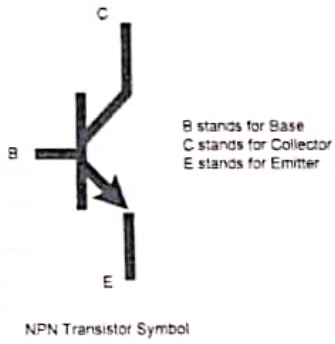
-Negative/Minus has the shorter leg of the two and is also called cathode.











Resistors

- A **resistor** are passive electrical components or circuit element that provides electrical resistance. They work by reducing electrical current flow by converting it to heat. Fixed resistors are generally two terminals without polarity. As there are fixed there are variable resistors (can be known as potentiometer).

An image of two typical fixed 1KΩ resistor

A schematic symbol of a typical fixed resistor

An image of a typical potentiometer

A schematic symbol of a typical potentiometer

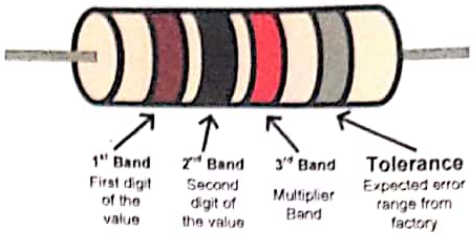
Resistor Color Codes

Color Value Table

Number	*Color*
0	Black
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Grey
9	White

Resistor Quantities from Kits

100Ω	Qty: 5
470Ω	Qty: 1
510Ω	Qty: 1
1KΩ	Qty: 7
4.7KΩ	Qty: 5
Potentiometer	Qty: 1

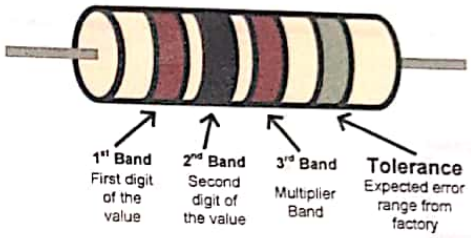


Example One: Using the first three color bands of the resistor above would be Brown, Black, and Red with the tolerance on the right. The first band and second band are just digits, while the third band is the multiplier.

Brown	1	Digits
Black	0	Digits
Red	2	Multiplier

Digits x Multiplier = Resistance (Ω)

[1 0] x 10^2 = 10 X 100 = 1000Ω or 1KΩ



Example Two: Using the first three color bands of the resistor above would be Brown, Black, and Brown with the tolerance on the right. The first band and second band are just digits, while the third band is the multiplier.

Brown	1	Digits
Black	0	Digits
Brown	1	Multiplier

Digits x Multiplier = Resistance (Ω)

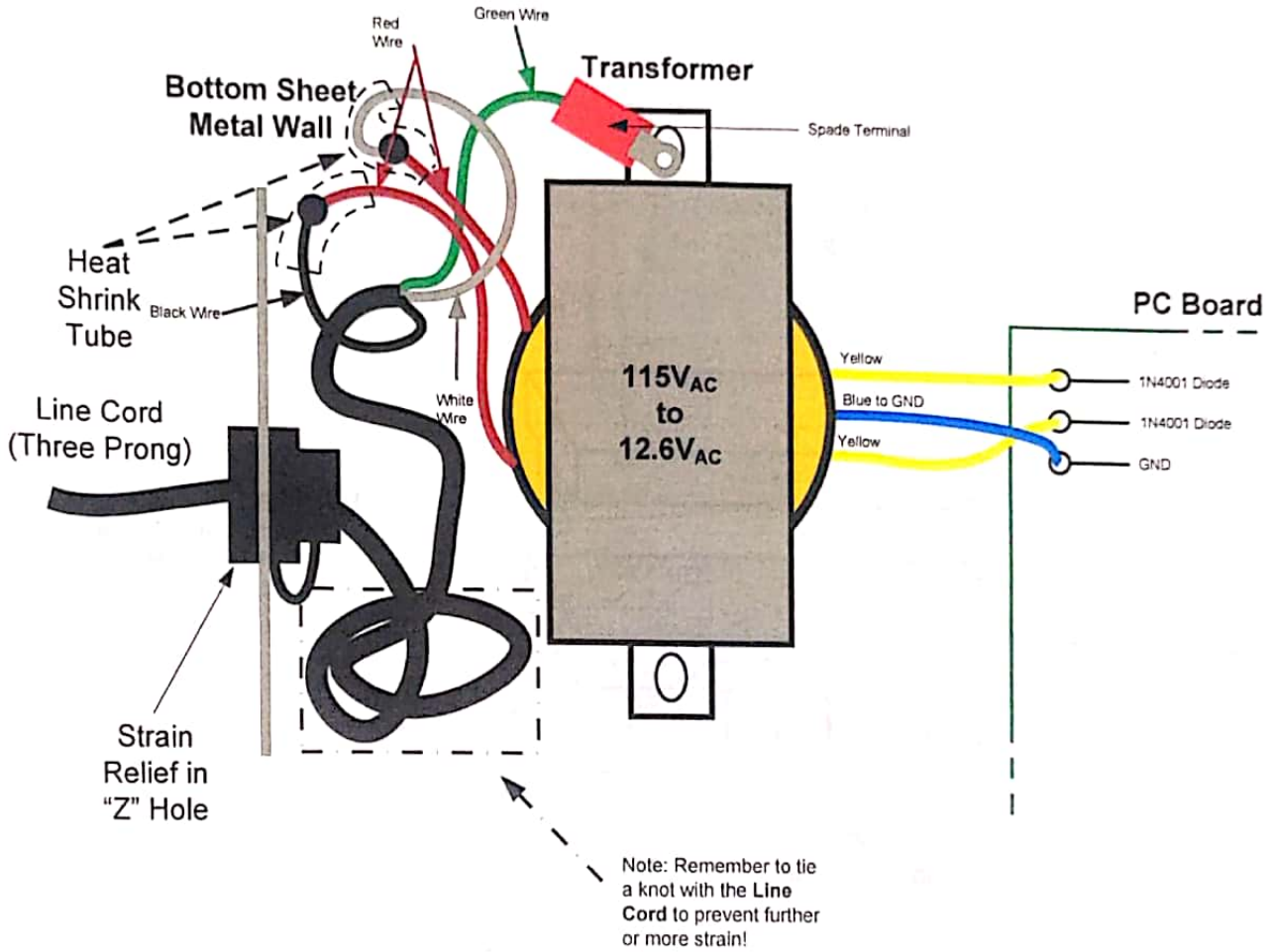
[1 0] x 10 = 10 X 10 = 100Ω

Line Cord (Three Prong Plug)

- Connect the **Strain Relief** (Black Round Plastic Piece) six inches from the end of the exposed wire and "POP" it in places on the **Bottom Sheet Metal** "Z" hole. Solder and crimp a **Spade Terminal** onto the exposed green wire and solder the Black and White wire to the primary **Red Wires** of the **Transformer** (Remember to heat shrink the cables).

Transfomer

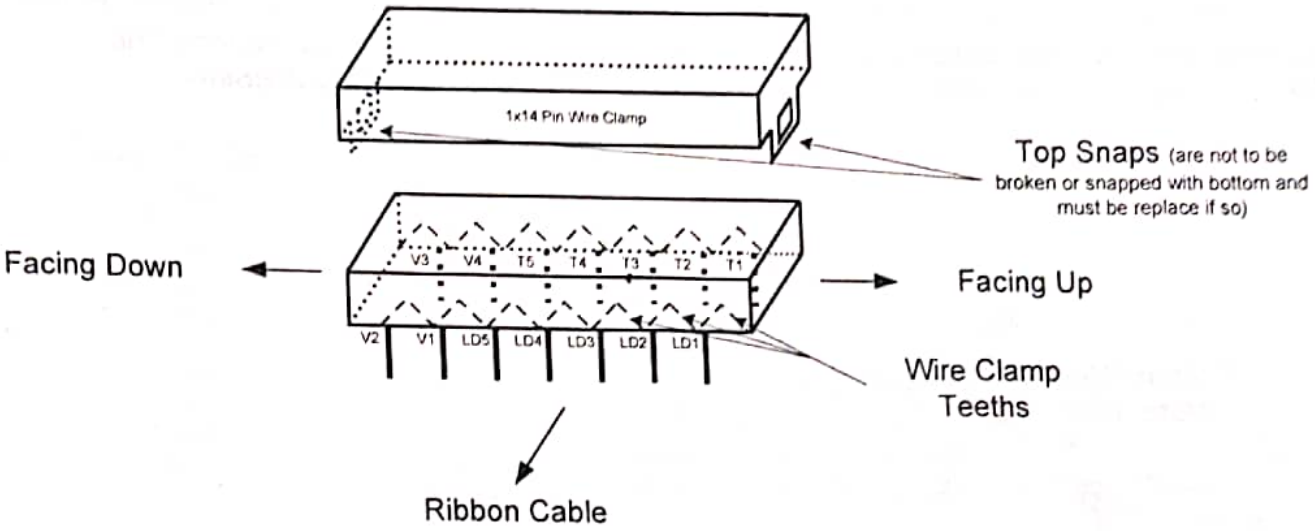
- The **Transformer** takes 115VAC and brings it down to 12.6VAC using coils.
- The each of the primary **Red Wires** on the transformer are soldered to the **Black** (Hot) and **White** (Neutral) wires (meaning **Red Wire** to **Black Wire** and **Red Wire** to White Wire) after the **Line Cord** is placed through the Bottom Sheet Metal "Z" hole. Remember to thread the **Red Wires** with two inches of **Heat Shrink Tubing** each before soldering them. The secondary wires of the **Transformer** which has two **Yellow Wires** and one **Blue Wire** goes to the **PC Board**.

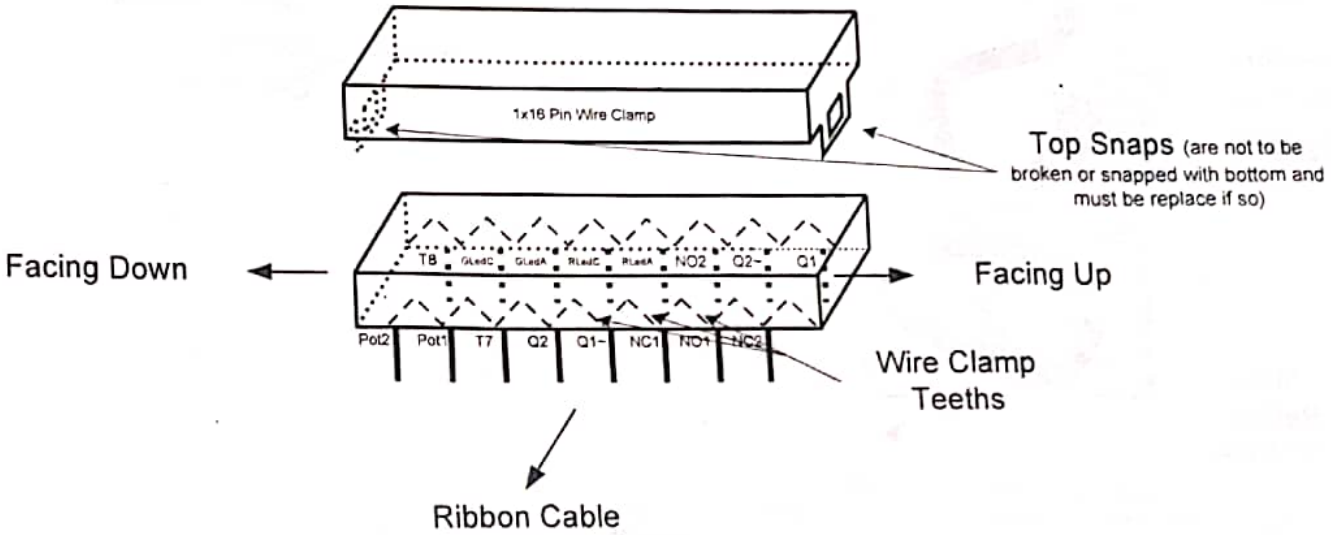


Wire Clamp

(1x14 Wire Clamp and 1x16 Wire Clamp)

- Used to clamp onto the one end of the **Ribbon Cable** and placed in the IC chip holders that are soldered onto the PC Board.
- Make sure that the **Ribbon Cable** is straight or perpendicular to clamp and every other wire are in the right teeth before you crimp.



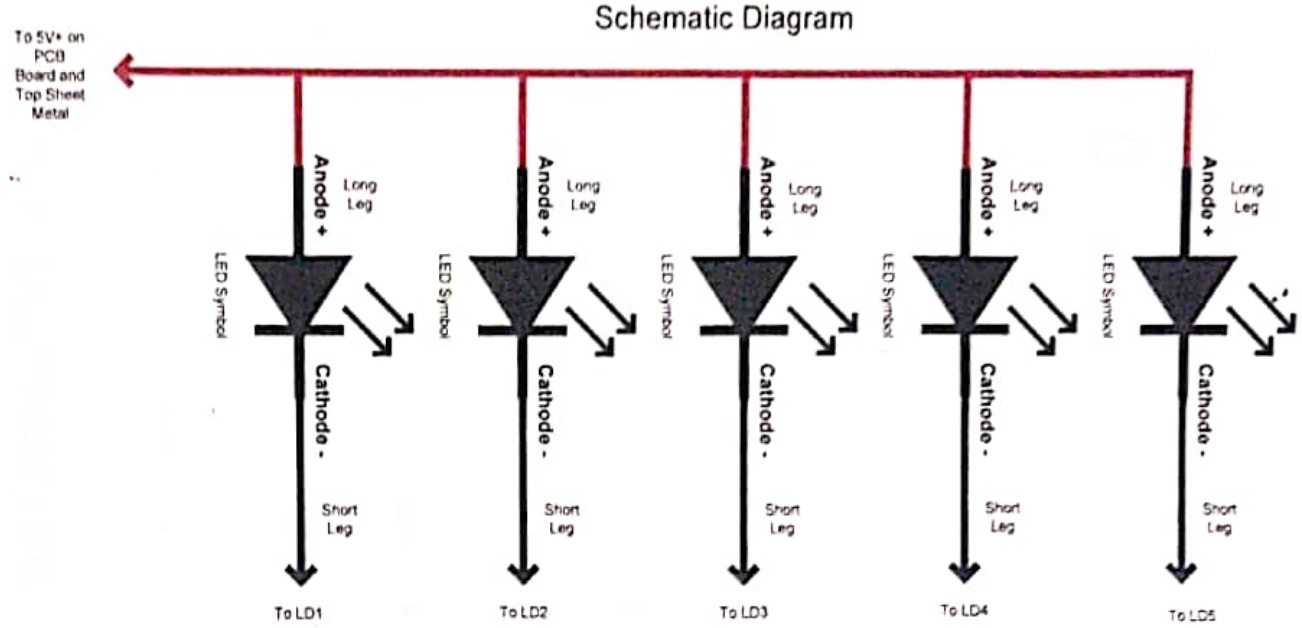


wear long sleeves ...

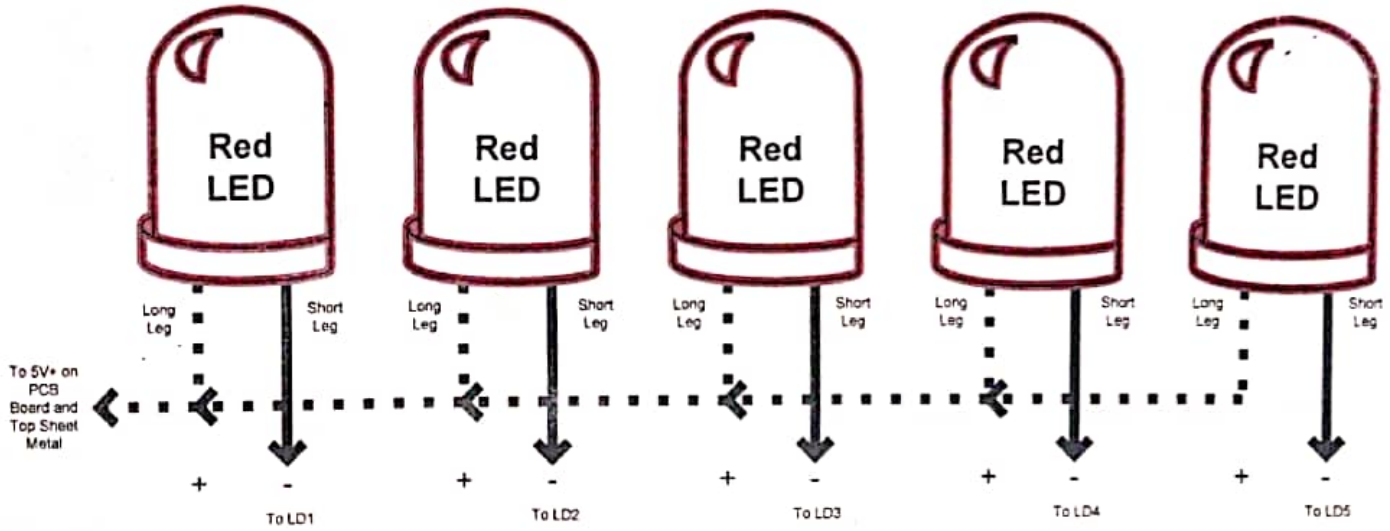
LED Configurations

- All LEDs should be mounted within the seven silver LED Holders(with nuts) along with the seven black plastic piece underneath each of the LEDs to keep the LEDs legs separate. **Note**: There are six **Red LEDs** and one **Green LED**.
- The five **Red LEDs** group are configure by the schematic below. Be sure you know the polarity of the LEDs, where as long is the positive and the short is the negative.
- The best method to connect the five Red LEDs configuration below is to connect all the Anode or long legs to the other long legs of the LEDs next to it.
- Below is a schematic diagram of the configuration and below that schematic diagram is a visual diagram of the configuration. **Note**: The dotted arrow represents the bent leg to the next Red LED to the left.
- As for the LED group with a single **Red LED** and single **Green LED** you can just mount them to the LED holders and connect them to the corresponding connection on the **1x16 Clamp Wire, Ribbon Cable.**

Schematic Diagram



Visual Diagram

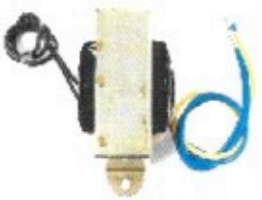


Identifing Components For EMT 1130 Kit

Potentiometer

LED Holders

Transistors



Transformer

Voltage regulator

Diode

Toggle switch

+ve long end
-ve short end
LED –Light Emitting Diode

IC socket

Momentary switch

IC-Intergate Circuit chips

Dip Connector

Resistors

Heat Sink

Terminal strips

Ribbon cable

Strain relief

Heat shrink tubing

Capacitor

Standoff

ELECTRICAL COMPONENTS

(used in EMT 1130 Lab Kits)

Resistors

an electrical component
at electricity can not
ravel through easily.
(no Polarity)

Ex:

1st = 1st digit of the value
2nd = 2nd digit of the value
3rd = Multiplier (10^x)

ie. Blue = 6
ie. Black = 0
ie. Red = 10^2 = 100

60 . 100 = 6000

Value of the resistor is 6000Ω

To find color scheme for a value i.e. 250Ω

2 | 5 | 0 |
red | green | brown

Color Value Table

Digit	Color
0	Black
1	Brown
2	Red
3	Orange
4	yellow
5	Green
6	Blue
7	Violet
8	Grey
9	White

Diodes

* Be Minded of the Polarity

An electronic component that restricts current flow to one direction

A rectifier (2 diodes) Converts Alternating Current into Direct Current (AC → DC) Voltages.

Transistors

Semi-conductor device that regulates current & voltage flow and acts as a switch or gate for electronic signals.

(Spread legs to fit onto the PC Board)

(* Make sure to match Flat side to the PC Board as Pictured on it)

+5 Volt Regulator

An electromechanical component that maintains constant output of volts.

IC Chip (Integrated Circuit)

Set of electronic circuits on one small Plate "Chip" of semi-conductor material

(* Do not Solder)

Capacitors

A device used to store an electric charge and then discharges it into a Circuit.

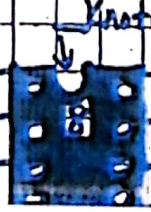
Heat Sink

- A device used for absorbing excessive heat and dissipating it into the surrounding area.

(Attached to +5V Regulator)

IC Chip Holder

- is used to mount the IC Chip to the Circuit Board

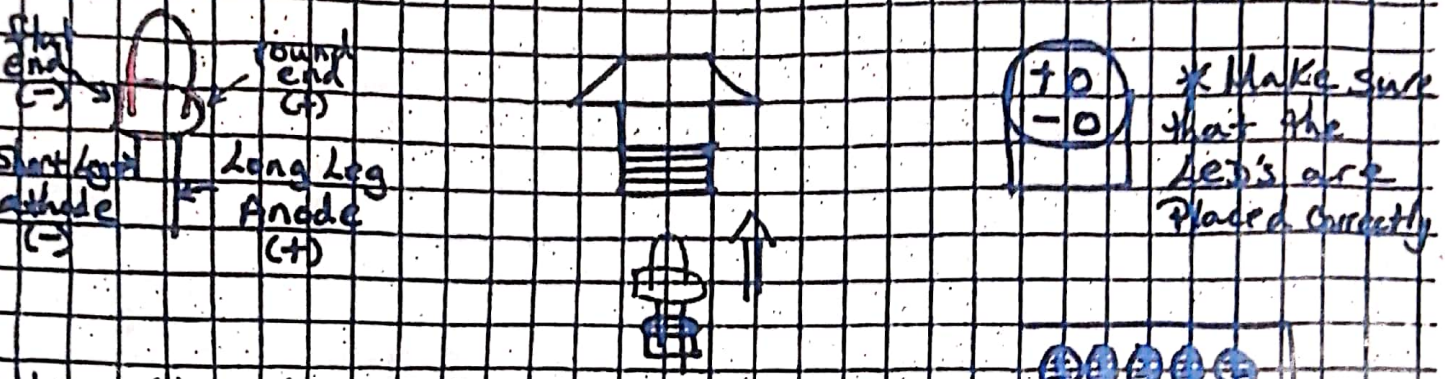


(* Solder onto PC Board)

Line Cord (3 Prong Plug)

- Connect the Strain relief (black Plastic Piece) 3" from the end of wires and "POP" it in Place on the bottom Sheet Metal. Crimp a Spade terminal onto the Green wires, and Solder the other two wires with the Primary wires of the Transformer (Don't forget the shrink tubes)

L.E.D + L.E.D. Holders (Light Emitting Diode)

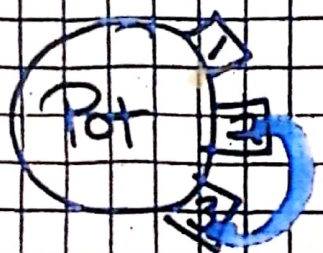


All positive legs on top and all negative legs on the bottom.
Bend all the positive legs like an "L" so that one leg touches the other. Then solder those Points. Have a Red wire long enough to reach the +5V Terminal strip on the top of the box.

(The other Red and Green LED's will get their own wires)

Potentiometer (Variable Resistor)

(1MΩ)



Points 2+3 are Soldered together with a wire (Any color wire is fine)

RESISTOR COLOR CODE

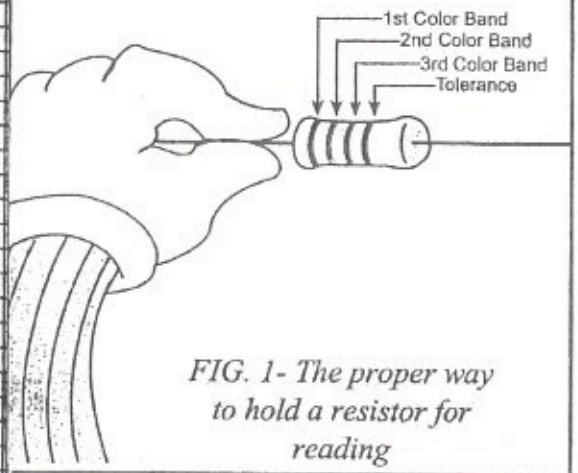


FIG. 1- The proper way to hold a resistor for reading

The resistor color code is a system of resistance value marking using color bands. It is in common use for resistors used in electronics circuits. We have shown the decoding chart below.

To use the color code select a brown, green, orange resistor from the parts package. Hold it in your hand orienting it so the band that is closest to the resistor metal lead is next to your index finger and thumb (see fig. 1).

You should notice that the first color band is brown. Decoding the color brown from the table gives a 1 (see fig. 2). Next look at the 2nd color band and notice that it is green. Decoding the green color from the table gives a number 5 (see fig. 2). The third color band is orange which is the multiplier. Decoding the orange color from the table gives 1,000 for a multiplier (see fig. 2). The value of this resistor is 15K. The fourth band is the tolerance which, in this case, is gold which equals ±5%.

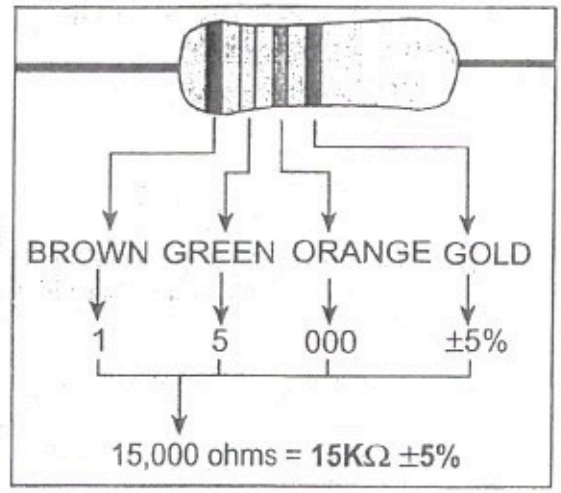


FIG. 3- 15K resistor decoding

RESISTOR COLOR CODE

COLOR	1ST DIGIT	2ND DIGIT	MULTIPLIER
BLACK	0	0	1.
BROWN	1	1	10.
RED	2	2	100
ORANGE	3	3	1,000 (K)
YELLOW	4	4	10,000
GREEN	5	5	100,000.
BLUE	6	6	1,000,000. (M)
VIOLET	7	7	10,000,000.
GRAY	8	8	100,000,000.
WHITE	9	9	1,000,000,000.

TOLERANCE: NO COLOR 20%, SILVER 10%, AND GOLD ±5%.

FIG. 2 - Resistor Decoding Chart

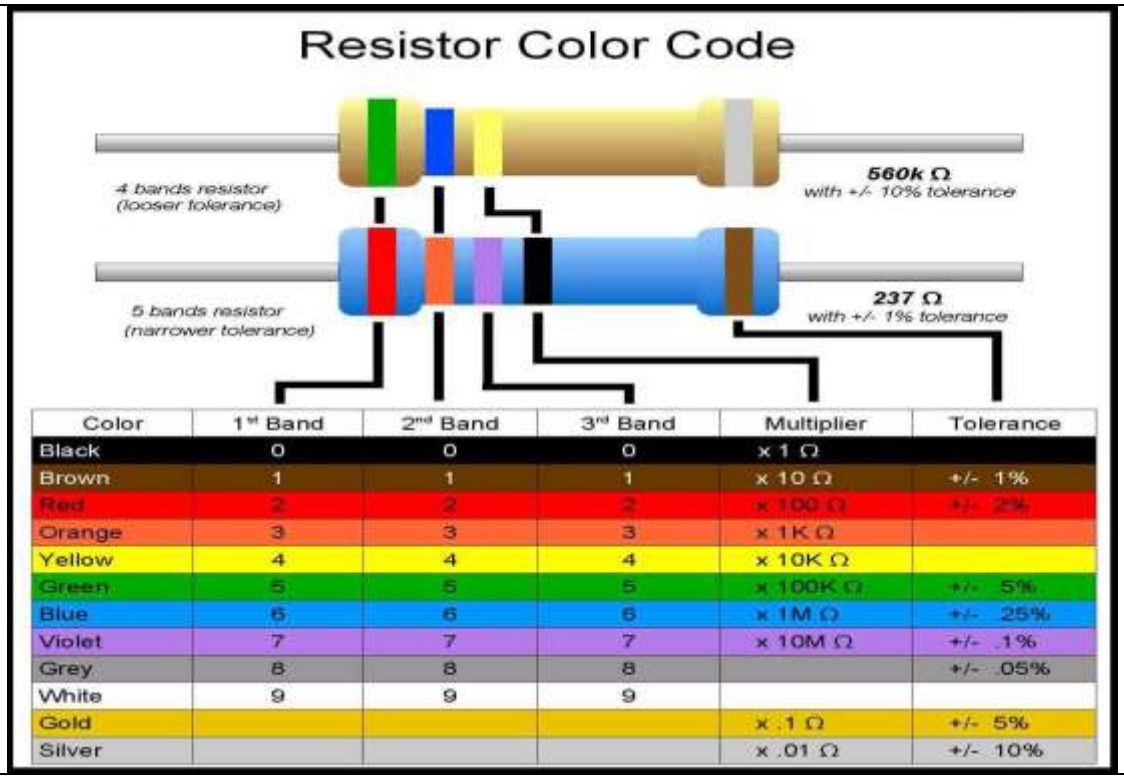
Electrical Components (used in EMT1130 Lab Kits)

Resistor

An electrical component that used to produce heat, light, regulate the electric power entering a device and to set voltages within an electrical circuit. No polarity.

Color Value Table

Digit	Color
0	Black
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Grey
9	White



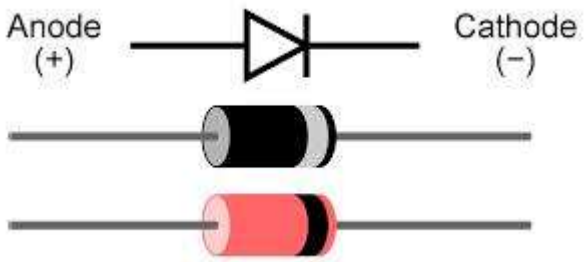
Color	1st Band	2nd Band	3rd Band	Multiplier	Tolerance
Black	0	0	0	x 1 Ω	
Brown	1	1	1	x 10 Ω	+/- 1%
Red	2	2	2	x 100 Ω	+/- 2%
Orange	3	3	3	x 1K Ω	
Yellow	4	4	4	x 10K Ω	
Green	5	5	5	x 100K Ω	+/- 5%
Blue	6	6	6	x 1M Ω	+/- 25%
Violet	7	7	7	x 10M Ω	+/- .1%
Grey	8	8	8		+/- .05%
White	9	9	9		
Gold				x .1 Ω	+/- 5%
Silver				x .01 Ω	+/- 10%

Example

The following resistor would be: Brown – 1 Black – 0 Red – 2 1 0 x10^2 = 1 0 x 100 = 1000Ω = 1k Ω	

Diodes

An electronic device that restricts current flow to one direction, having a negative end (cathode) and a positive end (anode).

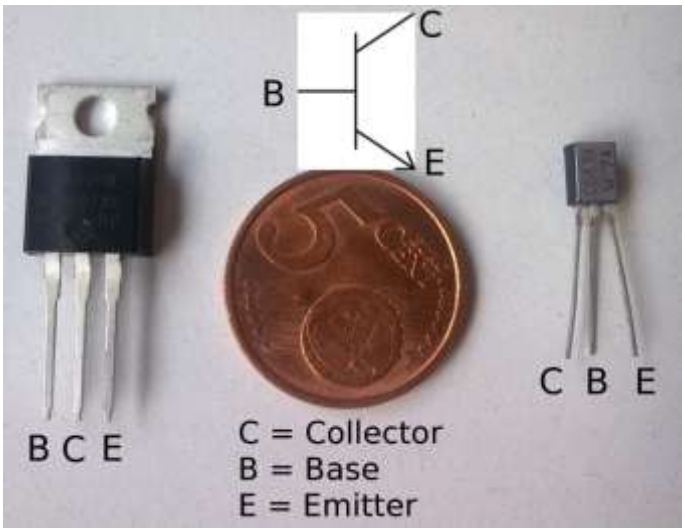


Heat Sink

A device used for absorbing excessive heat and dissipating it into the surrounding area. (on the back of regulator)

Transistors

A semi-conductor device that regulates current or voltage flow and acts as a switch or gate for electronic signals. (Transistor on the right)

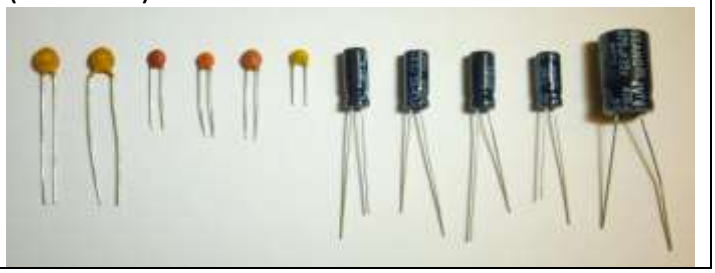


+5 Volt Regulator

An electromechanical component that maintains constant output of volts. (Regulator on the left)

Capacitors

A device used to store an electric charge and then discharges it into a circuit. (Long end positive (anode), short end negative (cathode).



IC Chip (Integrated Circuit)

A device made of interconnected electronic components, such as transistors and resistors that are etched or imprinted unto a tiny slice of a semiconducting material, such as silicon or germanium. An integrated circuit smaller than a fingernail can hold millions of circuits. ICs may also be called a chip, or microchip.

IC Chip Holder

A device used to mount the IC chip to the circuit board.