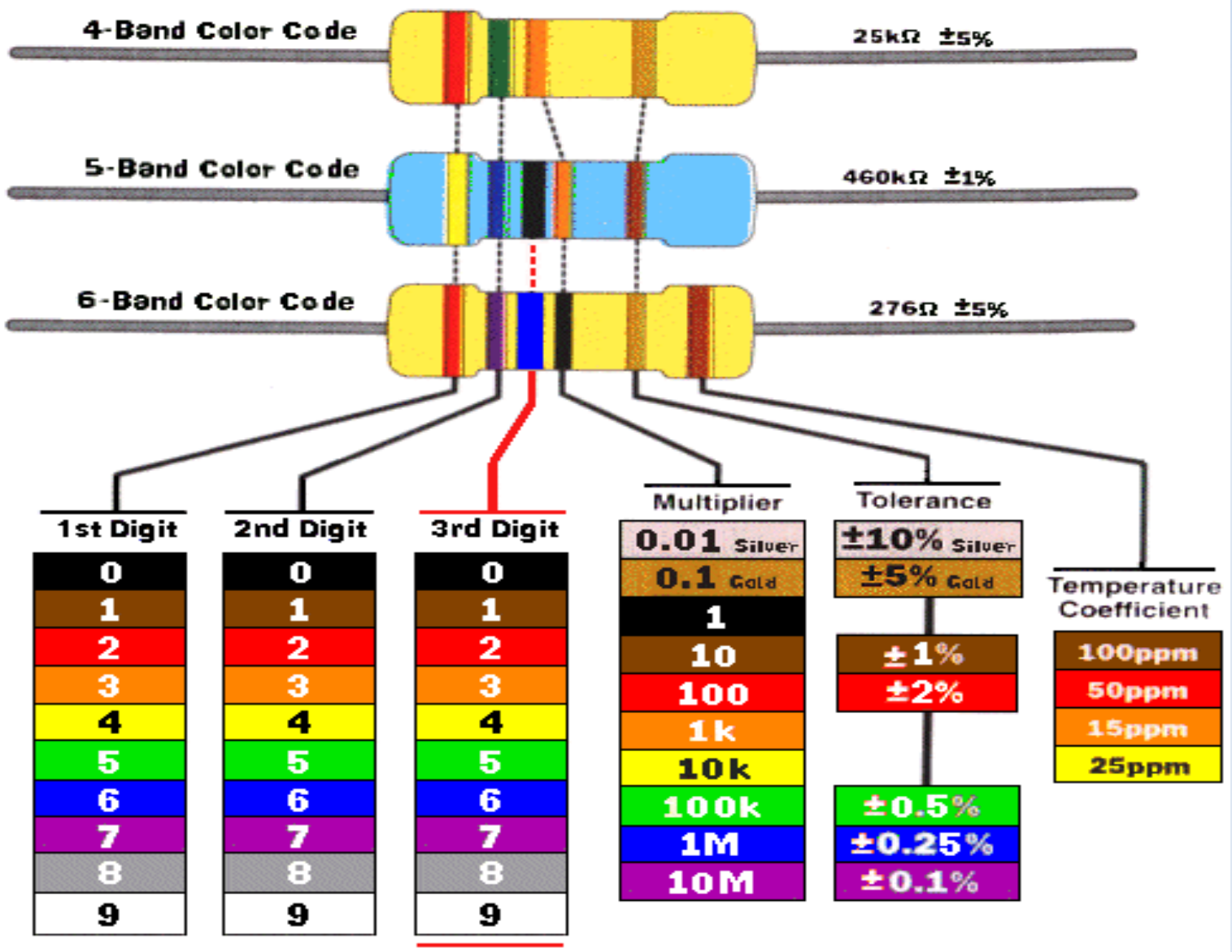
Intro to Laboratory Equipments

- Basic Electronic Components:
  - Resistor, Capacitor, Diode, Transformer,
  - Transistor, Opamp,
- Breadboard
- Function Generator
- Digital Multimeter
- Cathode Ray Oscilloscope

Resistors

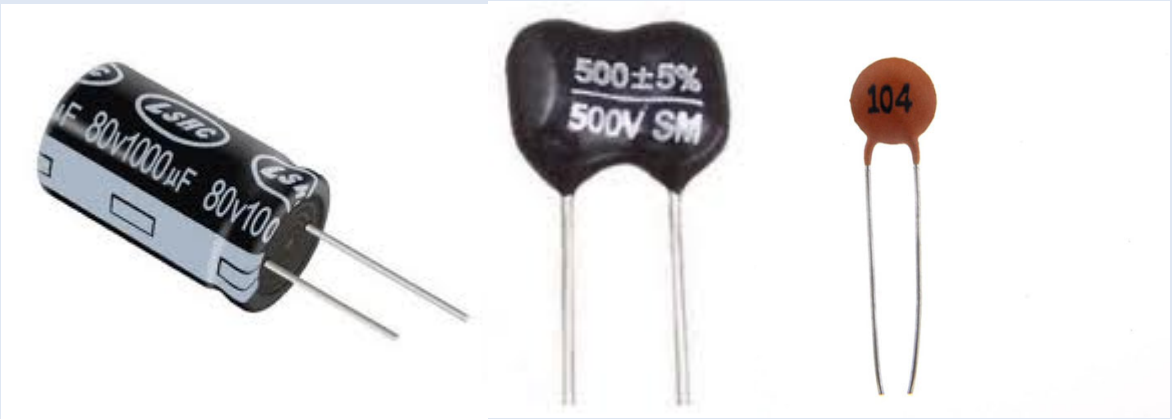
- Passive two-terminal compotent that is used to provide electrical resistance in the circuits
- Construction: carbon-composition/ film/ pile, metal/metal oxide film, wire-wound
- Type: Fixed-value Variable (Potentiometer)

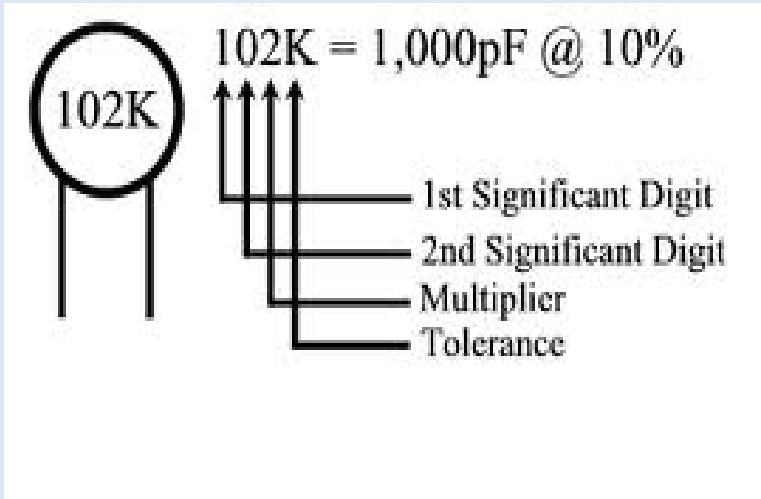
Color Coding of Resistors



Capacitors

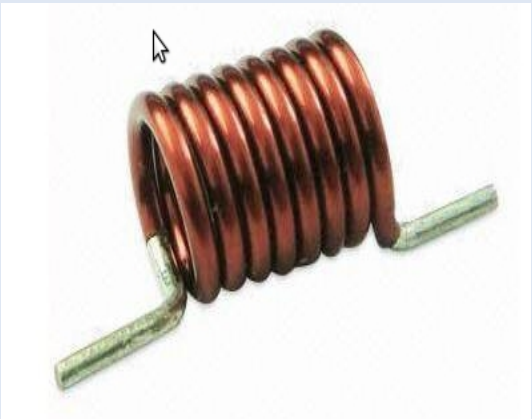
- Passive two-terminal compotent that stores energy in its magnetic field
- Types: fixed, variable; ceramic, mica, electrolytic
- Large caps show value with unit, for small caps just show digits-letter & value is computed as



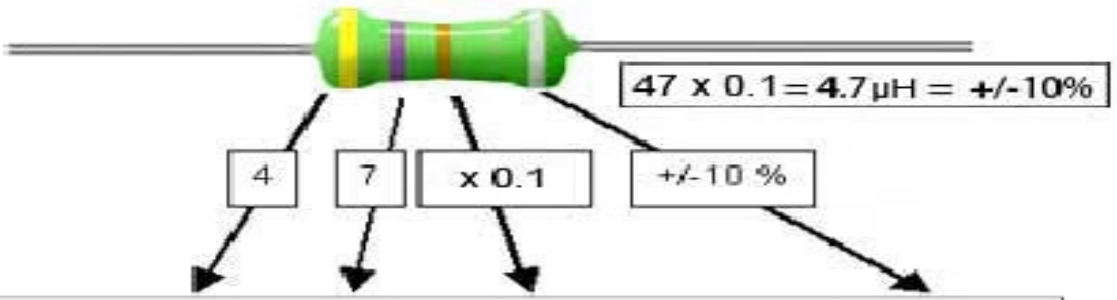


Inductors

- Passive two-terminal compotent that stores energy in its magnetic field
- Types: fixed and variable
- Core types: air, iron/steel, ferrite



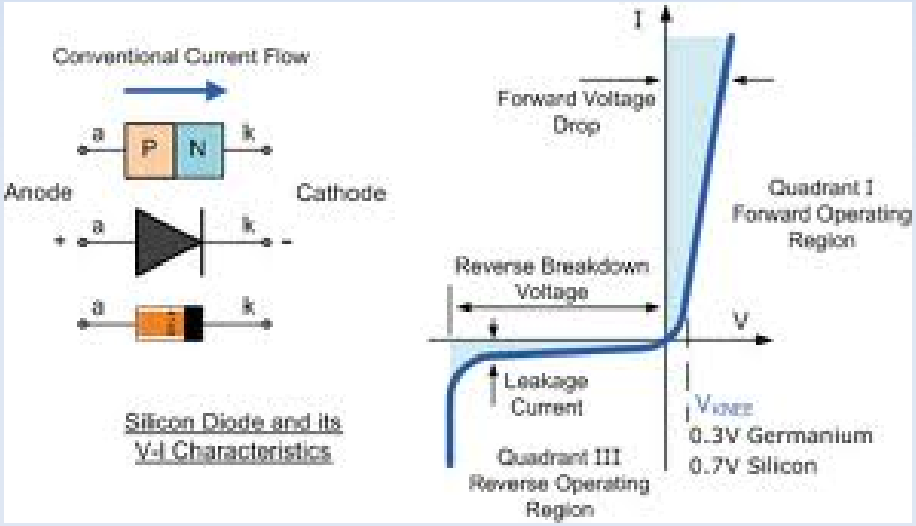

Color Coding for Axial Inductor



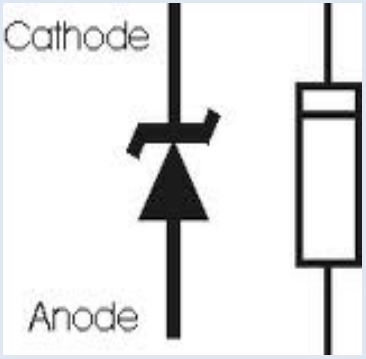
Band	1	2	3	4
Meaning	1st Digit	2nd Digit	(No. of zeros)	Tolerance %
Gold			.0 (divide by 10)	+/-5%
Silver			.00 (divide by 100)	+/-10%
Black	0	0	No Zeros	+/-20%
Brown	1	1	0	
Red	2	2	00	
Orange	3	3	,000	
Yellow	4	4	0,000	
Green	5	5		
Blue	6	6		
Violet	7	7		
Grey	8	8		
White	9	9		

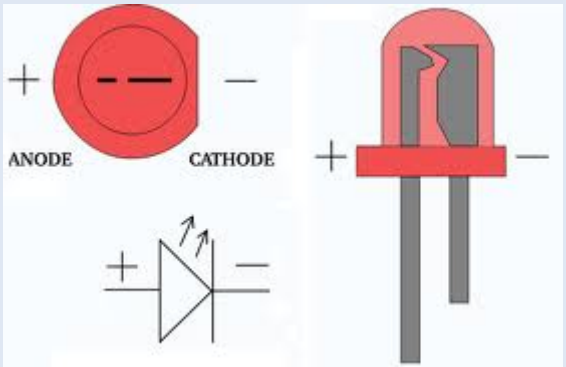
Diodes

- Two-terminal component with asymmetric transfer characteristics



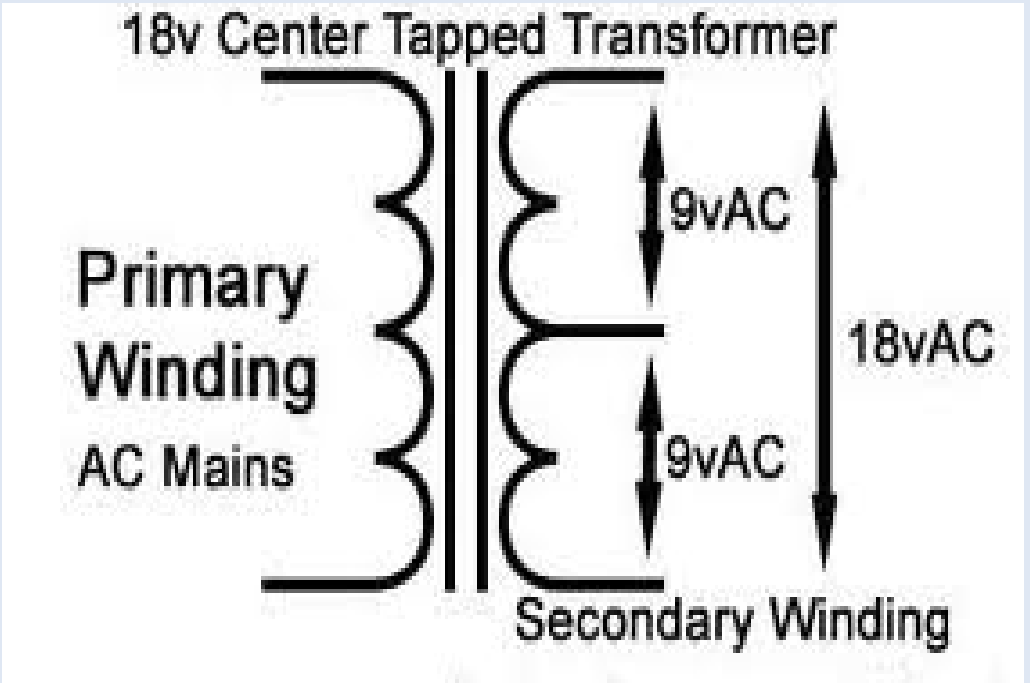
- Common types: normal, zener, LED





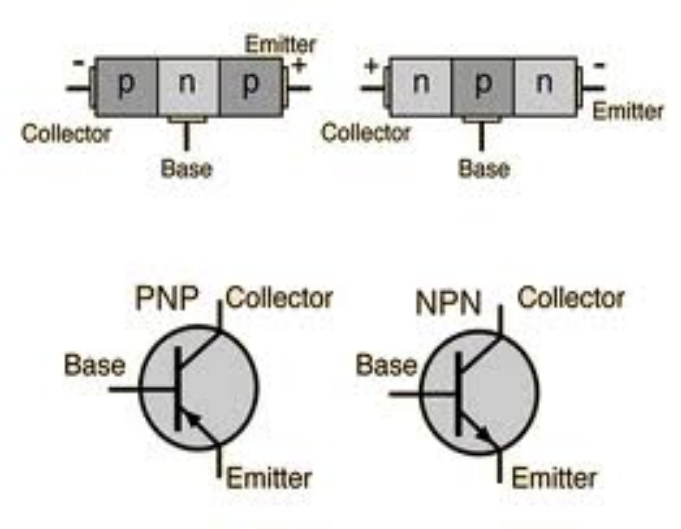
Transformer

- A device that transfers energy by inductive coupling between two or more of its windings
- Centre-tapped transformer: useful in making symmetrical positive & negative power supply

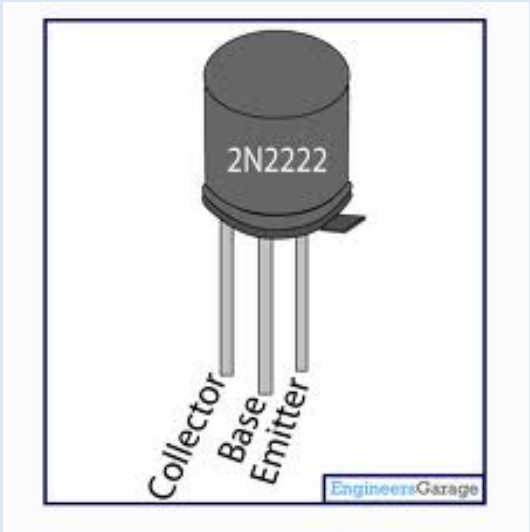


Transistor

- Transistor is semiconductor devide that used to amplify and switch electronic signals

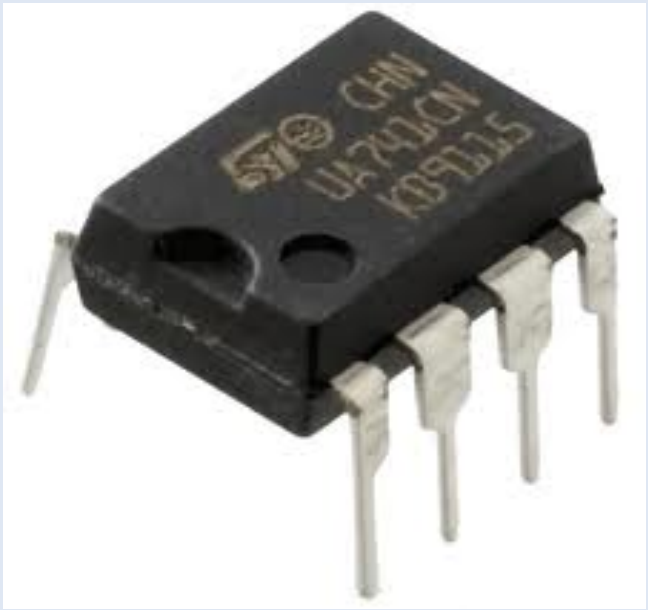


- Typical NPN transistors you may find in lab

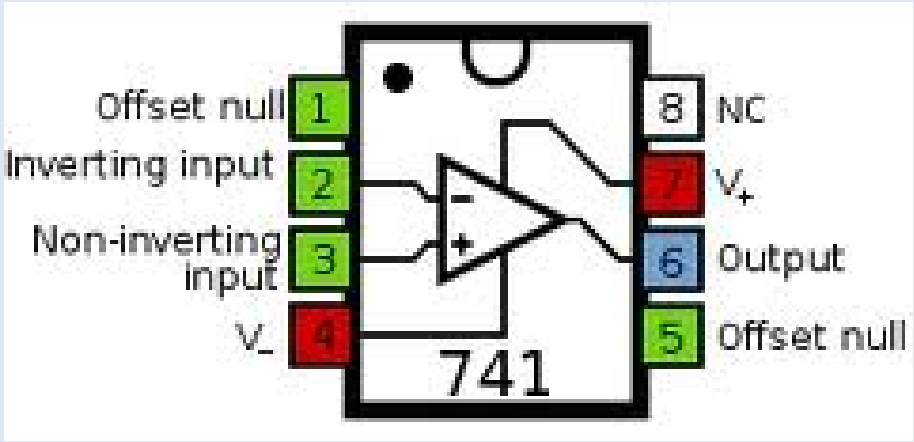


Operational Amplifier (OPAMP)

- A dc coupled high gain electronic voltage amplifier with differential input and usually single output

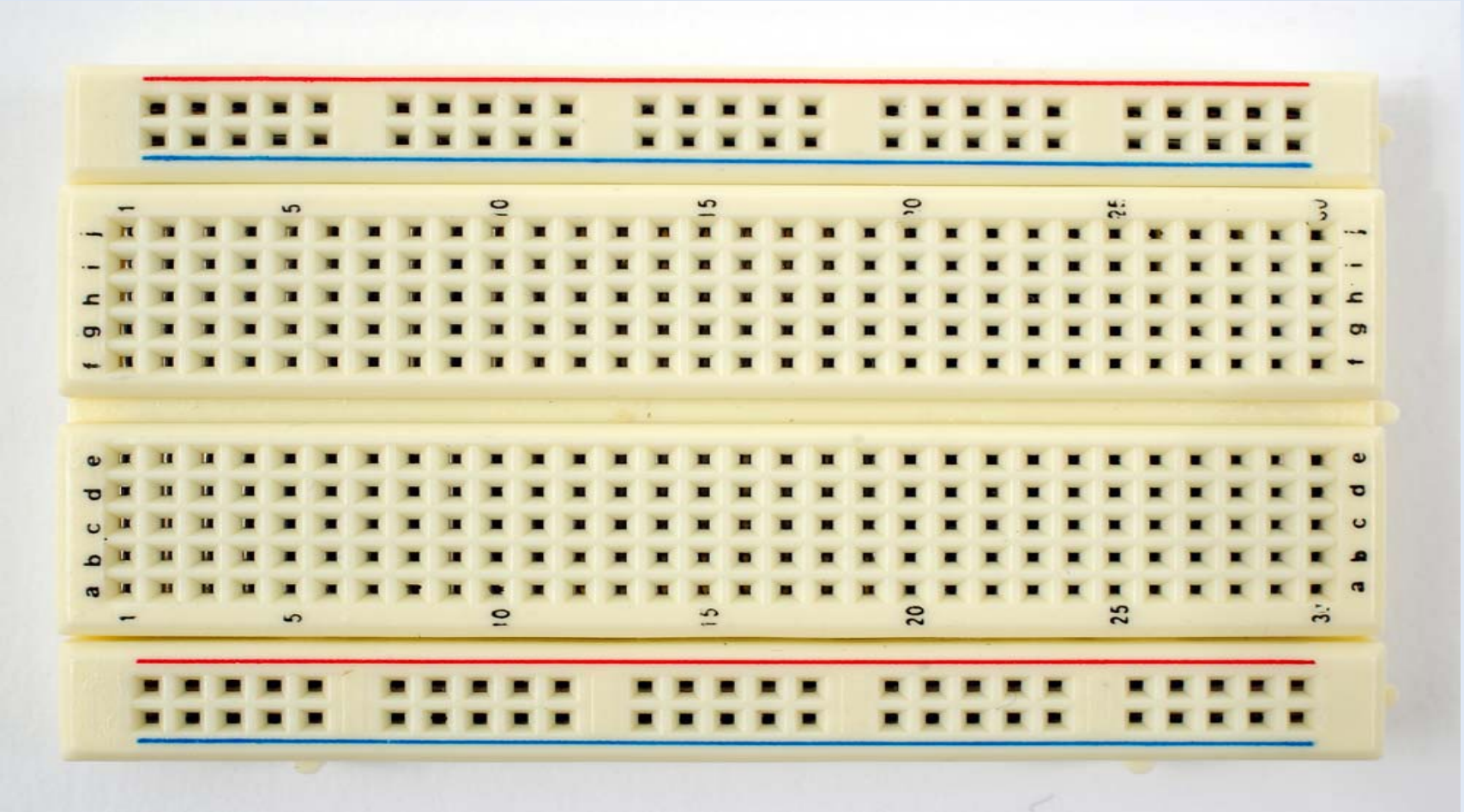


Pin diagram of LM741 IC

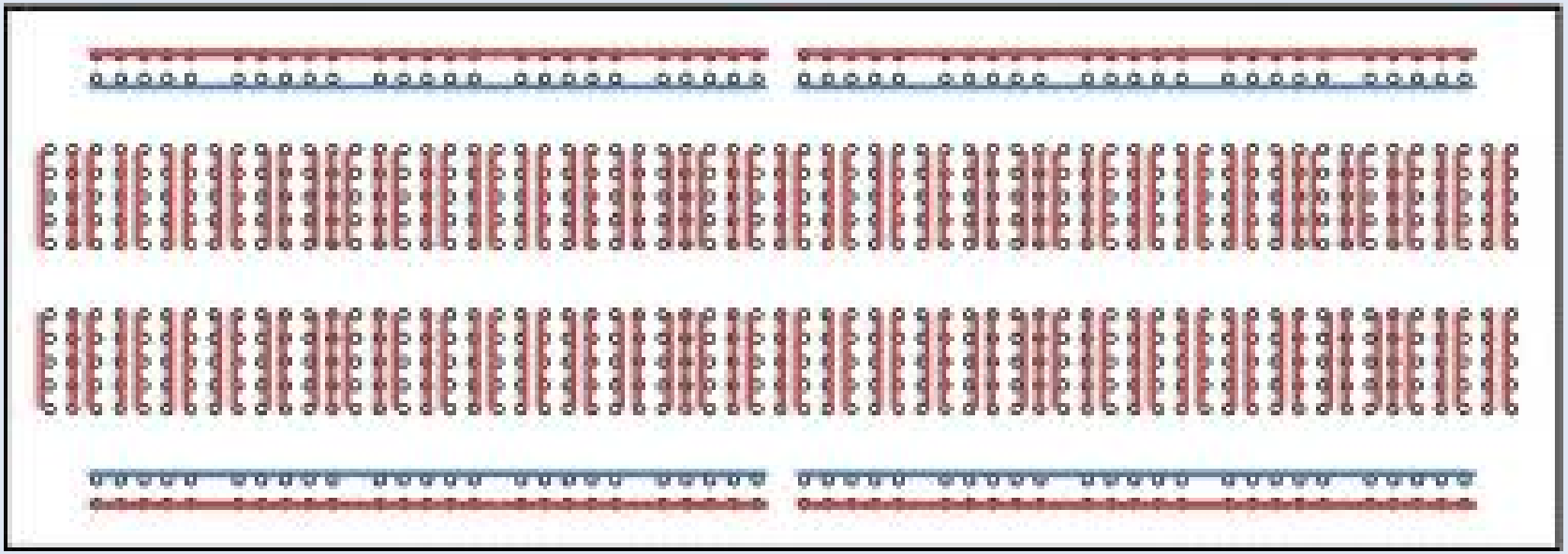


Breadboard

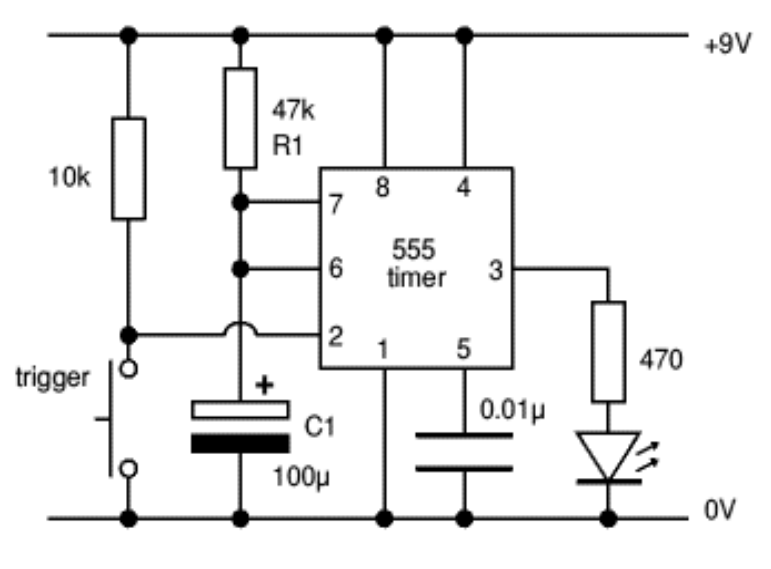
- A solderless base for prototyping electronic circuits. Shown below is 400-points breadboard

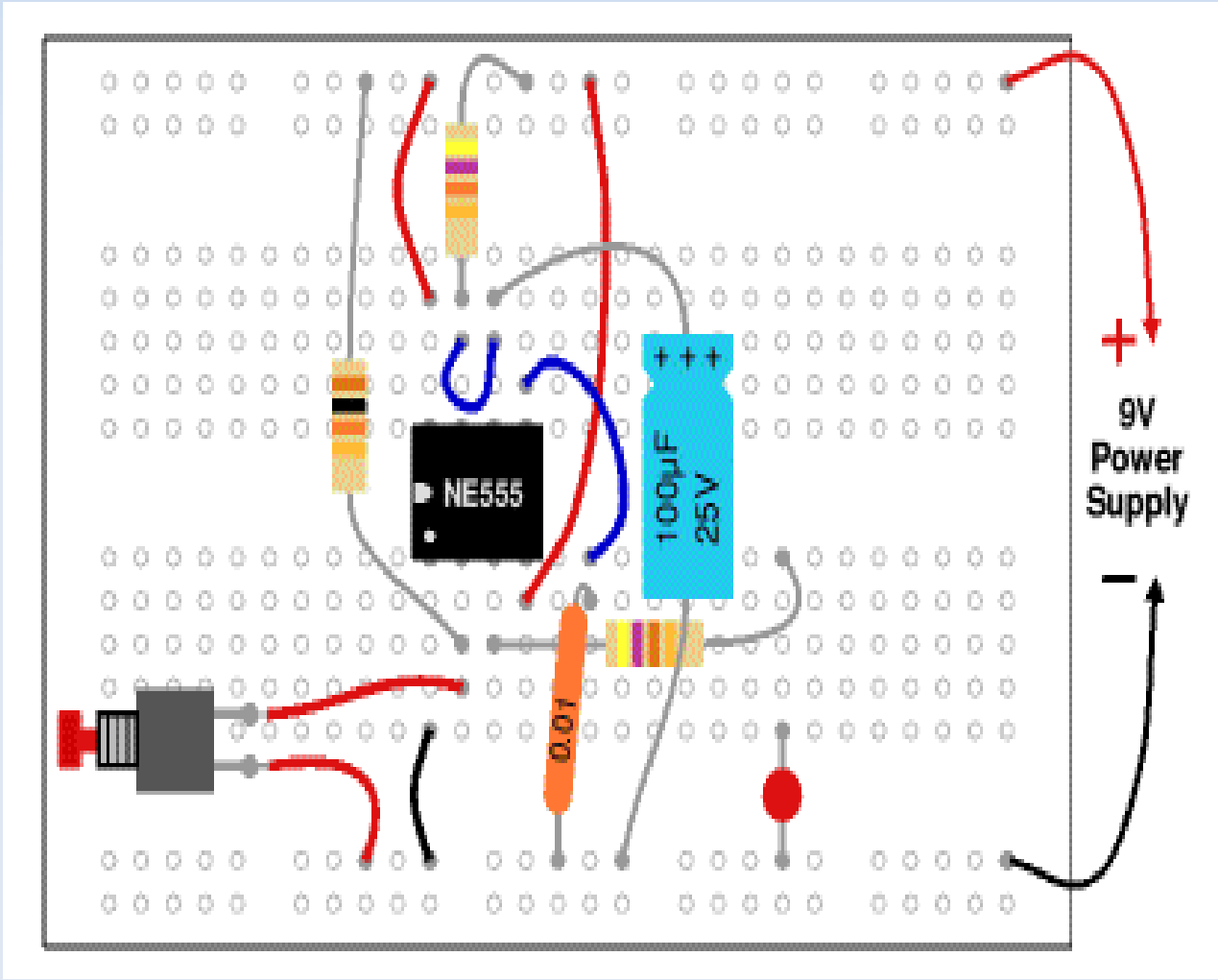


Internal Connections in a Breadboard



Example Circuit Realization





DC Power Supply

- Multi o/p (5V,±15V,32V) regulated DC power supply

Function Generator

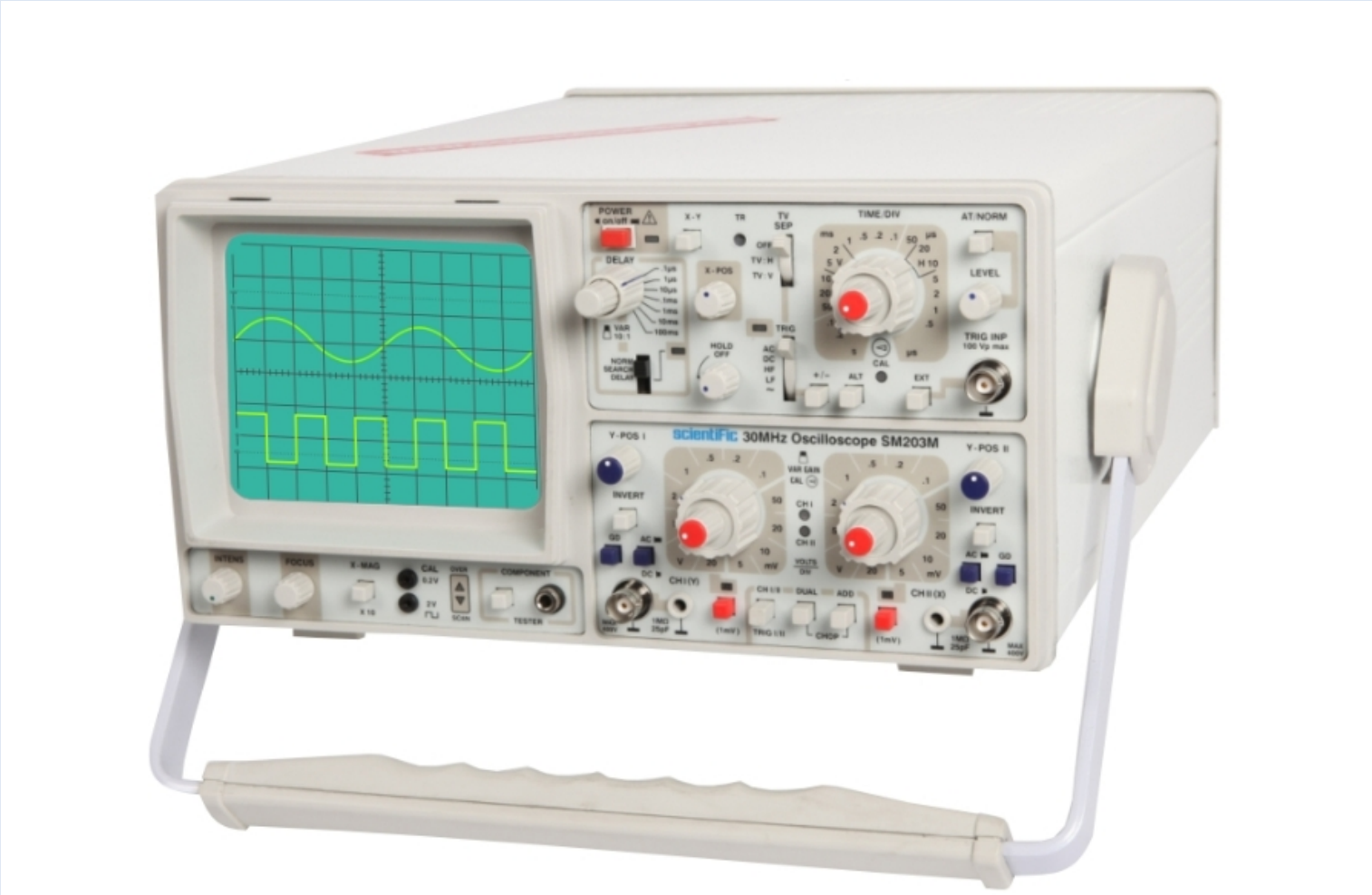
- An electronic device that generates differerent types of waveforms over wide ranges of freqs

Digital Multimeter

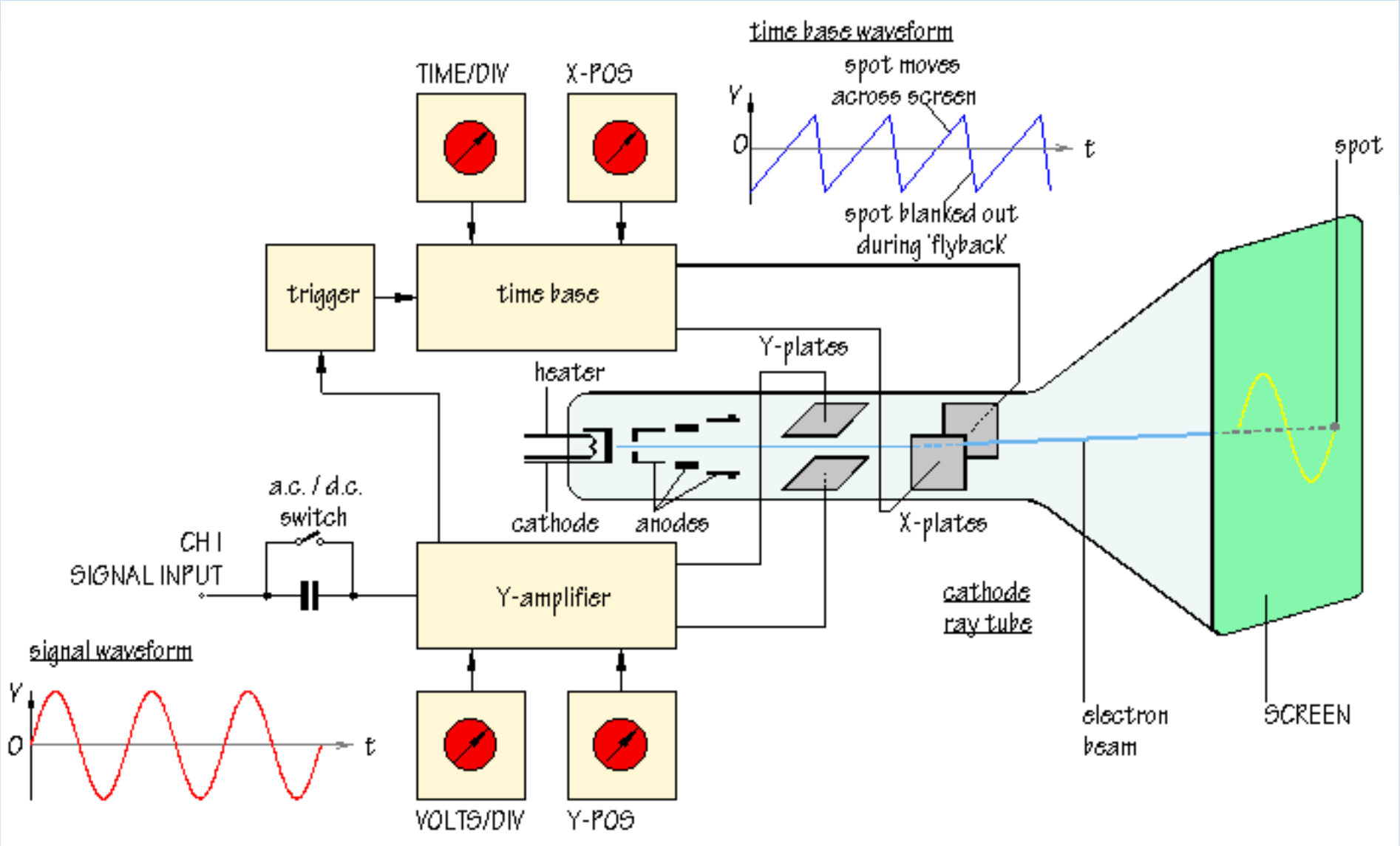
- Can measure AC/DC voltage, AC/DC current, Resistance. Manual control model is used in the lab

Cathode Ray Oscilloscope

- An electronic equipment which traces a V-t graph, with 'V' on Y-axis and 't' on x-axis

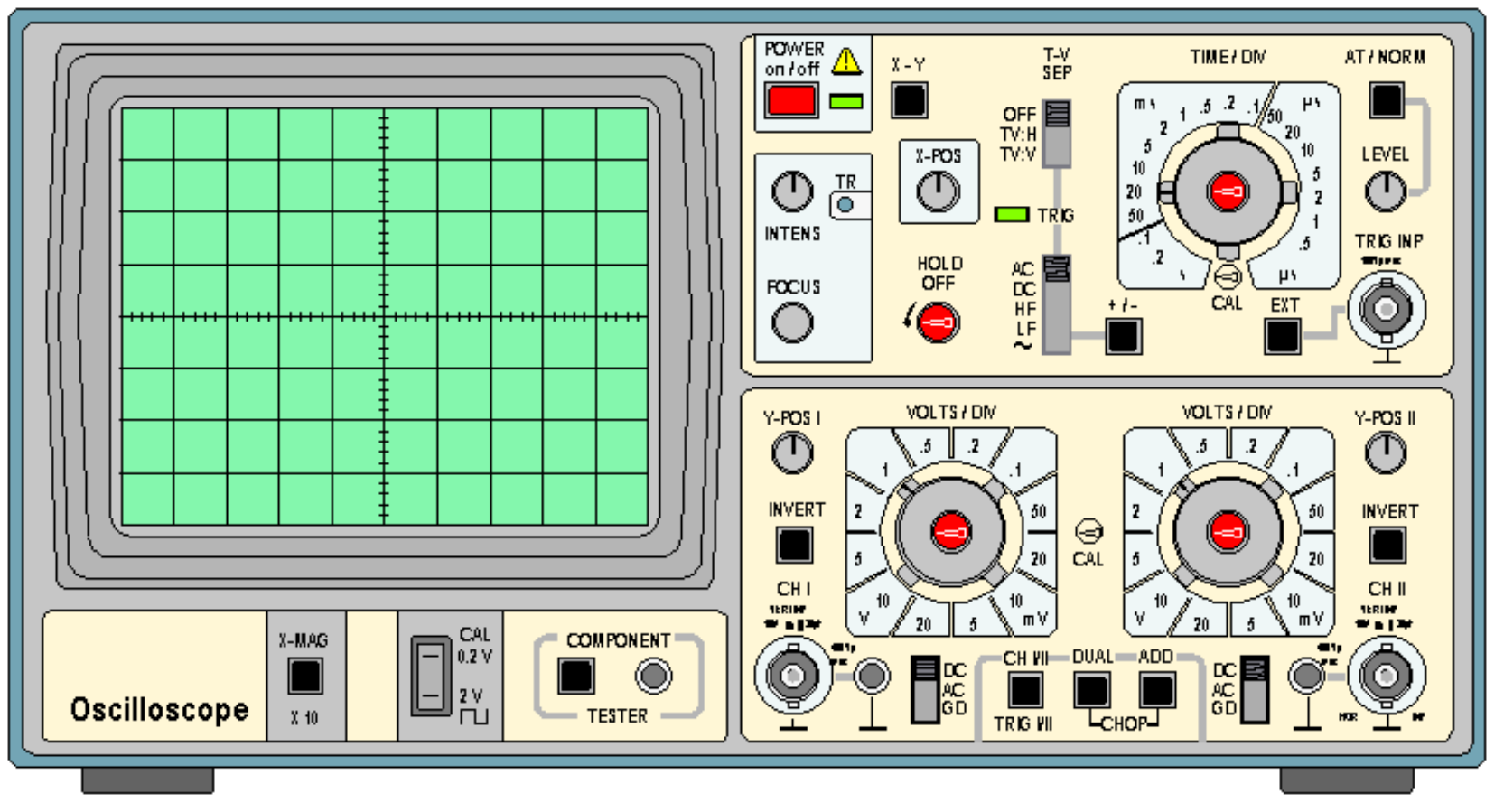


Internal Circuitry of a CRO



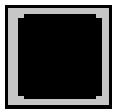
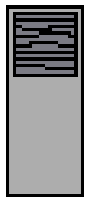
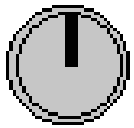
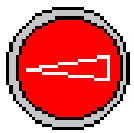
Front Panel Controls of a CRO

- Screen has 8 div on Y-axis, 10-div on X-axis with each div being 1 cm square



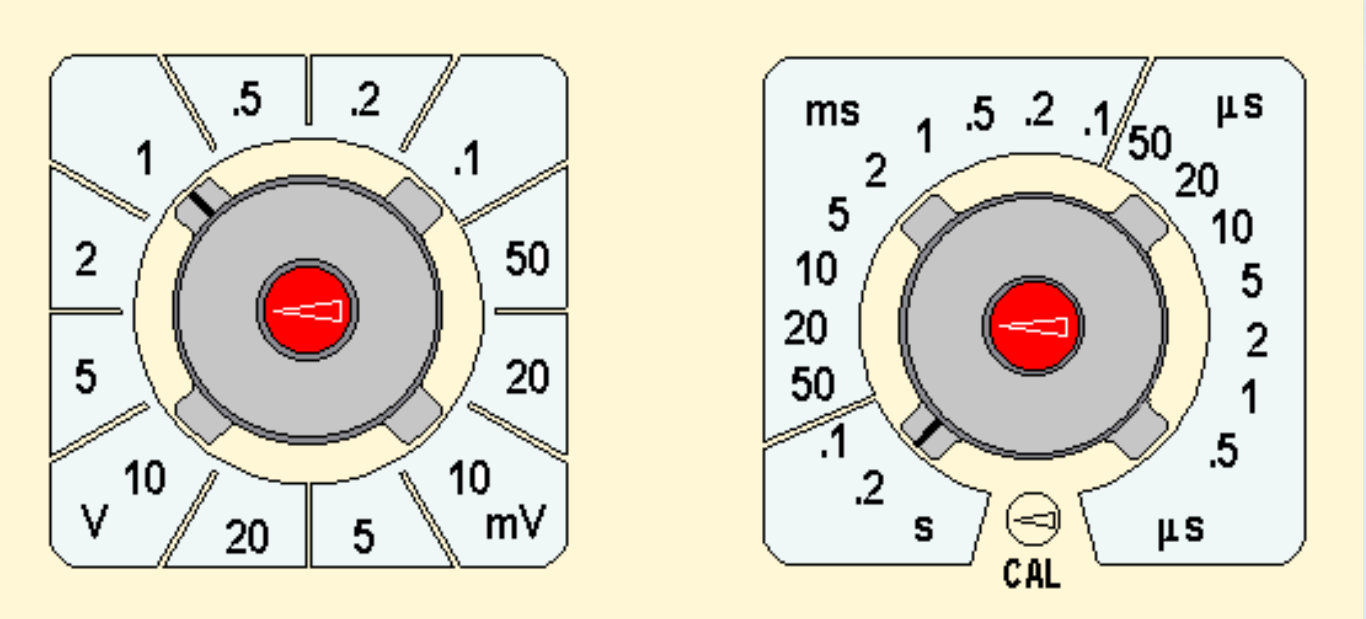
Setting up

- Check all controls & put them in these positions

push button switches		OUT
slide switches		UP
rotating controls		CENTRED
calibration controls		CAL position

Setting up Contd.

- Set both VOLTS/DIV control to 1V/DIV and TIME/DIV control to 0.2 s/DIV



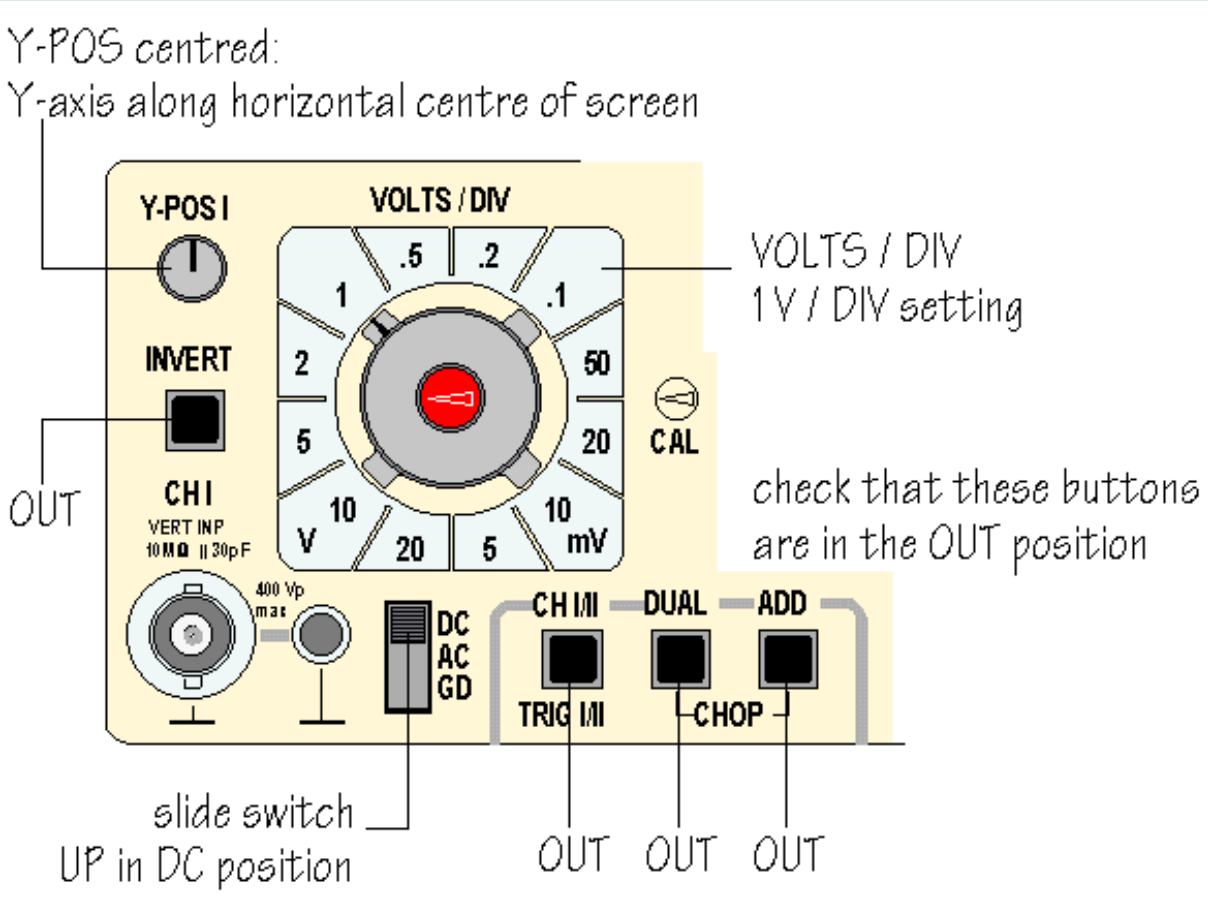
- Now switch ON the power button; green LED glows; you will see a 'trace' small bright spot moving slowly across the screen

Y-Position & Timebase Control

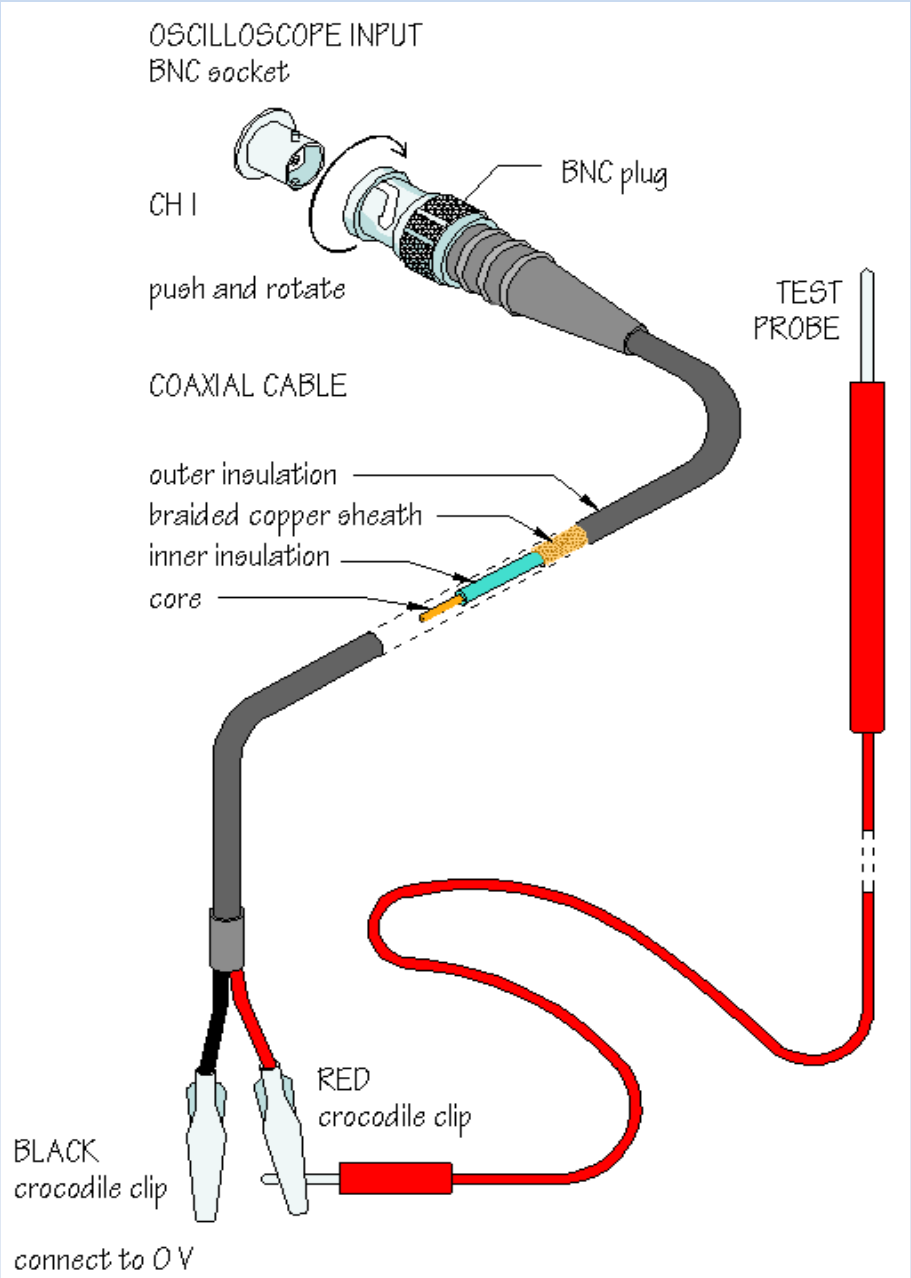
- Locate Y-POS 1 control, adjust trace to move horizontally across the screen
- With 10 div horizontally across the screen and TIME/DIV set to 0.2 s/DIV; trace would be taking 0.2 x 10 = 2 s to cross the screen
- On rotating TIME/DIV clockwise, the trace starts moving faster and around 10 ms/DIV it appears as continuous bright line due to **persistence** of vision

VOLT/DIV Control

- It determines the vertical scale of graph draw on the CRO screen



Connector


OSCILLOSCOPE INPUT
BNC socket
CH I
push and rotate
BNC plug
TEST
PROBE
COAXIAL CABLE
outer insulation
braided copper sheath
inner insulation
core
RED
crocodile clip
BLACK
crocodile clip
connect to 0 V

Checking the Calibration of CRO

- Insert a BNC plug to input of channel 1 and connect the clip at other end as shown