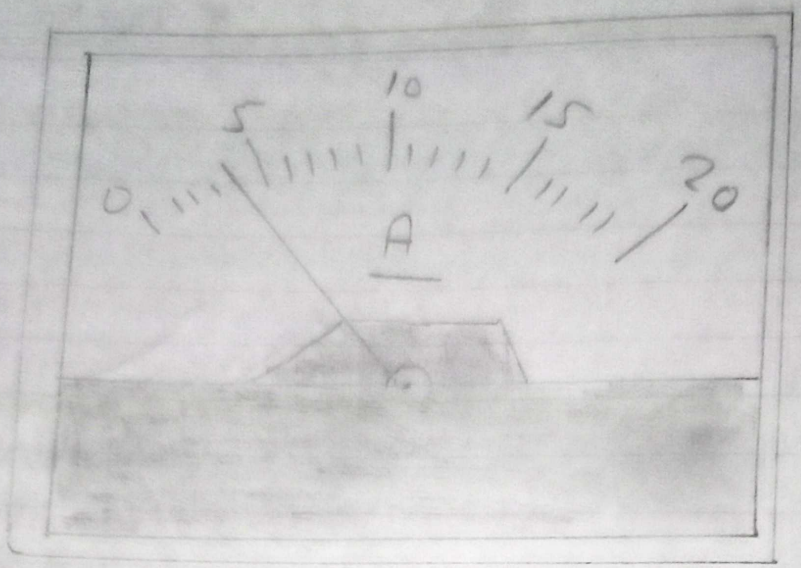
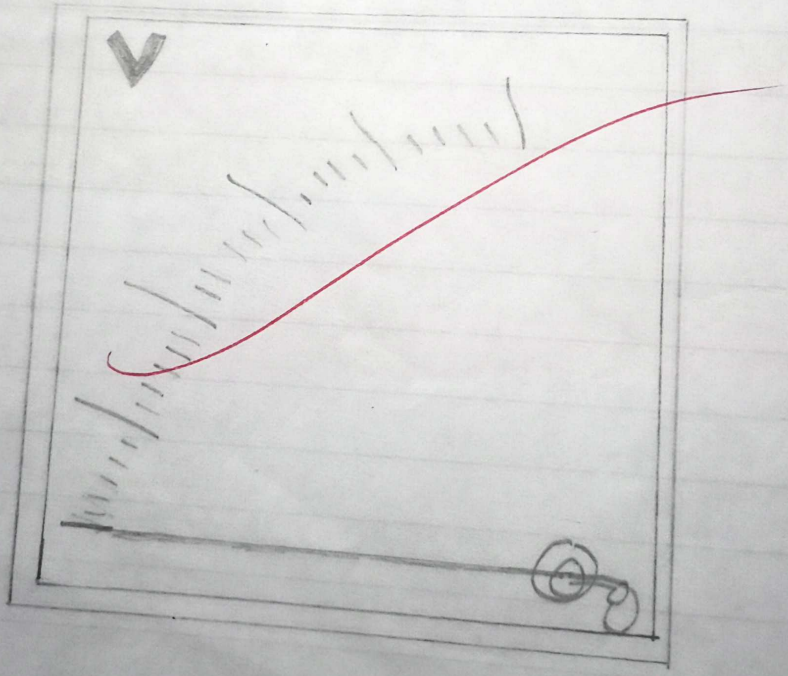


Analog Ammeter



Analog voltmeter

Date

Expt. No. 1 Page No. 1

Experiment no. 1

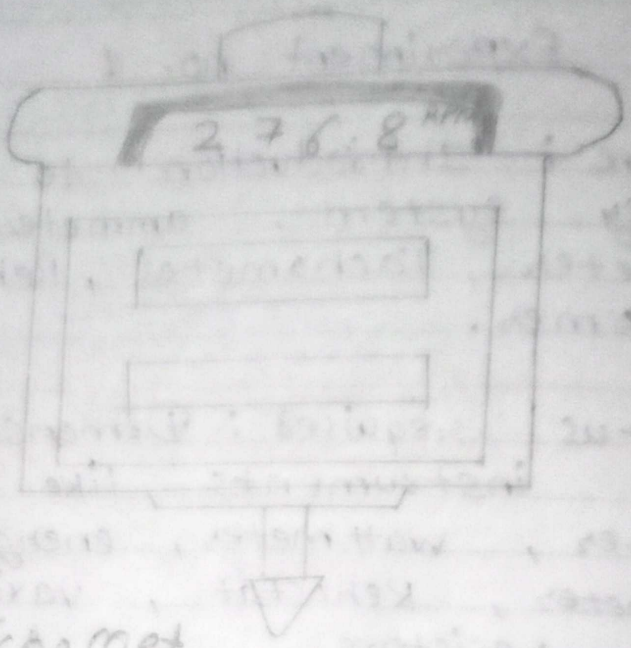
- Objective : Introduction to various Supply System, ammeter, Voltmeter, wattmeter, Tachometer, Rehostat, Transformer.

- Apparatus required : Demonstration of various instruments like ammeter, voltmeter, wattmeter, energy meter, Techometer, Rehostat, various capicator, various resistors, AC & DC power supply.

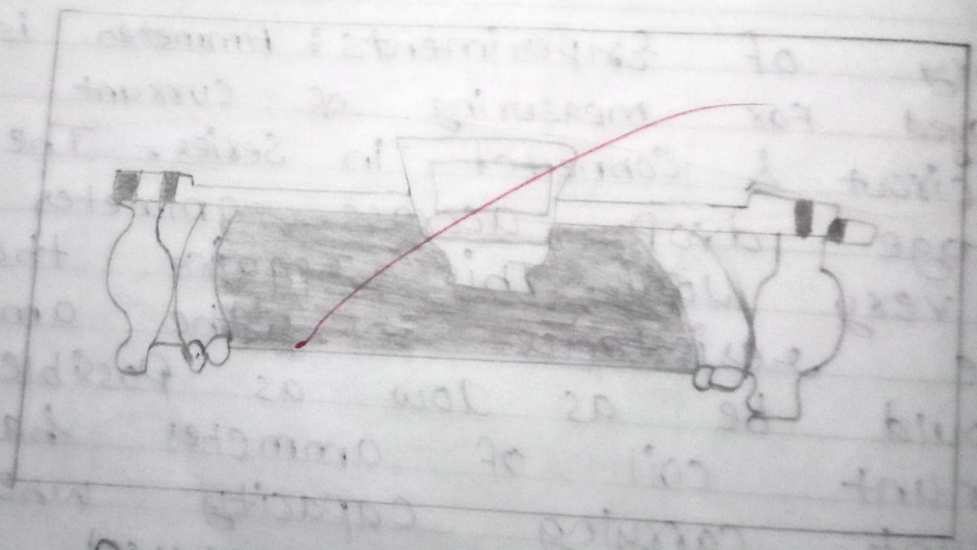
- Theory of Experiments : Ammeter is employed For measuring of current in a circuit & connected in Series. The voltage drop accross ammeter Terminal is very low. This require that the resistance OF the ammeter should be as low as possible. The current coil of ammetes has low current carrying capacity whereas the current to be measured may be quite high. So For protecting the equipment a low resistance is connected in parralel to the current

Teacher's Signature:

WRITO-LINE



Tachometer



Rheostates

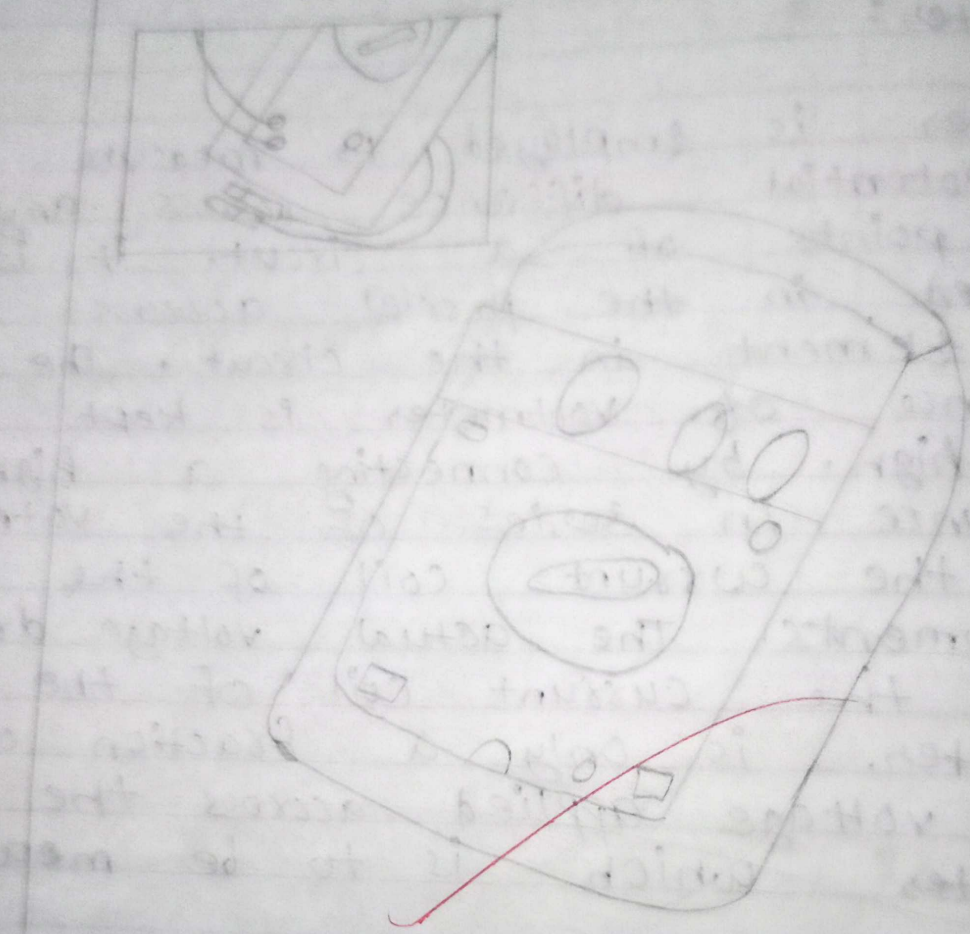
Coil & it is known as Shunt.

- Voltmeter:

Voltmeter is employed to measure the potential diffrence accross any two points of a circut. it is connected in the parrlel accross any element in the circut. The resistance of voltmeter is kept very high. by connecting a high resistance in series of the voltmeter with the currunt coil of the instruments. The actual voltage drop across the currunt coil of the voltmeter is only a fraction of total voltage applied accross the voltmeter which is to be measured.

- Tachometer: Tachometer is an instrument to measure the speed in (revolutions per minute) rpm. The speed of a rotating shaft is measured by intresting the tapered tachometer projected part of the hole in the rotating shaft inserting into the tapered

Teacher's Signature:



Multimeter

Speed of which is to be measured.

- Rheostat :

Rheostat are made up of high resisti-vity material, like nickel, chromium iron alloy closely wound over a circular tube. These are available both in Single tube & double tube. inter turn insulation is provided to avoid short circuting of turns. the tube of rheostat is made of insulating material, like asbestos. These are employed at places where resistance of a circuit is to be varied without breaking the circuit.

- various Supply System :

a) Ac supply system -

These are two types of Supply wire line In case the Fourth wire is there it is nutural while voltage b/w two phases lines is 400 v, b/w any Phase line & netusal it is 230 v.

Teacher's Signature:

Date

Expt. No. Page No. 4

b) DC Supply System:

There are two types of DC Supply System.

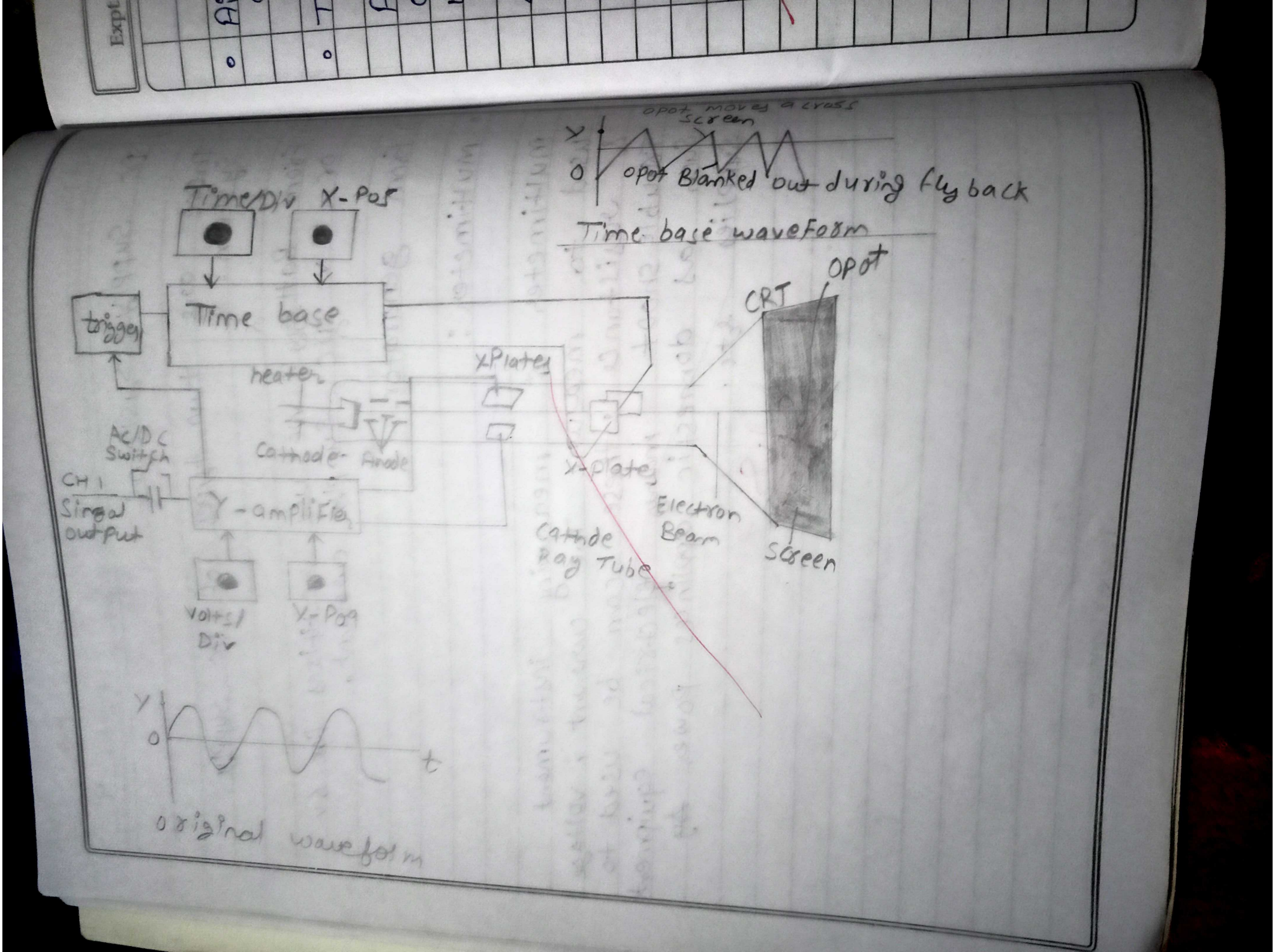
(i) From Battery: we use rectifires for 6v or 12 v DC Supply currunt.

(ii) From genarator.

o Multimeter:

Multimeter is measuring instrument used to measure the currunt, voltage & resistance. these can be used to Trouble shoot many electrical equipments such as domestic applinces power supplies etc.

Teacher's Signature:


Time/Div
X-Pos
trigger
Time base
heater
Cathode
Anode
xPlates
yPlates
AC/DC Switch
CH 1 Signal output
Y-amplifier
Volts/Div
Y-Pos
CRT
Opot
Electron Beam
Screen
Cathode Ray Tube
Y
0
t
original waveform
opot moves across screen
opot Blanked out during fly back
Time base waveform

Expt. No. 2 Date

Page No. 5

Experiment no. 2

- Aim :- Study of CRO & Frequency Generator.

- Theory :-

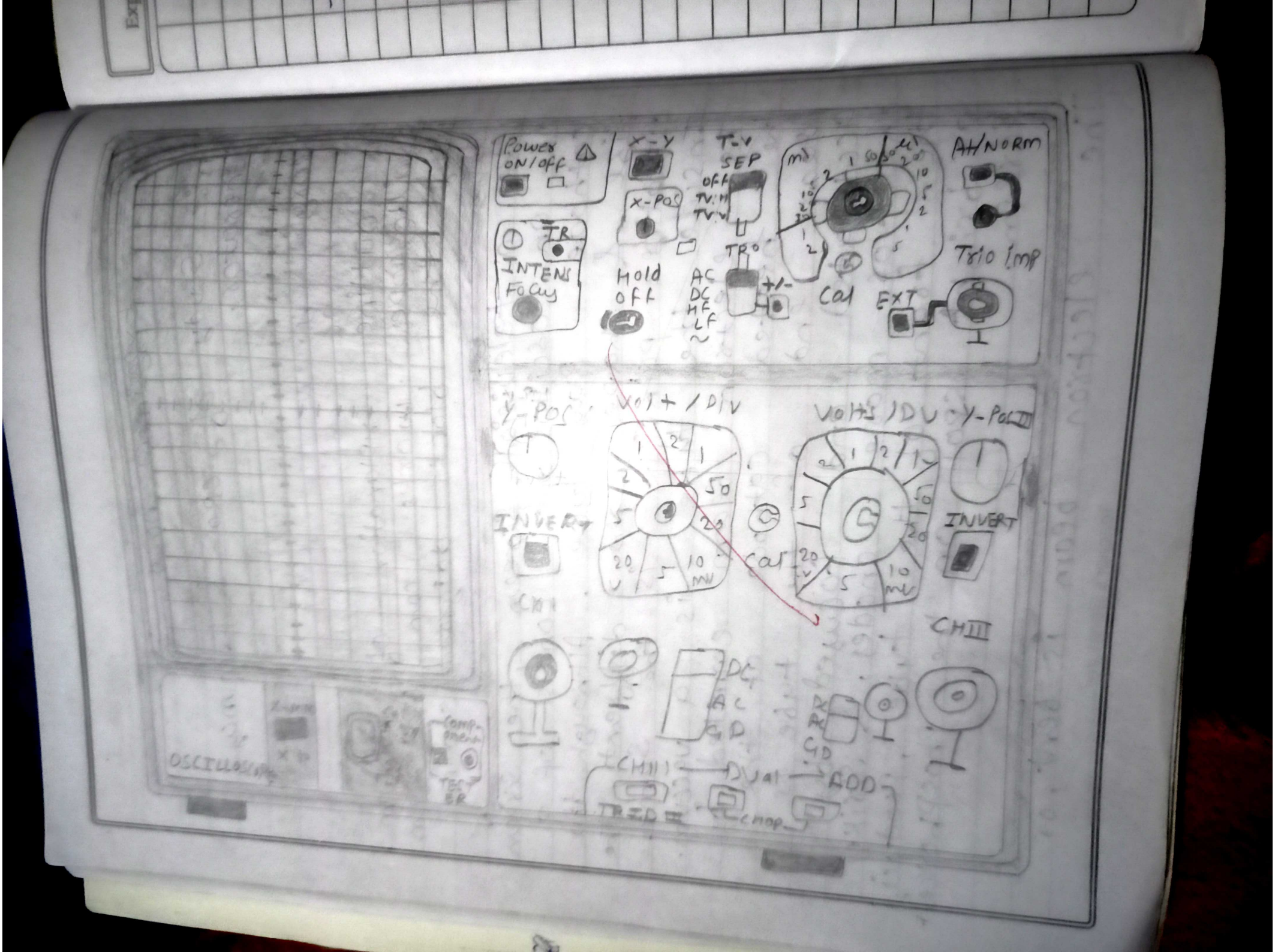
An outline explanation of how an oscilloscope works can be given using the block daigram shown.

Like a television screen, the screen of an oscilloscope consist of a cathode Ray tube. Although the size & shape are different, the operating principle is the same. Inside the tube is a vaccum. The electron beam emmited by the heated cathode at the rear end of the tube is accelerated and focused by one or more anodes, & strikes the front of the tube, producing a bright spot on the phosphorecent screen.

The electron beam is bent, or

WRITO-LINE

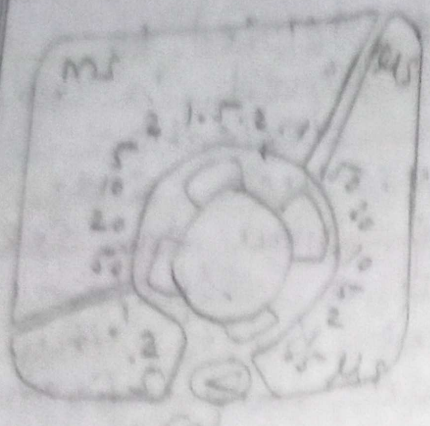
Teacher's Signature:

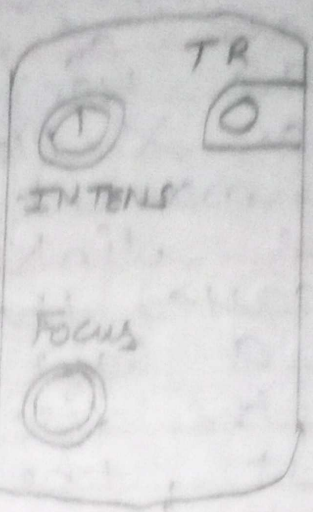

POWER ON/OFF
X-Y
T-V SEP
X-POS
TR
INTENS
FOCUS
Hold OFF
AC DC HF LF
+/-
Cal
EXT
AT/NORM
Trig Imp
Y-POS
VOLTS/DIV
INVERT
CH I
CH II
CH III
DUAL
ADD
CHOP
OSCILLOSCOPE

deflected, by voltages applied to two sets of plates fixed in the tube. The Horizontal deflection plates or X-Plates produce side to side moment. As you can see, they are linked to a system block called the time base, this produce a saw thoot waveform. During the rise phase of the saw thoot, the spot is driven at a uniform rate from left to right accross the Front of the screen. During the Falling phase, the electron beam return rapidly From right to left, but the spot is 'blanked out' so that nothing appears on the screen. In this way, The time base generates the X-axis of the V/t graph.

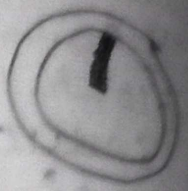
The slope of rising phase varies with the Frequency of the saw thoot & can be adjusted, using the time/DIV control, to change the Scale of the X-axis. Dividing the OSCILLOSCOPE screen into Squares

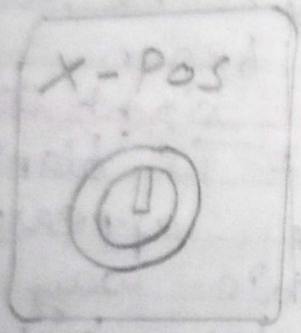
Teacher's Signature:



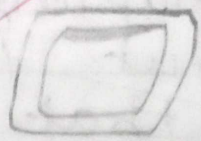


Y-POS





INVERT

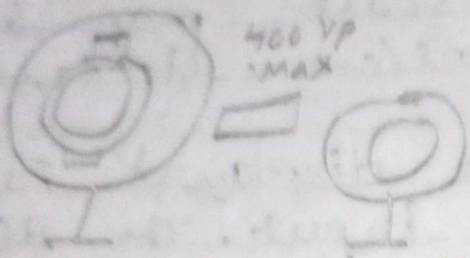


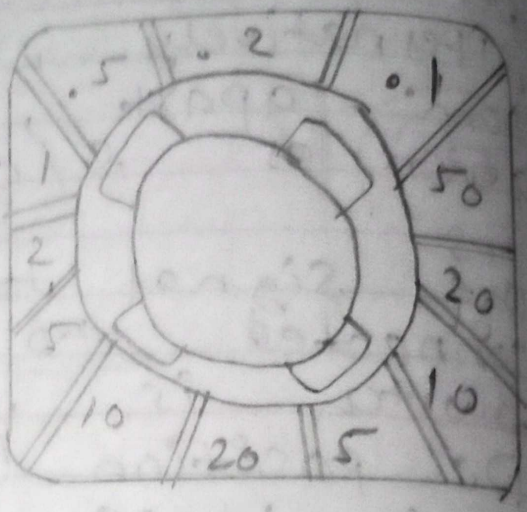
allows the horizontal scale of the x axis. Dividing Expressed in seconds, miliseconds or micro seconds per division (s/div, ms/div, ms/div). Alternatively, if the squares are 1cm apart, the scale may be given as s/cm, ms/cm, µs/cm

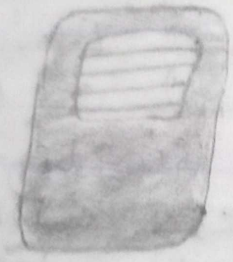
The signal to be displayed is connected to the input. The AC/DC switch is usually kept in the DC position (switch closed) so that these is a direct connection to the Y-amplifier. In AC Position (switch open) a capicator is placed in the single path. The capicator blocks DC signals but allows AC signals to pass.

The Y-amplifier is linked in turn to a pair of Y-plates so that the resulting display is neither too small nor too large, but fits the screen & can be seen clearly. The vertical scale is usually given in V/DIV or m V/DIV.

Teacher's Signature:







Voltage divisions ; Channels , Ac , DC & GND Knobs

Date

Expt. No. Page No. 8

The trigger circut is used to delay the time base waveform so that the same section of the input signal is displayed on the screen each time the spot moves across. the effect of this is to give a stable picture on the oscilloscope screen, making it easier to measure & interpret the signal.

changing the scales of the X-axis & Y axis allows many different signals to be displayed. Sometimes, it is also useful to be able to change the positions of the axes. this is possible using the X-Pos & Y-Pos controls. For Example, with no signal applied, The normal trace is a straight line accross the center of the screen. Adjusting Y-Pos allows the zero level on the Y-axis to be changed moving the whole trace up or down on the screen to give an effective display of signals like pulse waveforms

Teacher's Signature:

WRITO-LINE

which do not alternate b/w positive & negative values.

- on/off Switch :- Pushed into Switch the oscilloscope on the green LED illuminates.

X-Y Control :- Normally in the out positions.

When the X-Y button is pressed IN, the oscilloscope does not display a V/t graph instead, the vertical axis is controlled by the input signal via CH II. This allows the oscilloscope to be used to display a V/V voltage/ voltage graph.

The X-Y control is used when you want to display component characteristic curves, or Lissajous figures.

Tv - sepration : oscilloscope are often used to investigate wave form inside

Teacher's Signature:

television system. this control Allows the display to be synchronized with the television system but so that the signals from different points can be compared.

Time/Div: Allows the Horizontal scale of the V/t graph to be changed.

With more Exprience of using the oscilloscope, you will develop a clear understanding of the functions of the important triggers controls & be able to use them effectively.

- Intensity & focus :- Adjusting the intensity control changes the brightness of the oscilloscope display. The focus should be set to produce a bright clear trace.

If required, TR can be adjusted using a small screwdriver so that the oscilloscope trace is exactly Horizontal when no signal is connected.

Teacher's Signature:

Date

Expt. No. Page No. 11

- X-Pos: Allows the whole V/t graph to be moved from side to side on oscilloscope screen.

This is useful when you want to use the grid in front of the screen to make measurements, for examples, To measure the period of a waveform.

- Y-Pos I and Y-Pos II: These controls allows the corresponding trace to be moved up or down, changing the position representing 0 V on the oscilloscope screen.

To investigate an alternating signal, you adjust Y-Pos so that the 0V level is close to the centere of the screen. for a pulse waveform, it is more useful to have 0-V close to the bottom of the screen. X-Pos I & Y-Pos II allows the 0V levels of the two traces to be adjusted independently.

- Invest: When the invert button is

Teacher's Signature:

WRITO-LINE

is pressed IN, the corresponding signal is turned upside down, or inverted, on the oscilloscope screen. This features is sometimes useful when comparing signals.

- CH I & CH II inputs: Signals are connected to the BNC input sockets using BNC Plugs. The smaller sockets next to the BNC input socket provides an additional 0V, ground or earth connection.

- Volts / Div: Adjust the vertical scale of the V/t graph. The vertical scales for CH I & CH II can be adjusted independently.

- DC / AC / GND Switches: In The DC Positions, the signal input is connected directly to the Y-amplifier of the corresponding channel, CH I or CH II. In the AC position A capacitor is connected into the signal path way so that dc voltage are blocked & only changing AC

Teacher's Signature:

Signals are displayed.

in the GND position, the input of the Y-amplifier is connected to 0 V. this allows you to check the position of 0V on the oscilloscope screen. The dc position of these switches is correct for most signals.

- Trace selection Switches:

The settings of these switches control which traces appear on the oscilloscope screen.

Date

Expt. No. 3 Page No. 14

- Aim: Measure the frequency, voltage, current with help of CRO.
- Study Analog / Digital multi-meters & Function / Signal generator:-
- Theory:-

Cathode Ray oscilloscope:- The cathode Ray oscilloscope is probably the most versatile tool for the development of electronic circuits & systems, & has been one of the most important tools in the development of morden Electronics. The cathode ray oscilloscope is device that allows the amplitude of Electrical Signals, weather they be voltage, current, power etc. to be displayed primary as function of time. The oscilloscope depends on the movement of an Electron beam, which is then made visible. allowing the beam to impinge on a phosphor surface, which produces a visible spot. if the electron beam is deflected in either of two orthogonal axes, such as familias X & Y-axes

Teacher's Signature:

WRITO-LINE

used in conventional graph construction, The luminous spot can be used to create two dimensional displays. Typically, The x axis of oscilloscope is deflected at constant rate, relative to time, & the vertical of y-axis is deflected in response to an inputs stimulus such as a voltage. It produces the time dependent variation of input voltage which is very important to design development of electronic circuits.

⇒ Cathode Ray tube :-

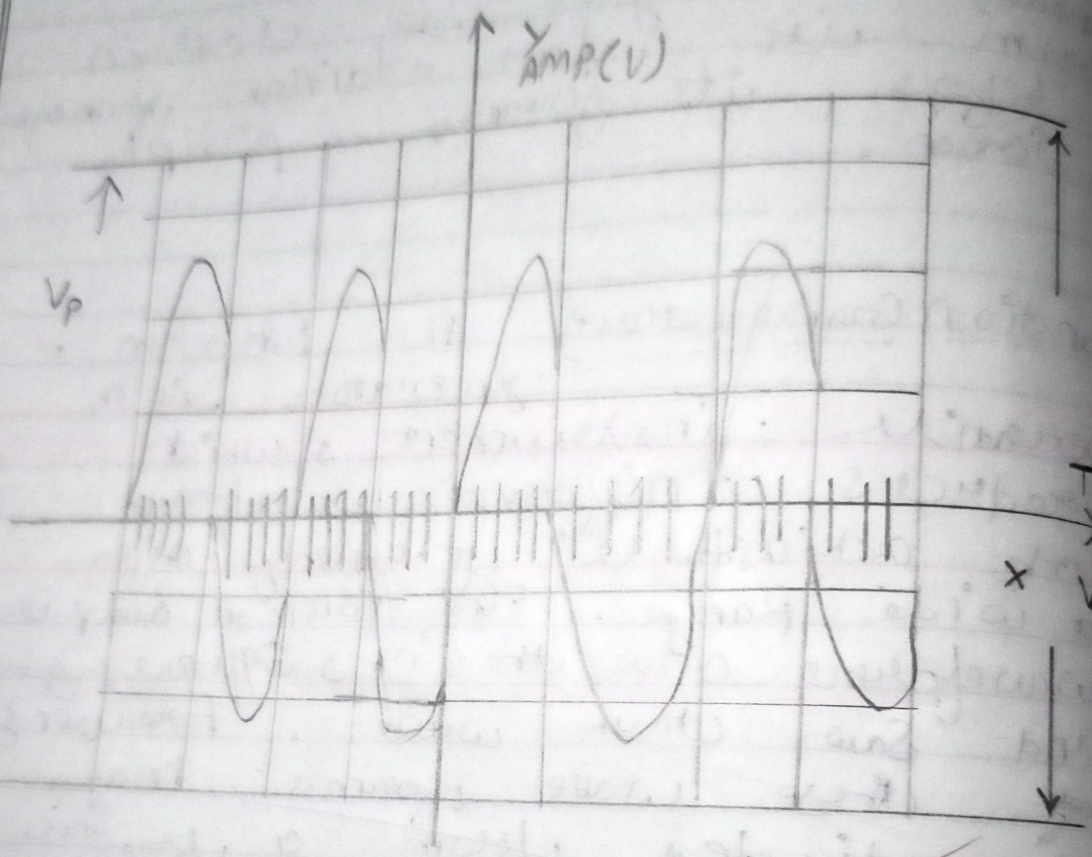
A heated emits electron, which accelerated to the first accelerating anode, or pre accelerating anode, through a small hole in the control grid. The amount of cathode current which governs intensity of spot, can be positive or so that electron beam will be accelerated in the electric field A focusing anode is mounted just ahead of the preaccelerating anode and a cylinder. following the focusing anode is the accelerating

anodes which gives the electron beam its last addition of energy before its journey to phosphor screen.

- Function Generator: A function generator is a versatile instrument which produces different waveforms of adjustable frequency over a wide Range. The common output waveforms are the sine, Square, triangle and Saw tooth waves. Frequency of these wave forms may be adjusted from a fraction of Hertz to several Hertz. The various output of generator can be made available at same time, for example generator can provide a Square wave to test the linearity of amplifier and simultaneously provide a saw tooth to drive Horizontal deflection amplifier of CRO to provide display

Teacher's Signature:

Modn waveforms



Sinosodual waveform

Expt.

S.No.

1.

2.

3.

B.

1.

2

3

Date

Expt. No. Page No. 17

observation :-

S.No.	No. of vertical divisions (X)	Voltage/Division (Y)	V_{p-p} = X * Y	$V_m = V_{p-p}/2$
1.	8	20 mv	16 mv	80 mv
2.	10	20 mv	20 mv	100 mv
3.	8	20 mv	16 mv	80 mv

B. Measurement of frequency

Procedure:

1. Make the connection as per the daigram shown above.
2. Put the CRO on a Sigle channel mode & brig the CRO into opreation by adjusting the trace of the beam to a normal brightness & into a thin line.
3. Now apply the Sinosodial wave form of different frequncies by using the level

Teacher's Signature:

WRITO-LINE

Date

Expt. No. Page No. 18

& COARSE buttons of the function generator.

4. Note down the Horizontal scale Period (T) in second by observing difference between the two successive Peaks of the waveform.

⇒ Observation :-

S.No.	No. of Horizontal Division (X)	Time/Division (Y)	T = X*Y	F = 1/T
1.	19 ms	2 ms	38 ms	26.3 Hz
2.	22 ms	2 ms	44 ms	22.7 Hz
3.	19 ms	2 ms	38 ms	26.3 Hz

Teacher's Signature:

WRITO-LINE

Expt. No. 4 Date

Page No. 17

Aim: Assemble house wiring including earthing For 1 Phase energy meter, MCB, ceiling Fan, tubelight, three pin socket & a lamp operated from two diff. positions. Basic functional study of components used in house wiring.

- Apparatus required:-

S.No.	Name of equipment	Range	QTY.
1.	Tubelight	1-ϕ, 230V, 50Hz, 40watt	01
2.	celling Fan	1-ϕ, 230V, 50Hz, 80watt	01
3.	one way Switch	1-ϕ, 230V, 50Hz	03
4.	MCB	230V, 50Hz, 10Amp	02
5.	Two way Switch	1-ϕ, 230V, 50Hz	02
6.	wire (P.V.C)	40 BSWG, .012 inch	10 mtrs
7.	Three pin Socket	1-ϕ, 230V, 50Hz, 5A	01

Teacher's Signature:

WRITO-LINE

Date

Expt. No. Page No. 20

Theory:

(a) House wiring: In this circuit three Switch, one tubelight, one three pin socket, & one Fan along with Fan regulator are required The circuit daigram For this wiring as shown in the figure where the neutral is connected to one terminal of the tube light switch S_1, Three pin socket Switch S_2 & Fan Switch S_3.

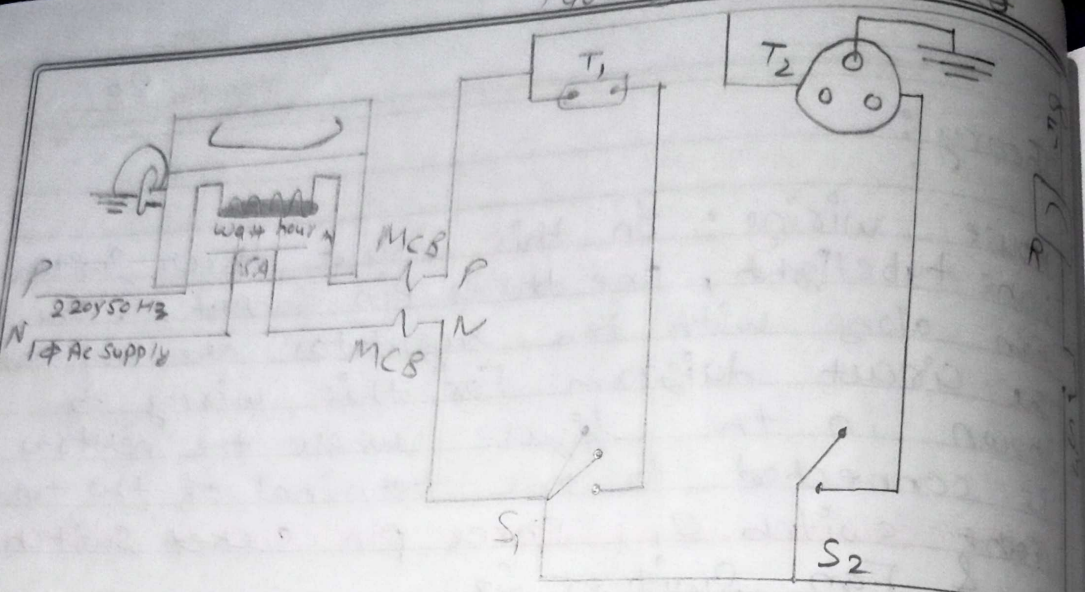
Phase point of the supply is connected to the each ~~three~~ Terminal of the tube light, three pin Socket & fan. the other terminals of tubelight & three pin socket are connected to Switch S_1 & S_2 & the other terminal of fan F_1 is connected to Switch S_3 through Fan regulator R.

(b) Staircase wiring ~~circuit~~ circuit: Stair case wiring or lamp circuit Controlled by two Switches. for the lamp to by controlled by two switches it is necessary to use two way switch. the wiring daigram is shown in ST_1 & ST_2 are two way Switches. the wiring daigram is shown

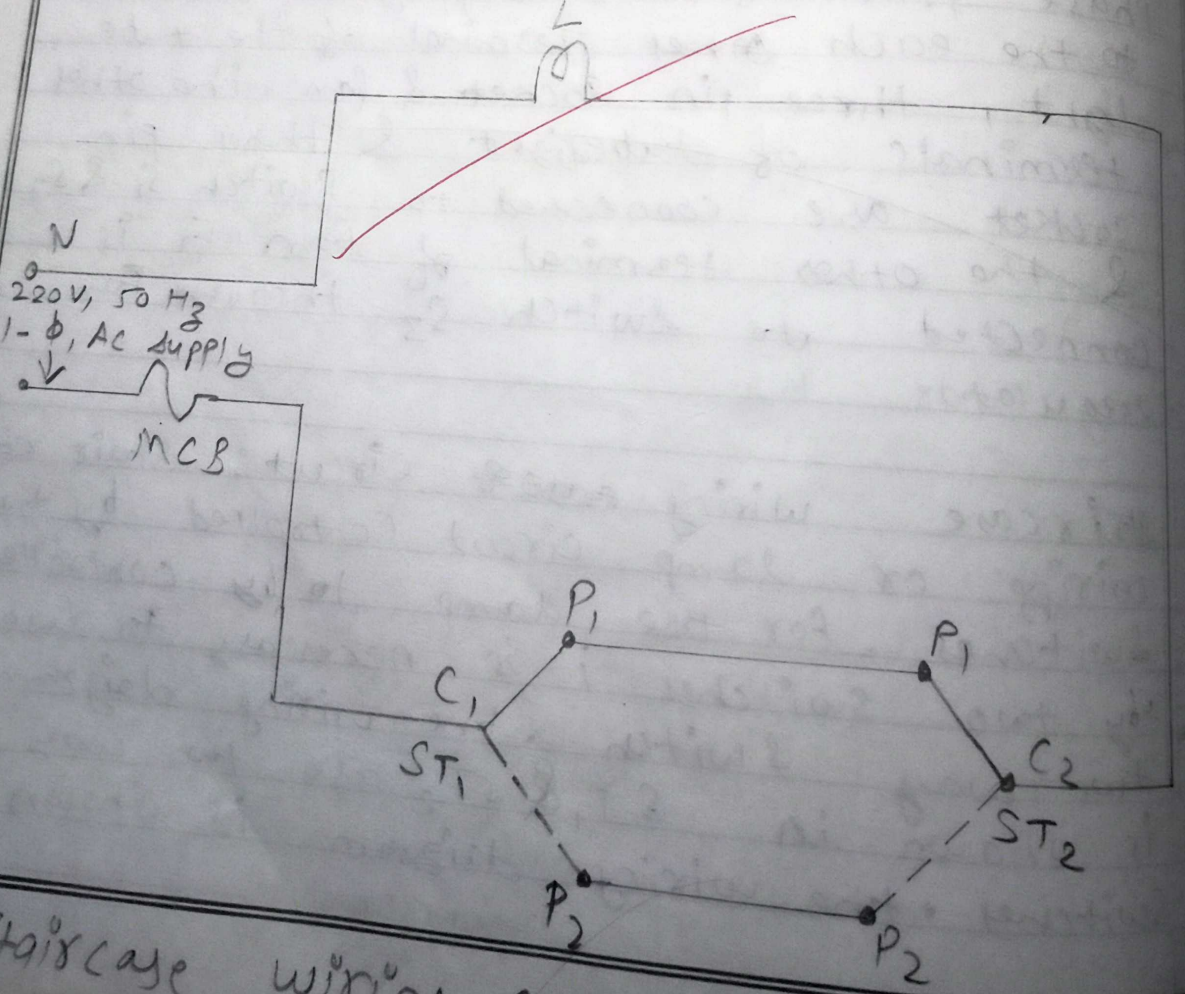
Teacher's Signature:

WRITO-LINE

Tube light 3 Pin Socket



House wiring CKT Diagram



Staircase wiring CKT System

Date

Expt. No. Page No. 21

L is Lamp, C_1 of ST_1 is connected to phase P & C_2 of ST2 is connected to one of the terminals of lamp L, The other terminal is connected is connected to natural N. terminals P_1 of ST_1 & ST_2 are connected as shown.

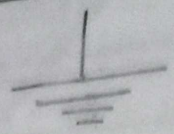
The lamp can be controlled from both the position of the switches ST_1 & ST_2 eg: if C_1P_1 of ST_1 are in contact & C_2P_1 of ST_2 are also in contact, then bulb get supply & it glows. Now if any of the combination of ST_1 or ST_2 are disturbed lamp will switch off.
Similarly when C_1P_2 are in contact then bulb can glow if C_2P_2 are also connected. Any of the combination is if disturbed, bulb again switches off.

- Precautions :-

(i) The Phase & neutral of the circuit should not directly come in contact it will result in to short circuit.
(ii) connection should be tight & insulated.
(iii) Terminals of regulator should be properly connected to avoid any hazards.

Teacher's Signature:

WRITO-LINE

Earthing 

Electric Bell 

Ceiling Rose 

Expt. No. Date

Page No. 22

- main components used in House wiring:

1. Switch: A Switch is used to make or break an electric circuit. The Switch so should break the current without Formation of an arc b/w the Switch blades & Contact terminals. A Switch must have a strong base & high insulation resistance.

2. wall sockets: They are used to contact the appliances with the electric supply. they are two types: (1) 2 Pin sockets (2) 3- Pin sockets. They are both 5 Amp and 15 amp current rating with 230 volt working voltage are used.

3. Plugs: For taping power from socket outlets 2 Pin or 3 pin Plugs with 5 Amp or 15 Amp. current rating 230 V working Voltages are used.

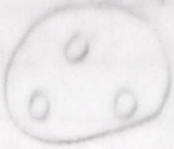
4. one way Switch: Switch, which is used For to make or break of light load circuit or controlled one point by one one Switches.

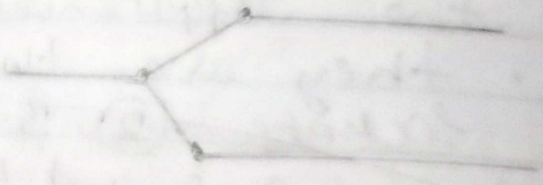
Teacher's Signature:

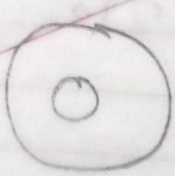
Switch 

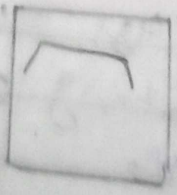
Socket outlet (S. A) 

Two pin plug 

Three pin plug 

Two way Switch 

Push button Switch 

Fan regulator 

Fuse 

Fan 

5. two way Switches: Switch, which is used for Stair case wiring For Controlling one point by two switches.

6. Push Button Switches: It consist of one blade, which is given a rocking motion by a push button. Its movements are normally used to control lighting circuit or bell switch.

7. Fan Regulator: It is normally used to control the speed of electric fan. we can say this as a selector switch.

8. Fuse: A fuse is a short peice of metal inserted in series with the circuit. which melt when excessive current flows through it and thus break the circuit. the material used for fuse element should pass the following properties

(i) Low melting point.
(ii) High conductivity or low repecef itivity.
(iii) Free from oxidation.

Teacher's Signature:

9. Fan: Fan is a device, which circuted air surrounding the medium. It is simply a permanent single phase induction motor. Capacitor is parmanentley connected in series with startid winding.

10. Earthing: the process of connecting metallic bodies of all the electrical appartus and equipment to the huge mass of earth by a wire having negligible resistance when a body is earthed, it is basically connected to the huge mass of earth wire having nagligible resistance Thus, the body is earthed, it is basically Connected to the huge mass of earth wire heaving negligible. resistance. Thus, the body attains zero potential of earth. thus engineers that whenever a live conductor comes in contacted with the other body, the charged is realesed to the earth immediatley.

11. Electric Bell: A bell activated by the magnetic effective of an electric current.

12. Ceiling Rose: it is basically use to control a single light fiting.

Teacher's Signature: