= =

Experiment No 01

= =

TITLE –WIRING EXERCISES

OBJECTIVES:

a) To study various wiring components (such as wires, fuses, plugs, sockets, lamp holders etc.), their uses and ratings.

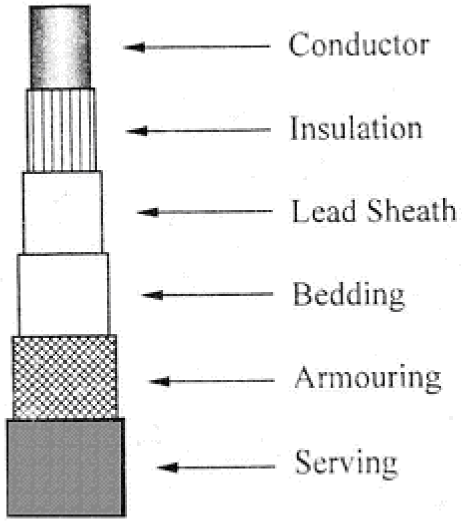
b) To study the control of two lamps from two switches (looping in system**)**

c) To study the staircase wiring

d) To study the use of megger for insulation test and continuity test of wiring installations and machines

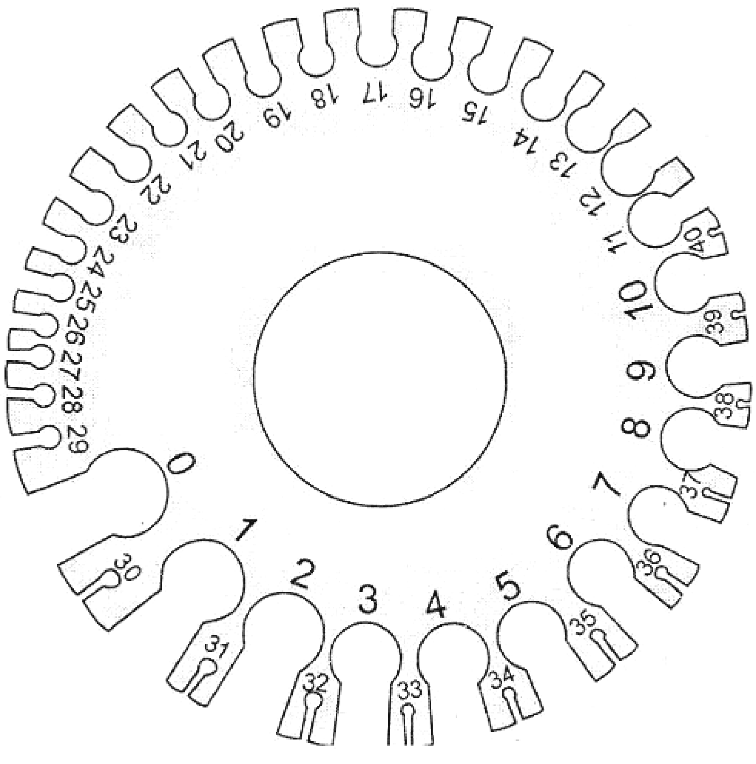
PREREQUISITE:

1. Students should know alternating current and direct current supply
2. Student should have basic knowledge about different types of conductors, resistance, different types of insulating materials



General construction of the underground cable

Fig 1.1



Standard wire gauge

Fig 1.2

Experiment No 1A

TITLE – STUDY OF WIRING COMPONENTS

I. Types of Wires

Various types of wires are used for electrical wiring. The commonly used types are

a) **V.I.R**. (Vulcanized India Rubber) wires: these types of wires consist of a tinned conductor coated with rubber insulation. The thickness of rubber varies with the voltage for which the wire is designed i.e., 250 or 660 volts. This rubber insulation is not moisture or heatproof.
b) **C.T.S.** (Cable Type Sheathed) wires: In this type, ordinary insulated conductors are provided with an additional tough rubber sheath .This also provides a protection against moisture, chemical fumes and tear.
c) **P.V.C** (Poly vinyl chloride): These are the most commonly used wires. These have conductors with P.V.C insulation. PVC is non- – hygroscopic. However, PVC softens at high temperature and hence is not used where extremes of temperature occur e.g. in heating appliances.
d) **Cables:** These consist of individually insulated conductors which are put together inside a protective mechanical covering. There are two types of cables used.
i) Aerial cables.
ii) Underground cables.

The construction of cable is as follows- (Refer figure No.1.1)

Conductor or Core: Each cable has one central core or a number of cores (2, 3, 3 1/2 or 4) which are normally made up of tinned copper or aluminum conductor. Stranding gives flexibility to the cable.

Insulation: Commonly used insulating materials are varnished cambric, vulcanized bitumen or impregnated paper. Impregnated paper is invariably used for higher voltage cable.

Metallic Sheath: Usually, a lead alloy or aluminum sheath is provided over the insulation for providing mechanical protection and preventing entry of moisture in the insulation, which impairs its insulation property.

Bedding: The bedding consists of a layer of fibrous material like jute or sometime a tape of strong coarse cloth of jute. It protects the metallic sheath against corrosion and from mechanical injury due to armouring.

Armouring: This layer usually consists of one or two layers of galvanized steel wire or steel tape and is provided to protect the cable from mechanical injury while laying it during the course of its use.

Serving: A layer of fibrous material like jute cloth is provided over the armouring to protect it from atmospheric condition. This layer is known as serving.

II Designation of Wires

a) **Type of Conductors**: Copper & aluminum conductors are commonly used. b) **Type of Wires:** Already discussed.

c) **Size of Wires:** As current flows through the wire, heat proportional to the square of the current is produced. This heat governs the current carrying capacity of the conductor, for a given size. (Refer figure 1.2)

Instead of referring to the wire size in terms of cross – sectional areas, the gauge number designates them. The British standard wire gauge is commonly used in India. The smallest wire gauge is of No.40 having a diameter of 0.1219 mm. The largest number of wire is 0,000,000 (named as seven zero) or written as 7/0, having a diameter of 127000mm. Thus, it will be observed that the higher the number of wire gauge, the smaller is the diameter.

The wire used for ordinary house wiring purposes have single solid conductor, whereas, wire with higher capacity or flexible wire have stranded conductors for flexibility. Therefore the number of strands and their gauge number specify the size of the wire. For example, a wire of '1/18' size will have a single solid conductor of 18 SWG, whereas, a wire of '3/20' size will have three stands of 20SWG.

d) **Number of Cores**: wire (cables) when used for some specific application may have single, 2, 3, $31^{/2}$ or 4 core.

e) **Voltage Grading:** It is the voltage to which the insulation of wire can safely withstand. Wires are normally graded for 250 V or 660 V.

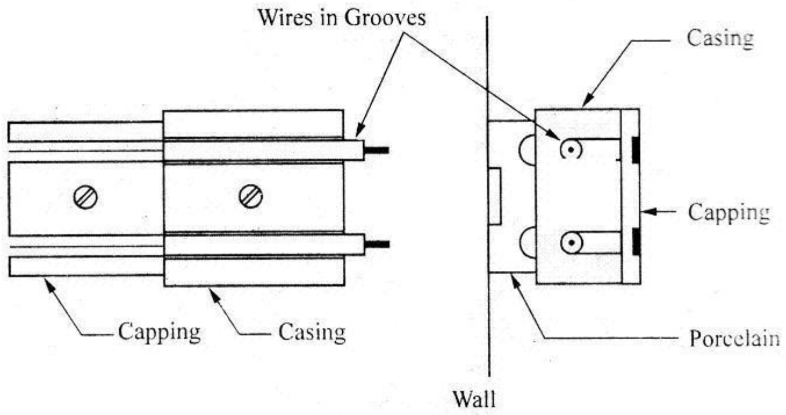
III. Various Systems of Wiring

Several systems of wiring are in use. However the choice of the particular type of wiring will be decided by the following factors.

a) Durability b) Safety
c) Appearance d) Accessibility e) Maintenance f) Cost

The following systems of wiring are commonly used in actual practice.

a) Wooden Casing & Capping Wiring: Casing is a rectangular strip made from seasoned teakwood and usually has two or three grooves. It is fixed with countersunk wood screws using rawl – plug or wooden plugs (gutties) on wall or ceiling. (Refer figure 1.3)



Casing - capping wiring

Fig 1.3

Porcelain round cleats are used to keep the casing away from the wall or ceiling in order to protect it from dampness. The V.I.R or P.V.C wires are run in the grooves in a wooden casing. The casing is then finally covered at the top by a rectangular wooden strip of the same width as that of the casing. This strip known as capping is then screwed to the casing. The casing and capping are given a double coating of shellac varnish from inside and at the back. They are painted or varnished from the out side after erection.

Application: This system is now almost superseded by other type of wiring even through it was very popularly used for residential and commercial buildings in the early days. However it is still in use for special situations and in places to fit in with the internal decoration of a room.

Advantages:

(a) Gives good mechanical protection to the conductors. (b)
Neat appearance.
(c) Installation and repairs are easy in comparison with conduit wiring.

Disadvantages

(a) The system is costly since it involves highly skilled labour.
(b) Wood being inflammable, it is quit susceptible to fire hazards.
(c) In spite of coating with varnish, it can not be used in damp situations.

b) Conduits Wiring: In this system, V.I.R or P.V.C wiring is run through black enameled or galvanized metallic tubing called conduits.

Types of Conduits:

i) **Thin Wall Conduits:** These are the light gauge iron conduits with a seam along its length.
ii) **Rigid Conduits:** These are the heavy gauge iron conduits either solid drawn or with welded seam. These conduits being more costly are normally used for all medium pressure (250 to 600 volts) circuits and in place where a good degree of mechanical protection and absolute freedom from moisture is required.

Type of Conduit Wiring: Depending upon whether the conduits are laid inside the wall or supported on the walls, there are two types of conduit wiring.

i) **Surface Conduit Wiring:** In this method, conduits are fixed on the wall by means of saddles screwed to rawl – plugs or wooden plugs embedded in the wall. In damp situation, these conduits are spaced apart from the wall surface by small wooden blocks fixed below the pipe at regular intervals as illustrated

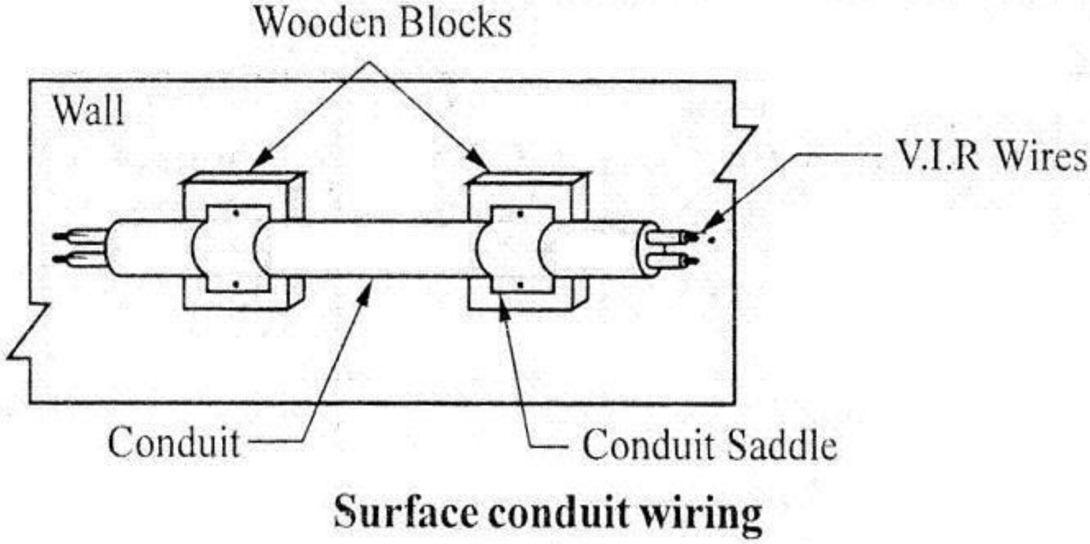


Fig 1.4

ii) **Concealed Conduit Wiring:** This method employs heavy gauge rigid conduits buried under wall plaster. Such wiring is used in case where beauty is the main consideration irrespective of cost.

Application: Surface conduit wiring is mainly used for all indoor and outdoor wiring of permanent nature for light and power e.g. in godowns, workshops and public buildings. The concealed type is preferably used in public building, offices, shops and houses for its nice appearance.

Advantages:

(a) Very long life.
(b) Provides good protection against mechanical injury, moisture and fire – hazards.
(c) Neat appearance. Particularly, the concealed type of conduit wiring adds to beauty of the building.
(d) Less maintenance.

Disadvantages:

(a) Most costly system of wiring
(b) Erection requires highly skilled labour and time.
(c) Repairs, particularly with concealed wiring are difficult and take long time.
(d) In the absence of earth continuity on all conduit joints, there is the possibility of an electrical shock.
(e) If proper precaution is not taken to file sharp edges of the conduits, there is possibility of damage to the wire insulation.

IV. Wiring Accessories

a) Fuses :

An electrical circuit must be safeguarded against the harmful effects of excessive current. This excessive current may be because of overloading or short circuit faults. A high current leads to an excessive heat rise which, if adjacent to inflammable material will almost certainly cause an outbreak of fire. In all such cases, therefore it is necessary to interrupt these excessive currents before they cause any damage. Fuse is the simplest current interrupting device for the protection against excessive current.

Function of the Fuse: In general, the fuse consists of a small piece of metal connected in between two terminals mounted on the insulated base.

When the fuse is inserted in a circuit to be protected, it carries the normal working current without heating. But when the current exceeds the pre determined value it melts due to rapid overheating. The circuit is then interrupted preventing any damage due to excessive current.

Fuse Element Material: Metals like tin, zinc, silver, antimony, copper and aluminum can be used for fuse elements. However, metals with low melting point like tin, lead, zinc or lead – tin alloys are found more suitable for this purpose. The main objection for the lead- tin alloys is that these alloys being soft are apt to spread under pressure. The most preferred lead – tin alloy for a fuse element contains 37% lead and 63% tin. Normally, lead – tin alloy wire is not used beyond 10 amperes because with higher currents, a wire with a large diameter will be required and after fusing, the metal released will be excessive. Copper wire is most suitable for higher currents.

The present trend, however, is to use silver for higher currents despite its higher cost as it is comparatively free from oxidation.

Types of Fuses: following two types of fuses are commonly used in practice.

(i) Semi – Enclosed or Rewirable Type Fuse:

Construction: In this type of fuse, the fuse element is semi – enclosed i.e. neither open nor totally closed. They are available in various forms. Figure 1.5 illustrates a typical rewirable fuse bridge and base (also known as a kit – Kat type fuse unit.)

The fuse element (E) consists of a short length of fuse wire of diameter depending upon the current rating of the circuit the fuse is protecting. The wire is threaded through a small hole in the porcelain fuse bridge (B1) and secured to the contacts (C) by means of screws (S). The incoming and outgoing live or phase wires are connected permanently with the help of connecting terminals to the base (B2). These terminals of the base are bridged by the contacts of the bridge through the fuse element when the bridge fits in to the base.

Operation: The fuse is wired in series with the circuit to be protected. At the fuse, because of the highest resistance, more heat is developed than at any other point in the circuit. During the fault, the circuit current rises in value. Therefore, the heat produced at the fuse causes temperature of the fuse wire high enough to melt the wire and break the circuit.

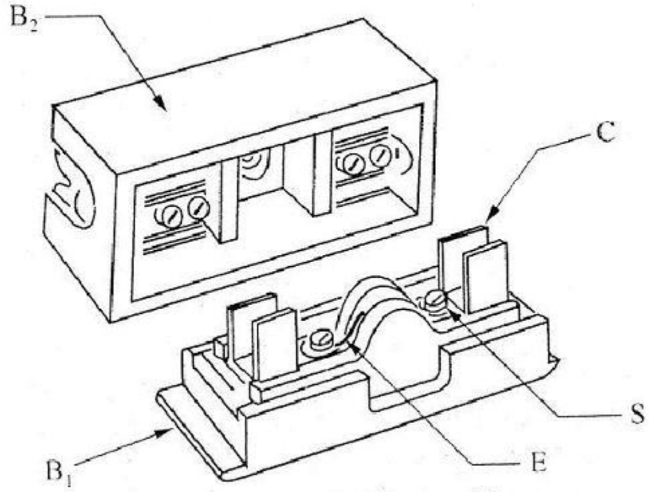


Fig 1.5

Application: Commonly used in domestic installations and the other circuits where very low values of fault currents are to be handled.

Advantages:

(a) They are cheaper

(b) After blowing off the fuse element, the bridge can be pulled out and again rewired with a new fuse wire. Thus, service can be restored very quickly with negligible additional expenditure.

Disadvantages:

(a) Cannot be used for higher values of fault current.

(b) Protection is not reliable due to inaccurate characteristics.

(c) Since the wire is exposed to air, it is subjected to deterioration due to oxidation caused by heating. This decreases the effective diameter of the wire. Heating due to increased resistance causes premature failure under normal load.

(d) Slow speed i.e., current interruption is not quick in comparison with other interrupting devices.

(e) Risk of fire – hazards due to external flash on blowing.

ii) High Rupturing Capacity (H.R.C) Cartridge Fuses:

With the increase in fault current level, the fuse clearing the fault would be called upon to withstand extremely heavy stresses in the process. A rewirable fuse would not be able to withstand these stresses and would probably disintegrate violently. The totally enclosed type – high rupturing capacity cartridge fuse, specially designed for extremely rapid operation are, therefore, used for such duties.

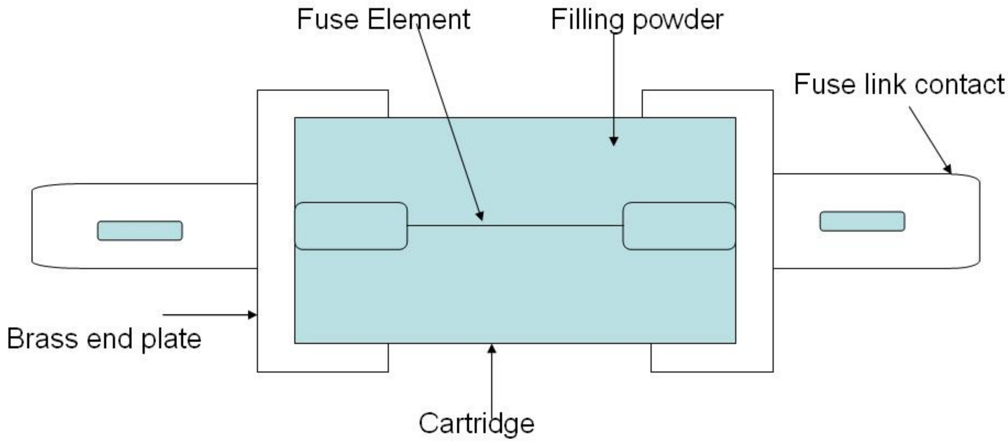


Fig 1.6

Application: With the increasing loads and size of the network, H.R.C. cartridge fuses are now gradually replacing the rewirable types, particularly in industrial installations. They are also frequently used in low voltage distribution systems.

Advantages:

(a) Being totally closed, there is no deterioration of the fuse element
(b) Due to accurate characteristics and consistent performance, protection is reliable.
(c) High-speed operation.
(d) Ability to clear high value of fault current.
(e) Its operation is silent and without flame, gases or smokes. Hence safe from the point of view of fire hazards.

Disadvantages:

(a) Costly in comparison with rewirable type fuses.
(b) The cartridge is to be replaced by a new one after each operation.
Over heating of the adjacent contacts is possible during the operation of the fuse.

b) Study of miniature circuit breaker (MCB)

A MCB is a mechanical switching device which is capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time and automatically breaking currents under specified abnormal circuit conditions such as those of short circuit. In short, MCB is a device for overload and short circuit protection. They are used in residential & commercial areas.

Fig- MCB

Rating:

In most cases, the ampere rating should not exceed the current-carrying capacity of the circuit. For example, if a conductor is rated at 10 amps, select a circuit breaker no larger than 10 amps.

Ampere ratings for miniature circuit breakers range from 10 to 150 amps. Voltage ratings for miniature circuit breakers are 120/240-volt and 240-volt. Interrupting ratings for miniature circuit breakers are 10, 22, 42, and 65 KAIC (thousand amps interrupting capacity).

Advantages:

- Instant re-closing of the circuit after a fault has been cleared.
- Safety disconnect features for circuit isolation.
- Terminal insulation for operator safety.
- Ampere ratings that can be fixed and modified.
- It is reusable, hence very little maintenance and replacement costs.
- Lower power losses.
- Simplicity of mounting and wiring.
- Lower space requirements.

Disadvantages:

• More expensive as compared to fuse.
• Difficult to identify where the fault occurred.

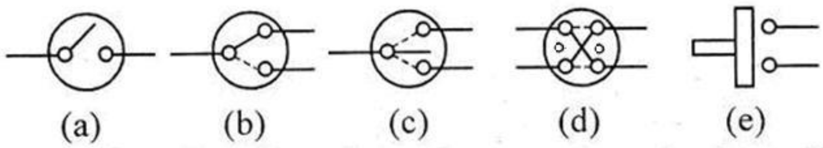
Applications:

- MCBs find wide application in residential, commercial and industrial operations.

c) Switches

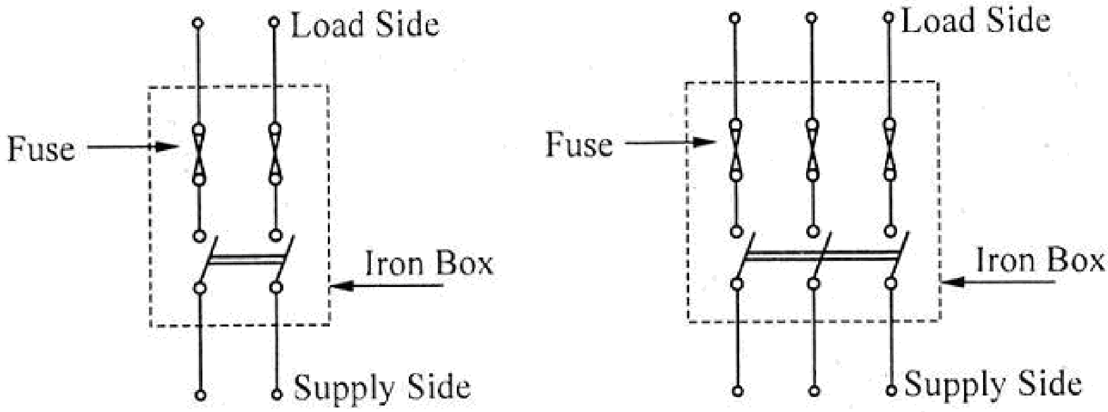
A switch is a manually operated mechanical device used for making or breaking the electrical circuit. Single pole switches are normally employed for controlling lighting and heating circuits in domestic wiring. Depending up on the circuit requirements, they may be of single–way (fig. 1.7a), two-way (fig. 1.7b), two-way center off (fig.

1.7c), intermediate (fig. 1.7d), or push-button (fig. 1.7e) types.



Various types of single pole switches in general use for domestic wiring

Fig 1.7



(a) Iron clad double-pole (I.C.D.P.) type

(b) Iron clad triple-pole (I.C.T.P.) type

Fig 1.8

These are generally made of hard plastic or bakelite and are fitted with quick make-and – break arrangement –using spring so as to reduce arcing time. This is essential because the arcing between the switch blades and contact terminals burns or damages the switch contacts and thereby reduces the life of the switch. The switches, which are mounted on the mounting blocks directly, fixed over the surface of the wall, are called surface switches or tumbler switches. These switches project out of the surface of the wall. On the other hand, the switches that are fixed in flush with the wall are called flush switches. Flush switches are normally used for better appearances.

Two or three-pole switches combined with fuses (Refer figure 1.8) are normally employed as main switches in domestic wiring. Combination of switch and fuses is enclosed in the same iron casing. The switch is fitted with quick make –and-break arrangement. For safety purposes, mechanical interlock is also provided which prevents the case being opened when the switch is on, or the switch being closed when the case is open. Main switches are commonly available with the rating of 250V – 15A, 500V – 30A, etc.

d) Lamp Holders:

Lamp holders made up of brass, bakelite or hard plastic are used to hold the lamps and connect them to the wiring. Connection of lamps to the wiring through the holders facilitates their quick removal or replacement without disturbing the wiring. The lamp holders are basically either of bayonet type or screw type. Lamps with bayonet base (or cap) are pressed against spring loaded brass plungers and turned in bayonet type holders whereas lamps with screw based are screwed into the screw type

holders. Each of the above two types of holder can be further subdivided into the following commonly used types. (Refer figure 1.9)

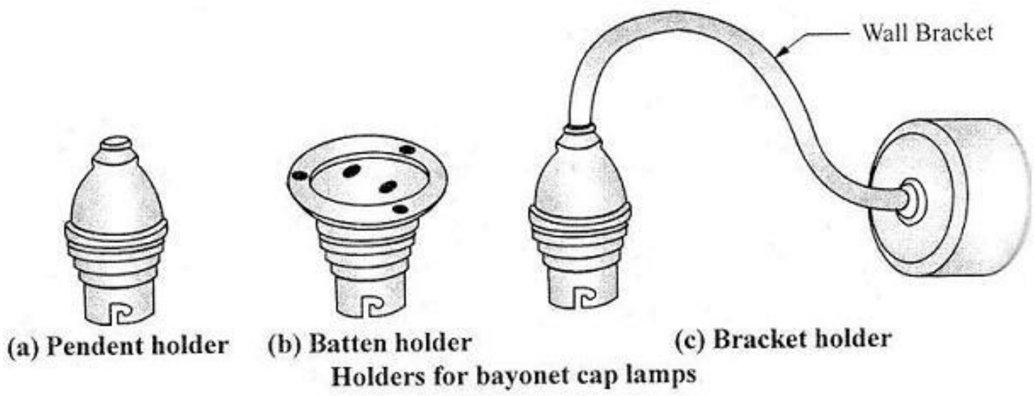


Fig 1.9

i) Pendant Holders: These are for the lamps, which are to be, kept hanging from the ceilings

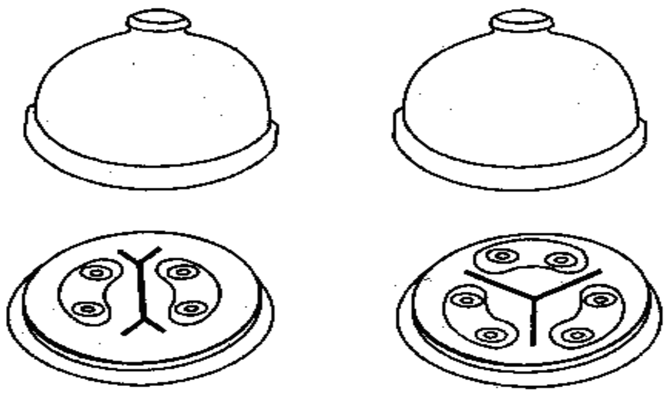
ii) Batten Holders: These holders can be screwed on the wooden blocks and as such are suitable for the lamps, which are to be fixed on the walls or ceiling. Angle batten holders are also available for fix angle directional lighting.

iii) Screwed Holders: This type of holders can be screwed on to a wall bracket of long stand of a table lamp.

e) Ceiling Roses:

Connection to the pendant lamp holders, fluorescent tubes and ceiling fans are provided from ceiling roses using flexible wires.

The ceiling roses are made of bakelite and have either two or three terminal plates. Accordingly, they are called two – plate or three – plate ceiling roses. (Refer figure 1.10)

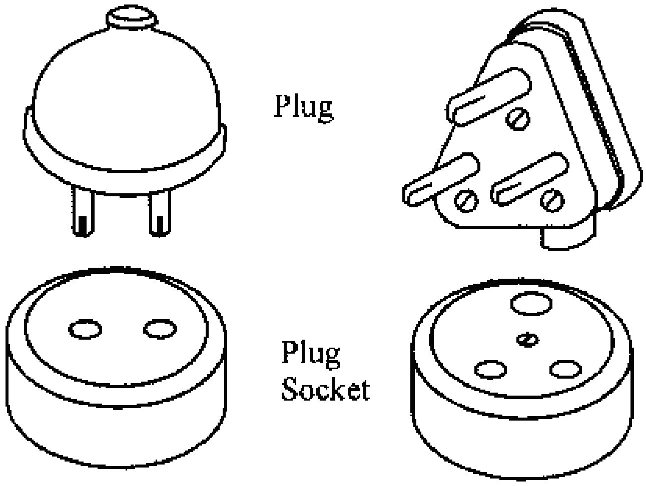


(a) Two-Plate Type Ceiling Roses **(b) Three- Plate Type Ceiling Roses**

Fig 1.10

f) Plug and Sockets:

These are used for providing connections to portable appliances such as mixers, table lamps, etc. and are made of bakelite. Even though the plugs and sockets of both two pin type and three – pin type are available, from the point of view of safety, only three pin type with a provision for earth connection are now used. The terminal sleeve with thicker cross – section on the three – pin type socket is used for earth connection. Both three – pin type and two type plugs and sockets are available with the rating of 5A – 250V and 15A – 250V. (Refer figure 1.11)



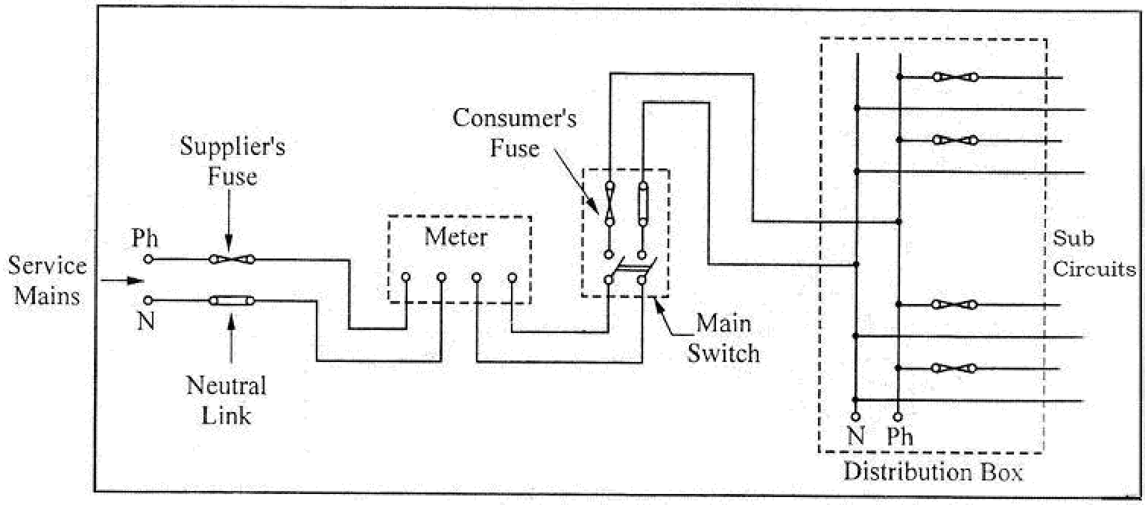
(a) Two-Pin Plug Socket **(b) Three-Pin Plug Socket**

Fig 1.11

V. Domestic Installations

The power to the domestic wiring installation is tapped from the low voltage distribution line known as the distributor. The wires supplying power from the distributors to the domestic wiring installation are known as service mains. Fig. 1.12 shows the layout of a domestic installation for a small house.

The supply is a single – phase a.c. and brought in through the supply company's sealed fuse box and meter to the consumer's main switch. From the main switch, supply is given to the distribution box, which feeds the various sub–circuits. Two separate meters can be provided, one for lighting (with 5 amperes capacity) and the other for power (with 15 amperes capacity). For the sub – circuit supplying lighting load, the number of points connected (i.e., lamps, tubes, and fans. etc.) should not exceed 10 and the total load should not be more than 800W. For the sub-circuit supplying power to the appliances such as heaters, electric irons, single phase motors, etc. the numbers of points connected in one sub – circuit should not exceed two and the total load should not be more than 3000 watts.



Domestic wiring installation

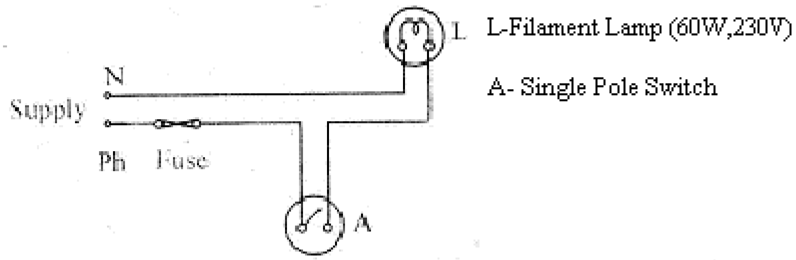
Fig 1.12

Experiment No 1B

TITLE – STUDY OF WIRING

(a) Aim: Control of One Lamp By Means of One Single Pole Switch.

Apparatus: Switches, lamps, wires, & fuse.



Wiring diagram for control of one lamp by one single pole switch

Fig 1.13

Wiring diagram: for controlling the lamp L, a single pole switch A is introduced in its circuits as shown in fig. 1.13
The live or phase wire is always connected to the lamp holder through the switch, whereas, neutral is connected directly to it. All the accessories such as a single pole switch, lamp holder, etc. are always fitted on the teak wood round block.
Working: When the switch is turned on, a full supply voltage is applied across the lamp terminals and the lamp glows. Thus, the lamp can be independently controlled by the single pole switch.

Application: the circuit is used for single room wiring.

(b) Aim: Two or More Lamps with Individual On-Off Control.

Wiring diagram: Fig.1.14 Shows the necessary wiring diagram using looping in system. Instead of running separate wires for each lamp from the supply point, they are looped in from one lamp to the other in manner shown in fig.1.14.

Working: In this case, it will be observed that the position of any switch does not affect the working of other lamps and thus, each lamp is controlled independently by its own switch.

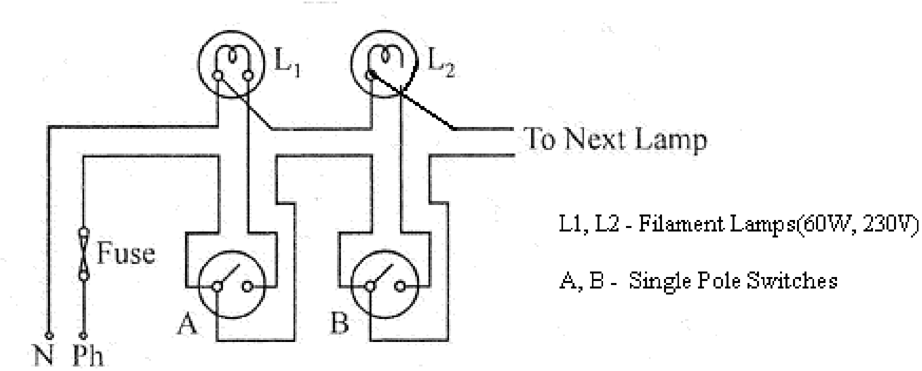


Fig 1.14

Application: This system is commonly used in domestic wiring as it saves length of wire and other wiring material.

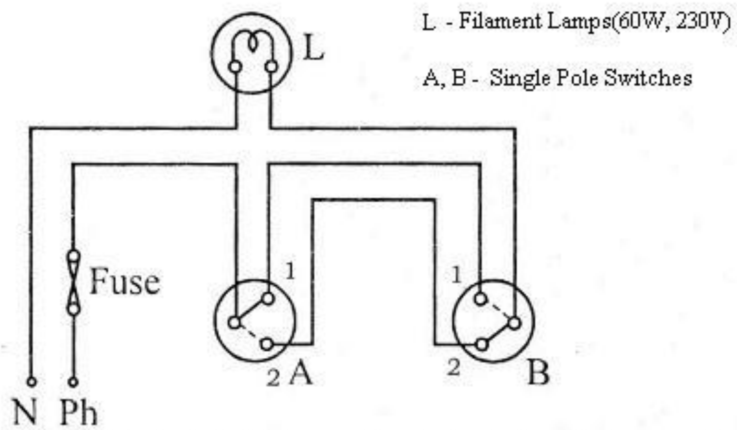
A	B	Lamp(L1)	Lamp(L2)
ON	OFF	Bright	-
OFF	ON	-	Bright

(c) Aim: Control of One Lamp by Means of Two Switches. (Stair Case Wiring)

Wiring diagram: Fig. 1.15 shows the wiring diagram. To control the lamp L from two places using two ways switches, A & B in the respective positions. As usual, neutral is directly connected to one terminal of the lamp holder and the phase wire is connected to its other terminal through two way switches A & B.

Working: With two way switches A & B in the positions shown, the lamp L will be in the ‘off’ condition. The lamp can be again switched on by one of the two switches & can be switched off by the other by changing their blade positions i.e. the lamp, switched on by the switch. A can be switched off by the switch B and vice versa. Thus, one single lamp can be controlled from two places.

Fig 1.15



Wiring diagram for controlling one lamp by two switches

Application: It is normally used for staircase & corridor lighting.

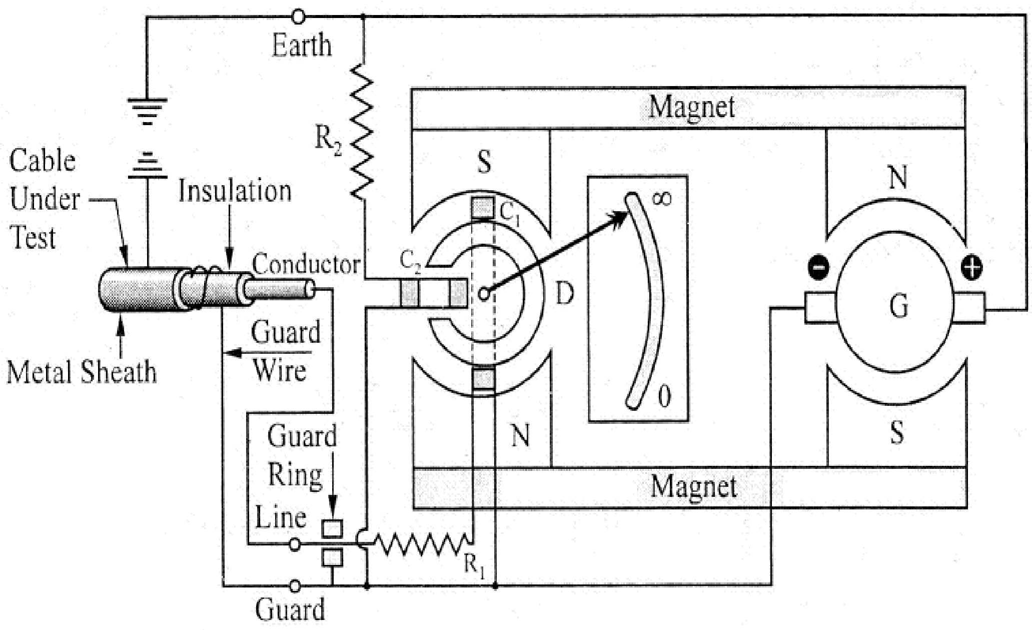
A	B	L
1	1	ON
1	2	OFF
2	1	OFF
2	2	ON

Experiment No 1C

TITLE: STUDY OF MEGGER

The insulation testing instrument megger is based upon the principle of ohmmeter.

Construction: - Figure 1.16 shows the constructional diagram of a megger. It consists of two primary elements, a direct reading ohm-meter and a small hand driven (through gearing) permanent magnet type D.C. generator G which supplies the testing voltage such as 500, 1000 or 2500V depending upon the instrument. The moving system of the ohmmeter consists primarily of two coils C_1 and C_2. These coils are mounted rigidly at an angle to one another and move in the air gap of a permanent magnet. Coil C_1, called the current coil or deflecting coil is connected between the negative brush of the generator and the line terminal along with the resistance R_1 in series with it. Coil C_2, called the potential coil or control coil, is in series with the resistance R_2 and connected across the supply of the generator. This coil is narrower than coil C_1 and encircles a part of the C- shaped iron core D during the course of its movement. Thin flexible ligaments exerting negligible tension on the moving system make connections to the coil. The whole moving system is supported between the two jewel bearings. The insulating bushing of the line terminal is mounted on a metal ring, known as a guard, which is connected, back to the negative line or the guard terminal.



Megger insulation tester

Fig 1.16

Operation: - As an illustration, the method of connecting the cable for its insulation resistance measurement by megger is shown in the fig.1.16 Rotating the handle at speed, insulation resistance of the cable can be directly read from the position of the pointer on the scale. During the test, each of the coils C_1 and C_2 experience a torque because of interaction between the current flowing through it and the field of the permanent magnet. The direction of the current in each coil is so arranged that the two torques developed oppose one another. The current coil C_1 carries the current I flowing in the resistance under test and the potential coil C_2 carries the current, which is proportional to the voltage V applied across the resistance. The resultant deflection for equilibrium of the two torques is therefore proportional to the ratio V/I = R i.e., resistance under test. Thus, the deflection of the pointer on the scale, which is precalibrated in terms of resistance, directly, gives the insulation resistance of the cable under test.

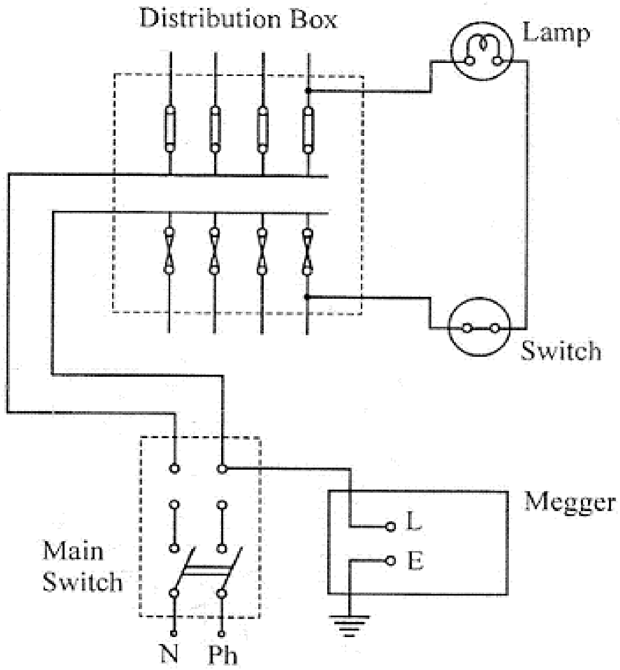
The resistance R_1 and R_2 control the effective range of the instrument. The resistance R_1 also protects the current coil in case the tester becomes short-circuited. Any leakage current over terminals or within the tester itself is collected by the guard ring and directly bypassed to the negative terminal of the generator without passing through the current coil of the ohmmeter. Similarly, end leakage current of the cable particularly due to moisture combined sometimes with dust is shunted to the negative terminal of the generator without passing through the current coil by the use of guard wire (a bare wire would tightly around the insulation of a cable) The accuracy of the reading therefore remains unaffected.

Applications:-Megger is a very useful instrument for the measurement of high resistance and insulation resistance of cables, bushing, electrical installations and machines.

Testing of Wiring Installations Using Megger:

It is necessary to carry out the following tests on a wiring installation before it is put into service.

Insulation Resistance to Earth: Insulation resistance between all the conductors and earth is measured with the help of a 500 V megger as illustrated in Fig. 1.17. With all fuse links in position, all switches on (except main switch which should be off) and all lamps in position, the line terminal of the megger is connected to either of the main leads (phase or neutral) and the earth terminal is connected to any point on the earth continuity conductor of the system. Handle of the megger is then rotated and its reading is noted down. This reading directly gives the insulation resistance between all the conductors and earth. This resistance should not be less than 50 M Ω divided by the number of outlets (every switch, socket and lamp holder counting as an outlet). However, for installations using P.V.C. insulated cables, it should not be less than 12.5 M Ω divided by the number of outlets. It is desirable that the insulation resistance should be more than 1 MΩ for the entire installation. For motors and large lighting installations, maximum leakage current allowed is not to exceed 1/5000 part of the full load current. Hence, minimum insulation resistance required may also be calculated from this limiting value of leakage current.



Measurement of insulation resistance to earth

Fig 1.17

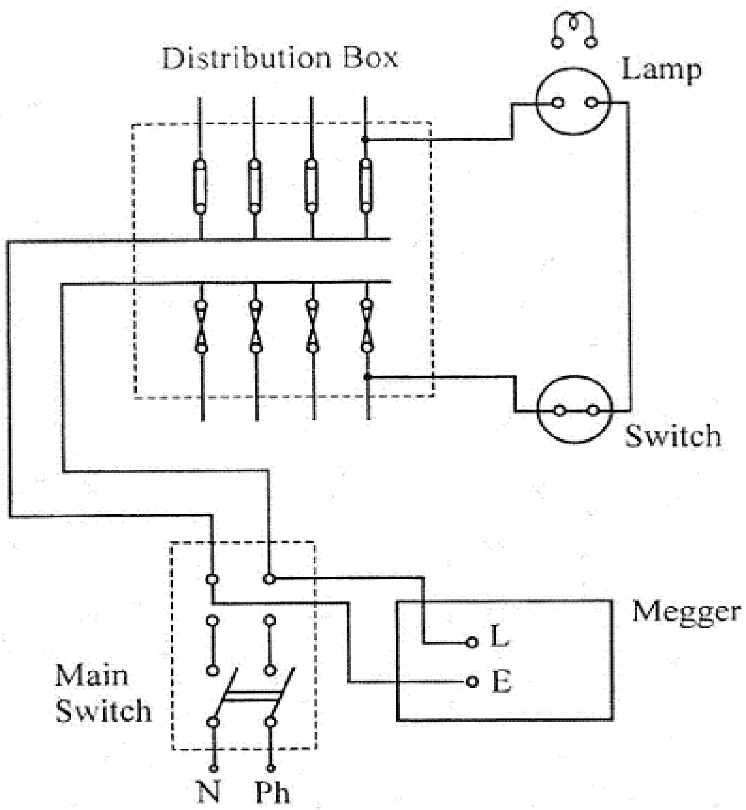
Insulation Resistance between Conductors: Insulation resistance between the two conductors (phase and neutral) of the wiring installation is also measured with the help of a megger. With all fuse links in position, all switches on (except main switch which should be off) and all lamps and appliance out, megger terminals are connected between the two conductors as shown in Fig.1.18. Reading of the megger under this condition gives the insulation resistance between the two conductors under test. The resistance should not be less than that specified in the previous test.

(c) Continuity Test: Continuity of any wire used for wiring installation or of any circuit in the wiring installation can be checked with the help of a megger. For this, the megger terminals are connected to the two ends of the wire or circuit under test .The handle of the megger is then rotated. If the pointer indicates zero resistance, then the wire or the circuit is continuous (or unbroken). If, however, the pointer shows infinity reading, then the wire or the circuit is faculty (or open-circuited).

Testing of Electrical Machines: Insulation test and continuity test can be conducted on electrical machines using megger in a similar manner.

Observations: -

1. Insulation resistance between shunt field winding (Z-ZZ) and armature winding (A-AA) = ... MΩ
2. Insulation resistance between shunt field winding (Z-ZZ) and body = ... M Ω
3. Between armature winding terminals (A-AA) and body = ... M Ω
4. Between armature winding terminals (A-AA) = ... M Ω
5. Between the terminals of the shunt field winding (Z-ZZ) and series field winding (Y-YY) = ... M Ω



Measurement of insulation resistance between the conductors

Fig 1.18

QUESTIONS:

1. Enlist various types of wiring components you are observing in day to day life
2. What are the different types of wires?
3. Enlist points only on basis of which you can compare aerial cables and underground cables.
4. What is the fuse? Give types of fuses.
5. Give the classification of resistance from measurement point of view.
6. What is megger? Give the specification of megger you have used.