Sri Bhagawan Mahaveer Jain Educational & Cultural Trust's

JAIN COLLEGE OF ENGINEERING, BELAGAVI

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(Accredited by NBA: Department of CSE, CVE, ECE and EEE)

Estd. 2010

PRAYOGSHALA

(Design, Repair and Learn)

ELECTRICAL WORKSHOP MANUAL



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EXPERIMENT NO. 1

T-Joint Connection

1. AIM

To demonstrate the construction of a T-joint connection and practice making a proper electrical wire joint.

2. APPARATUS REQUIRED

- PVC insulated wires
- Wire cutter
- Wire stripper
- Combination plier
- Insulation tape
- Electrical connector / terminal
- Test board
- Low-voltage demonstration supply

3. CIRCUIT DIAGRAM / IMAGE

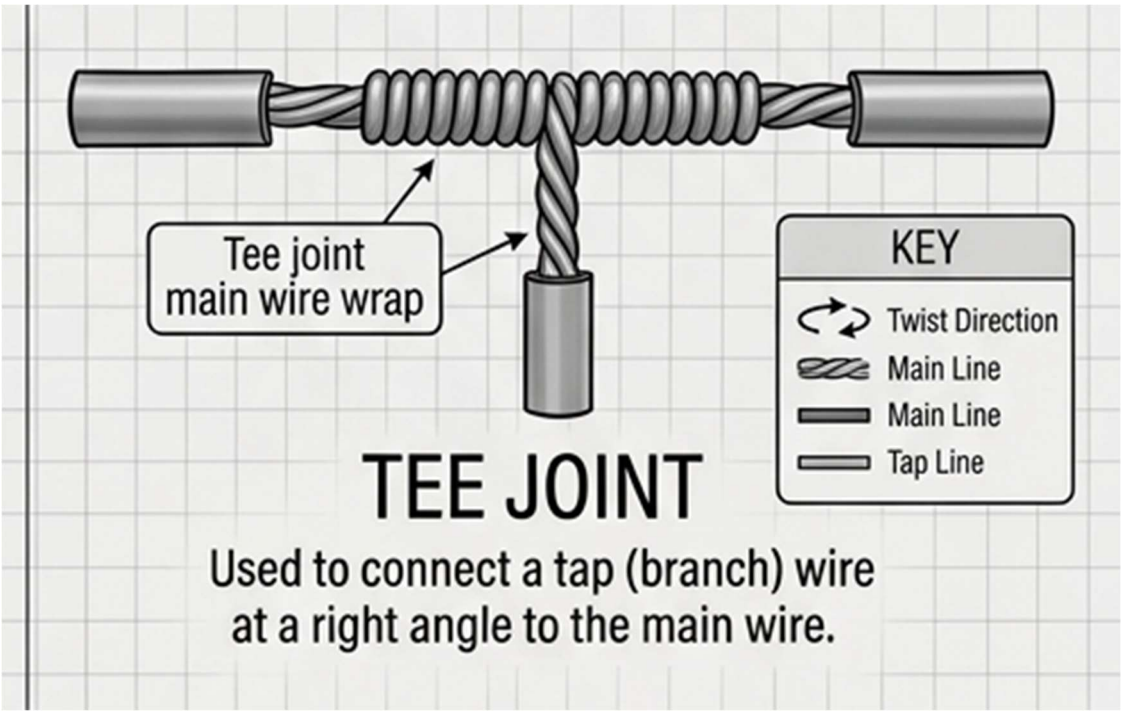


Figure 1. Circuit diagram / photograph of T-Joint Connection

4. PROCEDURE

1. Switch OFF and isolate the supply before making any connection.
2. Measure and cut the required length of insulated wire.
3. Remove insulation carefully from the required portion of the conductor.
4. Prepare the main conductor and branch conductor for the T-joint.
5. Make the branch connection mechanically tight with the main conductor.
6. Ensure that there are no loose strands or exposed unsafe portions.
7. Cover the completed joint with suitable insulation or use an approved connector.
8. Inspect the joint for mechanical strength and electrical continuity.
9. Demonstrate the completed T-joint under faculty supervision.

5. OBSERVATION TABLE

Sl. No.	**Parameter**	**Observation**
1	Joint mechanically tight	Yes / No
2	Insulation provided	Yes / No
3	Continuity	OK / Not OK
4	Loose strands	Present / Not Present

6. RESULT

The T-joint connection was constructed and its continuity and mechanical integrity were verified.

7. SAFETY PRECAUTIONS

- Always switch OFF and isolate the supply before making or modifying connections.
- Use properly insulated tools and wires.
- Do not touch exposed conductors.
- Check the circuit carefully before energizing.
- Use protective devices of appropriate ratings.
- Carry out mains-voltage work only under qualified faculty/laboratory supervision.
- Do not bypass MCB, fuse, RCCB or other protective devices.
- For appliance servicing, disconnect the appliance from mains before opening it.

8. QUESTIONNAIRE

1. What is a T-joint?
2. Where are T-joints commonly used?
5. What is meant by electrical continuity?

EXPERIMENT NO. 2

Single-Switch Connection

1. AIM

To construct a single-lamp connection using a switch and plug/socket arrangement.

2. APPARATUS REQUIRED

- Lamp holder
- Incandescent/LED lamp
- One-way switch
- Plug and socket
- PVC insulated wires
- Terminal connectors
- Test board
- Insulation tape
- Screwdriver and combination plier

3. CIRCUIT DIAGRAM

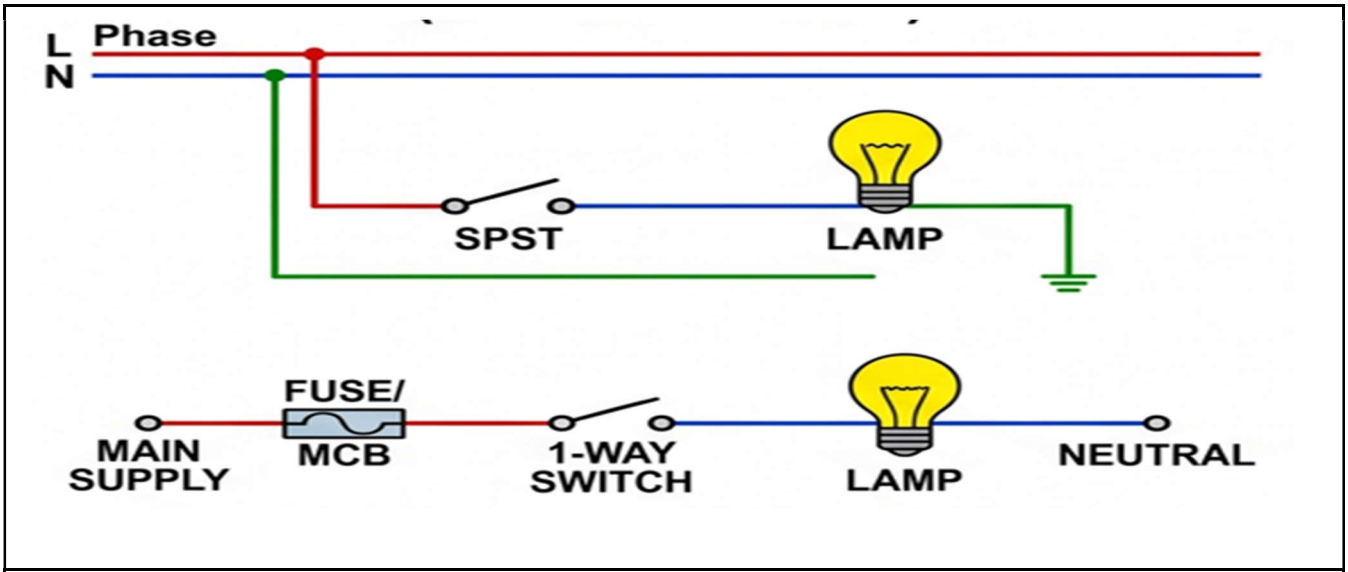


Figure 2. Circuit diagram / photograph of Single-Switch Connection

4. PROCEDURE

1. Keep the supply isolated before making connections.
2. Connect the phase conductor to the input terminal of the switch.

3. Connect the switch output to one terminal of the lamp holder.
4. Connect the neutral conductor directly to the other lamp terminal.
5. Connect the earth conductor to exposed conductive parts where applicable.
6. Check all terminals for tightness.
7. Inspect the circuit before energizing it.
8. Energize the circuit only under laboratory supervision.
9. Operate the switch and observe the lamp operation.

5. OBSERVATION TABLE

Sl. No.	**Switch Condition**	**Lamp Condition**
1	OFF	OFF
2	ON	ON

6. RESULT

A single lamp was successfully controlled using a single-pole switch.

7. SAFETY PRECAUTIONS

- Always switch OFF and isolate the supply before making or modifying connections.
- Use properly insulated tools and wires.
- Do not touch exposed conductors.
- Check the circuit carefully before energizing.
- Use protective devices of appropriate ratings.
- Carry out mains-voltage work only under qualified faculty/laboratory supervision.
- Do not bypass MCB, fuse, RCCB or other protective devices.
- For appliance servicing, disconnect the appliance from mains before opening it.

8. QUESTIONNAIRE

1. Why is the switch normally connected in the phase conductor?
2. What is the function of a lamp holder?
3. What is the purpose of a plug and socket?
4. Why should loose connections be avoided?
5. What is the function of the neutral conductor?

EXPERIMENT NO. 3

Two-Way Control (Staircase Wiring)

1. AIM

To control a single lamp from two different locations using two two-way switches.

2. APPARATUS REQUIRED

- Two two-way switches
- Lamp holder
- Lamp
- PVC insulated wires
- Test board
- Plug/socket
- Screwdriver
- Combination plier

3. CIRCUIT DIAGRAM / IMAGE

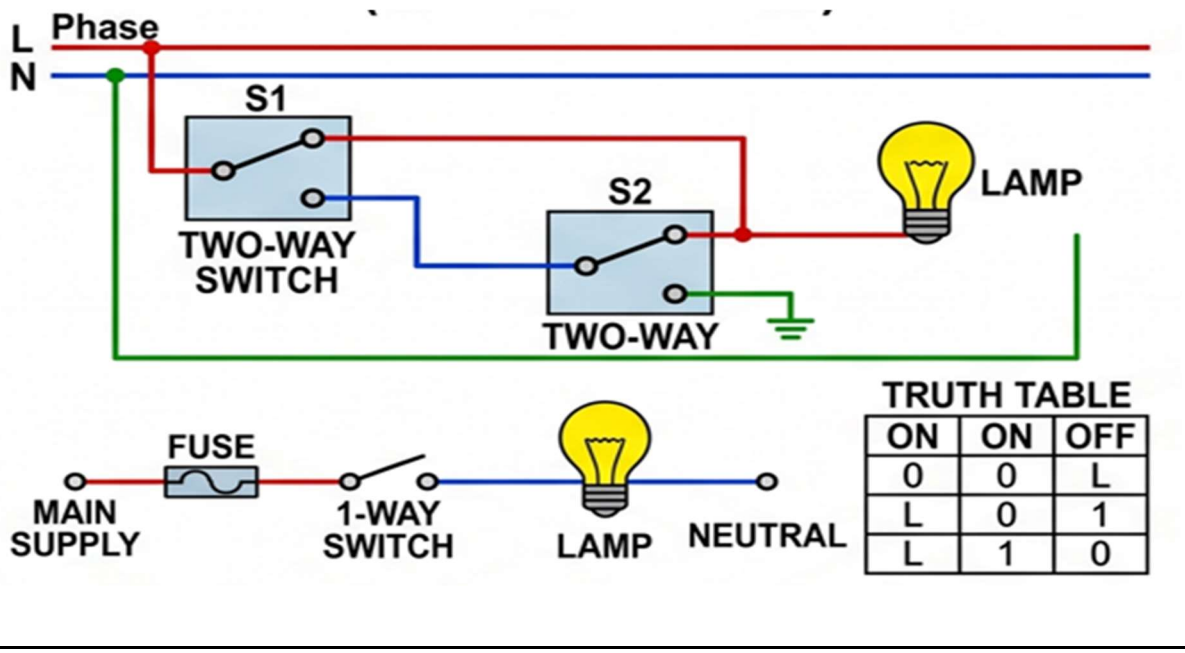


Figure 3. Circuit diagram / photograph of Two-Way Control (Staircase Wiring)

4. PROCEDURE

1. Isolate the electrical supply.
2. Connect the phase conductor to the common terminal of the first two-way switch.
3. Connect the two corresponding traveler terminals of the first switch to the traveler terminals of the second switch.
4. Connect the common terminal of the second switch to the lamp.
5. Connect the other terminal of the lamp to neutral.
6. Check all wiring connections carefully.
7. Verify continuity before energizing.
8. Energize the circuit under supervision.
9. Operate either switch and observe that the lamp state can be changed from either location.

5. OBSERVATION TABLE

Switch 1	**Switch 2**	**Lamp**
Position 1	Position 1	ON / OFF
Position 1	Position 2	ON / OFF
Position 2	Position 1	ON / OFF
Position 2	Position 2	ON / OFF

6. RESULT

The lamp was successfully controlled from two different locations using two-way staircase wiring.

7. SAFETY PRECAUTIONS

- Always switch OFF and isolate the supply before making or modifying connections.
- Use properly insulated tools and wires.
- Do not touch exposed conductors.
- Check the circuit carefully before energizing.
- Use protective devices of appropriate ratings.
- Carry out mains-voltage work only under qualified faculty/laboratory supervision.
- Do not bypass MCB, fuse, RCCB or other protective devices.
- For appliance servicing, disconnect the appliance from mains before opening it.

8. QUESTIONNAIRE

1. What is staircase wiring?

2. Why are two two-way switches used?
3. How many traveler wires are required?
4. Where is staircase wiring commonly used?
5. What is the function of the common terminal?

EXPERIMENT NO. 4

Series and Parallel Lamp Connections

1. AIM

To demonstrate and compare series and parallel connections of electrical lamps.

2. APPARATUS REQUIRED

- Two lamps
- Lamp holders
- Switches
- PVC insulated wires
- Plug/socket
- Test board

3. CIRCUIT DIAGRAM / IMAGE

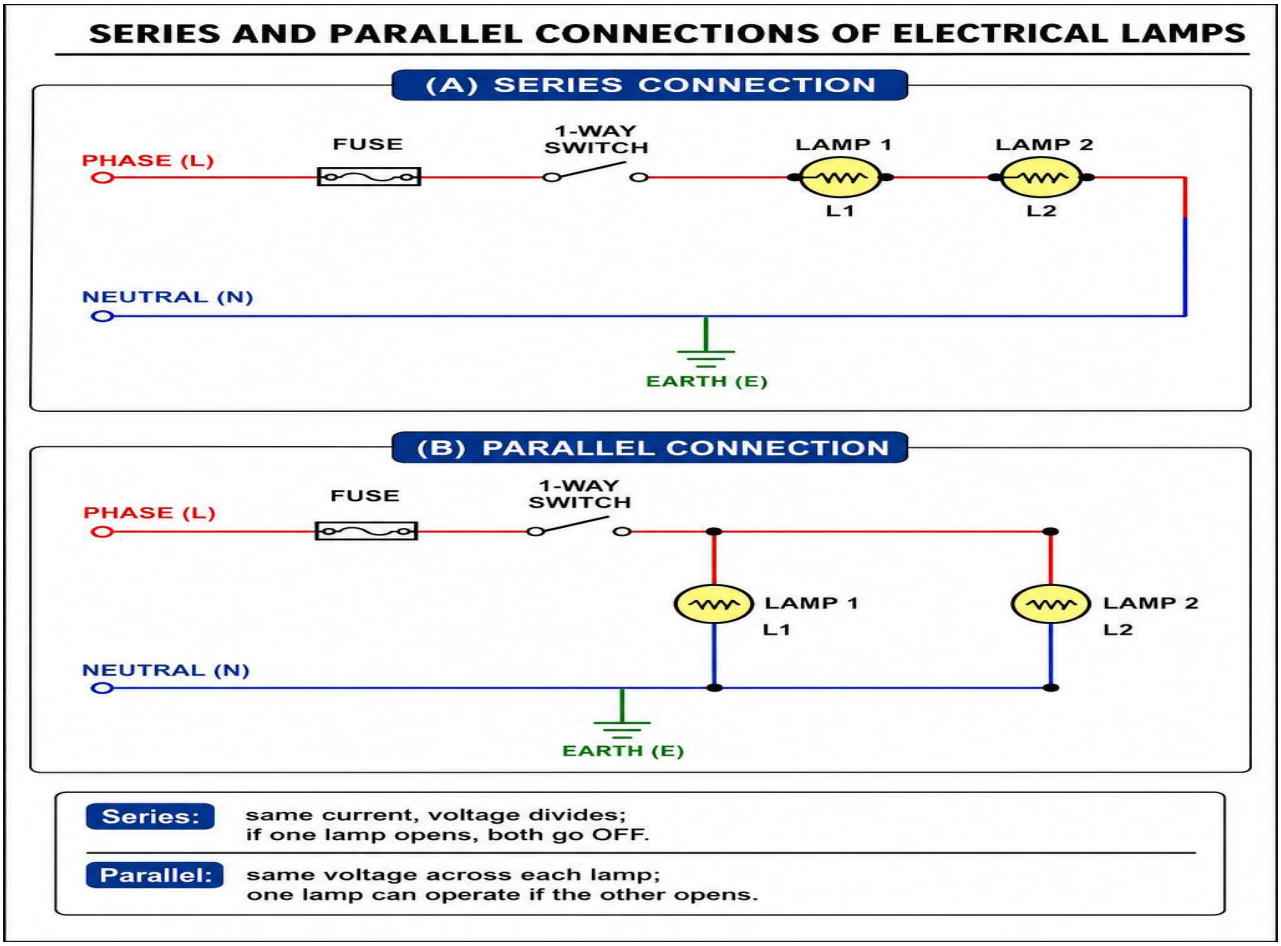


Figure 4. Circuit diagram / photograph of Series and Parallel Lamp Connections

4. PROCEDURE

1. Keep the supply isolated.
2. Connect two lamps in series as per the laboratory circuit diagram.
3. Check the connections before energizing.
4. Observe the brightness of both lamps.
5. Disconnect and isolate the circuit.
6. Connect the two lamps in parallel.
7. Energize the parallel circuit under supervision.
8. Observe and compare the brightness of the lamps.
9. Record the observations in the table.

5. OBSERVATION TABLE

Connection	Lamp 1	Lamp 2	Observation
Series	ON / OFF	ON / OFF	Brightness observed
Parallel	ON / OFF	ON / OFF	Brightness observed

6. RESULT

The series and parallel lamp connections were constructed and their operating characteristics were observed.

7. SAFETY PRECAUTIONS

- Always switch OFF and isolate the supply before making or modifying connections.
- Use properly insulated tools and wires.
- Do not touch exposed conductors.
- Check the circuit carefully before energizing.
- Use protective devices of appropriate ratings.
- Carry out mains-voltage work only under qualified faculty/laboratory supervision.
- Do not bypass MCB, fuse, RCCB or other protective devices.
- For appliance servicing, disconnect the appliance from mains before opening it.

8. QUESTIONNAIRE

1. What happens to lamp brightness in a series connection?
2. What happens if one lamp fails in a series circuit?
3. What happens if one lamp fails in a parallel circuit?
4. Why are domestic lamps generally connected in parallel?
5. State one difference between series and parallel circuits.

EXPERIMENT NO. 5

Hospital Wiring

1. AIM

To demonstrate hospital wiring in which individual patient bed lamps can be controlled independently along with a centralized emergency control/indicator arrangement.

2. APPARATUS REQUIRED

- Lamps
- Lamp holders
- Individual switches
- Master switch
- Emergency switch
- Indicator lamp/buzzer
- PVC insulated wires
- Terminal connectors
- Test board

3. CIRCUIT DIAGRAM / IMAGE

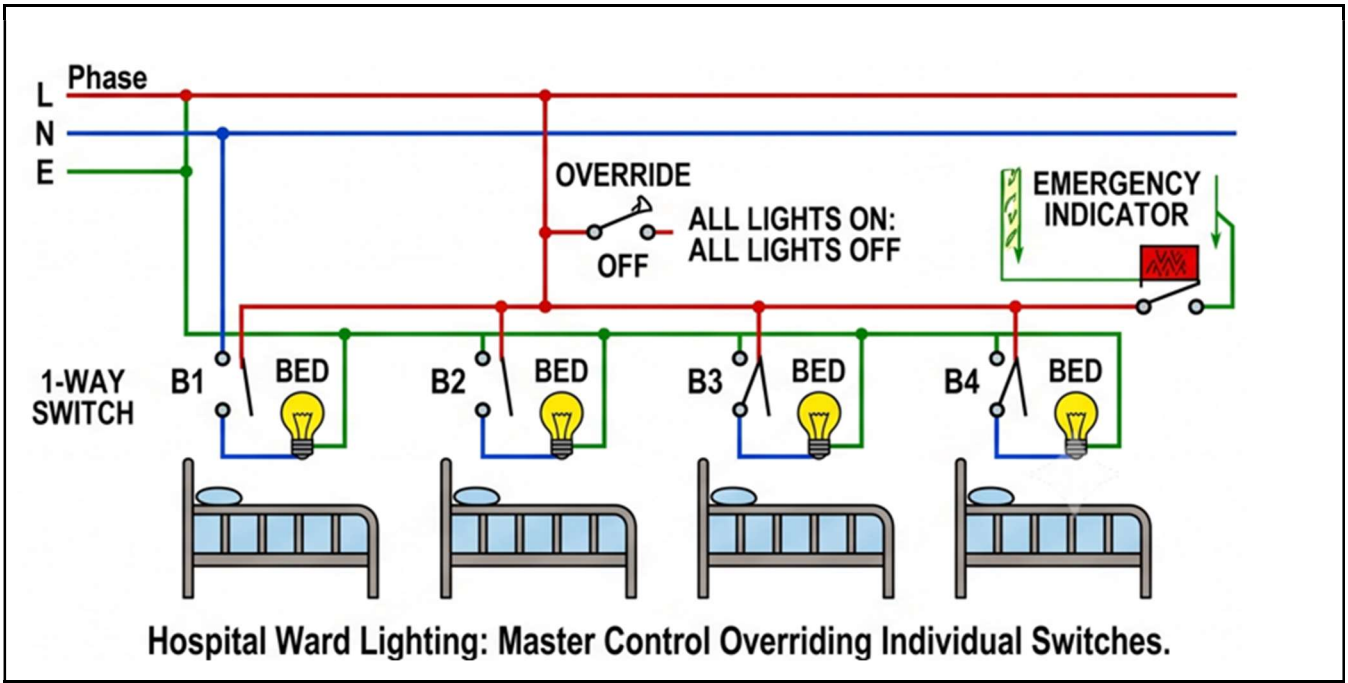


Figure 5. Circuit diagram / photograph of Hospital Wiring

4. PROCEDURE

1. Study the hospital wiring circuit and identify individual and master control points.
2. Keep the supply isolated while making connections.
3. Connect individual bed-lamp control switches as shown in the circuit diagram.
4. Connect the lamps corresponding to individual patient beds.
5. Connect the central/master control arrangement.
6. Connect the emergency indicator or alarm circuit where provided.
7. Check all connections for proper termination.
8. Verify circuit continuity before energizing.
9. Demonstrate individual lamp operation.
10. Demonstrate master/emergency operation under faculty supervision.

5. OBSERVATION TABLE

Operation	**Expected Condition**	**Observed Condition**
Bed Lamp 1	ON/OFF	_____
Bed Lamp 2	ON/OFF	_____
Bed Lamp 3	ON/OFF	_____
Master Control	Controls lamps	_____
Emergency Control	Indicator/Alarm	_____

6. RESULT

The hospital wiring arrangement was demonstrated and the operation of individual and centralized controls was verified.

7. SAFETY PRECAUTIONS

- Always switch OFF and isolate the supply before making or modifying connections.
- Use properly insulated tools and wires.
- Do not touch exposed conductors.
- Check the circuit carefully before energizing.
- Use protective devices of appropriate ratings.
- Carry out mains-voltage work only under qualified faculty/laboratory supervision.
- Do not bypass MCB, fuse, RCCB or other protective devices.
- For appliance servicing, disconnect the appliance from mains before opening it.

8. QUESTIONNAIRE

1. What is hospital wiring?
2. Why is centralized control useful in hospitals?
3. What is the purpose of an emergency switch?
4. Why are safety provisions especially important in hospitals?
5. What is the function of an indicator in an emergency circu

EXPERIMENT NO. 6

Three-Way Control

1. AIM

To demonstrate control of a lamp from three different locations using appropriate switching arrangements.

2. APPARATUS REQUIRED

- Two two-way switches
- One intermediate switch
- Lamp
- Lamp holder
- PVC insulated wires
- Test board
- Plug/socket
- Screwdriver and plier

3. CIRCUIT DIAGRAM / IMAGE

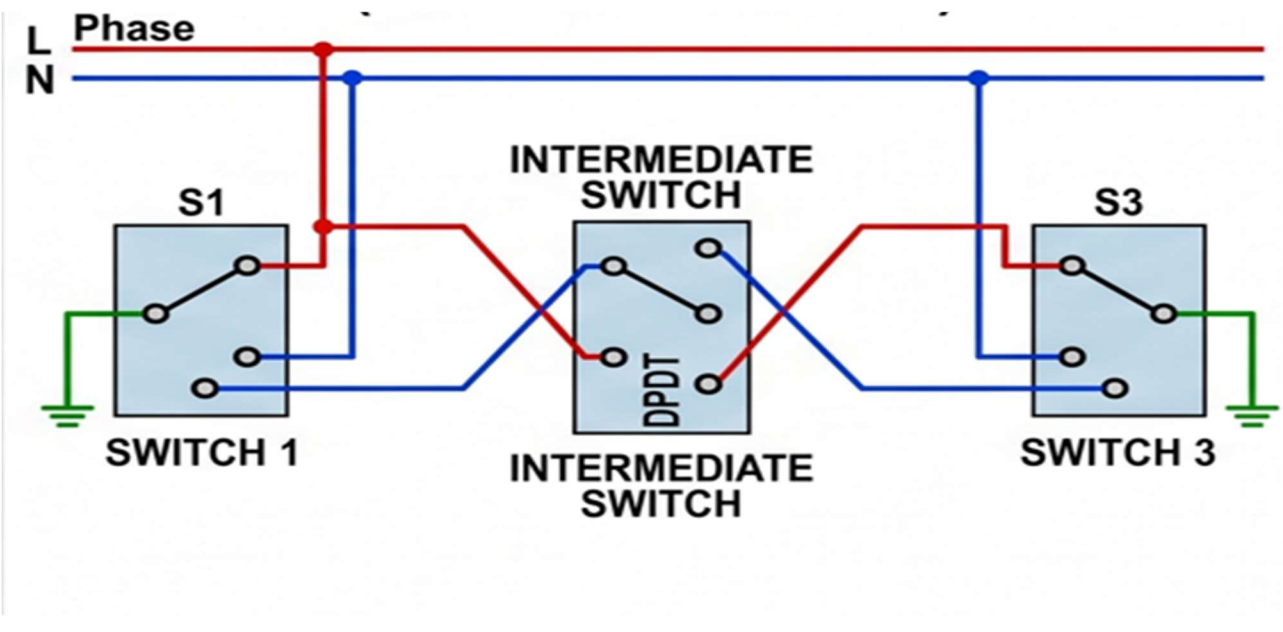


Figure 6. Circuit diagram / photograph of Three-Way Control

4. PROCEDURE

1. Isolate the supply.
2. Identify the common and traveler terminals of the switches.
3. Connect the phase conductor to the first two-way switch.
4. Connect the traveler arrangement through the intermediate switch.
5. Connect the final two-way switch to the lamp.
6. Connect the lamp return to neutral.
7. Verify continuity.
8. Energize only under supervision.
9. Operate the switches from all three locations and record the lamp condition.

5. OBSERVATION TABLE

Switch 1	**Intermediate**	**Switch 2**	**Lamp**
1	1	1	ON/OFF
1	2	1	ON/OFF
2	1	2	ON/OFF
2	2	2	ON/OFF

6. RESULT

Three-location control of the lamp was demonstrated successfully.

7. SAFETY PRECAUTIONS

- Always switch OFF and isolate the supply before making or modifying connections.
- Use properly insulated tools and wires.
- Do not touch exposed conductors.
- Check the circuit carefully before energizing.
- Carry out mains-voltage work only under qualified faculty/laboratory supervision.
- Do not bypass MCB, fuse, RCCB or other protective devices.
- For appliance servicing, disconnect the appliance from mains before opening it.

8. QUESTIONNAIRE

1. What is three-way control?
3. Where can three-way control be useful?
4. How does it differ from staircase wiring?
5. Why should the circuit be checked before energizing?

EXPERIMENT NO. 7

Ready-Load Circuit

1. AIM

To demonstrate a ready-load electrical circuit arrangement used for convenient connection and operation of electrical loads.

2. APPARATUS REQUIRED

- Ready-load board
- Lamp/load
- Switch
- Socket
- MCB/fuse as applicable
- PVC wires
- Plug
- Test board
- Multimeter

3. CIRCUIT DIAGRAM / IMAGE

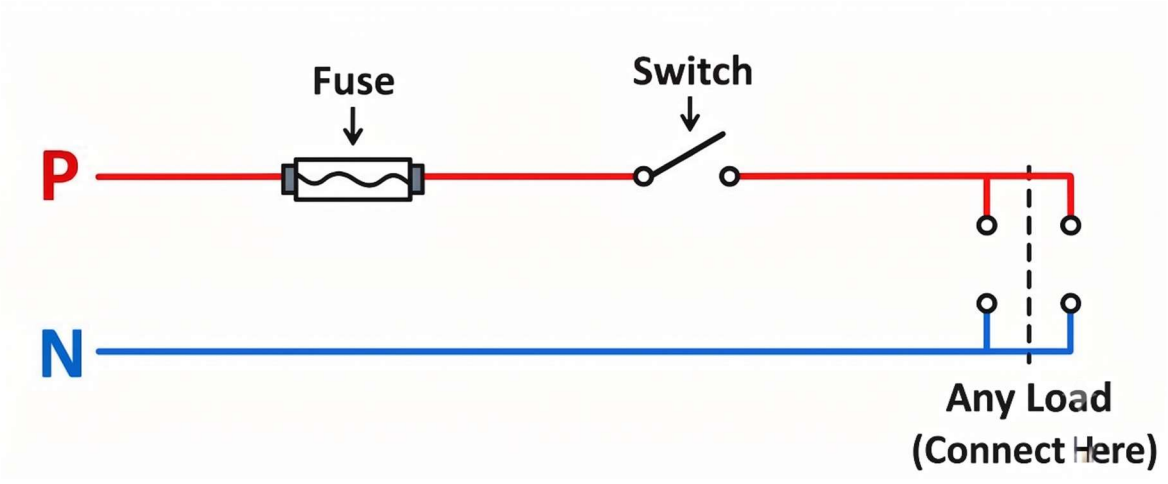


Figure 7. Circuit diagram / photograph of Ready-Load Circuit

4. PROCEDURE

1. Identify the input, protective device, switching device and load terminals.
2. Ensure the supply is isolated.

3. Make the connections according to the given ready-load circuit diagram.
4. Ensure phase and neutral are correctly identified.
5. Check the protective connection.
6. Inspect all terminals.
7. Perform continuity checks.
8. Energize the circuit under supervision.
9. Operate the load and record the observations.

5. OBSERVATION TABLE

Sl. No.	**Parameter**	**Observation**
1	Input supply	_____ V
2	Switch operation	OK / Not OK
3	Load operation	OK / Not OK
4	Protection operation	OK / Not OK

6. RESULT

The ready-load circuit was connected and its operation was verified.

7. SAFETY PRECAUTIONS

- Always switch OFF and isolate the supply before making or modifying connections.
- Use properly insulated tools and wires.
- Do not touch exposed conductors.
- Check the circuit carefully before energizing.
- Use protective devices of appropriate ratings.
- Carry out mains-voltage work only under qualified faculty/laboratory supervision.
- Do not bypass MCB, fuse, RCCB or other protective devices.
- For appliance servicing, disconnect the appliance from mains before opening it.

8. QUESTIONNAIRE

1. What is meant by a ready-load circuit?
2. What are the major components of the circuit?
3. Why is protective equipment required?
4. What is the purpose of a socket?
5. Why should the phase and neutral be correctly identified?

EXPERIMENT NO. 8

Identification of Neutral Fault

1. AIM

To demonstrate the identification of a neutral fault using suitable testing methods and electrical measurements.

2. APPARATUS REQUIRED

- Test board
- Multimeter/tester
- Lamp/load
- Switch
- Connecting wires
- Fuse/MCB
- Approved low-voltage demonstration arrangement

3. CIRCUIT DIAGRAM / IMAGE

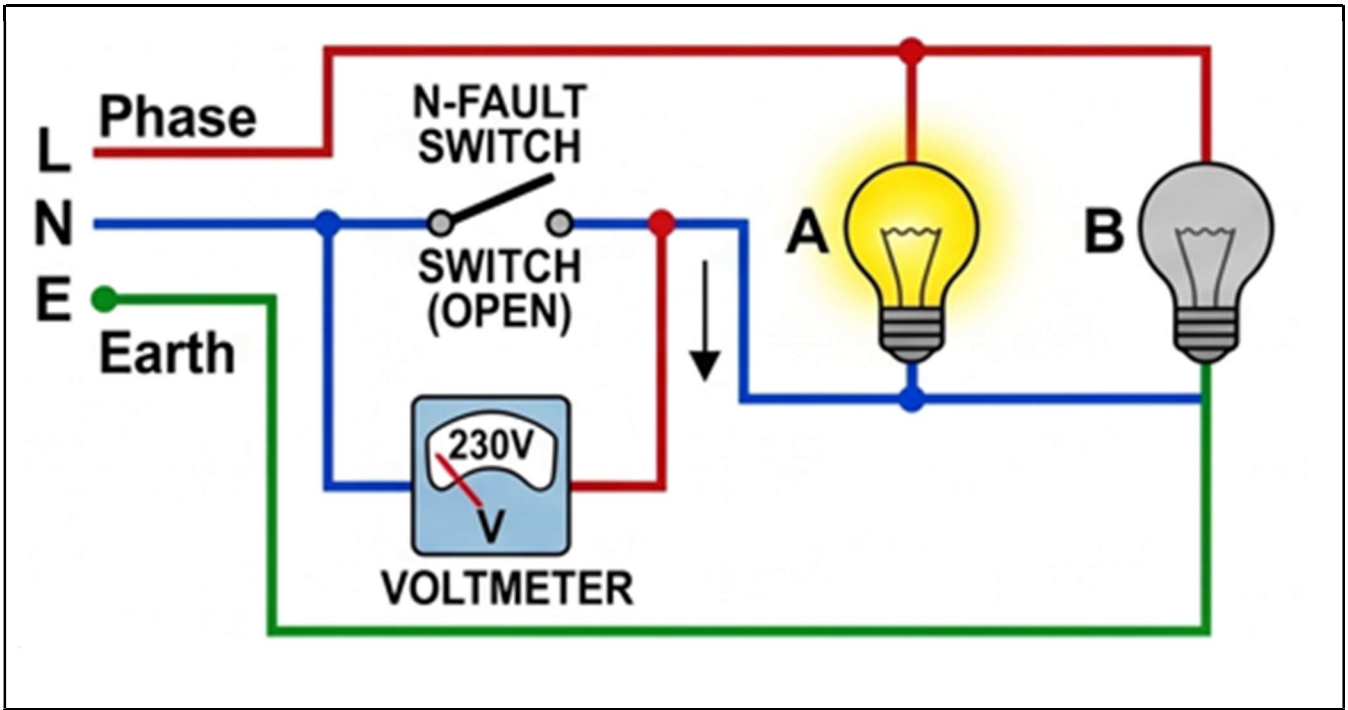


Figure 8. Circuit diagram / photograph of Identification of Neutral Fault

4. PROCEDURE

1. Ensure that the circuit is isolated before introducing or inspecting any fault.
2. Study the normal circuit and identify phase and neutral points.
3. Use an appropriate approved tester or multimeter according to faculty instructions.
4. Compare the expected readings at different test points.
5. Identify abnormal readings that may indicate an open or faulty neutral.
6. Do not touch exposed conductors.
7. Isolate the circuit before correcting any fault.
8. Restore the circuit only after the fault has been rectified and checked.

5. OBSERVATION TABLE

Test Point	**Expected Reading**	**Observed Reading**	**Condition**
Phase-Neutral	_____	_____	Normal/Fault
Phase-Earth	_____	_____	Normal/Fault
Neutral-Earth	_____	_____	Normal/Fault

6. RESULT

The procedure for identifying a neutral fault was demonstrated and the abnormal condition was identified.

7. SAFETY PRECAUTIONS

- Always switch OFF and isolate the supply before making or modifying connections.
- Use properly insulated tools and wires.
- Do not touch exposed conductors.
- Check the circuit carefully before energizing.
- Use protective devices of appropriate ratings.
- Carry out mains-voltage work only under qualified faculty/laboratory supervision.
- Do not bypass MCB, fuse, RCCB or other protective devices.
- For appliance servicing, disconnect the appliance from mains before opening it.

8. QUESTIONNAIRE

1. What is a neutral fault?
2. What are the possible causes of an open neutral?
3. What instrument can be used to check voltage?
4. Why should fault finding be performed with appropriate safety precautions?
5. What is the difference between neutral and earth?

EXPERIMENT NO. 9

Energy Meter Connection

1. AIM

To demonstrate the connection of a single-phase energy meter and observe energy consumption measurement.

2. APPARATUS REQUIRED

- Single-phase energy meter
- Lamp/load
- MCB/fuse
- DP switch
- PVC insulated wires
- Test board
- Multimeter
- Connecting terminals

3. CIRCUIT DIAGRAM / IMAGE

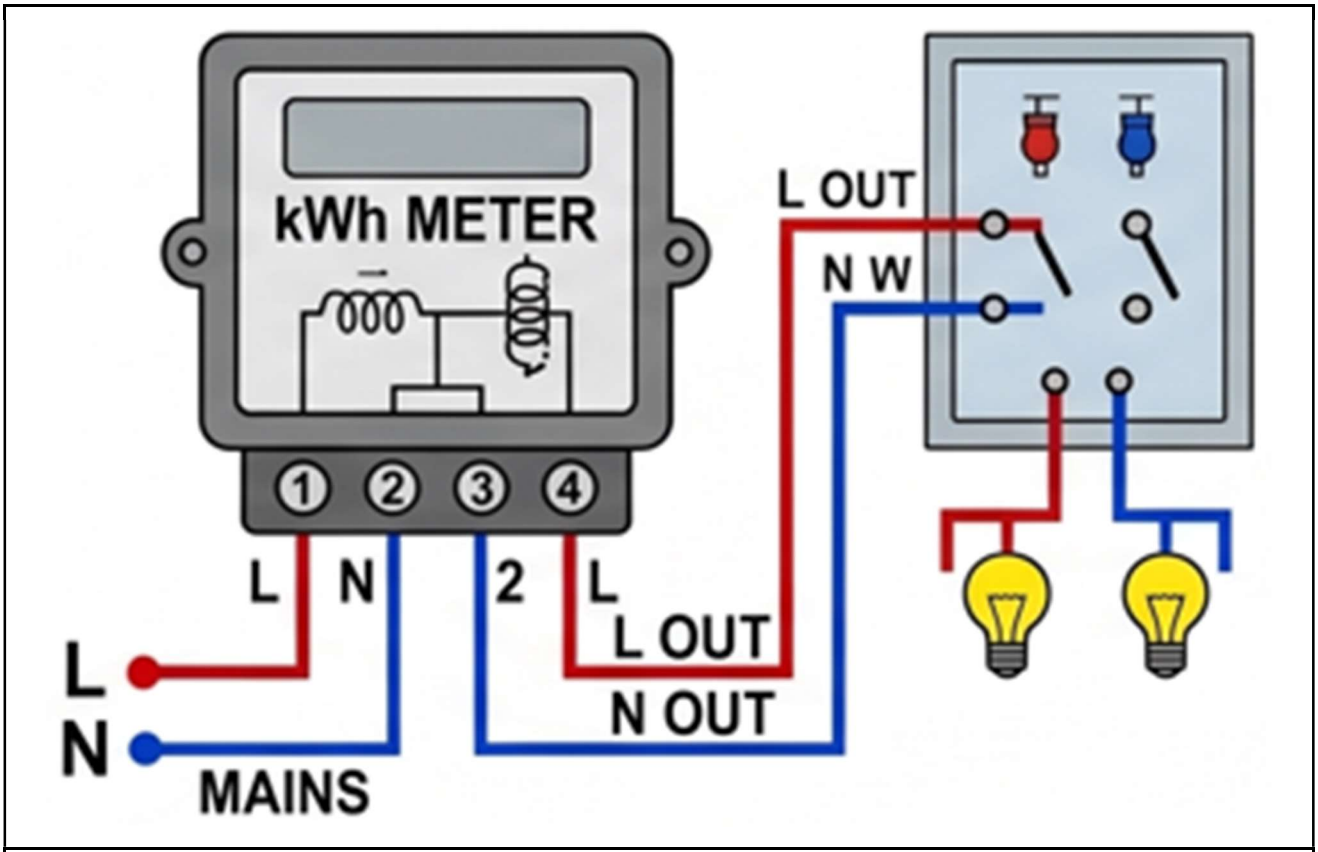


Figure 9. Circuit diagram / photograph of Energy Meter Connection

4. PROCEDURE

1. Identify the line and neutral terminals of the energy meter.
2. Keep the incoming supply isolated.
3. Connect the meter according to the manufacturer's terminal markings and laboratory circuit diagram.
4. Connect the protective and switching devices as specified by the laboratory setup.
5. Connect the load to the meter output.
6. Check all connections before energization.
7. Energize the setup under qualified supervision.
8. Observe the meter reading/pulse indicator.

5. OBSERVATION TABLE

Sl. No.	Load	Initial Reading	Final Reading	Energy Consumed
1	_____ W	_____ kWh	_____ kWh	_____ kWh
2	_____ W	_____ kWh	_____ kWh	_____ kWh
3	_____ W	_____ kWh	_____ kWh	_____ kWh

6. RESULT

The single-phase energy meter connection was demonstrated and energy consumption was observed.

7. SAFETY PRECAUTIONS

- Always switch OFF and isolate the supply before making or modifying connections.
- Use properly insulated tools and wires.
- Do not touch exposed conductors.
- Check the circuit carefully before energizing.
- Use protective devices of appropriate ratings.
- Carry out mains-voltage work only under qualified faculty/laboratory supervision.
- Do not bypass MCB, fuse, RCCB or other protective devices.
- For appliance servicing, disconnect the appliance from mains before opening it.

8. QUESTIONNAIRE

1. What does an energy meter measure?
2. What is the unit of electrical energy?
3. What is the function of an energy meter in a domestic installation?
4. What is the purpose of an MCB in the circuit?
5. What does kWh represent?

EXPERIMENT NO. 10

Protection and Safety Devices: MCB, Fuse and DP Switch

1. AIM

To identify and demonstrate the operation and applications of MCB, fuse and double-pole (DP) switch.

2. APPARATUS REQUIRED

- MCB
- Fuse and fuse carrier
- DP switch
- Lamp/load
- Test board
- Connecting wires
- Multimeter
- Demonstration supply

3. CIRCUIT DIAGRAM / IMAGE

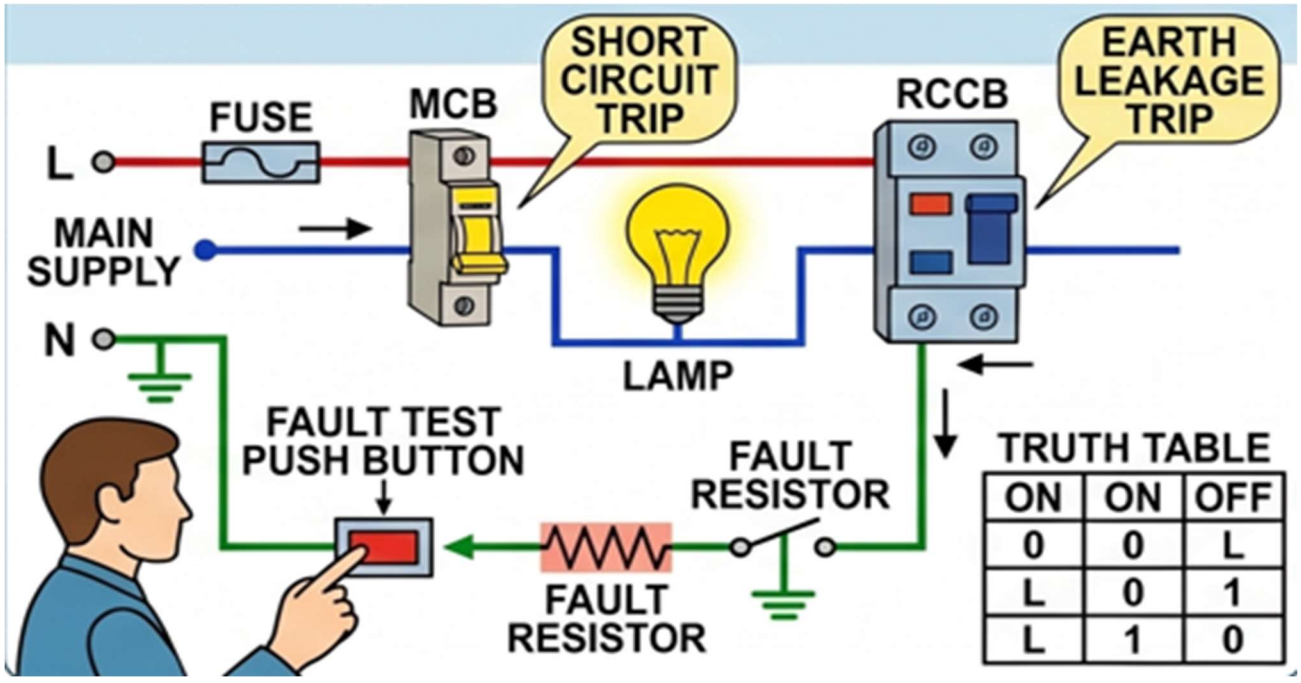


Figure 10. Circuit diagram / photograph of Protection and Safety Devices: MCB, Fuse and DP Switch

4. PROCEDURE

1. Identify the physical construction and ratings of the MCB, fuse and DP switch.
2. Observe the input and output terminals of each device.
3. Study their normal operating condition.
4. Demonstrate isolation using the DP switch.
5. Demonstrate the protective function of an MCB using the approved laboratory demonstration method.
6. Observe the fuse and explain its operation under excessive current conditions.
7. Compare the devices based on operation and application.
8. Record the observations.

5. OBSERVATION TABLE

Device	**Main Function**	**Resettable?**	**Observation**
Fuse	Overcurrent protection	No	_____
MCB	Overcurrent protection	Yes	_____
DP Switch	Isolation/switching	Yes	_____

6. RESULT

The construction, function and applications of MCB, fuse and DP switch were demonstrated.

7. SAFETY PRECAUTIONS

- Always switch OFF and isolate the supply before making or modifying connections.
- Use properly insulated tools and wires.
- Do not touch exposed conductors.
- Check the circuit carefully before energizing.
- Use protective devices of appropriate ratings.
- Carry out mains-voltage work only under qualified faculty/laboratory supervision.
- Do not bypass MCB, fuse, RCCB or other protective devices.
- For appliance servicing, disconnect the appliance from mains before opening it.

8. QUESTIONNAIRE

1. What is the full form of MCB?
2. What is the function of a fuse?
3. Why is an MCB resettable?
4. What is the purpose of a DP switch?
5. State two differences between an MCB and a fuse.

EXPERIMENT NO. 11

Wiring and Service Demonstration of Mixer Grinder

1. AIM

To study the wiring, major components and basic service procedure of a domestic mixer grinder.

2. APPARATUS REQUIRED

- Mixer grinder
- Plug and flexible cable
- Switch/control assembly
- Universal motor
- Jar and blade assembly
- Multimeter
- Screwdriver set
- Combination plier
- Cleaning tools

3. CIRCUIT DIAGRAM / IMAGE

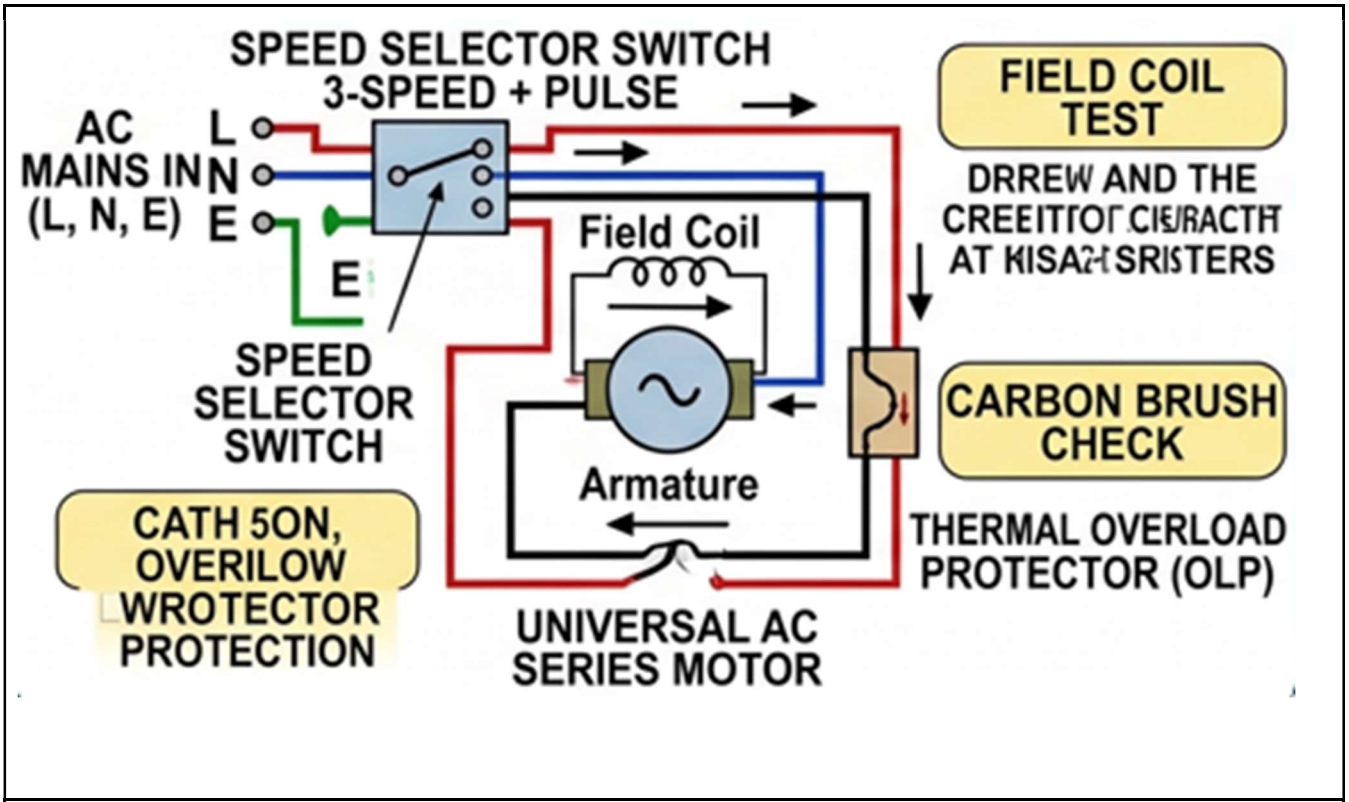


Figure 12. Circuit diagram / photograph of Wiring and Service Demonstration of Mixer Grinder

4. PROCEDURE

1. Disconnect the mixer grinder completely from the mains supply.
2. Identify the external components such as plug, cord, switch/control and motor assembly.
3. Inspect the power cord and plug for visible damage.
4. Open the appliance only under faculty supervision and according to the manufacturer's service procedure.
5. Identify the motor, switch/control assembly and internal wiring.
6. Use a multimeter for appropriate continuity checks only when the appliance is completely isolated.
7. Inspect connections for loose terminals or damaged insulation.
8. Clean the accessible components as instructed.
9. Reassemble the appliance correctly.
10. Perform a final safety inspection before any supervised functional test.

5. OBSERVATION TABLE

Component	**Condition**	**Observation**
Power Cord	Good/Faulty	_____
Plug	Good/Faulty	_____
Switch/Control	Good/Faulty	_____
Motor	Good/Faulty	_____
Internal Wiring	Good/Faulty	_____
Jar/Blade Assembly	Good/Faulty	_____

6. RESULT

The wiring, major components and basic service procedure of the mixer grinder were studied and demonstrated.

7. SAFETY PRECAUTIONS

- Always switch OFF and isolate the supply before making or modifying connections.
- Use properly insulated tools and wires.
- Do not touch exposed conductors.
- Check the circuit carefully before energizing.
- Use protective devices of appropriate ratings.
- Carry out mains-voltage work only under qualified faculty/laboratory supervision.

- Do not bypass MCB, fuse, RCCB or other protective devices.
- For appliance servicing, disconnect the appliance from mains before opening it.

8. QUESTIONNAIRE

1. What type of motor is commonly used in a mixer grinder?
2. What is the function of the switch/control circuit?
3. Why must the appliance be disconnected from mains before servicing?
4. How can a multimeter be used for continuity testing?
5. List any four common faults in a mixer grinder.

EXPERIMENT NO. 12

Wiring and Service Demonstration of Electric Iron

1. AIM

To study the wiring, major components and basic service procedure of a domestic electric iron.

2. APPARATUS REQUIRED

- Electric iron
- 3-pin plug and flexible cable
- Fuse
- Thermostat / temperature-control switch
- Heating element
- Indicator lamp
- Multimeter
- Screwdriver set
- Combination plier
- Cleaning tools

3. CIRCUIT DIAGRAM

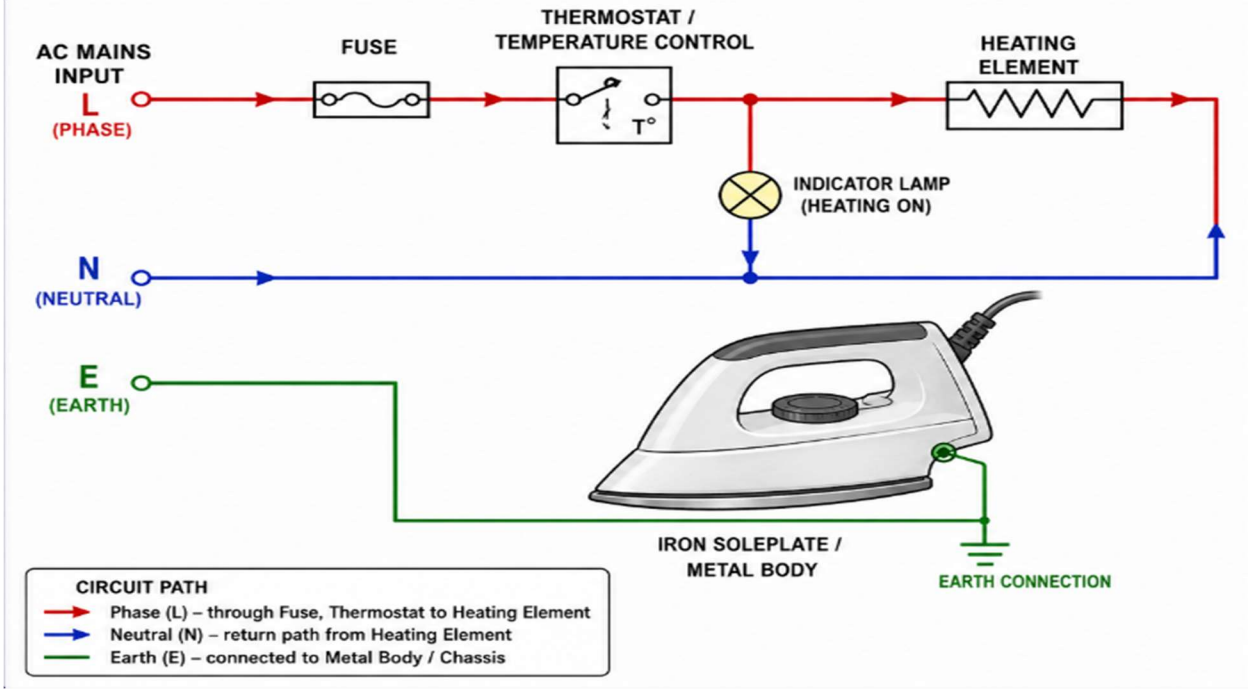


Figure 12. Circuit diagram / photograph of Wiring and Service Demonstration of Mixer Grinder

4. PROCEDURE

1. Disconnect the electric iron completely from the mains supply.
2. Identify the external components such as the 3-pin plug, flexible cord, thermostat/control knob and iron body.
3. Inspect the power cord and plug for visible damage, cuts or loose connections.
4. Open the appliance only under faculty supervision and according to the manufacturer's service procedure.
5. Identify the heating element, thermostat, indicator lamp and internal wiring.
6. Check the continuity of the power cord and heating element using a multimeter only when the appliance is completely isolated from the supply.
7. Inspect the thermostat for proper mechanical operation and check for loose or damaged terminals.
8. Inspect the heating element and internal connections for signs of overheating, burning or damaged insulation.
9. Check the earth connection between the metal body/soleplate and the earth terminal.
10. Clean accessible components and remove dust or deposits as instructed.
11. Reassemble the electric iron correctly.
12. Perform a final safety inspection before carrying out any supervised functional test.

5. OBSERVATION TABLE

Component	Condition	Observation
Power Cord	**Good/Faulty**	_____
3-Pin Plug	**Good/Faulty**	_____
Fuse	**Good/Faulty**	_____
Thermostat / Temperature Control	**Good/Faulty**	_____
Heating Element	**Good/Faulty**	_____
Indicator Lamp	**Good/Faulty**	_____
Internal Wiring	**Good/Faulty**	_____
Earth Connection	**Good/Faulty**	_____
Iron Soleplate / Body	**Good/Faulty**	_____

6. RESULT

The wiring, major components and basic service procedure of the electric iron were studied and demonstrated.

7. SAFETY PRECAUTIONS

- Always switch **OFF and isolate the mains supply** before making or modifying connections.
- Do not open or service the iron while it is connected to the mains.
- Use properly insulated tools.
- Do not touch exposed conductors.
- Ensure that the fuse is of the appropriate rating.
- Check the circuit carefully before energizing.
- Ensure proper earthing of the metallic body of the iron.
- Do not bypass the fuse, thermostat or other protective components.
- Allow the soleplate to cool before handling or servicing.
- Carry out mains-voltage testing only under qualified faculty/laboratory supervision.
- Do not operate the iron if the power cord, plug or insulation is damaged.

8. QUESTIONNAIRE

1. What type of heating element is commonly used in an electric iron?
2. What is the function of the thermostat in an electric iron?
3. Why is a fuse provided in the electric iron circuit?
4. What is the purpose of the indicator lamp?
5. Why is earthing necessary for an electric iron having a metallic body?
6. How can the continuity of the heating element be checked using a multimeter?