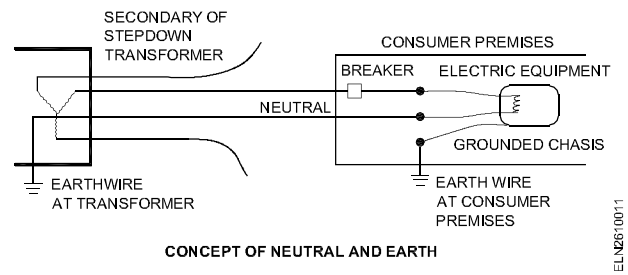
Concept of Neutral and Earth - Cooking range

Objectives: At the end of this lesson you shall be able to
- **state the concept of neutral and earth**
- **define the domestic appliance**
- **define the cooking range**
- **explain the parts of electric range**
- **list out the problems, possible causes and remedies.**

Concept of neutral and earth (Fig 1)

Fig 1



CONCEPT OF NEUTRAL AND EARTH

Earth point is the point connected to the ground, i.e. earthed locally at the consumer premises while Neutral point is the star point of the secondary stepdown transformer feeding the consumer premises.

The role of Neutral point (Nuetral wire) is to close the circuit and carry the consumer load current (return current) back to the transformer. The earth point (earth wire at consumer premises) shall carry no current in normal situations.

The earth point (earth wire) is used to connect the metallic chassis of consumer equipment with the earth and isolate them from the live wires. Hence, the earth wire is used to ensure safety of equipment and personnel.

The earth wire will carry (short) currents in case of chassis of the equipment becomes electrified, i.e. a bare live conductor touches the metallic chassis. This short current will trip some circuit breaker in the way immediately.

The earth wire will carry (Leakage) small currents due to insulation deterioration, humidity and carbon deposit on the insulator. In this case a special breaker called ELCB (Earth Leakage Circuit Breaker) or RCCB (Residual Current Circuit Breaker) that is calibrated to trip at small currents (of the order of 6-30 mA for residual purposes and 300 mA for industrial purposes). Not all electric codes enforces the uses of ELCBs or RCCBs.

Domestic appliances:

Domestic appliance is an electrical equipment/machine used in houses for the various house hold tasks like cooking, washing and cleaning etc.

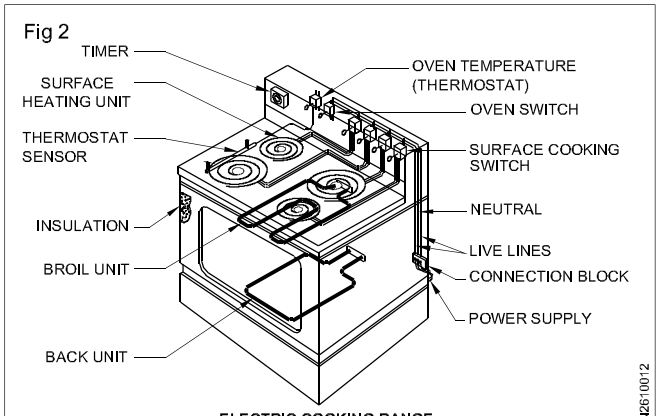
Standard safety norms: Trainees may be instructed to refer the international Electrotechnical commission (IECF 60335 -part 2 - section 64) for the standard safety norms related with domestic appliances for the further details.

Cooking range

Electric cooking range is the combination of an oven and hot plate. The electric range consist of highly efficient heating elements, it gives better cooking control, has shelf oven, fingertip controls and designs to fit almost every possible kitchen need.

The surface heating units are set in the top of the range, the electric connections for these units are carried in the space between the top of the range (Fig 2). Oven controls are also kept in the top but in separate elevated pedestal.

Fig 2



ELECTRIC COOKING RANGE

The parts of a cooking range

Surface heating elements: In present day cooking range the nichrome element is encased in a metal tube with magnesium oxide insulation. This enclosed surface heating element (Fig 2) more efficient, more durable and safe to handle.

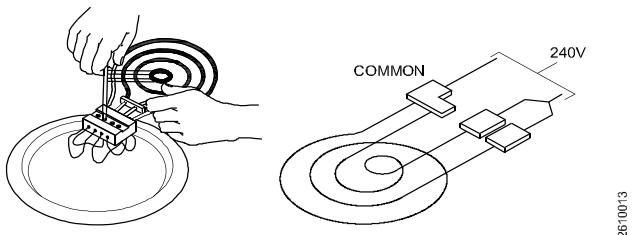
Step/Selector switches: A step switch is simply a rotary switch, which can select four or six different heats (wattages) Fig 3 and 4.

The step switch connected to two or three elements to 240 volts. The total circuit resistance or the voltage is changed to provide different heats.

High heat is obtained by connecting total elements in parallel. For low heat all the coils are connected in series (Figs 3 & 4).

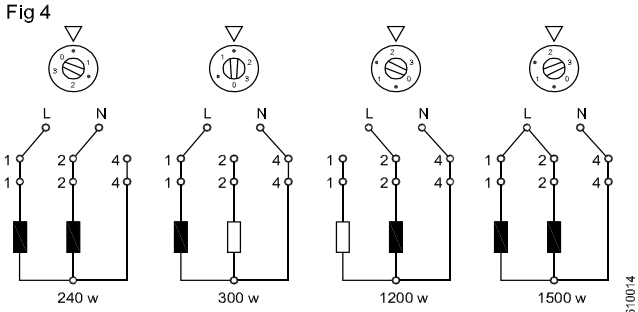
Oven unit: The oven unit consists of two heating elements, an upper element and a lower element.

Fig 3



HEATING ELEMENTS

Fig 4



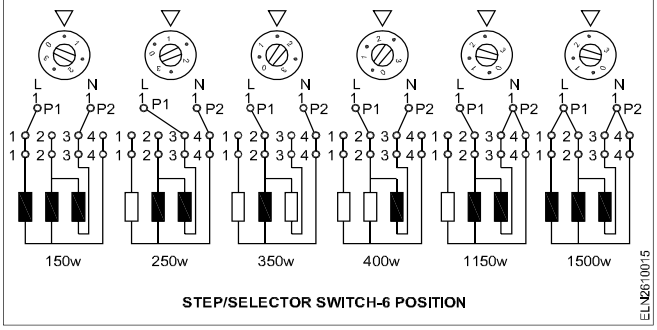
STEP/SELECTOR SWITCH-4 POSITION

The oven heat is normally controlled by thermostat and timing device.

In a oven electric circuit, the broil unit is constructed by stringing the element through the frame in two separate coils, whereas the bake unit is strung with only one coil.

Now-a-days instead of thermostat switch, the typical infinite-heat switches are used (Fig 5). This switch operates the internal heater causes the bimetal to open and close the switch that controls the range heater element. This bimetal heater is series the cooking range and must have the correct resistance for the element being controlled.

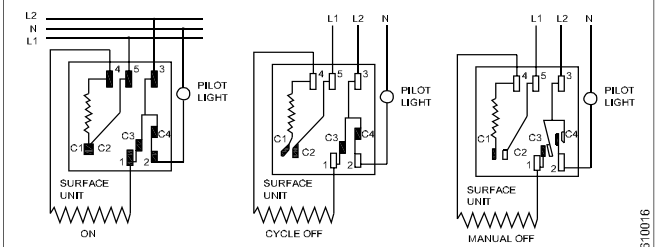
Fig 5



STEP/SELECTOR SWITCH-6 POSITION

A schematic diagram of a typical electric range is given in Fig 6.

Fig 6

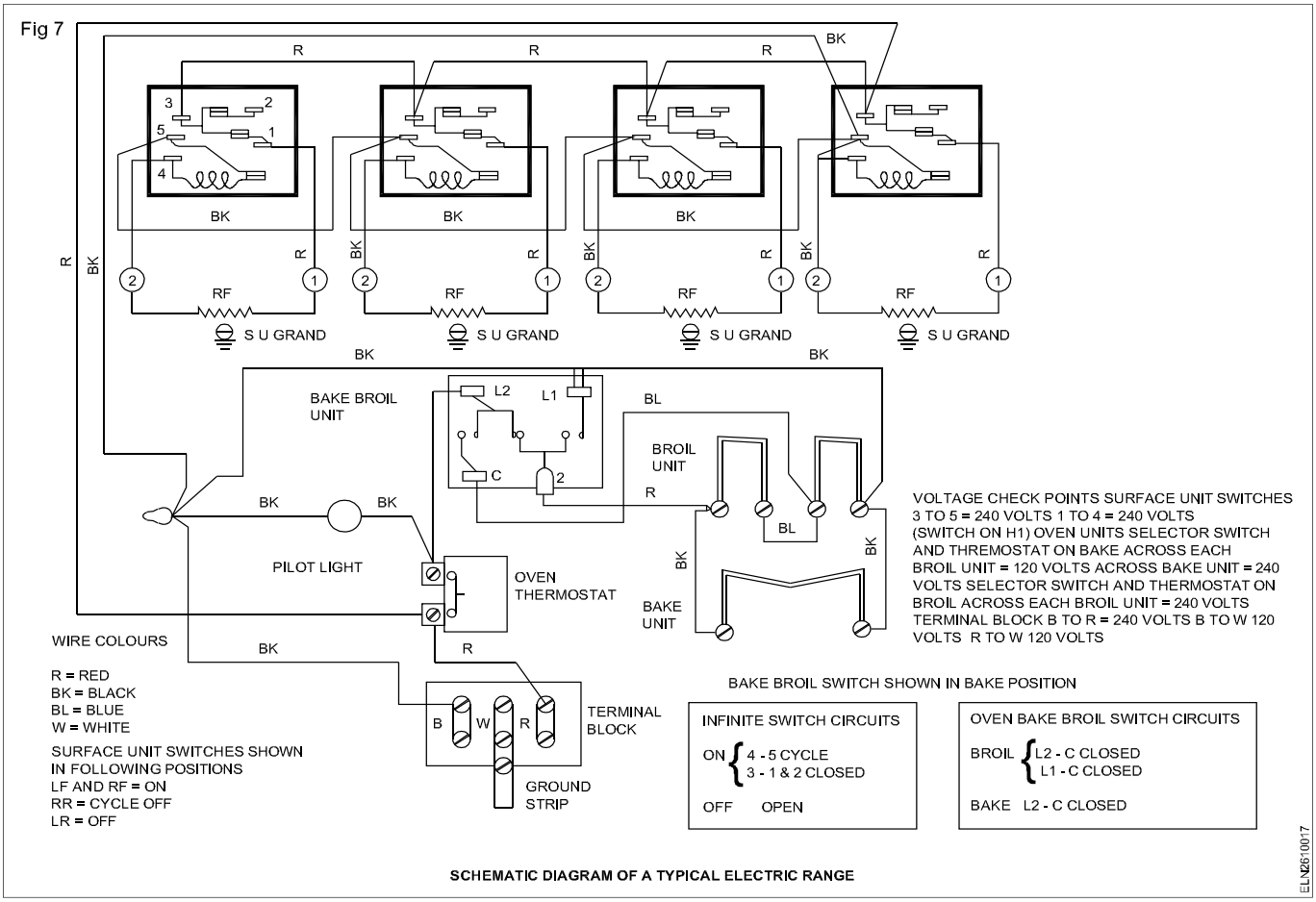


TYPICAL INFINITE-HEAT SWITCHES

Troubleshooting Chart for Electric Ranges

Problem	Possible cause	Corrective Action
Oven will not heat.	Selector switch is OFF. Blown fuse. Inoperative oven control. Open circuit in oven element Loose connection. Timer inoperative.	Set selector switch. Check fuses. Check controls. Check circuit continuity. Tighten all connections. Check timer setting.
Oven too hot or cold.	Thermostat calibration. Improper oven door fit.	Check “Thermostat adjustment”. Check “Door seal and fit”.
Oven will not turn off.	Inoperative selector switch. Inoperative timer.	Check selector switch. Check timer setting.
Oven interior light does not light.	Loose or inoperative bulb. Inoperative light switch. Loose connections.	Tighten or replace bulb. Light switch replacement. Tighten all connections
Oven door opens under heat.	Door needs adjustment. Loose or worn pin.	Check “door seal and fit”. Replace bracket.
Oven door drops down.	Worn hinge bracket.	Replace bracket.

Fig 7



SCHEMATIC DIAGRAM OF A TYPICAL ELECTRIC RANGE

Problem	Possible cause	Corrective Action
Timer does not operate properly.	Incorrect setting	Refer to owner's manual. See "Timer operation."
	Loose connection	Tighten all connections
	Inoperative motor	Replace motor
	Inoperative mechanism	Replace timer.
Timer will not control often.	Incorrect connection	Check wiring diagram.
	Inoperative timer	Replace timer.
	Selector switch not correctly set.	Set selector switch.
Oven drips water or sweats.	Oven not preheated with door open	Check oven operation.
	Oven temperature excessive	Check thermostat calibration
	Door does not seal at the top	Adjust oven door.
	Clogged oven vent.	Clean vent
Surface unit does not heat.	Blown main fuse.	Check fuse
	Loose connection.	Tighten
	Inoperative switch.	Replace switch.
	Open unit.	Check wiring diagram.
	Incorrect connection.	Check wiring diagram.
	Broken wire.	Continuity check.