Home Electrics

Part 2 – the consumer/fuse box

Getting started

- Today I hope to give you a better understanding on how the power coming from the consumer box is distributed to the electrical appliances & lights we use on a daily basis in our homes.
- The first rule of thumb before doing work on any part of the electrics is to:
  - **TURN THE POWER OFF**
- This can either be done by switching off the particular circuit in the circuit breaker consumer box that you are working on, or if you are not sure, then turn the big red main switch in the circuit breaker consumer box to the off position.
- In the case of a fuse box:
  - **Pull the fuse of the circuit you are working on, or if your are not sure turn the main power switch off in the fuse box.**

The Consumer/ Fuse Box

- A live & neutral phase is presented at the consumer box via your meter.
- The consumer box will either be:
  - a ‘circuit breaker consumer box’ with RCD & MCB trip switches, of which the MCB switches will ranges from 6 amps up to 63 amps.
  - Or a fuse box which will have various size fuses ranging from 5 amps up to 60 amps
- Larger ‘circuit breaker consumer boxes are available for the larger properties than the working model I have here on display.
- Our working model is ideal for a bungalow, flat or a small house.
- It has a main red double pole power switch, two RCD test switches, six MCB switches, three neutral bars & one earth bar.
- The big red switch is the main power switch and is where the main power cables that come from the meter are connected.
- This switch will turn off all power in your home when it is in the off position.

Consumer Unit

- The display model we have here has two groups of three MCB switches.
- Each group of MCB switches is connected to one RCD switch.
- A switch marked as RCD, stands for Residual Current Device.
- This switch will turn on and off all the MCB group of switches that are connected to that RCD switch
- The switches marked as MCB, stands for Miniature Circuit Breaker.
- These MCB switches will be marked underneath each switch as to what circuit this switch is used for:
  - i.e. lighting, ring main, cooker socket, outbuildings, security systems, etc.
- Please note: the outbuildings MCB switch could either be a shed, garage or both, which will have lights & plug sockets in them.
- These plug sockets & lights will not be on the same circuits that the lights & plugs sockets in your home are on.

MCB Switches

- Circuits on MCB switches will be marked as to define what the switch should be used for and is as follows:
  - 6 amps: should be used for your household lighting circuits.
  - 16 amps: can be used for your outbuildings, security equipment etc.
  - 32 amps: should be used for your ring main circuit.
  - 40 amps: is normally used for the cooker socket.

- A typical home with a ‘circuit breaker consumer box’ may have two or more groups of RCD circuits and may have four, five or more MCB switches connected to each RCD switch.
- Each RCD group will have its own neutral bar.
- Therefore, connecting a lighting circuit to a MCB switch for example: the live brown wire is connected to a particular MCB switch that is part of a RCD group of switches the neutral blue wire must be then connected to the neutral bar that is associated with the RCD group of MCB switches.
- When working on the house lighting circuit, you only need to turn off the MCB switch for that particular lighting circuit, which should be clearly marked and that circuit will then become dead.
- All other MCB switches that are connected to the same RCD switch that has other circuits such a ring main, cooker socket etc, will remain live and will not affect your appliances such as tv’s, fridge-freezers, computers, cooker & outbuildings plugs & lights etc.

Cabling

- New cables will be installed in most homes. however, but be aware there will be some homes that may still have old cables or a mixture of old & new cables.
- if you have old cables, get them checked out by: <u>**A Qualified Electrician**</u>

Colour coded cables for old & new cables

Colours & Sizes of the wires

	old cables			new cables		
		ring main	lights		ring main	lights
Live wire	red	7029	3029	brown	2.5mm	1.5mm
Neutral wire	black	7029	3029	blue	2.5mm	1.5mm
earth wire	green	3029		green/yellow	1.5mm	

- 7029 cables used on a ring main will have 7 small strands of wire for the red live wire and for the black neutral wire & 3 small strands of wire for the earth wire.
- 3029 cables used on lighting circuits will have 3 small strands of wire for the red live wire, 3 small strands of wire for the black neutral wire & three small strands of wire for the earth wire.
- <u>**Any property that has 7029 or 3029 cables must be replaced a.s.a.p. by a Qualified Electrician.**</u>

Cabling for a Ring Main circuit

- A ring main circuit is the main power source to operate all electrical appliances, like computers, tv’s & cleaning equipment etc., a 2.5mm cable runs out of the consumer box, connecting all the plug sockets up in the house in parallel.
- From the last socket, the cable runs back to the consumer box forming a ring circuit, where the wires are then connected to a 32amp MCB switch inside the consumer box.
- To add another separate ring main just repeat the above.

CABLING FOR THE LIGHTING CIRCUIT

- Just one 1.5mm cable that has been connected to a 6amp MCB switch runs out from the consumer box for the lighting circuit.
- This cable connects all the ceiling roses up in parallel in the rooms of the house.
- Unlike the ring main circuit there is **no** return cable back to the consumer box on this circuit.
- To add another separate lighting circuit just repeat the above.

Cabling for Outbuildings, Security Etc and a Cooker Socket

- **Cabling for outbuildings, security etc.**
- Just one 2.5mm cable after being connected to a 16amp MCB switch in the consumer box runs to the outbuildings or any point that is required for security equipment.

- **Cabling for the cooker socket**
- Just one 6mm or 10mm cable, (depending on how powerful the cooker is) runs out from the consumer box to the cooker socket.
- The wires of this cable are connected to a 40amp MCB switch.

- Whilst I recognise that todays cookers do not use so much current as old cookers did, I still consider using a 6mm or 10mm cable is good practice.

Earth Wires

- The earth wires in new & old cables is a bare wire within the cable itself and will have to be protected with a green/yellow sleeve when connecting the earth wire in a consumer box, a plug socket or a ceiling rose etc.
- All connection of the above should be done by a: **<u>Qualified Electrician</u>**

Best Practice

- In a property with two floors and requires two ring mains and two lighting circuits, the **best practice** is to split both these circuits across the two floors.
- Should one of the circuits go out due to a faulty cable bulb or appliance etc, then you are not completely without power or lights on either of the floors.
- If the fuse blows or the circuit breaker switch, trips out and cuts off the power to that circuit, this has happened in order to protect the wiring from overheating because there could be a fault on the wiring or too many appliances running on the same circuit at the same time.
- Get a **qualified electrician** to check this out.

To calculate how much load to have on any one particular wiring circuit

- Multiply the voltage by the amperage which will give the wattage.

  This is expressed as: **Volts x Amps = Wattage**.

- For example on a ring main that is protected by a 30 amp fuse in a consumer box = 7,200 watts and on a lighting circuit that is protected by 5 amp fuse = 1,200 watts.

- On a consumer box that has circuit breaker switches, a ring main that is protected by a 32 amp tri switch (RCD) = 7,680 watts and on a lighting circuit that is protected by 6 amp trip switch (RCD) = 1,440 watts.

AMPS

- Amperage is a way to measure the amount of electricity running through a circuit. Amperage is the "rate" that current is flowing through the circuit or the number of electrons moving through the wire.
- You might come across amps if you look inside your home's consumer box. You'll see different circuit breakers listed as 6amps 15 amps, and 32 amps. The larger the amperage, the more electricity can flow through the circuit. Again, large appliances like air conditioners, washers and dryers will be connected to 32-amp circuits, while most outlets in a home will be powered by 6-amps or 15-amp circuits.
- The unit is named after French physicist André-Marie Ampère, one of the fathers of electromagnetism.

VOLTS

- Voltage is a measurement of the electric potential or "pressure" at which electricity flows through a system. Voltage is also described as the speed of individual electrons as they move through a circuit and is measured in units called volts.
- Volts are named after the Italian physicist 'Alessandro Volta', who built one of the first batteries in the 1800

WATTS

- Of all these different units of electricity, **wattage** is probably the most familiar. For years, you've been buying 40 & 60 watt light bulbs. A light bulb of 60-watt is generally understood is brighter than a 40-watt bulb.
- Wattage, is the amount of power an electric device consumes. Another way to think about wattage is "electricity at work" — the power it takes to actually do something, whether it's running a vacuum (400 to 900 watts), ringing the doorbell (2 to 4 watts) or illuminating a light bulb (40 to 75 watts).
- To calculate wattage, you simply multiply voltage (pressure/speed) by amperage (volume), expressed as **V x A = W**. The faster each electron moves through the circuit and the greater the volume that the circuit can hold, the higher the wattage.
- Wattage is named after James Watt, the Scottish engineer who popularized the steam engine.

OHMS

- Circuits are made up of wires and wires are not always perfect conductor’s electricity. Most electrical wiring in the home is made of copper and both of those materials have a certain amount of resistance or friction, which slows down the flow of electricity. When electricity passes through electrical devices and appliances, they also apply their own resistance built in these devices and appliances.
- Therefore this resistance is measured in ohms, which are named after the German physicist and mathematician Georg Simon Ohm.