ELECTRICAL & ELECTRONICS CONTRACTING LTD

HOME OWNER'S GUIDE TO

DEALING WITH AN ELECTRICAL EMERGENCY

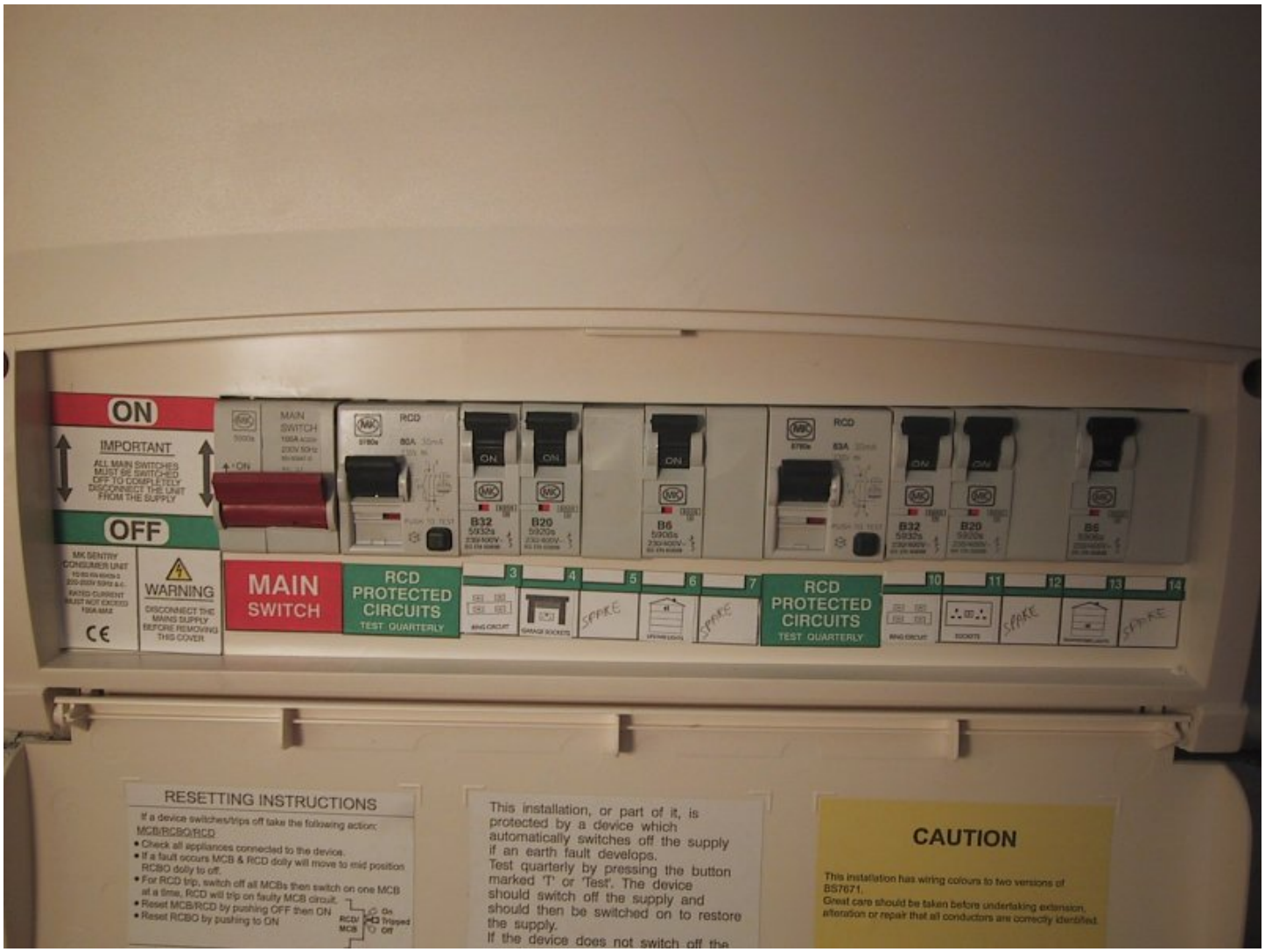
FOR MAIN INCOMING SUPPLY PROBLEMS PHONE 08000 727282
(THE SCOTTISH & SOUTHERN ENERGY 24 HOUR EMERGENCY NUMBER)

Your domestic electrical incoming supply should look something like this and usually located in the cupboard under the stairs like this one or behind a plastic door on an outside wall like the photos below.

If you can see (and/or there is a smell of) burning, in this area or any of the cables show signs of damage i.e. exposed copper showing through or blistering, phone the emergency number (**08000 727282**) immediately.

It doesn't matter which provider supplies your electricity, Scottish & Southern Energy are responsible for the safety of the supply to your property (in the Southampton & surrounding areas).

EMERGENCIES BEYOND THE INCOMING SUPPLY

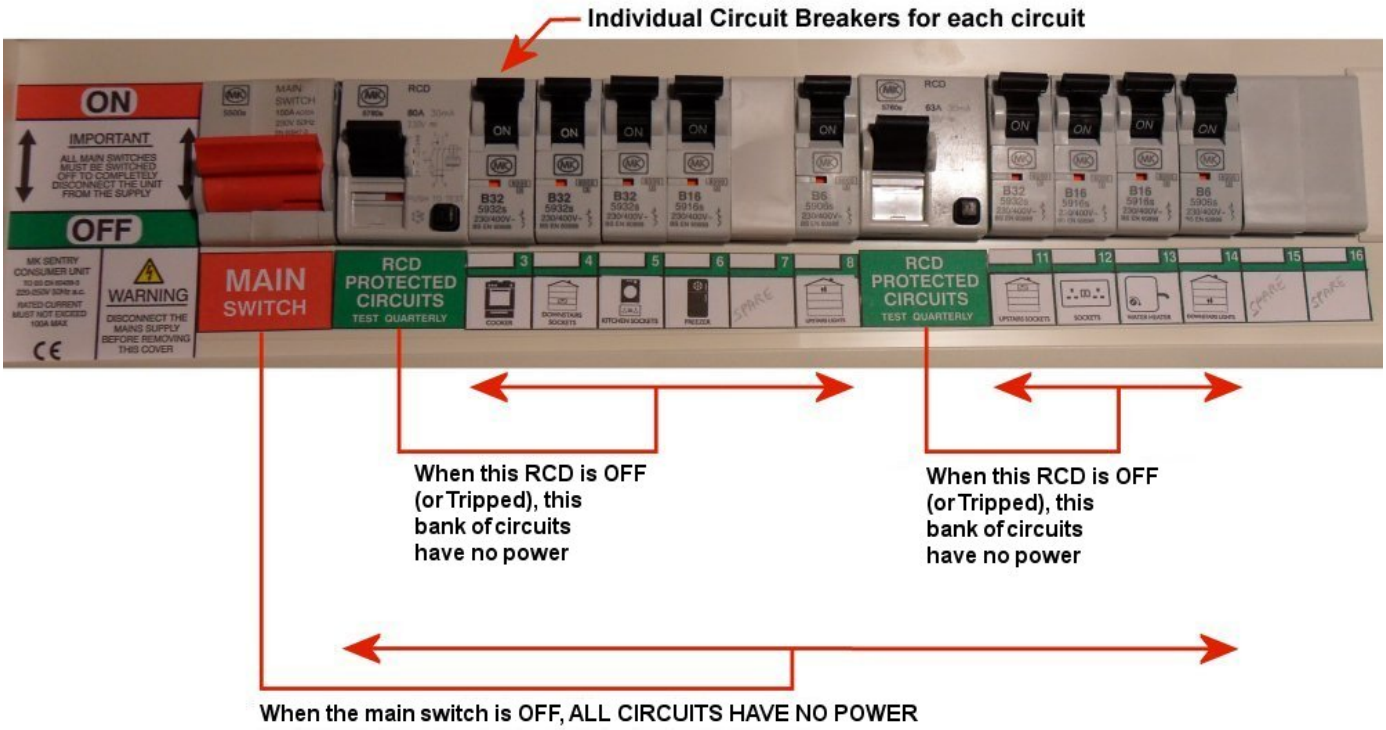


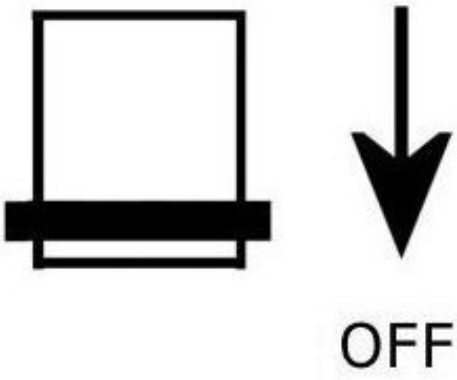
This is a typical consumer unit installed by EEC to the latest wiring regulations (17th edition) & Part-P of the building regulations.

Where the entire electrical supply needs to be turned off, locate the "MAIN SWITCH" and turn it "OFF" before contacting EEC on 07986 949233.

IDENTIFYING PARTS & FUNCTIONS

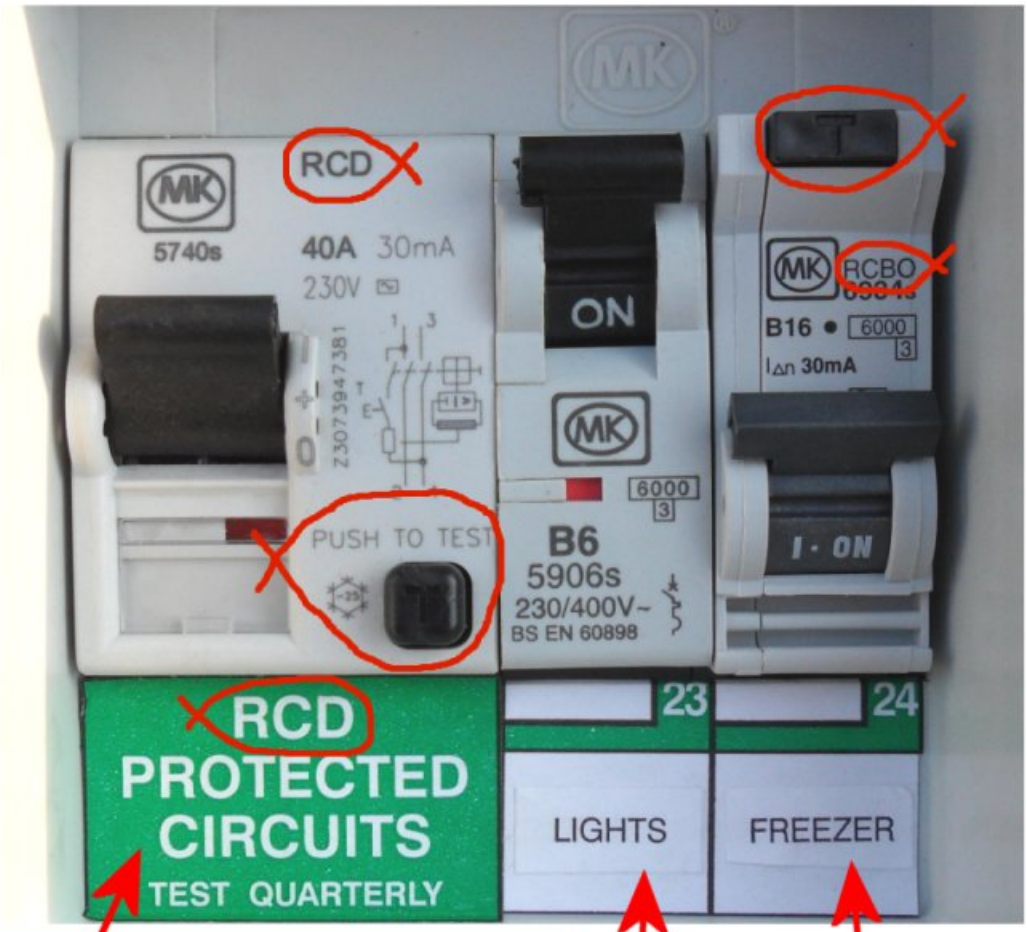
Main Switch:	Turns everything OFF (if there is more than one consumer unit, there will be more than one main switch).
Circuit Breaker:	A safety device that trips and disconnects power on overload or a short circuit on the relevant circuit. Think of it like the brakes on a car - it stops you before you hit real trouble.
RCD:	A safety device that trips and disconnects power when there's a leakage of current to earth on any of the circuits it protects. Think of it like a seat belt in your car - it's not the same as the brakes, but it's an extra layer of protection. And just like a seat belt, sometimes when you pull it to put it on, it operates and jams and you need to feed it back and try again. RCDs are prone to "nuisance tripping" or tripping for no apparent reason. Usually it's cured by resetting the RCD, but if it happens too frequently (more than once every few months), it needs further investigation.
RCBO:	A Residual Current Breaker with Overload Protection. In other words, it combines the functions of a Circuit Breaker and an RCD in one module. It could have tripped on overload or short circuit like a Circuit Breaker or earth leakage like an RCD.
FUSE:	A piece of wire that breaks when a fault occurs. The fuse wire size is calculated to fail before the circuit cable it protects shows signs of stress. Unlike a modern circuit breaker, it can take a significant amount of time to disconnect the faulty circuit. Think of it like the brakes on a 1950s car - it will stop eventually, but you may be in the ditch by then.





ALL POWER
ON or OFF

The Main Switch turns everything **OFF**
(if there is more than one consumer unit, there will be more than one main switch).



The RCD protects against earth faults, is a double width module, has "RCD" written on it's body and has a "Test" button.

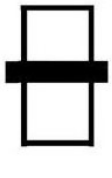
A Circuit Breaker protects individual circuits against overload & short circuit and is a single width module

An RCBO combines the function of an RCD and Circuit Breaker in a single width module.

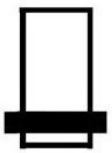
LIGHTS STOPPED WORKING

This is normally due to a lamp (light bulb) blowing and tripping the circuit breaker for the lighting circuit. Switch off the faulty light (or all lights if you are not sure which light is faulty). Locate the tripped circuit breaker (usually labelled "upstairs lights" or "downstairs lights") and reset it. If the circuit breaker fails to reset, it could be due to a fault on one of the lighting circuits. Try switching off all the lights on that circuit before resetting the circuit breaker again.

If the circuit breaker fails to reset after three (3) attempts, contact EEC on 07986 949233.



LEVER in MID POSITION
= TRIPPED



To Reset:
Turn OFF

and
ON

CIRCUIT BREAKER TRIPPED / TRIP SWITCH TRIPPED

Locate the cause of the fault if possible - most likely to be the last item plugged in or switched on. Switch off (and if possible unplug) the faulty device (switch off electric cookers etc at their wall isolator switch). Locate the tripped circuit breaker and reset it as detailed above for the lighting circuit.

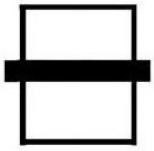
If the circuit breaker fails to reset after three (3) attempts, contact EEC on 07986 949233.

RCD TRIPPED / TRIP SWITCH TRIPPED – NORMALLY SHOWS UP AS "SOCKETS (& SOME LIGHTS) NOT WORKING"

Where the circuit breakers trip on an overload (or short circuit) fault, the RCDs (sometimes called a "Trip Switches") trip when there is excessive earth leakage detected in one of the circuits. This normally happens when there is an internal fault in a piece of equipment being used, water has leaked into a piece of equipment or a socket / light fitting etc.

BASIC RCD FAULT FINDING & RESETTING

- Locate the cause of the fault if possible - most likely to be the last item plugged in or switched on.
- Switch off and unplug the faulty piece of equipment.
- Locate the tripped RCD and reset it.



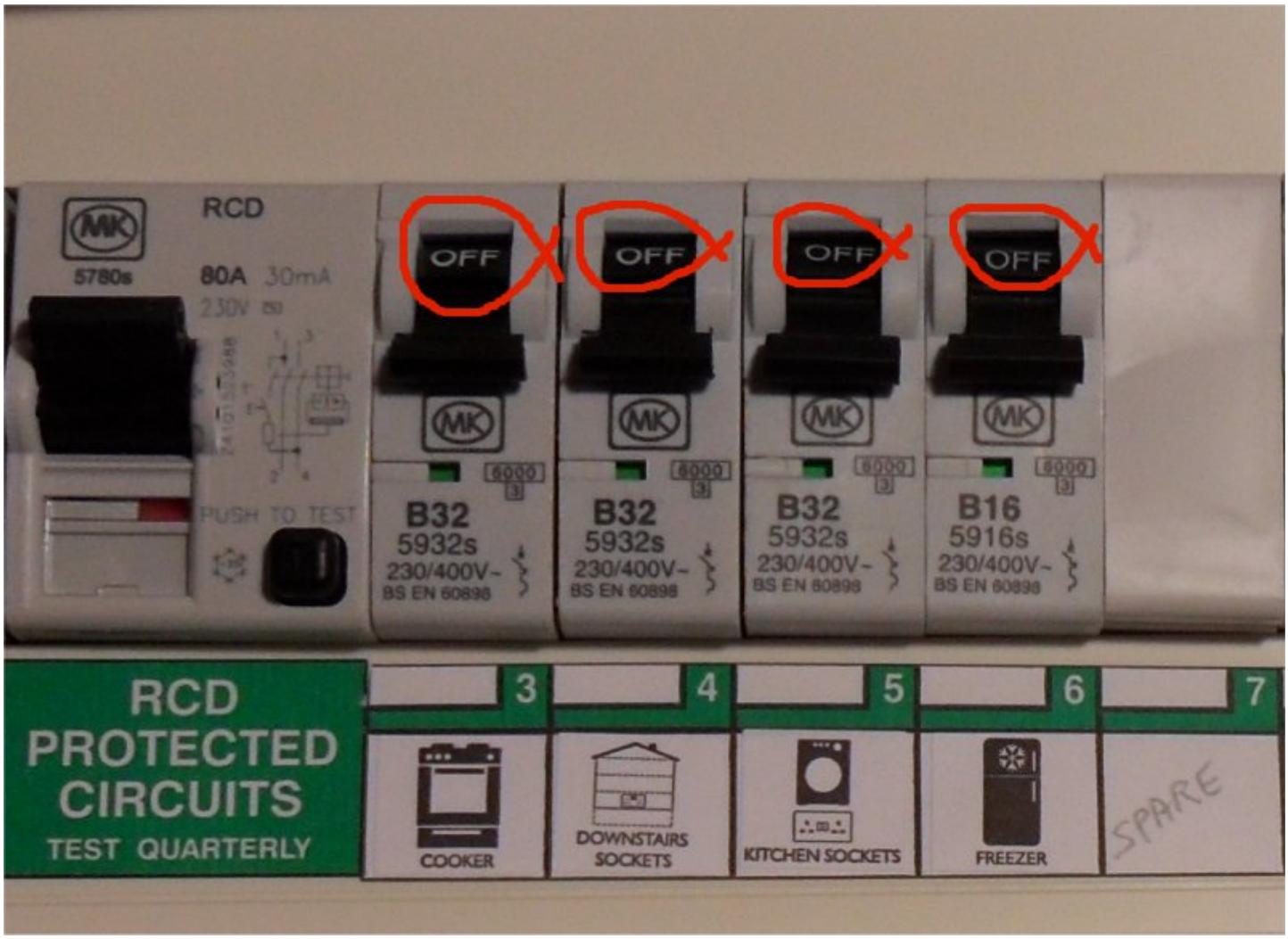
LEVER in MID POSITION
= TRIPPED

To Reset:
Turn OFF

and
ON

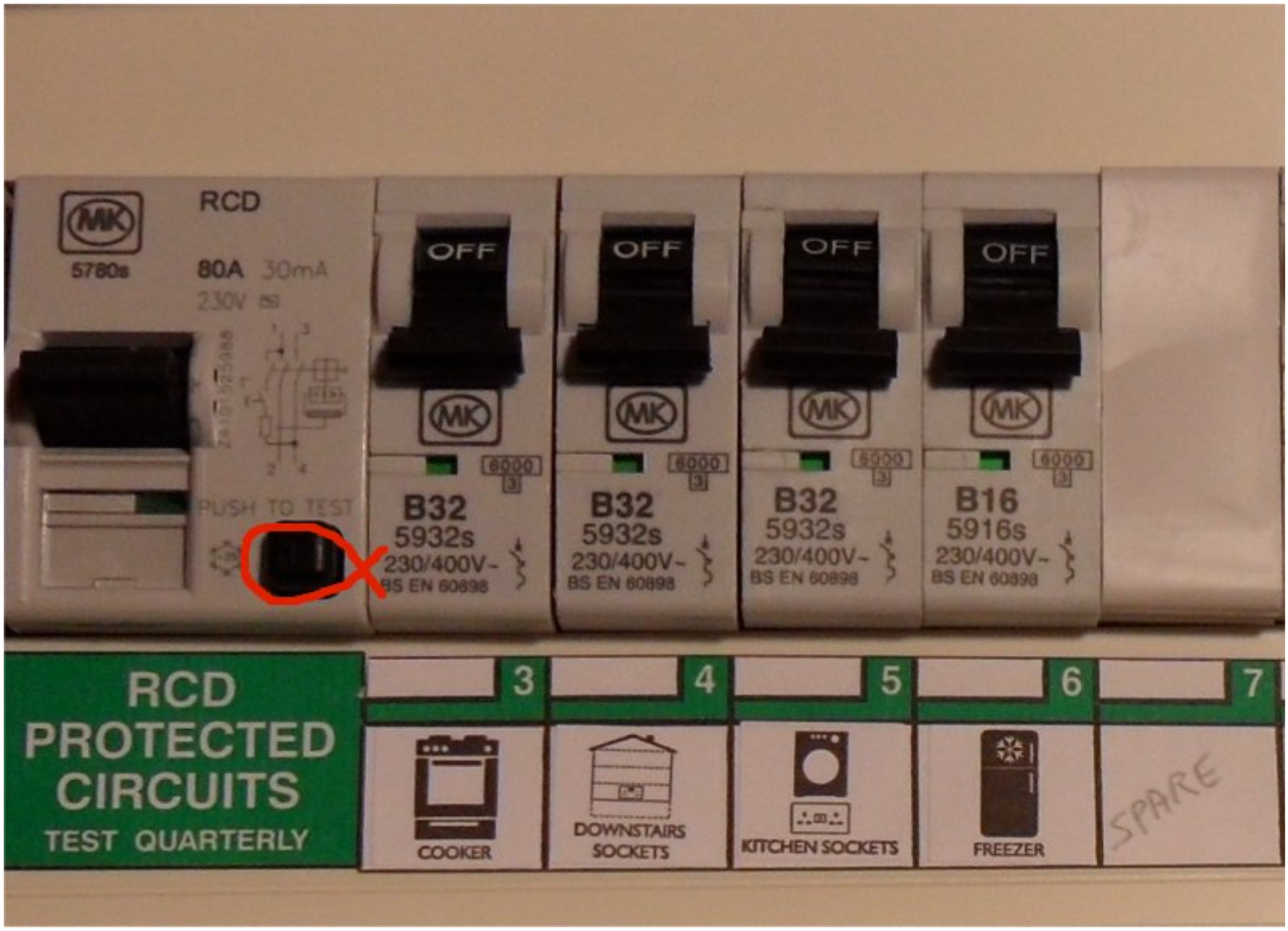
ADVANCED RCD FAULT FINDING & RESETTING

- If, after following the basic instructions above, the RCD does not reset:
  - Below each circuit breaker, there is a label identifying the circuit it protects e.g. "Cooker" for the 1st circuit in the example below.
  - Switch off all lights connected to the circuits protected by the tripped RCD.
  - Unplug everything that's connected to the circuits protected by the tripped RCD - unplugging devices with a 13A plug at the wall (switching off is no good, they must be unplugged to eliminate them as suspects).
  - Switch off cookers, ovens, hobs, immersion heaters and electric showers using their appropriate switches if the label on the circuit breaker indicates that they are on this block of circuits.
  - Turn OFF all circuit breakers to the right of the RCD.
  - Reset the RCD.
  - **If the RCD fails to reset, contact EEC on 07986 949233.**



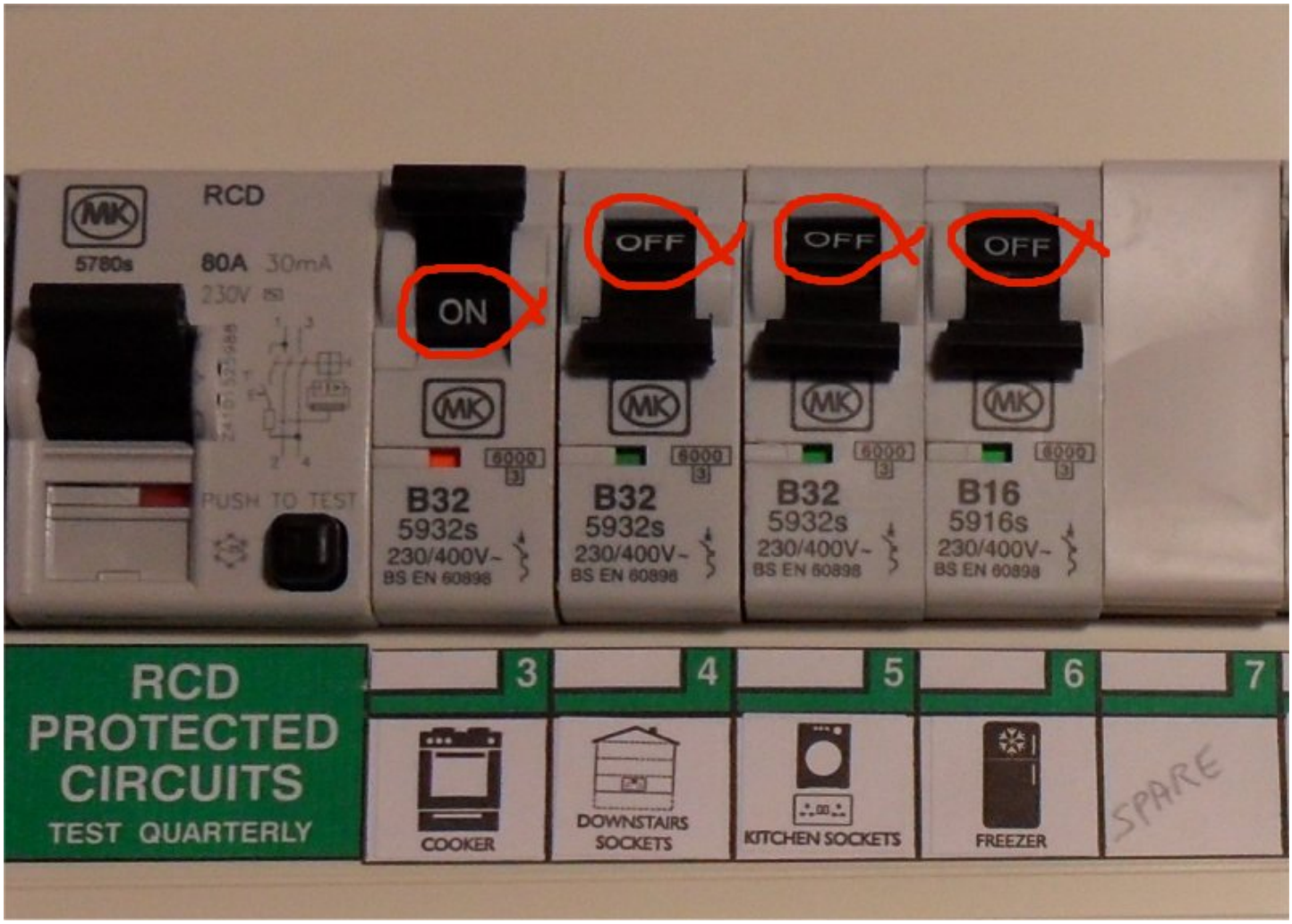
Resetting the RCD with no loads connected (to make sure that the RCD is working).

- Press the RCD test button - the RCD should go to the "Tripped " position (make sure that the Main Switch is ON).
- **If the RCD fails to trip when the test button is pressed, contact EEC on 07986 949233.**



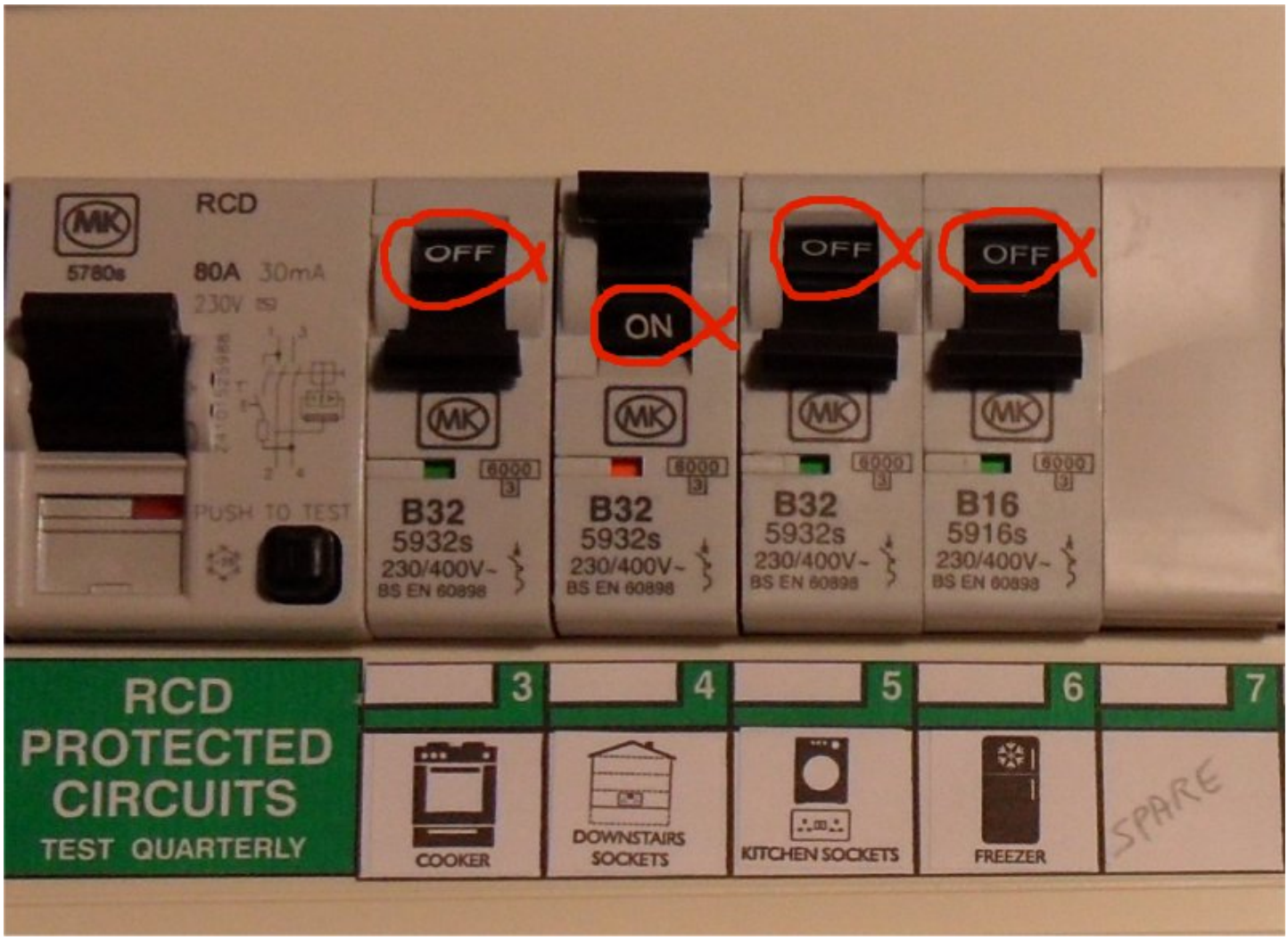
Testing the RCD with no loads connected (to make sure that the RCD is working).

- Reset the RCD.
- Turn ON the first circuit breaker and check that the RCD does not trip.



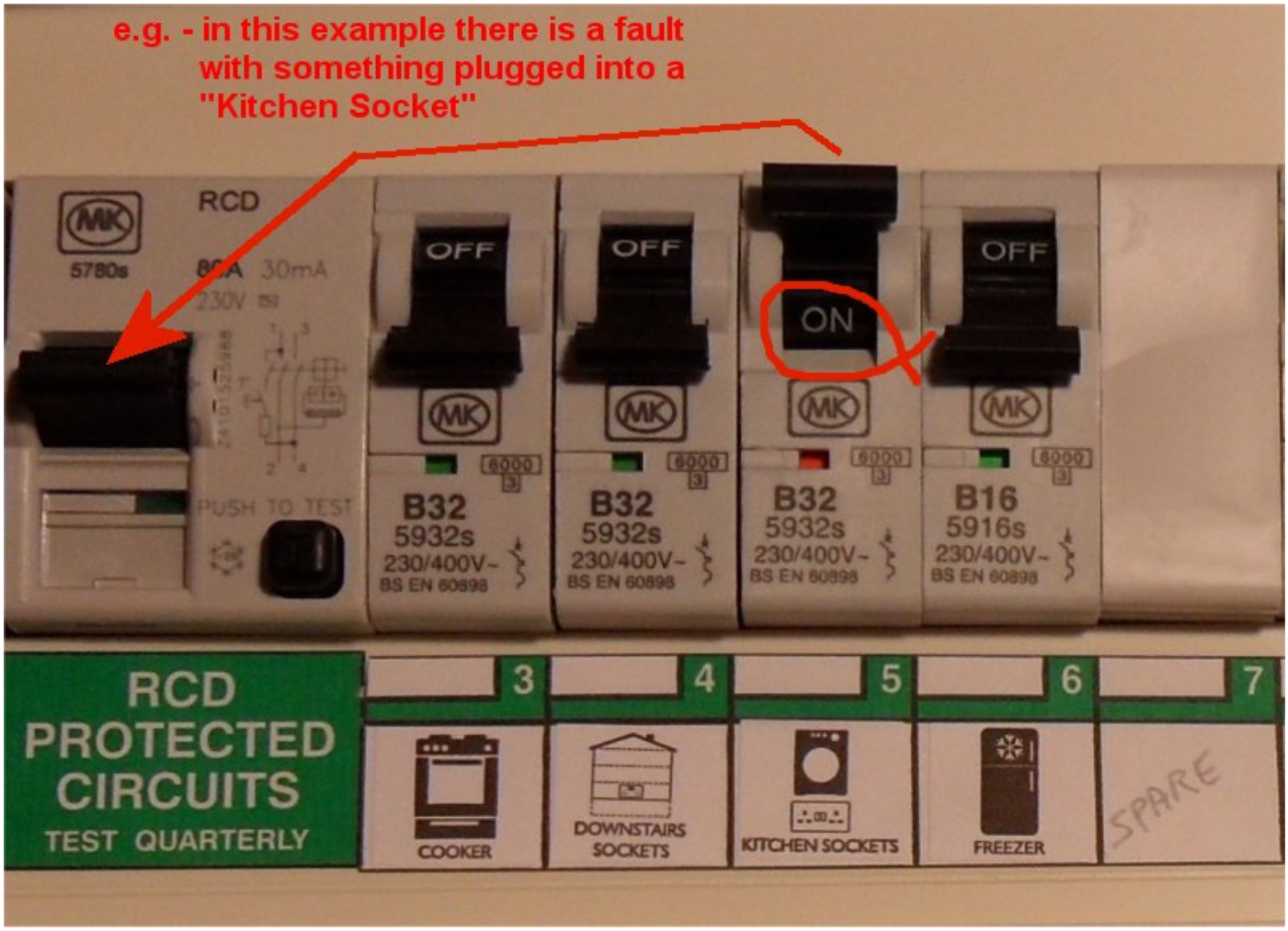
Connect one load, with the RCD on to check the circuit for an earth fault.

- Turn OFF the first circuit breaker and turn ON the second circuit breaker and check that the RCD does not trip.



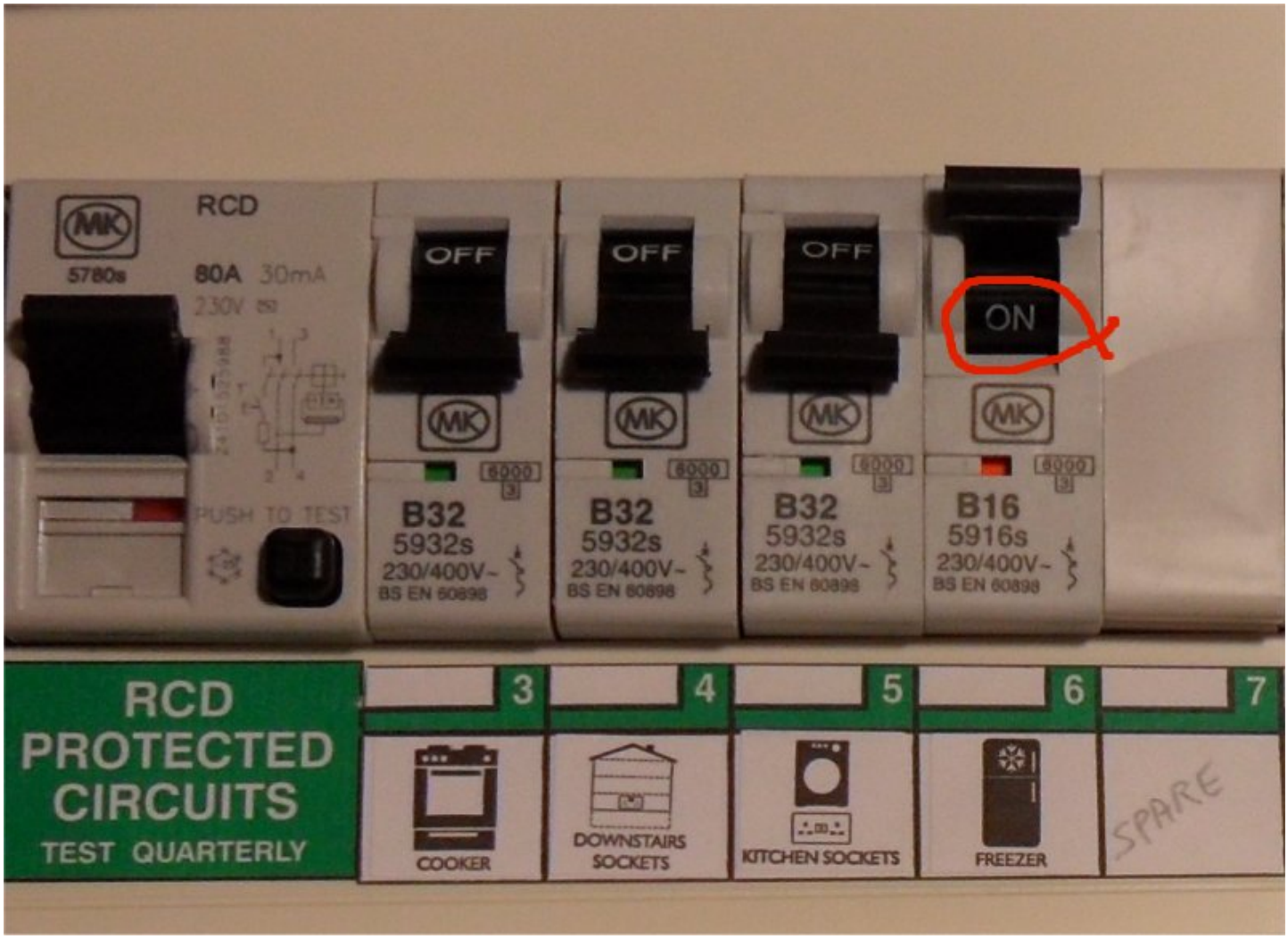
Continue testing one circuit at a time, with the RCD switched on.

- Turn ON one circuit breaker at a time and check that the RCD does not trip - in this example, switching ON the kitchen sockets trips the RCD.



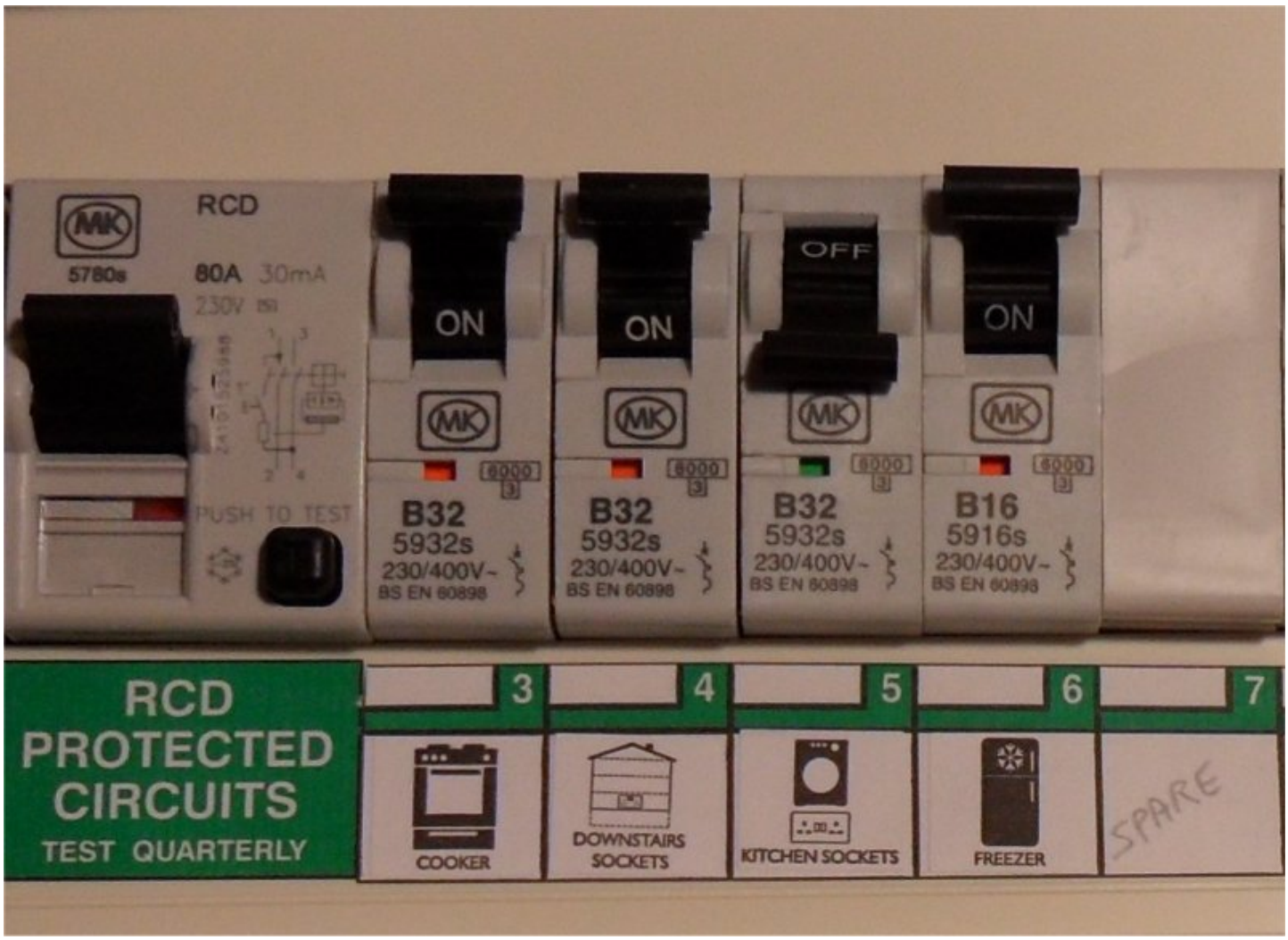
The faulty circuit will cause the RCD to trip.

- If the RCD trips, turn OFF the circuit breaker that causes the trip, reset the RCD and continue testing the rest of the circuits.



Continue testing the other circuits, one at a time, in case there is another fault.

- If the faulty circuit can be identified, turn on the remaining circuit breakers and continue searching for the faulty equipment on the relevant circuit (kitchen sockets in this example).



Turn on all but the faulty circuit.

- When all circuit breakers are ON (in the UP position) and the RCD is ON (in the UP position), start plugging in and switching on equipment, one at a time, checking that the RCD is still ON.
- If the RCD trips on plugging in or switching a piece of equipment, switch off and unplug that piece of equipment, set it aside and mark it as "FAULTY - DO NOT USE", reset the RCD and try attaching the remaining equipment.
- If the fault cannot be found, it must be investigated by an electrician using the appropriate knowledge & test equipment (not available from one of the DIY sheds). **Do not attempt to open the consumer unit and have a go - there are lethal voltages present and you are at risk of serious injury or death.**

Typical professional test equipment required to find faults on modern RCD protected circuits.

THE USUAL SUSPECTS

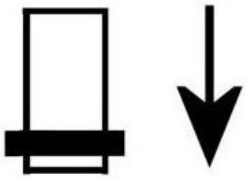
The most likely devices to develop a fault that trips an RCD are devices that contain water or come into contact with water:

- Kettles.
- Washing Machines.
- Dishwashers.
- Electric Cookers, Ovens & Hobs.
- Electric Showers.
- Steam Irons.
- Food Processors, Juicers etc.
- Wallpaper Steamers.
- Hair Dryers, Curlers, Straighteners.
- Sockets under the sink.
- Sockets on outside walls of the house or in the garden.
- Sockets & lights in Sheds & Greenhouses.
- Hot Tubs.
- External lights.
- Fluorescent light fittings.
- Anything electrical that's plugged in and gets rained on.
- Wiring, Cabling or junction boxes in damp or wet areas - under floors, in sheds etc.

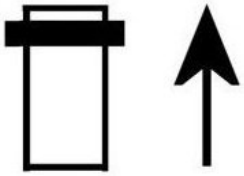
RCBO TRIPPED

RCBOs combine the earth fault protection function of an RCD and the overload / short circuit protection function of a circuit breaker. They are normally used for dedicated circuits like freezers, outbuildings etc, or where space is limited. Switch off (and if possible unplug) the faulty device, locate the tripped RCBO and reset it.

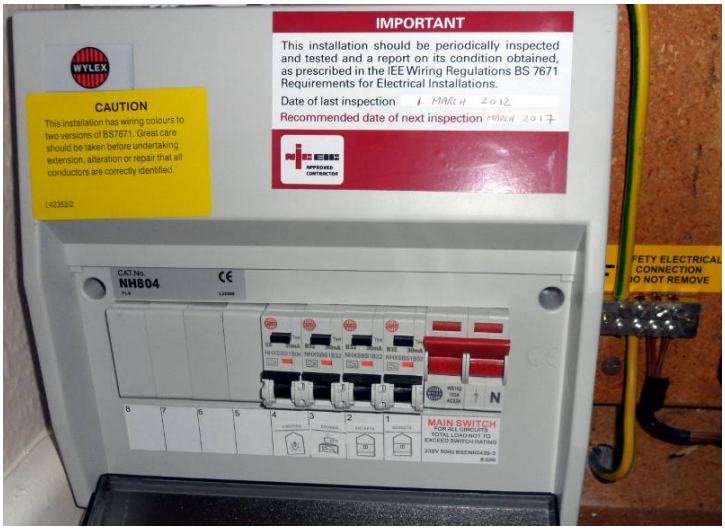
If the RCBO fails to reset after three (3) attempts, contact EEC on 07986 949233.



TRIPPED
or OFF



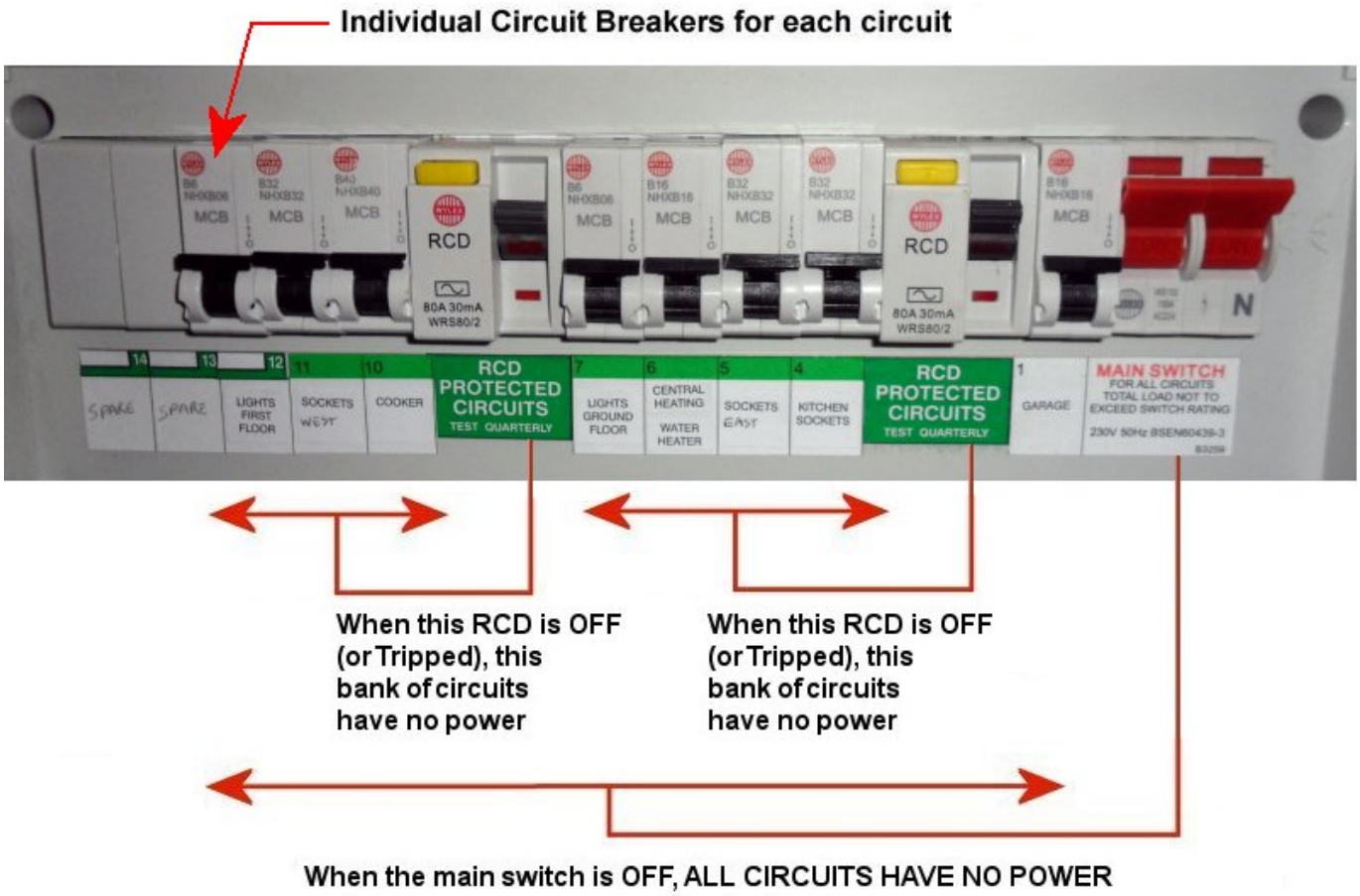
To Reset:
Turn ON



In some circumstances, where an old 1950's style fusebox is replaced by a modern consumer unit, space constraints mean that a larger dual RCD board will not fit and it's necessary to use RCBOs throughout (look for the "Test" button at the top of the RCBO - if it's missing, then you have a Circuit Breaker instead).

OTHER MODERN CONSUMER UNIT CONFIGURATIONS

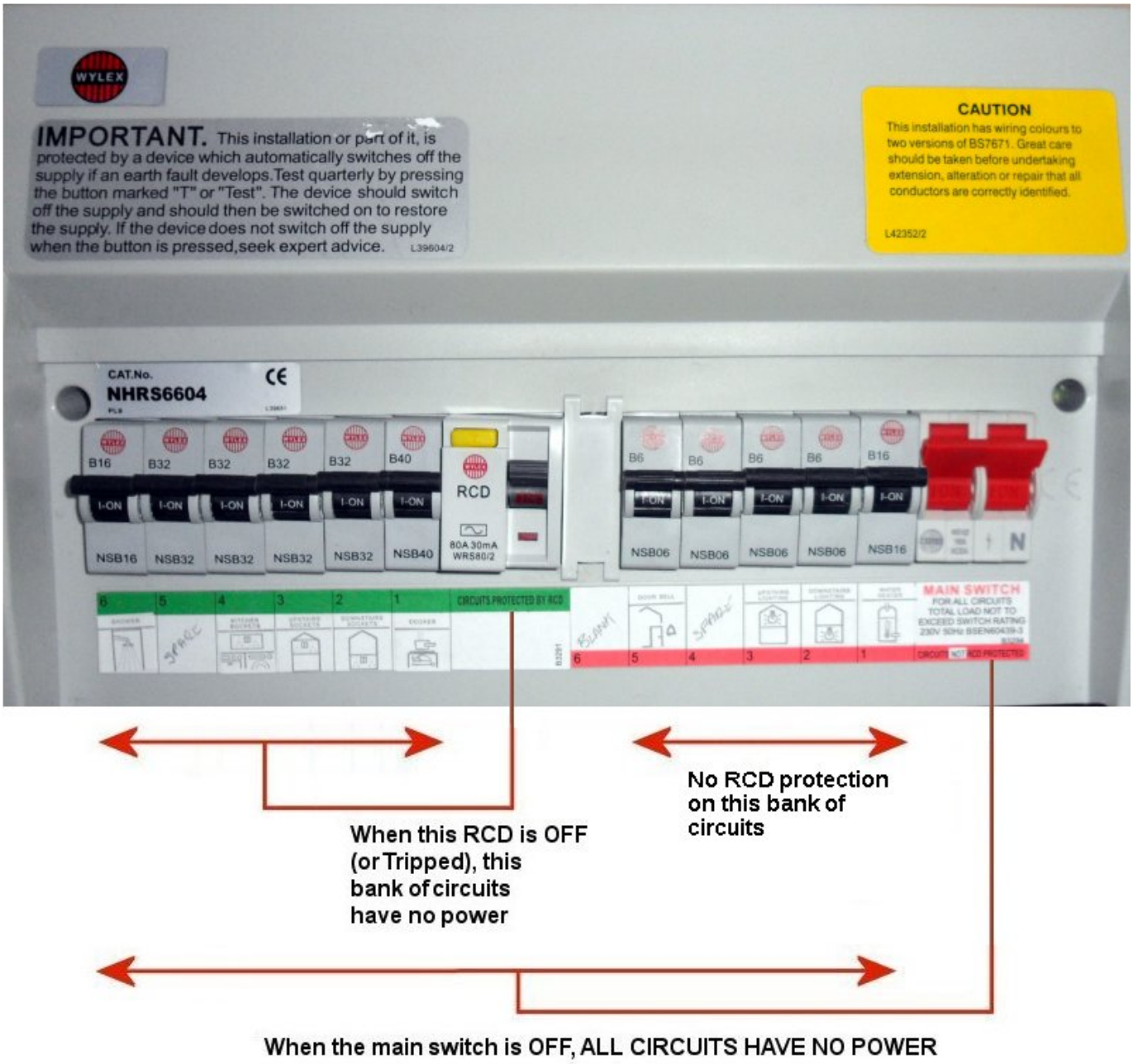
It's impossible to describe the layout of every make and model of consumer unit on the market,but in general, all 17th edition consumer units (installed since 1st January 2008) will have two (2) RCDs with the main switch on the extreme left (as in the case of the MK unit described above) or the main switch on the extreme right (as in the case of the Wylex unit shown below). Where the main switch is on the extreme left, read the circuits left to right and where the main switch is on the extreme right, read the circuits right to left to find the RCD attached to the relevant circuit breakers. Some models of circuit breaker and RCD have the centre "Tripped" position feature and some do not distinguish between "Off" and "Tripped".

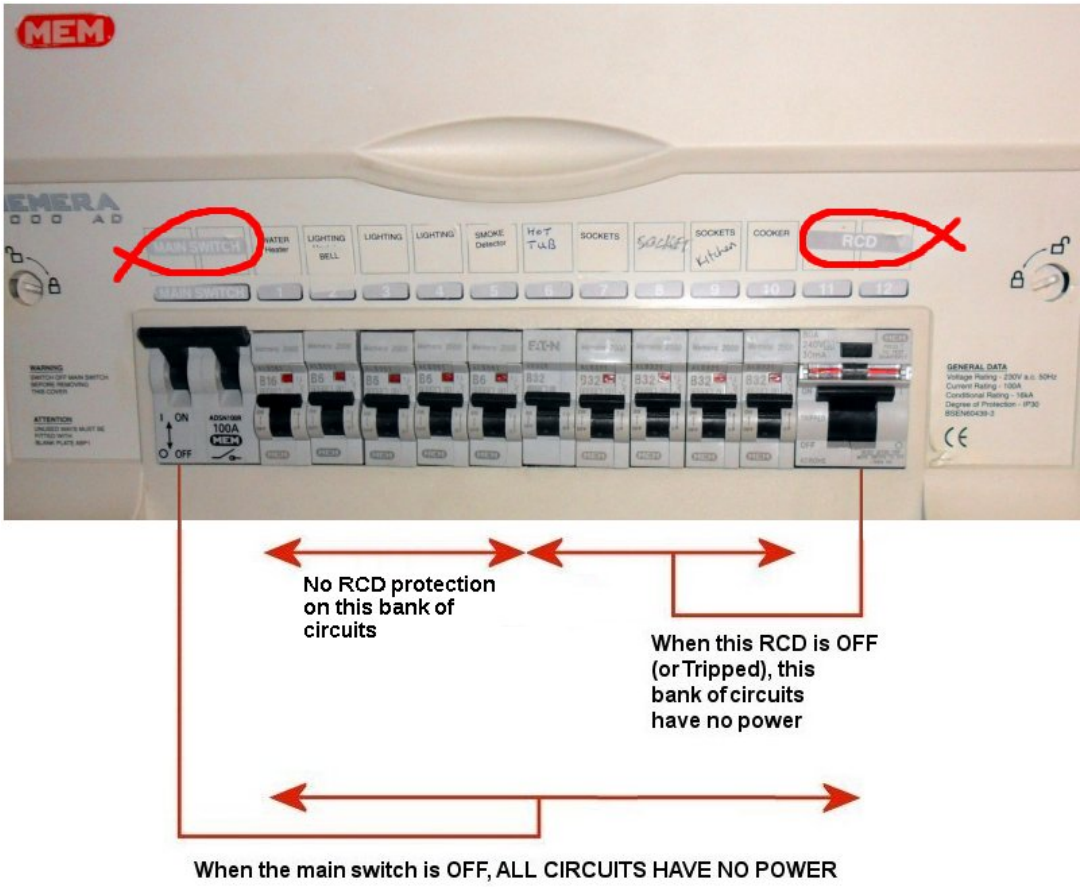


Consumer unit with main switch on the extreme right hand side installed to the latest wiring regulations (17th edition) & Part-P of the building regulations. The circuit breakers & RCDs in this consumer unit do not distinguish between "Off" and "Tripped".

CONSUMER UNITS INSTALLED BEFORE 2008

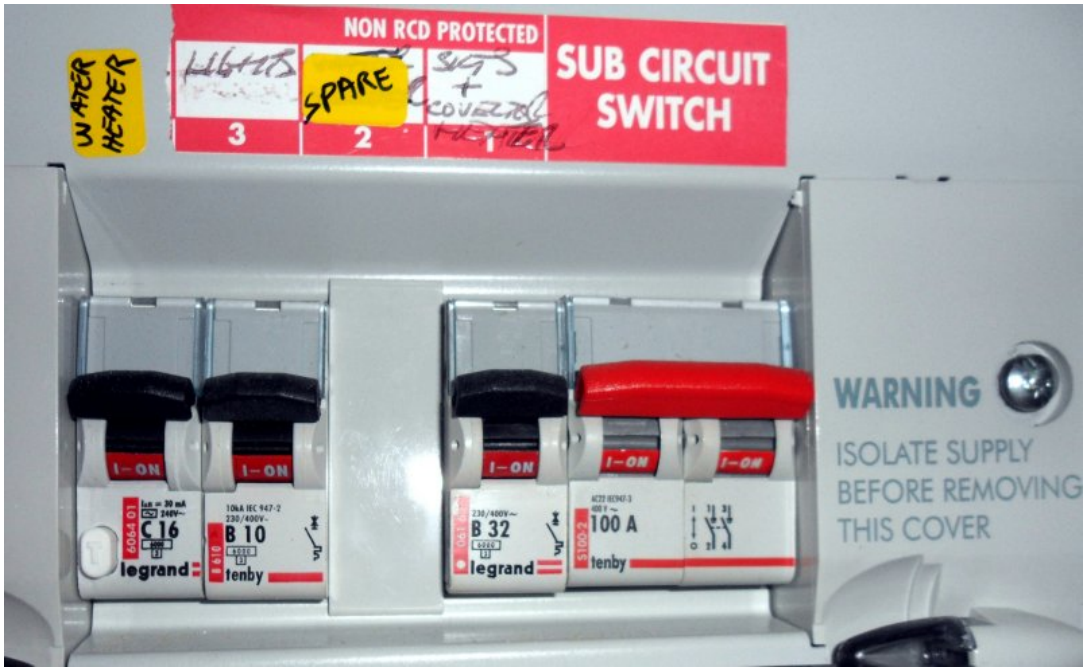
Consumer units installed between 1991 and 2008 and complying with the 16th edition of the wiring regulations did not require all circuits to have RCD protection. An RCD was only required on circuits likely to be used outdoors and shower circuits. In reality, the cooker, upstairs ring, downstairs ring and shower circuits were RCD protected and lighting circuits, immersion heaters etc were not on RCD protected circuits.





Some manufacturers put the main switch and RCD at opposite ends of the consumer unit but once you know what the objective is, it's easy to work out their logic for this layout.

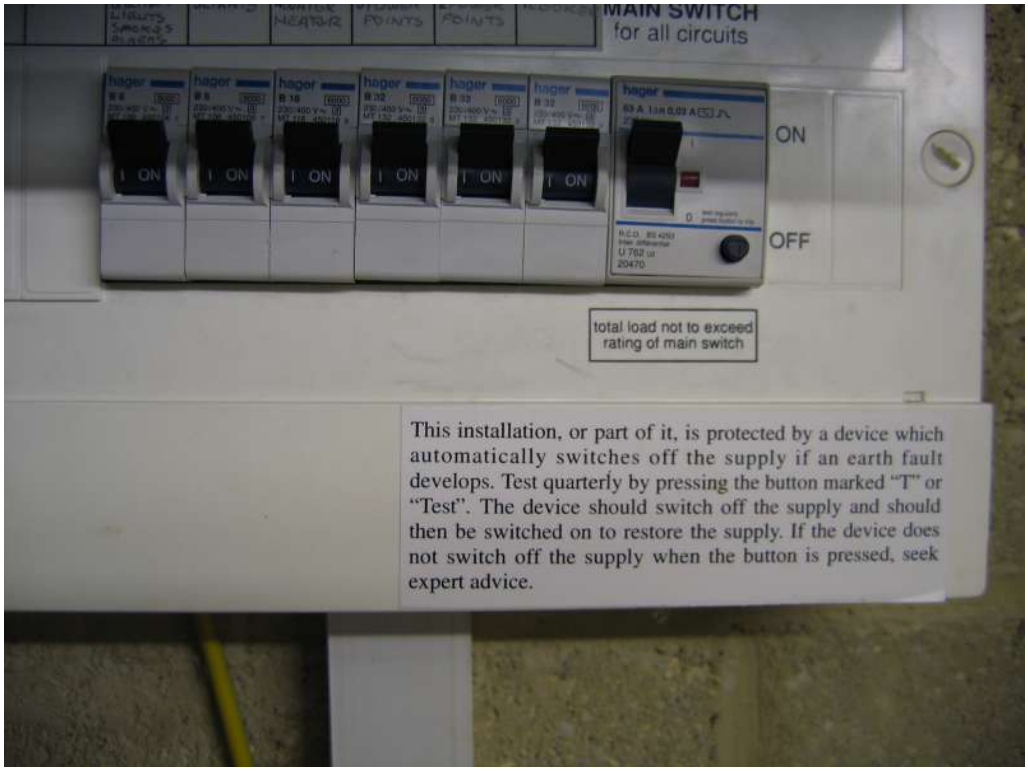
This consumer unit appears to have an RCD for some circuits, but on closer examination, only circuit number 1 for "sockets all" has a 2 pole RCBO fitted - 32A overload and 30mA RCD ratings. All other circuits have no RCD protection.



In this case, the consumer unit is in an upstairs flat and an RCD was not required because there are no circuits likely to be used outdoors. However, there is an RCBO for the "Water Heater" circuit added since 2005.

CONSUMER UNITS BEFORE 2005 - THE GOOD, THE BAD & THE UGLY

Consumer units that were installed before 2005 (the introduction of part-P of the Building Regulations), when only registered electricians could legally install consumer units, could be in any state. Some are good, some are bad and some are positively dangerous. In fact some unregistered electricians were (and still are) installing consumer units illegally.

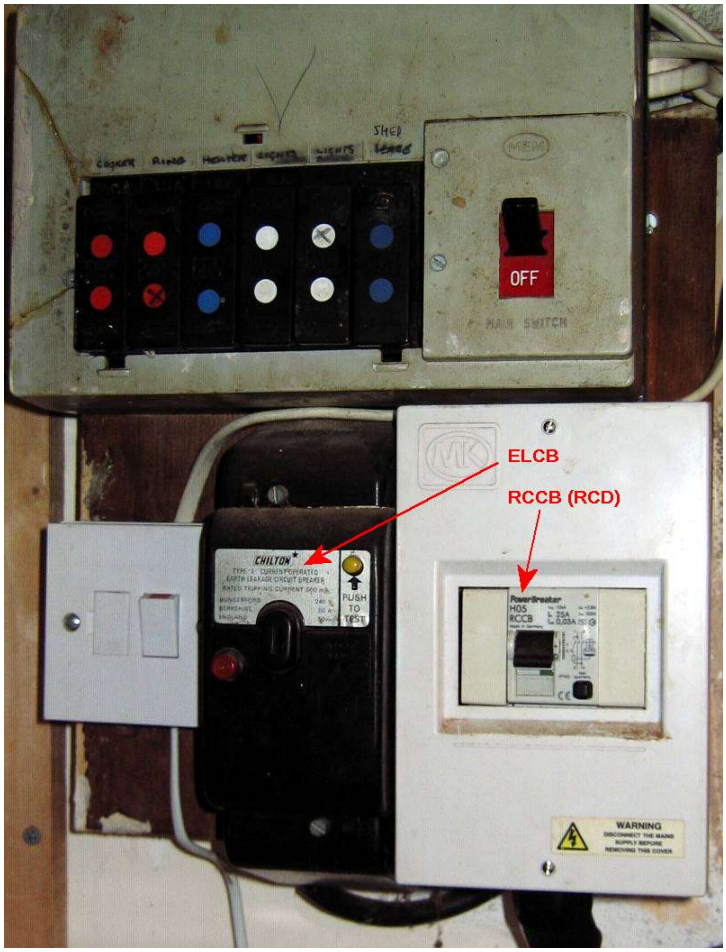


In this late 1980s consumer unit, an RCD is used as the main switch. When the RCD trips, the whole house loses power, including the lighting circuits.

A consumer unit fitted in the 1990s, where an RCD has been fitted ahead of the consumer unit. If you have no power and all the Circuit Breakers and main switch are in the "ON" position, There may be an RCD somewhere between the meter and the consumer unit that has tripped.

In this late 1970s / early 1980s consumer unit, an RCD (larger than modern units) is used as the main switch. When the RCD trips, the whole house loses power, including the lighting circuits.

In this mid 1970s consumer unit, an RCD is used to protect the circuits with 13A sockets. The Lighting circuits are not RCD protected.



In this 1960s original, with 1990s upgrade, where RCD protection has been added for the garage circuit, there is an original ELCB for the main fusebox.

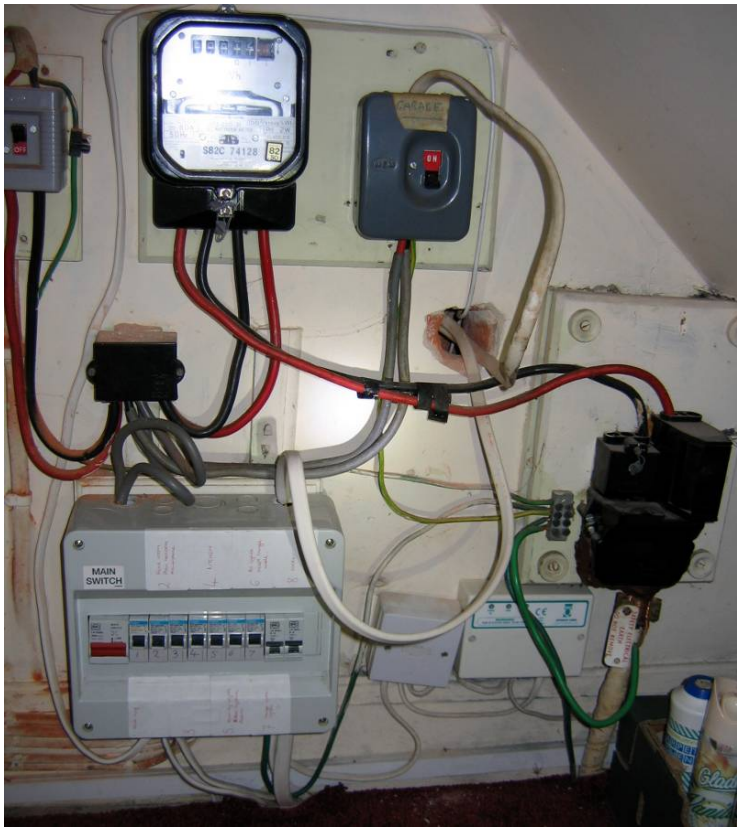
Note:
An RCCB (Residual Current Circuit Breaker) is the same as an RCD (Residual Current Device).

An ELCB (Earth Leakage Circuit Breaker) is an early type of earth fault protection device. ELCBs only operate and disconnect power when the fault current is flowing through the earth wire. Where the fault current finds a different path to earth, i.e. through your body and into the ground an ELCB will not operate. For this reason ELCBs are no longer used as they do not provide sufficient protection against electric shock.

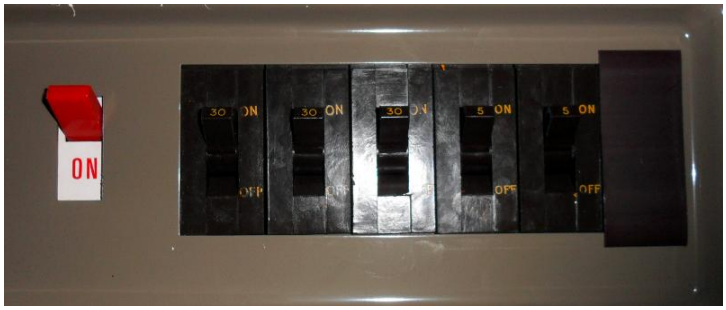
Other manufacturers made ELCBs, but they generally look similar. This particular ELCB has a trip current rating 0f 500mA (0.5A).

An even earlier type of earth fault protection device was the VOELCB (Voltage Operated Earth Leakage Circuit Breaker). VOELCBs only operate and disconnect power when a voltage greater than 50 volts is measured on the earth wire relative to true earth.

Since 1981, a VOELCB is no longer accepted as protection against electric shock and an RCD must be used in its place.



This installation has a consumer unit with circuit breakers and no RCD protection. There is an untidy collection of smaller fuseboxes and poor wiring. It is obvious that there has been several (poor) attempts to add circuits throughout it's life.



In this late 1960s consumer unit, there is no RCD protection. The Bakelite cased circuit breakers are labelled 30A and 5A as expected with pre mid 1970s units. After the mid 1970s, the circuit breakers were rated at 6A and 32A with the introduction of metric cable sizes.

FUSEBOX DESIGNED IN THE 1950s STILL FOUND IN THE MAJORITY OF HOMES TODAY

The Wylex fusebox with re-wireable fuses, originally introduced in the 1950s and it's successors were still being installed in the late 1980s.

This original 1950's Wylex fuseboxes was still in use in 2011. In the 1950's when it was installed, rubber covered cables were used throughout the house. Over the years the cables had perished and were in a very unsafe state. The fusebox itself has an open frame, made of wood and a Bakelite cover.

Fuseboxes of this type no longer meet current safety standards and have no RCD protection. They are functionally and technically obsolete with the potential for sudden & catastrophic failure.

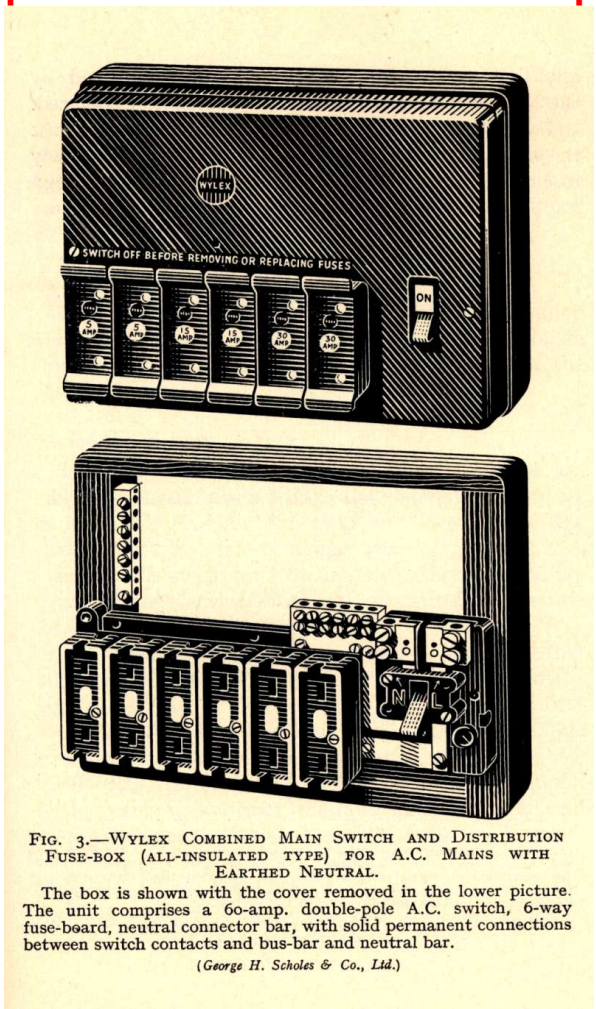


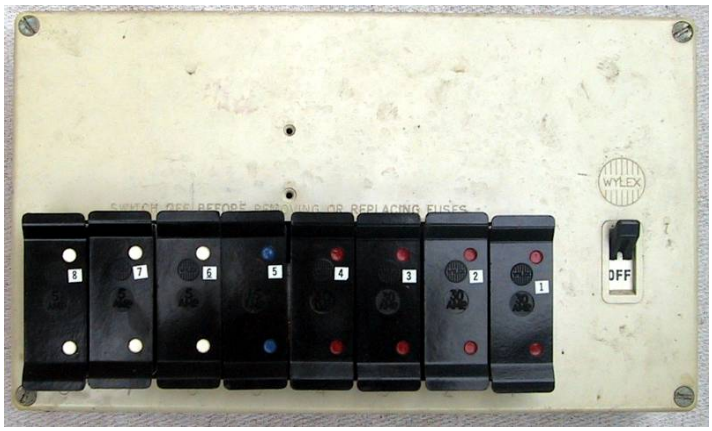
FIG. 3.—WYLEX COMBINED MAIN SWITCH AND DISTRIBUTION FUSE-BOX (ALL-INSULATED TYPE) FOR A.C. MAINS WITH EARTHED NEUTRAL.

The box is shown with the cover removed in the lower picture. The unit comprises a 60-amp. double-pole A.C. switch, 6-way fuse-board, neutral connector bar, with solid permanent connections between switch contacts and bus-bar and neutral bar.

(*George H. Scholes & Co., Ltd.*)

An original catalogue description of the Wylex fusebox from the 1950s.

Available colours were - Brown, Black or White.



The fusebox cover is removed to reveal the fuse carriers.

The actual fuse is a piece of wire, threaded through the fuse holder body and screwed to terminals at each end.

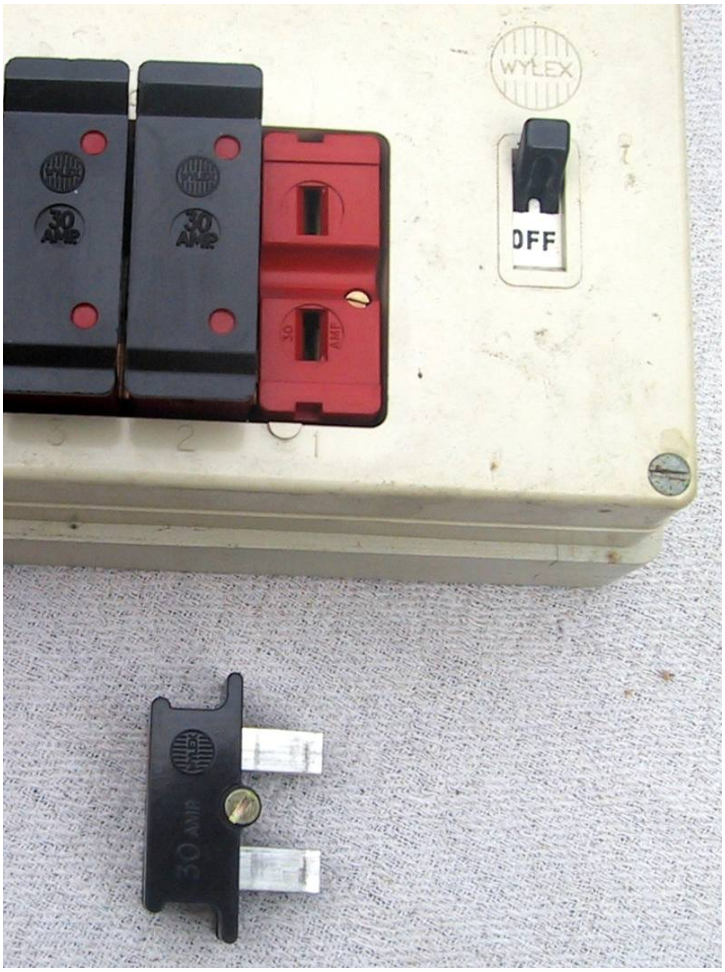
It's better to have a fault checked by a qualified electrician, before attempting a repair that could cause more damage or danger.
When there is absolutely no other option:
Switch OFF the main switch.
Remove the fuse carrier and visually check the fusewire for damage. If a fuse has blown due to over current or short circuit, the fault **MUST** be cleared before replacing the fusewire with the correct size of fusewire. **NEVER** use fusewire of a higher rating or normal wire - **this could lead to an electrical fire.**
ONLY USE ONE STRAND of the correct size fusewire in order to maintain safety.

EVOLUTION OF THE 1950s FUSEBOX

Throughout the life of this type of fusebox, several upgrades (usually retro-fitted to existing fuseboxes) occurred over the years.
Some of the said retro-fits actually make the installation more dangerous, when done incorrectly or badly.

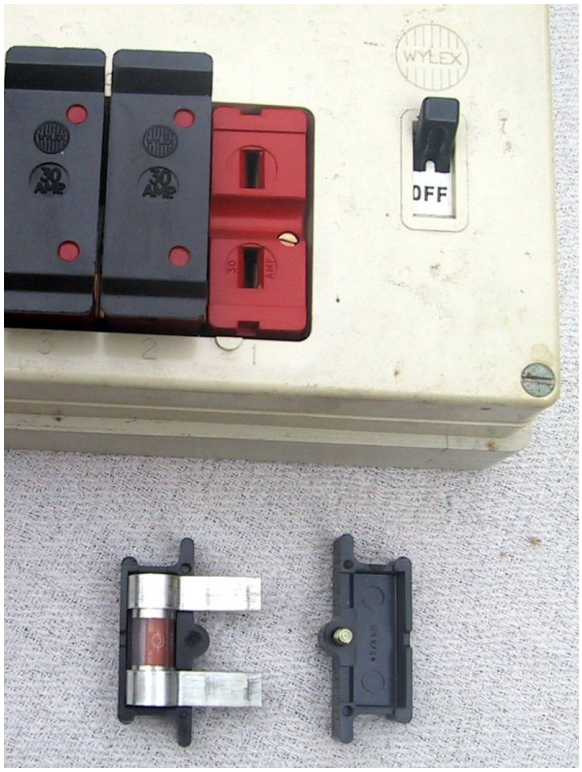
Cartridge fuse holders retro-fitted on some or all circuits was popular in the 1960s & 1970s.

NOTE:
This type of fuse (to the BS1361 specification) was removed from the IEE Wiring regulations in 2011.



The cartridge fuse holder is removed in the same way as the rewireable fuses.

The main switch must be switched OFF before removing the cartridge.



To split the cartridge fuse holder, carefully unscrew the centre screw to separate the left and right hand shells.

To remove the cartridge fuse (the red cylinder with silver caps at both ends on the left of the picture), carefully pull off the connecting plates.

Replace the whole cartridge fuse (it cannot be repaired) with the correct rating of fuse and re-assemble the carrier. Make sure the fault has been cleared before replacing the cartridge holder in the fusebox and powering up.

Another common upgrade in the 1970s was to replace the rewireable fuses with push button circuit breakers.

Note 1: The fuse cover lid has been cut to allow the circuit breakers through.
Note 2: The Circuit breakers are rated at **5A**, **15A** and **30A** indicating that this upgrade was done before the mid 1970s (i.e. with imperial size cable). After the mid 1970s, and the introduction of metric size cable, the circuit breakers were **6A**, **16A** and **32A**.

When this type of circuit breaker trips, the larger button at the top protrudes.

After clearing the fault, press the protruding top button to reset the circuit breaker.

To turn off the circuit, press the smaller button (and the larger top button will pop out again), disconnecting the circuit.

Another common 1970s upgrade was to replace the rewireable fuses with lever operated circuit breakers.

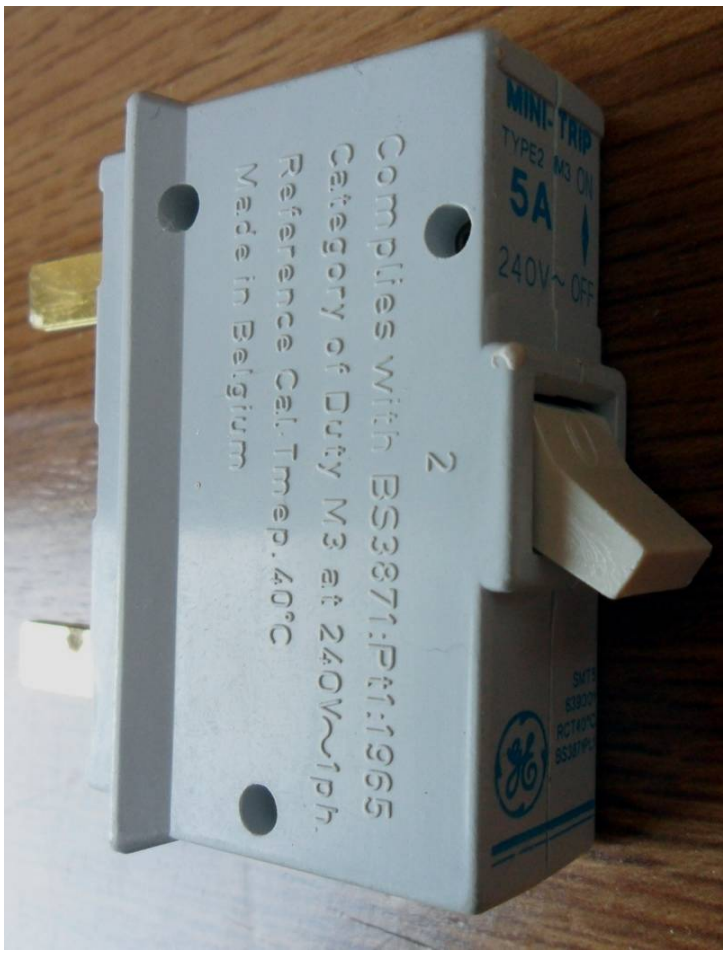
The Circuit Breakers shown are rated at **5A** & **30A** indicating that this upgrade was done before the mid 1970s. From the mid 1970s and the introduction of metric cable sizes, the Circuit Breakers were rated at **6A** & **32A**.

This type of retrofit on it's own does not provide RCD protection and does not make the installation meet the current wiring regulations.

The same lever operated circuit breaker retrofit from the 1980s & 1990s.

Note 1: The Circuit breaker shown is rated at 6A, indicating that this upgrade was done after the mid 1970s.

Note 2: This circuit breaker is marked as meeting the BSEN60898 specification - dating it to after 1984.



Before 1984, circuit breakers were to the BS3871 specification and the 5A rating dates it to before the mid 1970s. The side markings show "Complies with BS3871:Pt1:1965" - the revision of the specification in use when the circuit breaker was manufactured.

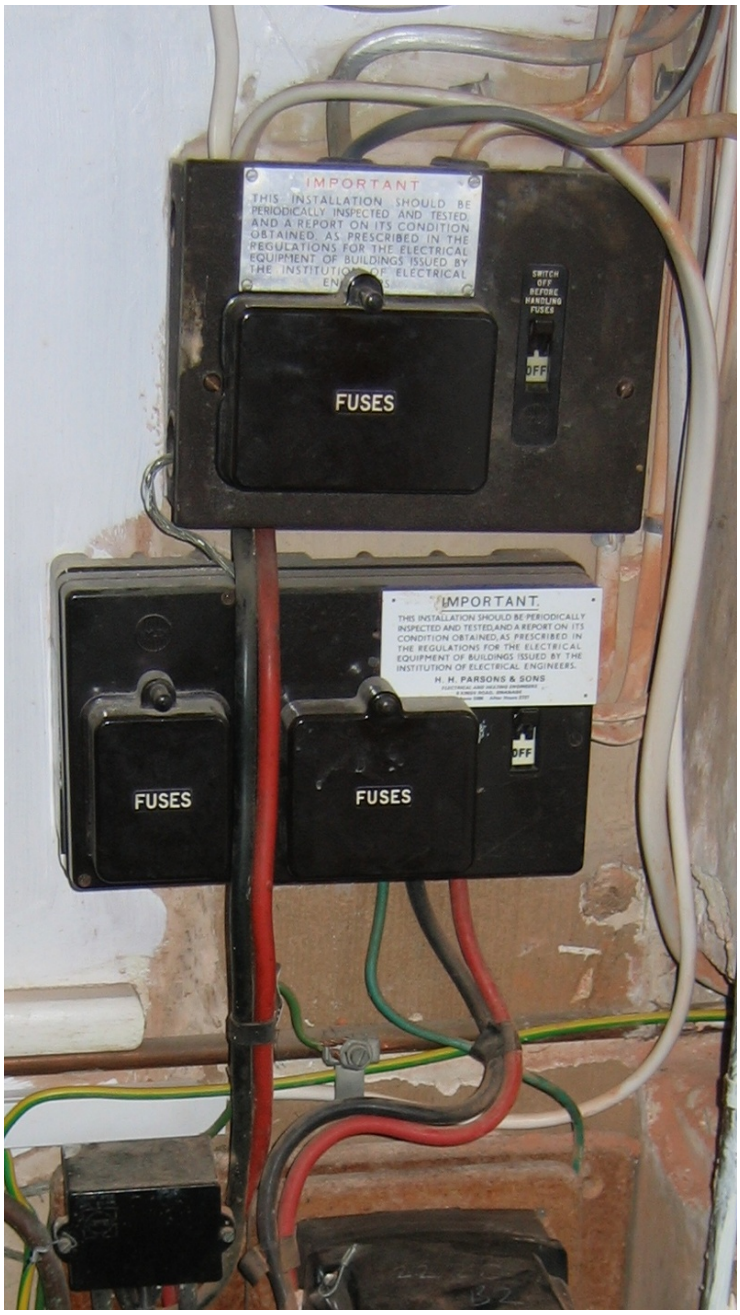
Our best guess is that this circuit breaker was installed between 1965 and 1976.

To reset this type of circuit breaker, after clearing the fault, move the lever to the "up" / "on" position as shown.

All fuseboxes of this type, with or without retrofitted cartridge fuses or circuit breakers have outlived their serviceable life.

As an emergency measure, it's usually possible to get things working again, but early replacement is strongly recommended.

ABUSE OF THE 1950s STYLE FUSEBOX



As this type of fusebox has been around for such a long time, it's possible to find examples of abuse by DIY amateurs and people passing themselves off as professionals.

In this example, it is not possible to open the lower fusebox for inspection or repair/upgrade of a circuit without disconnecting the entire supply to the house. Also, the overall standard of cabling is very poor.

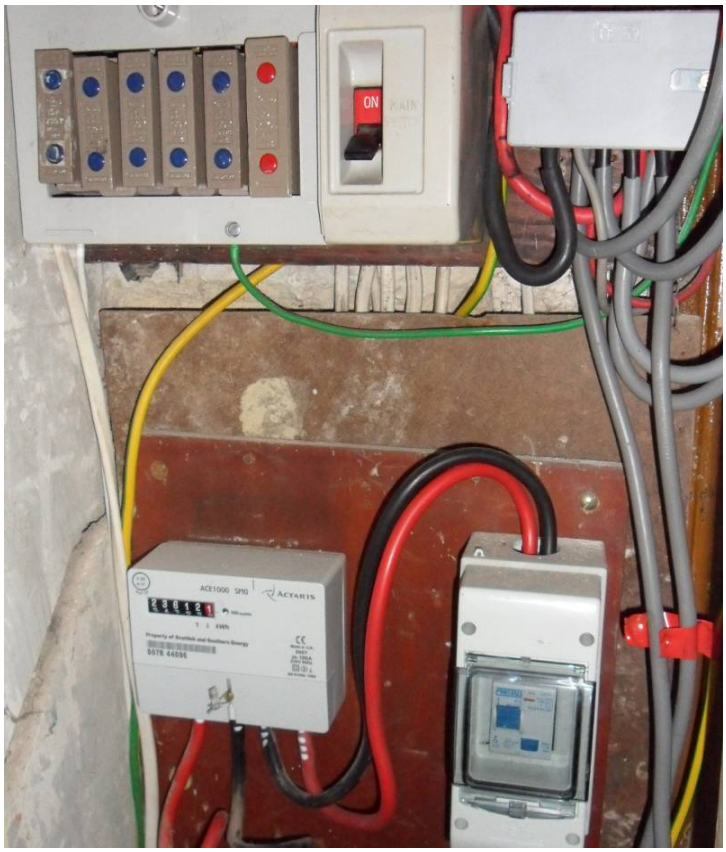
This fusebox is in a lethally dangerous state.
Most of the fuse carriers have been broken and all the exposed metal parts are live. The first fuse carrier for the lights has a 13A fuse fitted (it should be 5A).

DO NOT TOUCH ANYTHING YOU FIND LIKE THIS.

ALTERNATIVE MANUFACTURER OF THE 1950s STYLE FUSEBOX

Another manufacturers fusebox of similar design to the 1950's original, installed in the 1980's.

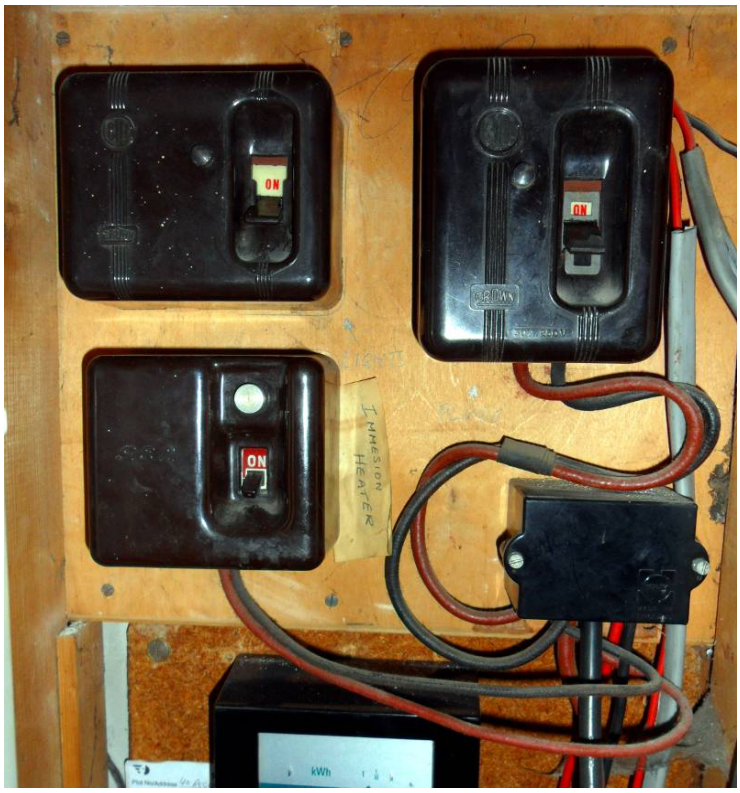
IN THE LAND THAT TIME FORGOT



Sometimes (in fact far too often) we find something from the dawn of time.

This untidy installation had an RCD (poorly) fitted between the meter and a series of old fuseboxes containing porcelain fuse carriers of unknown age, but probably at least 60 years old!

A real fire & electric shock hazard area !



This collection of 1950's Bakelite fuseboxes, cotton covered cables and badly installed PVC cables at some later date was still in use when found in January 2012.

A real fire & electric shock hazard area !

This service head (green cast iron box) and array of fuseboxes were fitted in 1938. We know that, because the current owner of the house has lived there since it was built. The cables were replaces during the years, but the fuseboxes are as fitted in 1938. Apart from the obvious fire & electric shock risk, the hidden dangers are -

1. The service head (green cast iron box) - known in the industry as a "Coffin Incomer" is filled with asbestos and has usually rusted away from the inside - and has a tendency to explode without warning. Normally, the electricity company will turn off the whole street to replace it.
2. The fuseboxes have 2 fuses per circuit, one on the Live (Phase, Line) conductor and one on the Neutral side. It is possible for the neutral side fuse to blow, leaving the circuit non-functional but the circuit still live and dangerous.
3. On further investigation, it was found that there was no electrical earth for the property. When the house was built, the water main was uses as a means of earthing (no longer acceptable), however - the main stopcock had been replaced and the old stopcock, with earth wire attached was found sitting on the soil under the floorboards.

This Cast Iron fusebox was found in a property, built in 1932.