

PME Power Supply & Radio Amateurs

by
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The earth provided by the electricity supplier is intended as a protective part of the circuit to reduce SK membership, as well as protecting devices and equipment attached to the supply.

**Over the years the way in which the earth connection has evolved has seen several changes and many variations for different types of consumer
, e.g. industrial, farming, medical, petrol stations, gas storage plants etc.**

Earthing is a very important part of the circuit that has to comply with various parameters as set out currently in the 18th Edition of the IEE Regulations, BS7671.

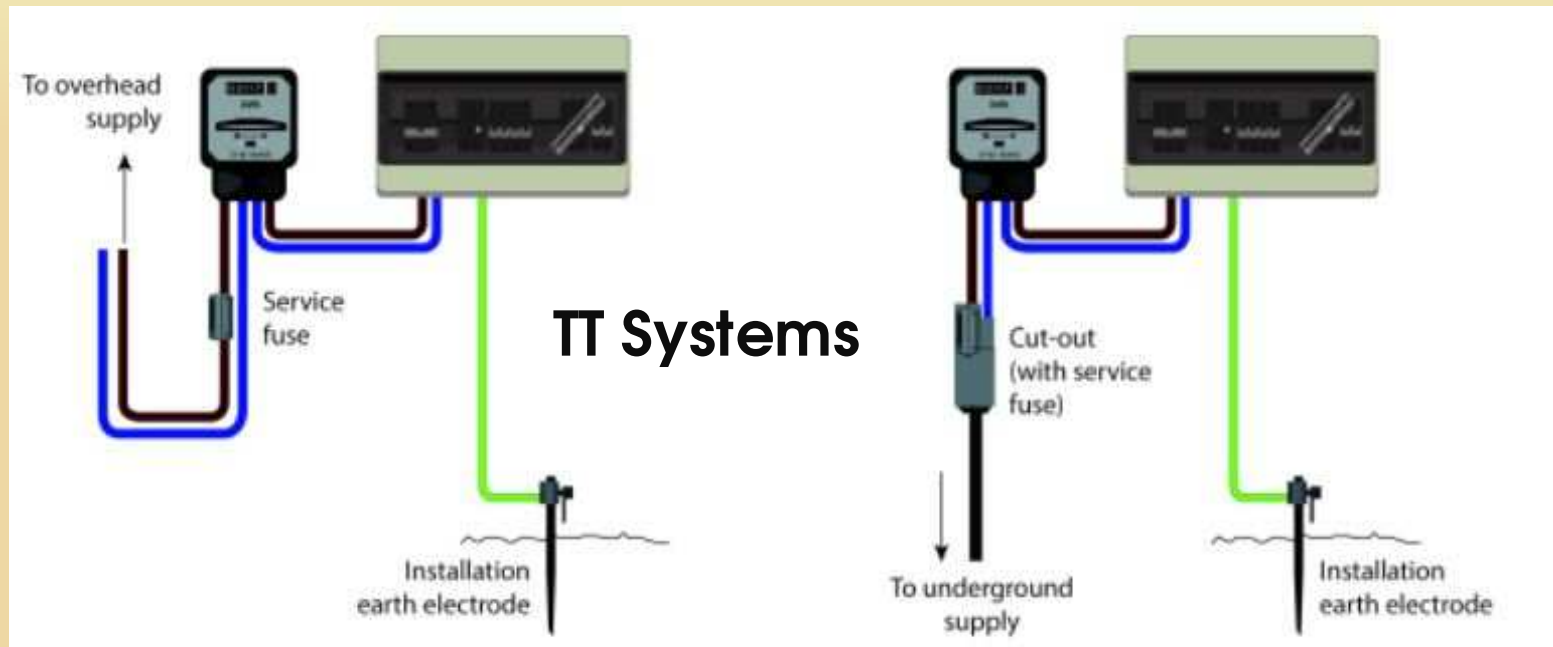
For most of us the configuration used by the electricity supplier for our earth connection will be somewhat dependant on the age of the dwelling. I will discuss this further in a few minutes.

But firstly let us see how the earth connection supplied to us is derived. In your local sub-station, usually a several kV supply feeds a transformer that has a star configuration secondary winding that provides a 3 phase output, this giving a 400V 3 phase supply for industry and some others, or a single phase of 230V for domestic use.

At the central connection of the star configuration of the 3 phase transformer is the neutral point that we need for our single phase supply. The neutral point is earthed by means of ground rods.

Keep in mind that the earth is referred to as the Protective Earth essentially to protect life in the event of mal-function of machines or other equipment, and with the addition of a fuse, in older systems, or a Residual Current Circuit Breaker in more recent installations, to protect persons from accidental contact with the live feed of the supply. The RCCB should operate(trip) at 30mA, this is about half the current level at which the heart muscle would be paralysed.

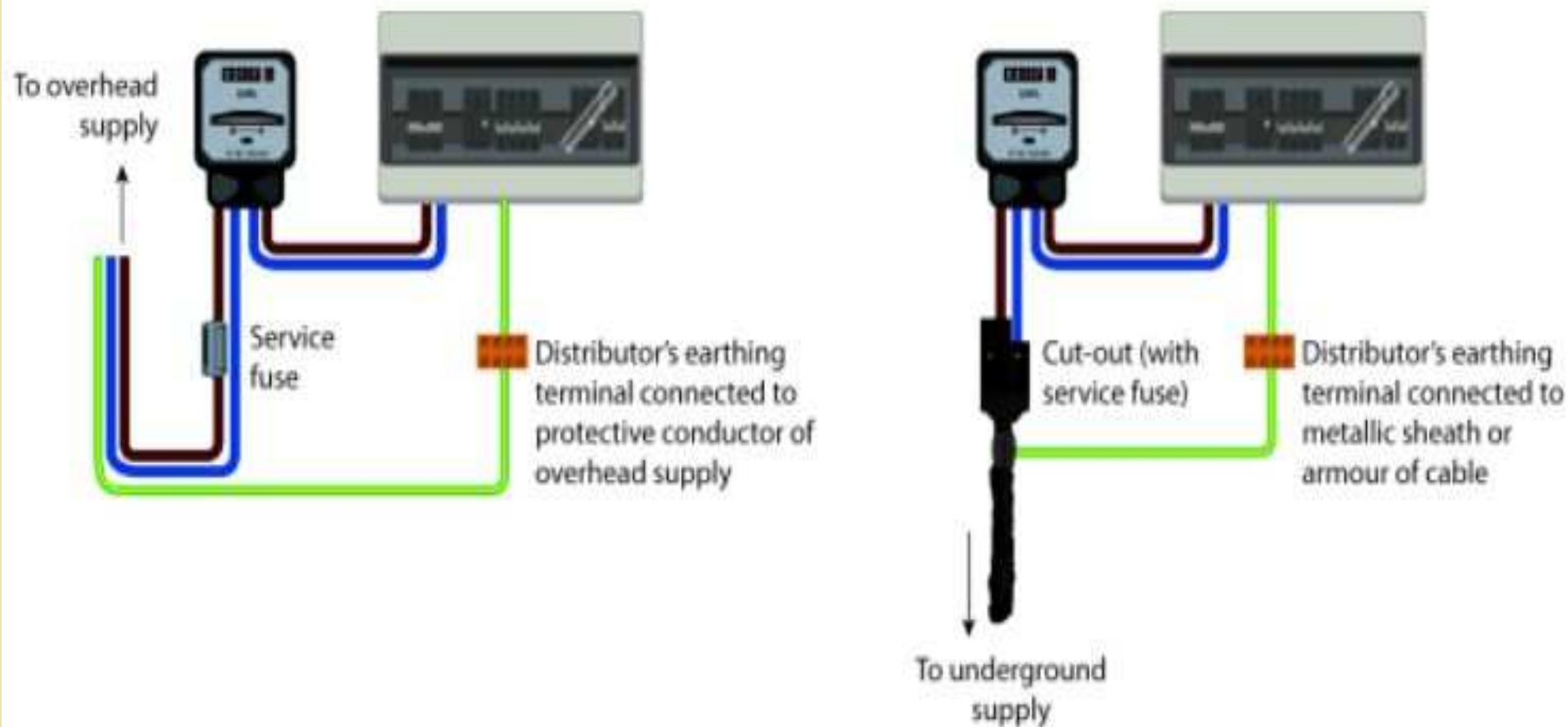
Lets have a look at the earthing arrangements that have been provided over the years ;-



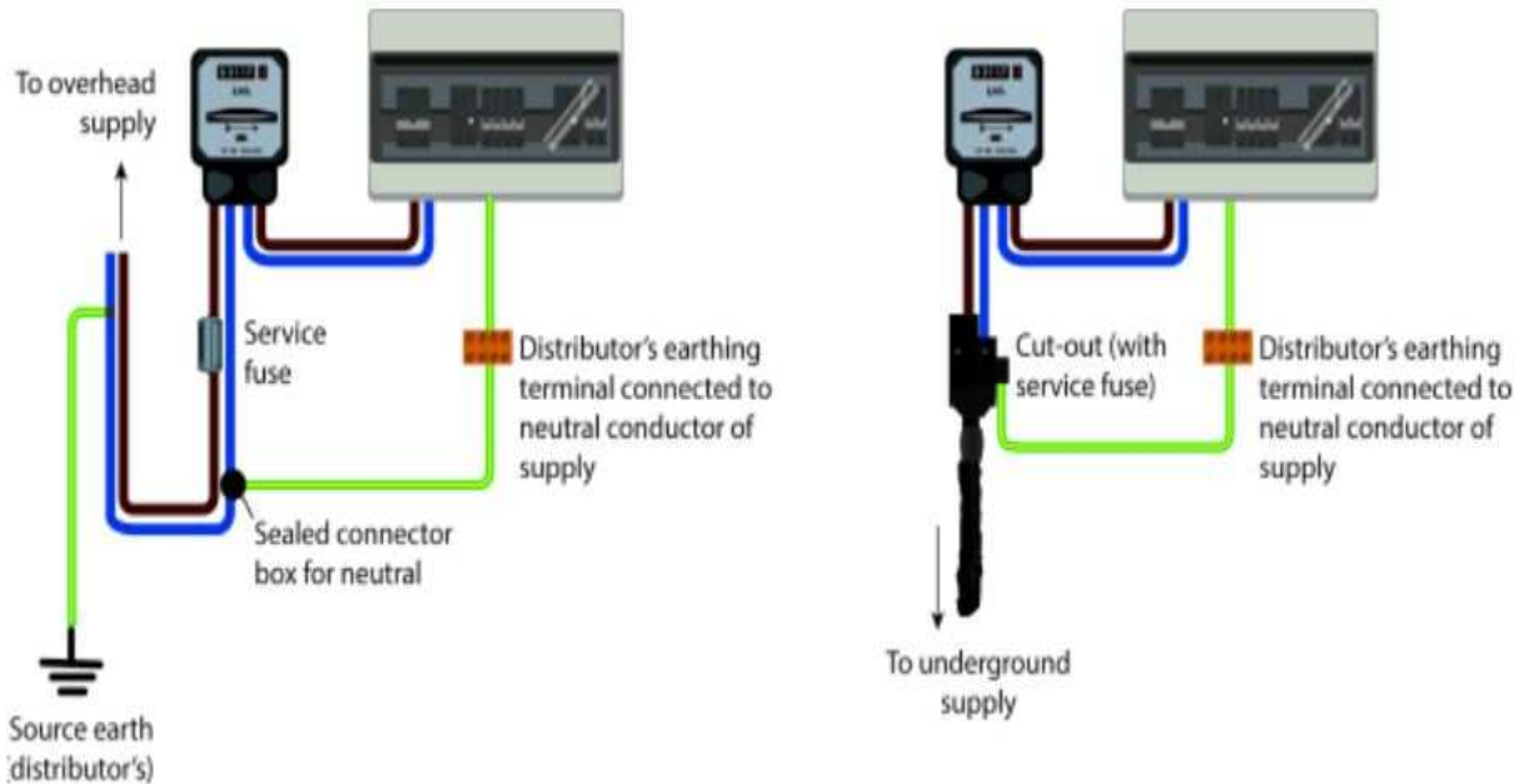
T is from the French word terre for earth / ground.

The first T is the grounding of the neutral at the sub-station, the second T for the earth provided by the earth rod that was the responsibility of the consumer.

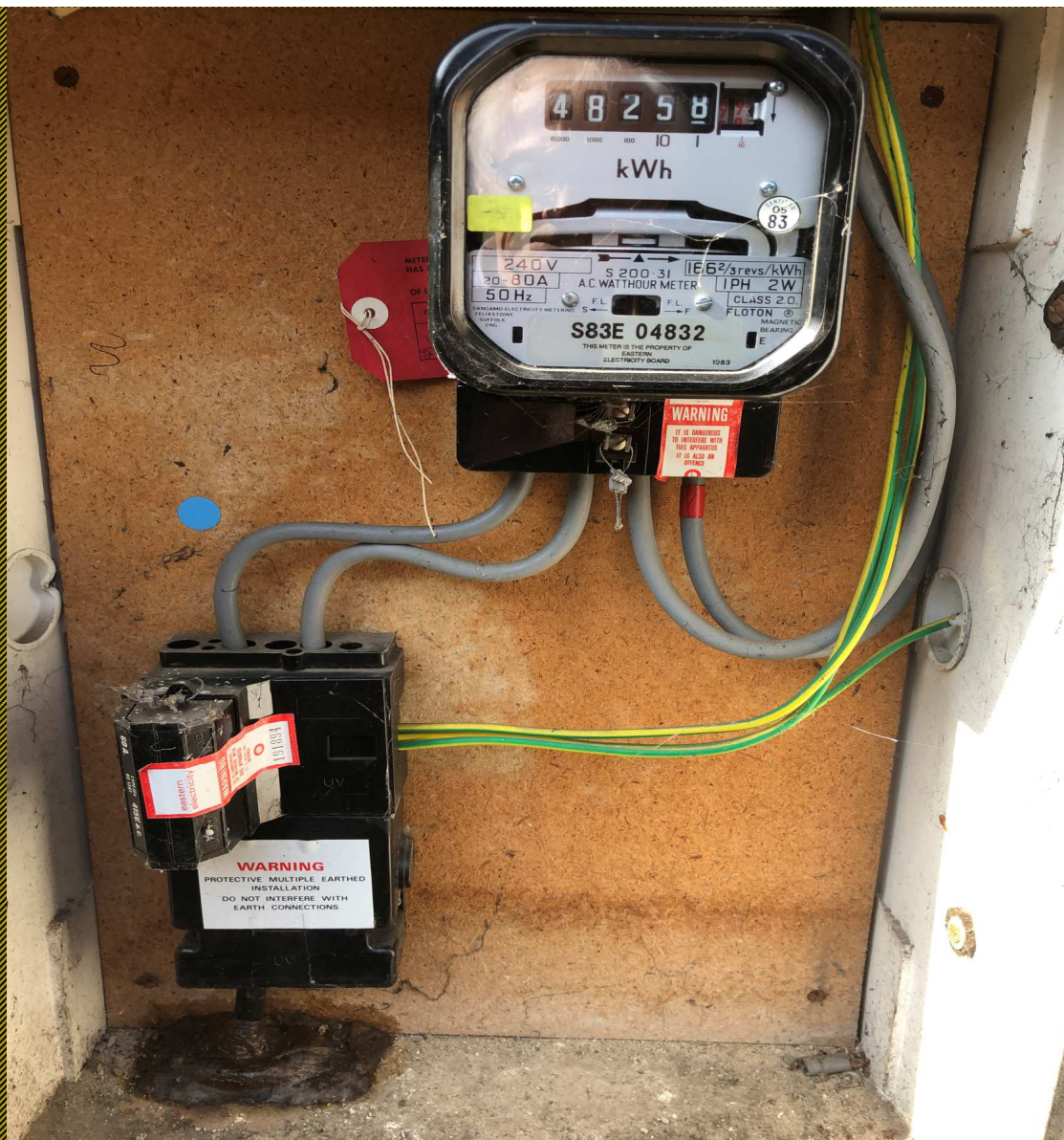
TT was the usual form of supply many years ago (pre 1950's +/-) but not now used.



This shows the typical arrangements of the TN-S system for overhead line supply or underground cable supply.

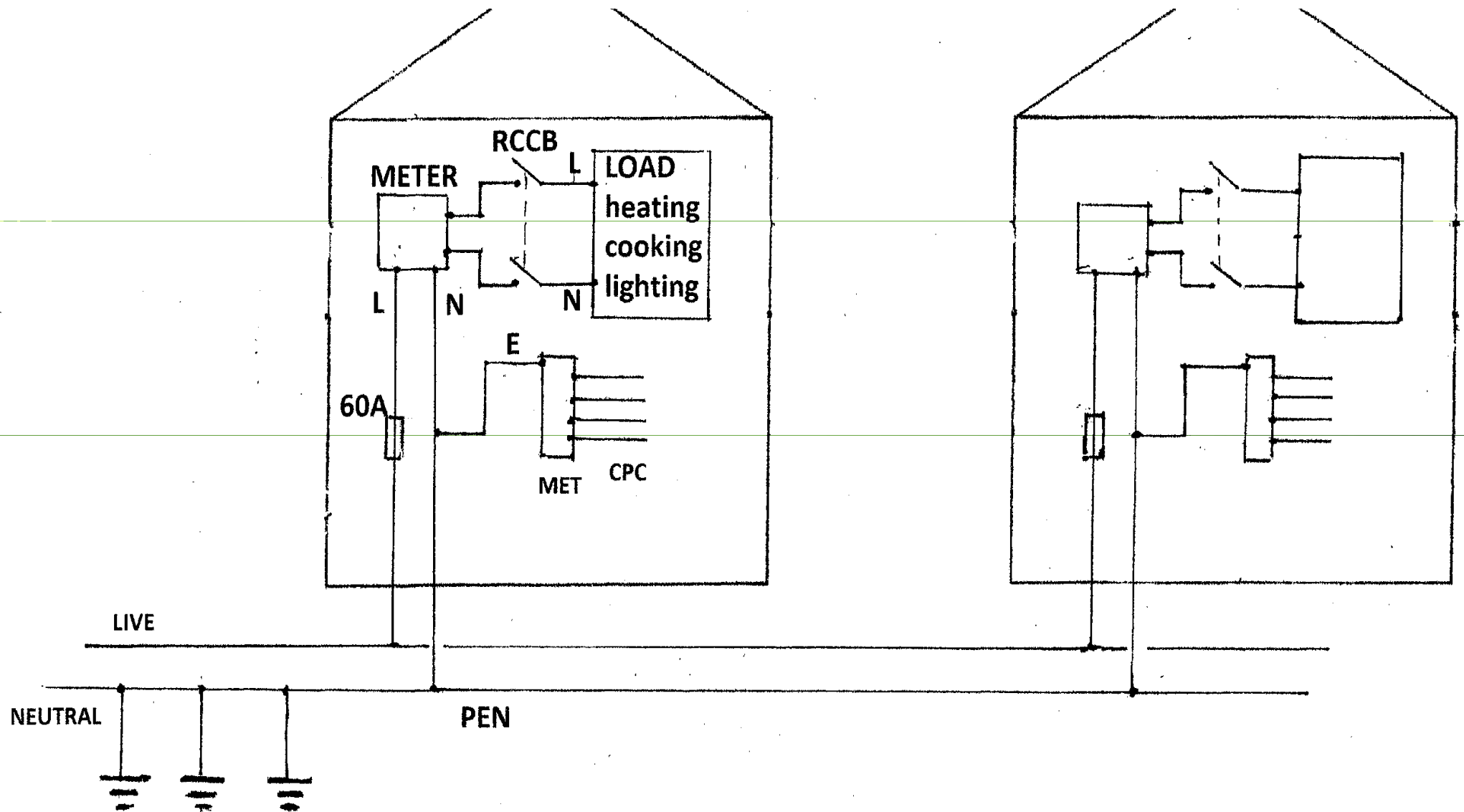


This shows the typical arrangement of the TN-C-S system.

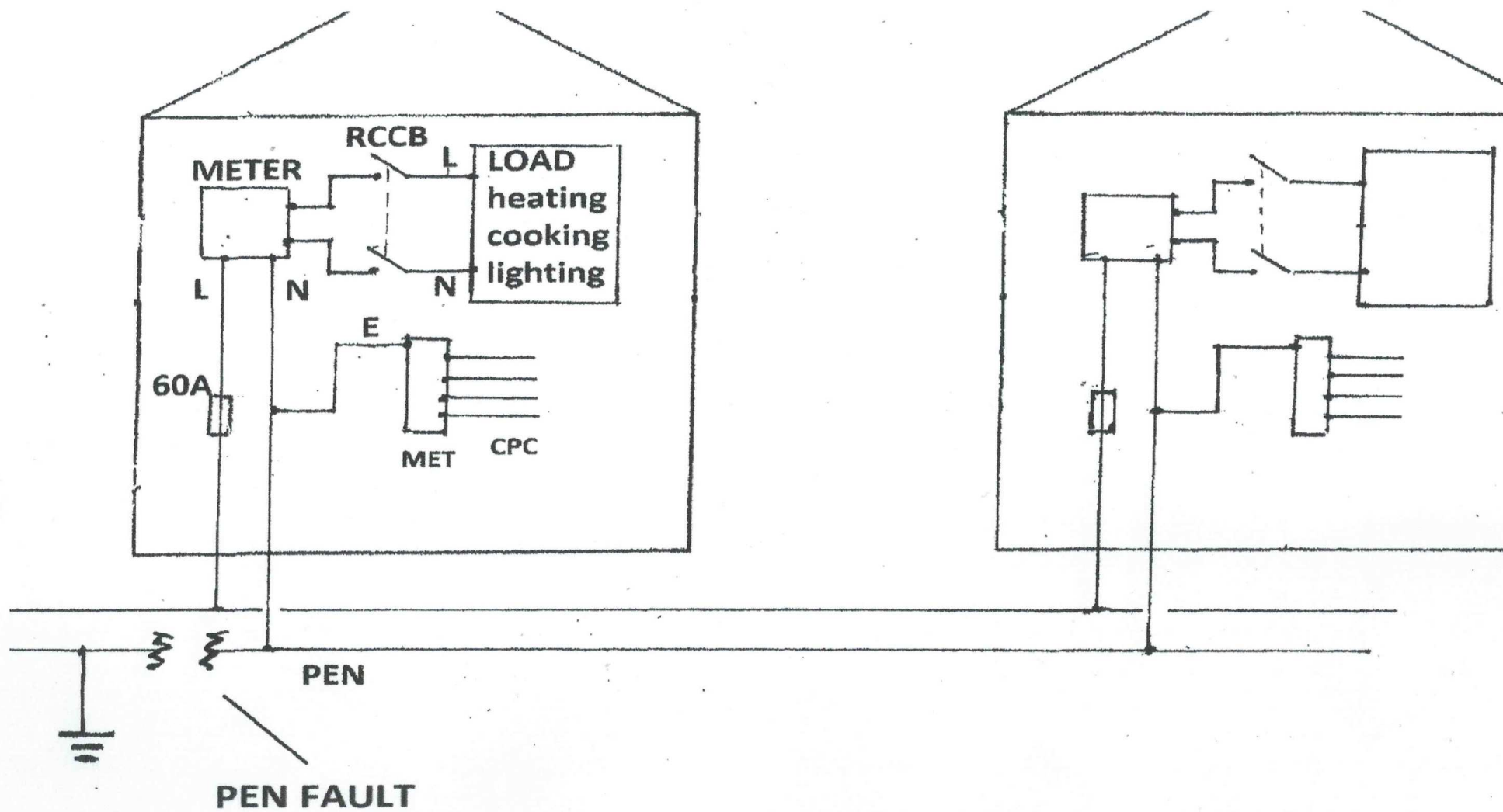


For the majority of us the TN-C-S / PME, or the TN-S systems will most probably be our electricity supply arrangement. If it is the PME system, installations from around 1970, this arrangement is where we meet a challenge.

An article in RadCom in 1980 titled “Mains Safety - The Killing Grounds” by Peter Chadwick, G3RZP, well known for his many presentations at RSGB conventions, highlighted the possibility of a failure of the neutral of a PME supply system that could lead to a disastrous situation arising, a situation that can and has arisen in the past. Indeed, averaged over the past 3 years there have been 402 failures per year with an upward trend. So not a large number but a significant number.



So, what's the issue if there is a break in the neutral of a PME supply. Let's have a look to see what happens, the impact it may have and the repercussions for Radio Amateurs. Hold your breath.....

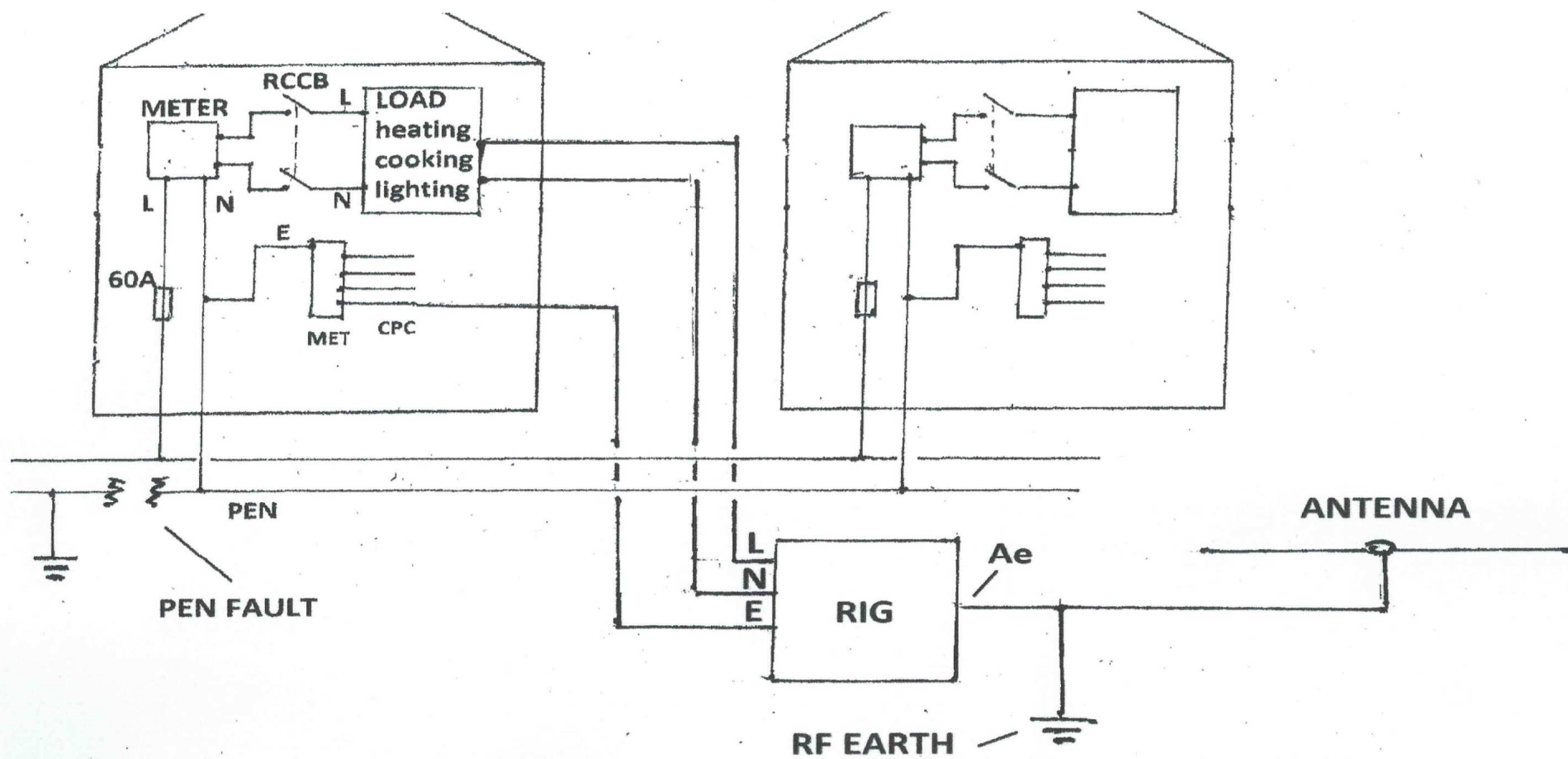


The PEN neutral has been cut but the live is still active. If any of the loads are switched on then the neutral from the loads to the RCCB will be, live so the earth of the MET will also be live. So now everything in the house will be live eg cooker, washing machine, fridge etc. In this case the inside of the house can be considered a Faraday Cage and is accepted as being safe.

However, if there is any external equipment or fittings, outside lights, caravan charging and so, on then they will be outside the Faraday Cage and will be potentially very dangerous since their earthed parts will be at 230V.

The RCCB will not trip if contact is made to the internal or external earthed parts.

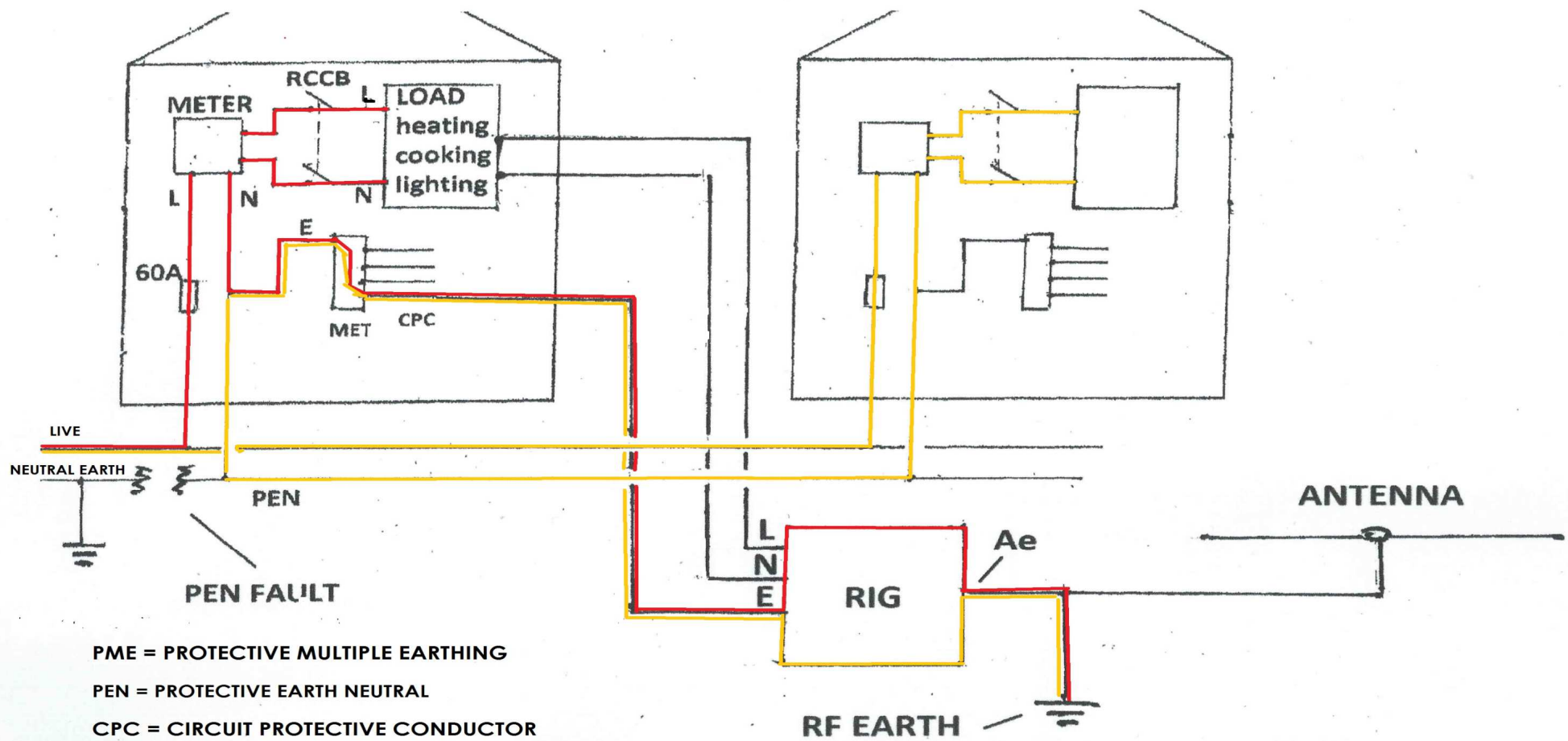
Joe Bloggs read on the internet that if he grounds the coax screen feeding his antenna there will be no common mode current in the shack. A nice simple solution and easy to install.



We now have a rig plugged into the ring main so now the chassis of the rig will be at 230V. If the shack is outside the house then Joe is in real danger.

As Joe heard that earthing the coax screen will get rid of common mode current in the shack a secondary problem now appears. The RF earth will effectively replace the PEN fault so all the household loads could operate if the RF earth can sink all the current and if the coax screen can carry the current, which is very doubtful. Fire is a real possibility now.

On the next slide follow the red line to see how the current will flow from the live to the RF earth. Then look at the next house and follow the orange line to see that the RF earth is allowing their loads to be used. The RCCBs in the houses will not trip in this situation.



RF EARTH

So, you can see that there is a possibility of a catastrophic situation that can arise.

The earth connection supplied by the electricity company is strictly for protection of the persons in the household. The HSE now, by law, have to be promptly advised of a PEN failure.

A notice attached to the PME access point says ;~

**PROTECTIVE MULTIPLE EARTH INSTALLATION
DO NOT INTERFERE WITH EARTH CONNECTIONS**



You are not permitted to change, modify or add to the PME earthing system apart from perhaps the allowance to add simple light fittings or a socket outlet to the ring main provided the correct connections are made to the CPC earth wiring. Anything more must be done by a Part P registered electrician.

A good many Radio Amateurs may have an RF earth and often this will be attached to the PME via the antenna connector. An unfortunate situation mainly due to a misunderstanding of the limitations and requirements associated with making such a connection.

PLEASE DO NOT CONNECT ANY EXTERNAL EARTH THAT IN ANY WAY WILL BE OR COULD BE IN CONTACT WITH THE PME EARTH. THE ELECTRICITY SUPPLY COMPANY AND THE HSE (Health and Safety Executive) WILL ALMOST CERTAINLY CONSIDER SUCH A SUPPLEMENTARY EARTH AN ILLEGAL CHANGE TO THE PME EARTHING CONFIGURATION.

THIS NOTE IS MOST IMPORTANT, DO NOT IGNORE IT NOR TRUST TO FATE THAT YOU WILL NOT EXPERIENCE A PEN FAULT.

So what's to do ?

Do you really need an RF earth ? Insulated radials, above ground, or a counterpoise arrangement for those antennas needing an earth, both would work well. Many claim that the counterpoise is quite superior to radials.

But, if you have a tower you will, no doubt, want to protect against high static charge build-up and electric storms thus needing an earth point close by. If you have a motor to raise and lower the mast, and if you have a motor to rotate the antenna then think about the earthing arrangements, an isolated supply may be the only solution for these motors.

What else can we do ?

Well, you could completely isolate the shack from the mains power supply by using a double wound isolating transformer. Thereby your rig, ATU and any other devices could all be connected to your RF earth without compromising or interfering with the earth provided by the electricity supplier.

This would be quite a simple way of operating BUT to comply with the 18th Edition it is implied that there must be a separation of at least 2.25m between household circuits and their earth contacts to the earthing of your isolated supply – your RF earth. Keep in mind lights, switches, 13A socket outlets, radiators, vacuum cleaners, etc.

A suitable 1kW isolation transformer would set you back about £150 or so, but keep in mind that the continuous operating power is about 65% of quoted operating power – the sellers hide behind intermittent operation to imply the higher rating !

Thank you for your attention, I trust that it has been of interest and maybe of some help to you.

I do hope that you will remain aware of the dangers that can result by any earthing arrangement you may want to use. Do remember that there are rules and regulations that must be complied with. Taking short cuts or simply 'risking it' are not options that should be taken.

Good Night.