

Fig 5. PME fault—all bonded network at live potential

Let's say that John does not connect the earth lead in the 13A mains plug. Now the metalwork in the house, such as radiators, electric fires, kettles, coffee-pots etc, will sit at 240V above true earth. John's rig is earthed and the chance of 240V appearing across John is high. True the elcb, if fitted, might protect him. When did you last check your elcb? Press the test button once a month—in daylight, as the house supply should vanish.

So John Q Newham could rapidly be a silent key by having an earth lead.

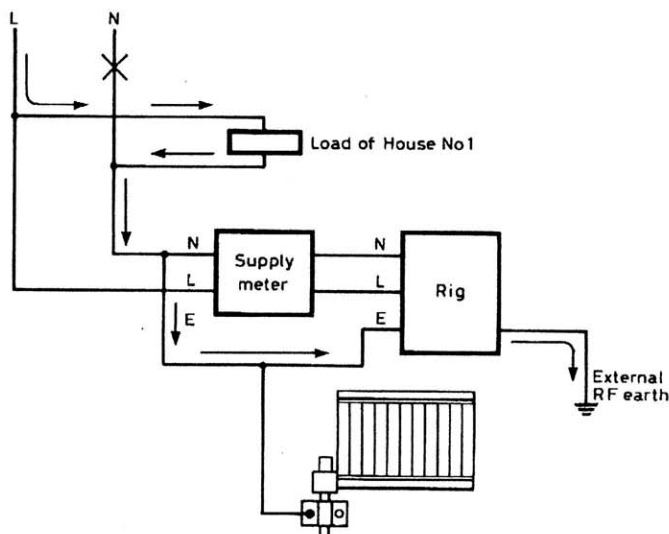


Fig 6. Current flow in pme with fault and external earth

Safe earthing

There are two ways round this problem. One is to have an earth-free room, in which everything connected to the rf earth is a minimum of 2m away from anything bonded to the electricity earth, and then **disconnect** the earth lead from the plug on the equipment mains lead. Fit a circuit breaker (eg RS Part No 334-094 on the cable) or replace the wall socket with one incorporating a breaker (eg RS 331-095 or 331-102). Then remember that **nothing** connected to the mains earth is allowed within 2m of the equipment. This includes light switches where an exposed metal screwhead connects to the mains earth. No kettles, coffee pots, vacuum cleaners, soldering irons—nothing connected to the mains earth. So if a fault occurs, it is impossible to get a shock. But don't disconnect the earth lead **until** you've fitted a circuit breaker. It is **vital** that the earth lead doesn't flap around inside the plug—so bring it back through the cord grip and insulate it **outside** the plug. Then attach a label to the plug saying "DANGER, NOT EARTHED". This means that if you lend your rig to someone—or send it away for repair—the people plugging it in are aware that it isn't earthed. Attach a label to the rf earth where it's joined to the rig saying: "SAFETY EARTH—DO NOT REMOVE".

If you can't establish an Earth-free zone, then a simple way out exists. This is to bond the rf earth to the electricity supply earth at the consumer unit and nowhere else. The earth lead must be at least 80/0.44mm so that it can carry a heavy current (a less-flexible (10mm²) lead is 7/1.35mm). When the extra earth lead is installed, it should conform to the IEE wiring regulations. These will be found in your local library—but if in doubt, consult a competent electrician.

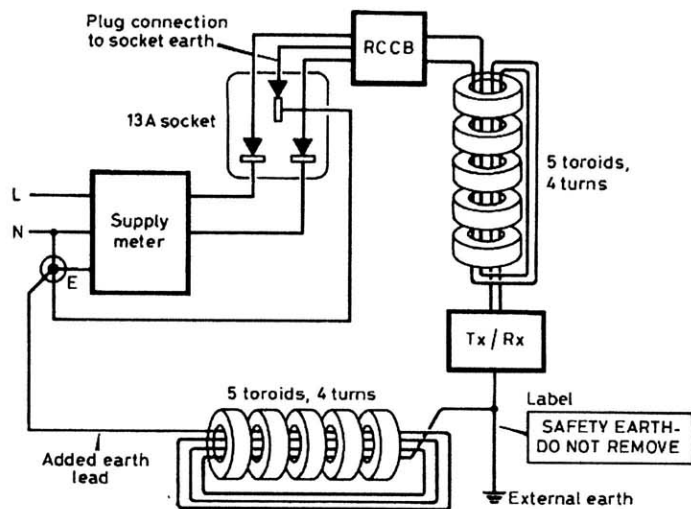


Fig 7. Earth lead for pme with rf choke—the SAFE method

The problem still exists of keeping rf noise that is on the mains away from the rig. Here the use of ferrite rings is indicated. These are available from RSGB HQ, and by winding the earth lead around the rings, an rf choke is formed. The product of turns × number of rings should be about 20, and with a thick earth lead it is best to use about 3 to 4 turns with 5 to 8 rings. Now, the earth lead is connected at the wall socket, and it is a good idea to use a circuit breaker. The mains lead to the rig is wrapped around ferrite rings to keep rf noise out. But don't forget the label where the added earth lead from the mains supply joins the rf earth. John Q Newham's installation now looks like Fig 7. If the earth lead is very long, it is often worthwhile screening it; Fig 8. The screening is only connected at the earth end.

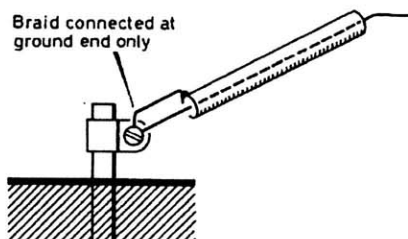


Fig 8. The screened earth lead

Earthing equipment externally in a modern house (or possibly even a recently rewired one) can lead to the danger of fire or electrocution. If these simple guidelines are followed, then there will be no safety problems.

Let's just go back to John Q Newham. Starting on 144MHz he says he doesn't need an earth, so this doesn't apply. If he doesn't mind his antenna floating at 240V in an accident, no. If he doesn't mind the lack of lightning protection, it doesn't apply. But a sensible installation will earth the antennas for dc where possible, and provide a good solid earth for lightning protection. Remember that nothing protects against a direct strike, but lightning conductors do provide a discharge of the atmosphere. Relying on the mains earth can be very expensive.

If you haven't got a good external earth on the antennas, disconnect them **before** you work on them. If a neutral fault occurred while you were working on them it could kill! If you own an old-fashioned power tool with a metal case which is connected back to the mains earth, **don't** use it outside—or, of course, in an earth-free area. If you've got pme and an outside water tap, consult the Electricity Board.

You don't have to have pme. It is possible to have the pme bonding removed, **but** do get this done professionally. Have an rccb fitted to supply the total house load, and, for good measure, have some earth rods driven to provide a good earth. Ensure that the bonding of the rf earth to these is by a heavy conductor—it's unlikely that any rf on the earth will cause problems except in your house! **Do** make sure you test the rccb once a month!

Finally, how about the neighbour whose equipment is suffering because of emc difficulties? The same rules apply on earthing, only more so. Electrocuting a neighbour or setting fire to his house won't make you popular—even if it does stop him complaining! Earthing is easy—just as long as it is done correctly. That's how John becomes John Q Oldham.