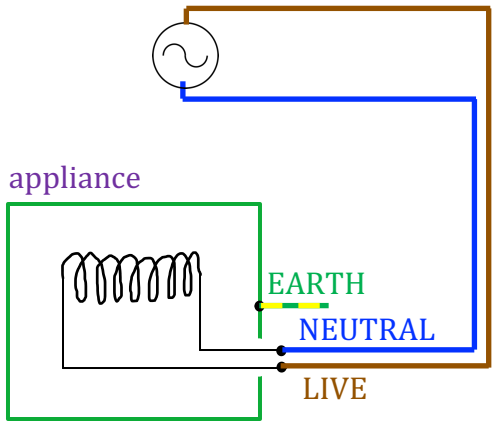
2.6.2 The function of the earth wire

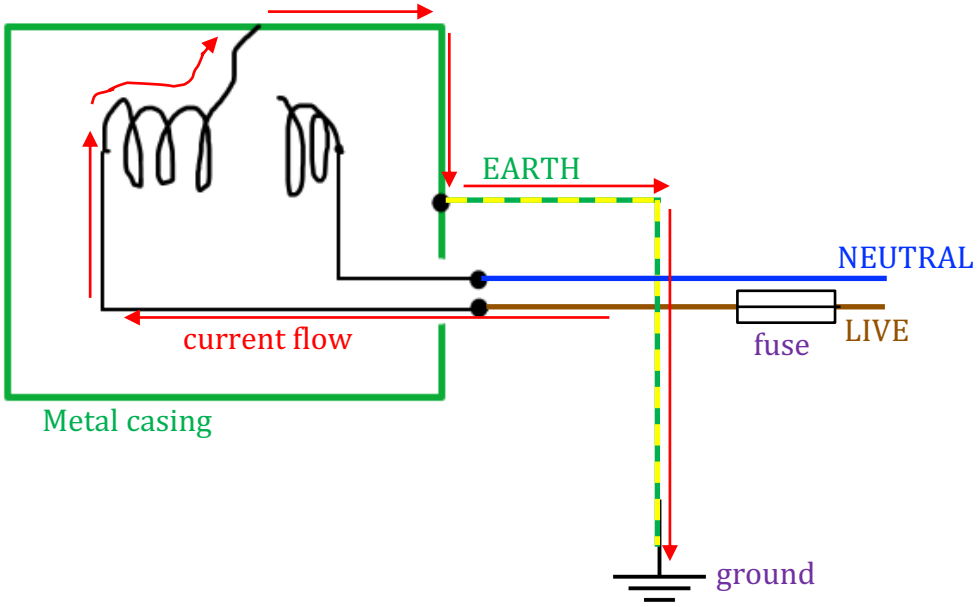
In normal operation, an alternating voltage on the live wire will drive an alternating current through an appliance, with the neutral wire completing the circuit. The earth wire plays no part in normal operation.

videos



The earth wire only functions when there is a fault with the appliance.

The earth wire is connected to the metal casing of the appliance. This means that if a fault develops (e.g. a wire touches the casing) and the casing becomes 'live' (i.e. a voltage is being supplied to the casing), a current will flow through the earth wire and to the ground.



Because this is an easy route for charge to take (i.e. low resistance), a large current will flow to ground. This large current blows the fuse, cutting off electricity supply to the device.

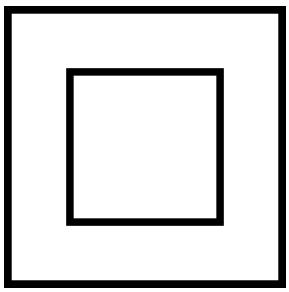
(1) The human body has a relatively high resistance. Explain why someone, touching the metal casing, doesn't receive a serious shock when a fault develops.

(2) The earth wire provides an easy route (i.e. low resistance) for current to flow to ground. Why does the large current that flows not cause heating and potentially a fire? (Hint: Think of the role of the fuse.)

(3) An appliance will still work if the neutral and live wires are swapped round. Explain why it would be dangerous, to have the fuse connected to the neutral wire instead of the live wire. (Hint: Think of the path the current will take in the event of a fault.)

(4) Appliances which have plastic casings don't require an earth wire. Explain why.

Appliances that have plastic casings are marked with the following symbol:



They are said to be 'double insulated'.