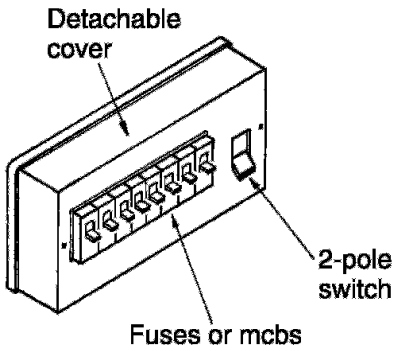
Historically, electrical installations required a separate fuse and isolator for each circuit. Modern practice is to rationalise this into one `fuse box', known as a consumer's power supply control unit or consumer unit for short. This unit contains a two-pole switch isolator for the phase/live and neutral supply cables and three bars for the live, neutral and earth terminals. The live bar is provided with several fuse ways or miniature circuit breakers (up to 16 in number for domestic use) to protect individual circuits from overload. Each fuse or mcb is selected with a rating in accordance with its circuit function. Traditional fuses are rated at 5, 15, 20, 30 and 45 amps whilst the more modern mcbs are rated in accordance with BS EN 60898: Circuit breakers for over current protection for household and similar installations.

Circuit	Mcb rating (amps)
Lighting	6
Immersion heater	16 or 20*
Socket ring main	32
Cooker	40 or 45*
Shower	40 or 45*

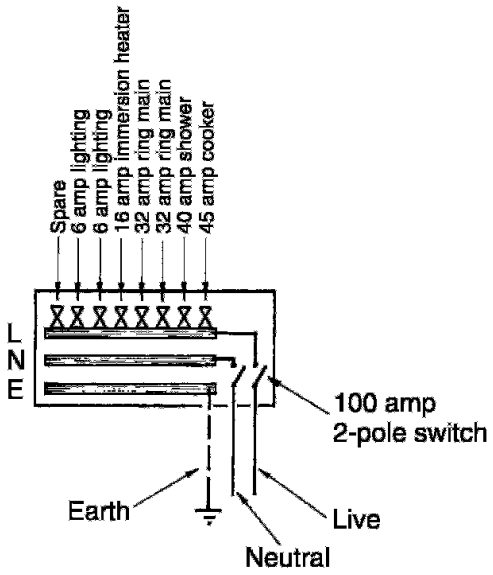
* Depends on the power rating of appliance. A suitable mcb can be calculated from: Amps = Watts ÷ Voltage.

E.g. A 3 kW immersion heater: Amps = 3000 ÷ 230 = 13.

Therefore a 16 amp rated mcb is adequate.



Eight-way consumer unit

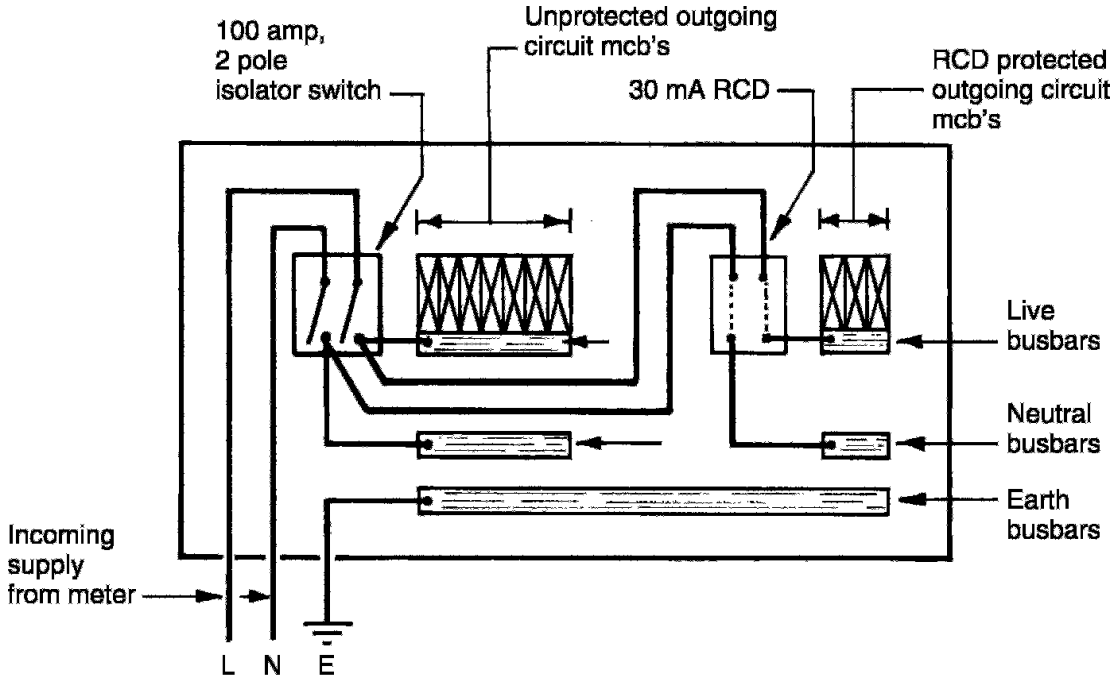


Typical contents of consumer unit

Refs: BS 5486-11 and 12, and BS EN 60439-3: Low-voltage switchgear and controlgear assemblies. Specifications.

A split load consumer unit provides for additional and specific protection to outgoing circuits that may supply electricity to portable equipment for use outdoors. This is particularly appropriate for ground floor sockets that could have an extension lead attached. For example, cooker control panel, kitchen ring main circuit and ground floor ring main circuit.

These ground floor circuits have a dedicated live and neutral bar within the consumer unit and an RCD (RCCB) protection device in addition to miniature circuit breakers for each individual circuit. A typical disposition of components within a split load consumer unit is as shown.



Contents of a split load consumer unit

Types of protection against residual current by residual current devices (RCDs):

- RCCB – Residual current circuit breaker. An incoming switch disconnecting device activated by an earth leakage fault – see page 398.
- RCBO – Residual current circuit breaker with integral overload protection. An alternative to a miniature circuit breaker (mcb) as an outgoing individual circuit protection device. It has a dual function, combining earth leakage protection with the current overload protection provided by an mcb.

Ring Circuit

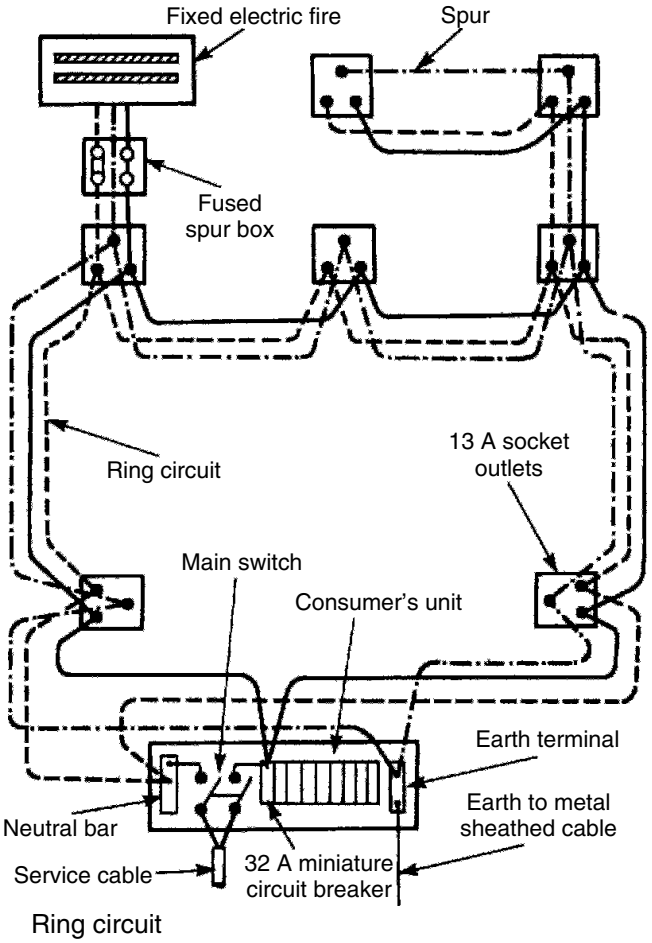
A ring circuit is used for single-phase power supply to three-pin sockets. It consists of PVC sheathed cable containing live and neutral conductors in PVC insulation and an exposed earth looped into each socket outlet. In a domestic building a ring circuit may serve an unlimited number of sockets up to a maximum floor area of 100 m^2. A separate circuit is also provided solely for the kitchen, as this contains relatively high rated appliances. Plug connections to the ring have small cartridge fuses up to 13 amp rating to suit the appliance wired to the plug. The number of socket outlets from a spur should not exceed the number of socket outlets and fixed appliances on the ring.

Cable rating:
2·5 mm^2 c.s.a.

Consumer unit:
BS 5486-13 and
BS EN 60439-1.

3-pin plugs and
sockets: BS 1363-1 and 2.

Plug cartridge
fuses: BS 1362.



Note: Fixed appliances such as fires, heating controls and low powered water heaters can be connected to a fused spur from a ring socket. Appliances and installations with a load factor above 3 kW, e.g. immersion heater, cooker, extension to an outbuilding, etc. must not be connected to any part of a ring circuit. These are supplied from a separate radial circuit from the consumer unit.

Power sockets should be positioned between 150 mm and 250 mm above floor levels and work surfaces. An exception is in buildings designed for the elderly or infirm, where socket heights should be between 750 and 900 mm above the floor. Every socket terminal should be fitted with a double outlet to reduce the need for adaptors. Disposition of sockets would limit the need for lead lengths to no more than 2 m.

The following provides guidance on the minimum provision for power sockets in domestic accommodation:

Location	Minimum quantity of sockets
Living rooms	8
Kitchen	6
Master bedroom	6
Dining room	4
Study bedroom	4
Utility room	4
Single bedrooms	4
Hall and landing	2
Garage/workshop	2
Bathroom	1 – double insulated shaver socket

Maximum appliance load (watts) and plug cartridge fuse (BS 1362) selection for 230 volt supply:

Maximum load (W)	Plug fuse rating (amp)
230	1
460	2
690	3
1150	5
1610	7
2300	10
2900	13

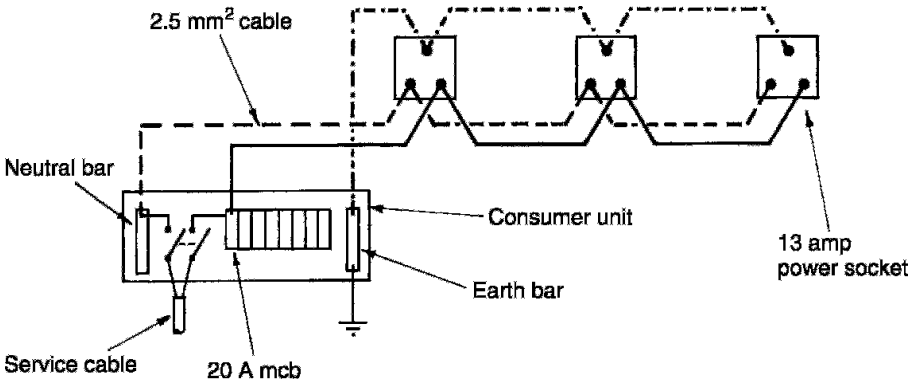
Calculated from: Watts = Amps × Voltage.

A radial circuit may be used as an alternative to a ring circuit to supply any number of power sockets, provided the following limitations are effected:

Cable c.s.a. (mm^2)	Minimum overload protection (amps)	Remarks
2.5	20	Max. 20 m^2 floor area, 17 m cable
4.0	30	Max. 50 m^2 floor area, 21 m cable

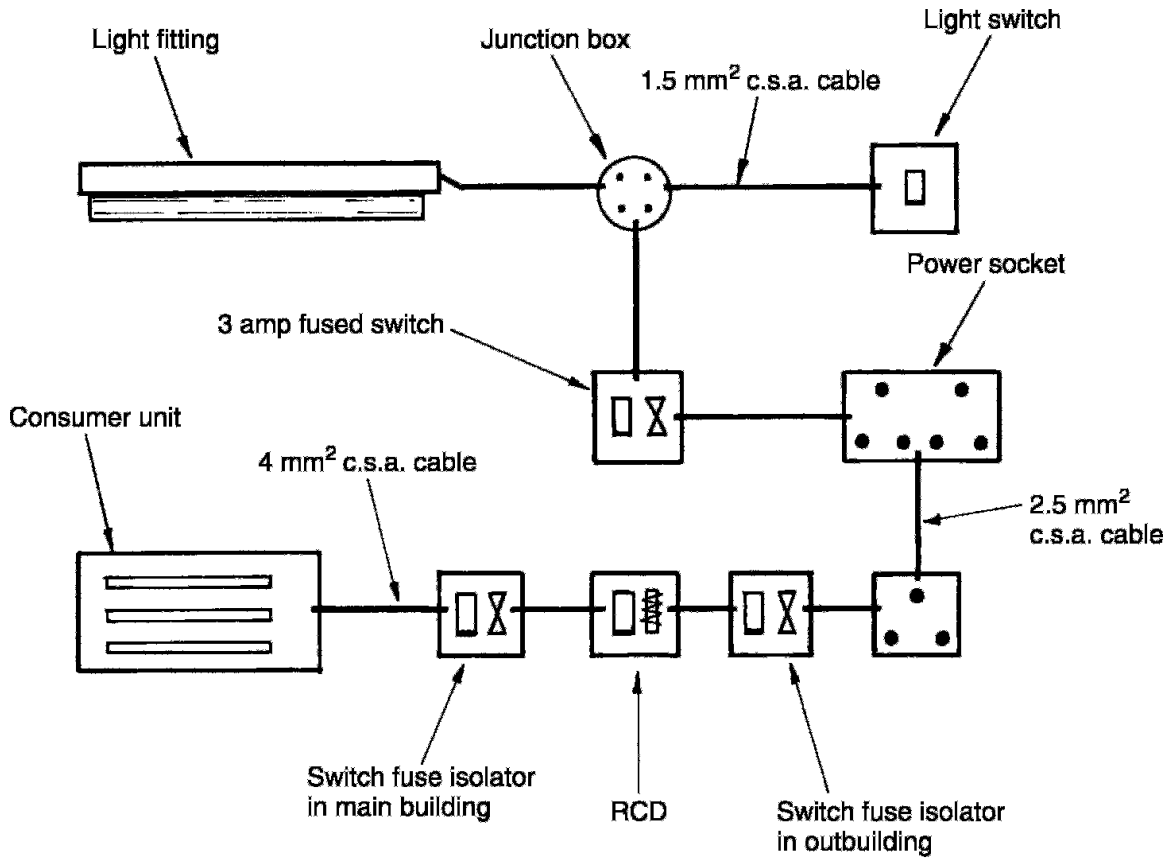
With 2·5 mm^2 cable length limitation of 17 m over 20 m^2 floor area for a radial supply to sockets, a ring main with a maximum cable length of 54 m over 100 m^2 will usually prove to be more effective. Therefore radial circuits are more suited to the following:

Application	Cable c.s.a. (mm^2)	Minimum overload protection (amps)	Remarks
Lighting	1·5	5	Max. 10 light fittings
Immersion heater	2·5	15	Butyl rubber flex from 2-pole control switch
Cooker	6	30	Cable and fuse ratings to suit cooker rating
	10	45	
Shower	4, 6 or 10	30 to 45	See page 286
Storage radiator	2·5	20	See page 410
Outside extension	2·5	20	Nominal light and power
	4	30	Max. five sockets and 3 amp light circuit (next page)



Radial circuit to power sockets

An electricity supply to an outside building may be overhead at a height not less than 3·5 m. It may be supported in a conduit or from a catenary suspension wire. An underground supply is less obtrusive and should be at least 500 mm below the surface. The cable should be armoured PVC sheathed or copper sheathed mineral insulated (MICC). Standard PVC insulated cable may be used, provided it is enclosed in a protective conduit. Fused isolators are required in the supply building and the outside building, and a residual current device (RCD) `trip switch' should also be installed after the fused switch control from the consumer unit. Two-point-five mm^2 c.s.a. cable is adequate for limited installations containing no more than a power socket and lighting. In excess of this, a 4 mm^2 c.s.a. cable is preferred particularly if the outbuilding is some distance to overcome the voltage drop.



Schematic diagram of electricity supply to an outbuilding