

Standard circuit arrangements for socket-outlet circuits

Bill Allan
continues
his look at
circuits



Introduction

Last month, we looked at the accessories for socket-outlet circuits. This month, we'll consider the standard circuit arrangements for socket-outlet circuits. In this article, we hope to cover the main questions which are asked about socket-outlet circuits.

Standard circuit arrangements

There are two standard circuit arrangements for final circuits using BS 1363 socket-outlets and fused connection units (FCU):

- Ring circuits (called 'ring final circuits' in BS 7671)
- Radial circuits

Table 1 below shows the maximum floor area which can be served by these circuits.

TABLE 1

Circuit	Minimum conductor size (pvc insulated, copper conductors)	Copper conductors, MI cable	Rating of overcurrent device	Maximum floor area served
Ring	2.5 mm ²	1.5 mm ²	30A or 32 A	100 M ²
Radial	4 mm ²	2.5 mm ²	30A or 32 A	75 M ²
Radial	2.5 mm ²	1.5 mm ²	20A	50 M ²

Table 1 permits, for each type of circuit shown, an **unlimited number** of socket-outlets to be installed up to the maximum floor area indicated.

The Table is applicable for circuits protected by:

- Fuses to BS 3036, BS 1362 and BS 88
- Circuit breakers types B and C to BS EN 60898
- RCBOs to BS EN 61009-1
- Circuit breakers to BS 60947-2
- MCBs to BS 3871, types 1, 2 and 3

NOTE: The cross-sectional area of a conductor may be reduced for fused spurs, which are discussed below.

Ring circuits

Ring circuits, as the name implies, are connected in a 'ring', which is formed by the cable running from the consumer unit to the first socket-outlet, then to the second socket-outlet and so on, with the cable returning back to the consumer unit from the last socket-outlet in the circuit (see Fig. 1). Ring circuits are protected by either 30 amp or by 32 amp protective devices, are normally wired in 2.5 mm²

cable and can have an unlimited number of socket-outlets as long as the floor area served is no greater than 100 m². However, consideration must be given to the value of the connected load to ensure that it does not exceed the rating of the circuit's overcurrent protective device.

Regulation 553-01-07 of BS 7671 requires that an adequate number of socket-outlets be installed, taking account of portable equipment likely to be used, in order to discourage the use of extension leads and long flexible cords on equipment.

Due to the number of items of electrical equipment commonly located in kitchens, these may require a separate socket-outlet circuit.

Socket-outlets in kitchens must be located so as to provide reasonable sharing of the load in each leg of

the ring circuit. Alternatively, a 4mm² radial circuit could be installed. Regulation 433-02-04 gives the requirements for ring circuits.

Larger items of current-using equipment, such as immersion heaters, cannot normally be plugged into a ring circuit but require a separate circuit.

Spurs

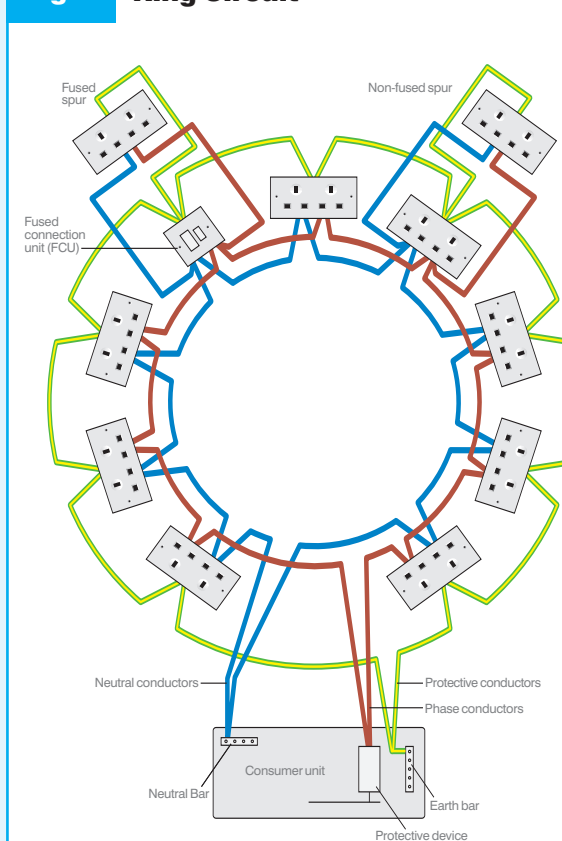
A spur is a socket-outlet or FCU supplied by a single cable which is connected to the ring circuit. When adding a socket-outlet to a ring circuit, it is often easier to do so by using a spur.

Non-fused spurs

A spur which is connected directly into the ring circuit is called a **non-fused spur**. (Fig. 1). The number of non-fused spurs connected to a ring circuit must not exceed the total number of socket-outlets and items of stationary equipment connected to the ring.

A non-fused spur can be connected to a socket-outlet on the ring circuit or it can be connected by means of a suitably rated junction box. If a junction box is used, it must be borne in mind that BS 7671

Fig 1 Ring Circuit



requires that joints must be accessible for inspection, testing and maintenance (see Regulations 131-12-01, 513-01-01 and 526-04-01). A few exceptions to this requirement are given in Regulations 526-04-01 and 543-03-03.

A non-fused spur can supply only one single or twin or multiple socket-outlet or one item of stationary equipment.

Fused spurs

A spur which is connected to the ring circuit by means of a FCU is called a **fused spur** (Fig. 1). The number of fused spurs which can be supplied by a ring circuit is unlimited

and the number of socket-outlets which can be supplied by a fused spur is also unlimited.

Radial circuits

A radial circuit differs from a ring circuit in that no cable is brought from the furthest socket-outlet back to the consumer unit (see Fig. 2). Reference to Table 1 indicates that two types of radial circuits are permitted using BS 1363 socket-outlets:

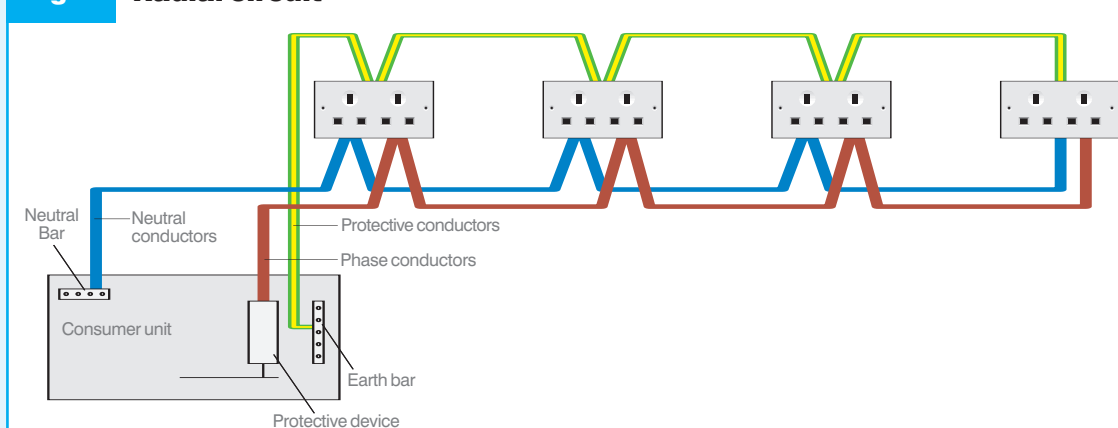
- those wired in 2.5 mm² cable and protected by a 20 A overcurrent device (these can supply an unlimited number of socket-outlets up to a maximum floor area of 50 m²)
- those wired in 4 mm² cable and protected by a 30A or 32A overcurrent device (these can supply an unlimited number of socket-outlets up to a maximum floor area of 75 m²)

Radial circuits are often considered to be more economical to install than ring circuits, especially in large premises where bringing a cable from the furthest socket-outlet back to the consumer unit or distribution board could effectively double the length of cable used.

Conclusion

Further information on socket-outlet circuits can be obtained in IEE Guidance Note 1 Selection and Erection (Appendix C in particular) and the IEE On-Site Guide (especially Appendix 8).

Fig 2 Radial circuit



See overleaf for
Student Activities