

SOCKET & SEE™

Guide 1



FREE

Step-by-step
guide to easy

Insulation and Continuity Testing

PART P

Ring circuit continuity

The ring circuit has become standard for socket outlets, and, as the name implies, is wired in the form of a complete ring, usually using twin and earth cables. The two ends of the ring are connected to the circuit breaker or fuse at the consumer unit, and we need to check that the phase (often called the live), the neutral and the earth connections are continuous. We will also test to ensure that there are no cross connections (some times called spiders).

1 Turn off the main isolator at the consumer unit



2 Remove the cover



Turn off the main isolator at the consumer unit. Check that the system has really been switched off. With the tester SWITCHED ON carefully put the probes on the terminals at the live side of the mains isolator.

The red WARNING VOLTAGE PRESENT will flash with a warbling warning tone.

There may be more than one ring circuit, so identify the one you wish to test. The board shown has ten miniature circuit breakers (MCBs), four of which are 32 A, one for the cooker and the other three protecting ring circuits. Switch off all the MCBs and disconnect the cables from the one whose circuit is to be tested. There will be two red, two black and two green/yellow-insulated conductors. If the installation is a new one, the conductors will be brown and blue rather than red and black. Old installations may have bare earth conductors, sometimes enclosed in green sleeving.

Now switch the DIT 400 to the continuity measurement function by pressing the "CONTINUITY" button. Plug the crocodile clips into the leads, connect them together and press the "TEST" button. The display will show the resistance of the leads, and pressing the "NULL TEST LEADS" button will ensure that this resistance value is subtracted from all future continuity readings. (Until switched off).

Next connect the clips to the two disconnected red (or brown) phase conductors. The "TEST" button will then show the resistance of the complete ring, and verify its continuity. (Fig. 5).

5 Measuring the phase (live) ring continuity



Next, go to each socket outlet, remove it from its box (Fig. 7) and test the resistance from phase to neutral on each (Fig. 8).

As an alternative to removing sockets, the Socket & See SS 130 Socket Adaptor can be used (Fig. 7a).

7 Socket removed for testing



7a Using SS 130 Socket Test Adaptor



8 Checking for "bridges" at socket outlets



3 Testing the live side of the main isolator



Next, put the probes on the output side, where there should be no indication. (Fig. 4).

The mains present LED should not illuminate, and there will be no warning tone.

4 Verifying that the consumer unit is switched off



Repeat this test with connections to the two neutral conductors (black or blue) (Fig. 6), with results that should be about the same as for the phase ring. A further test on the earth ring should result in values about 66% greater than those for the phase and neutral because the earth conductors have smaller cross-sections.

6 Measuring the neutral ring continuity



Next we need to make sure that the ring is not "bridged", which happens if two spurs from opposite points on the ring are joined up. First, connect the phase (or live) conductor from one end of the ring to the neutral from the other end (red or brown to black or blue), and do the same with the other two phase and neutral conductors. The easiest way to do this is to join the two pairs of conductors with a couple of unplugged crocodile clips as shown in Fig 10. If the wiring is carried out using twin with earth cables, it will be obvious which conductors are from opposite ends of the ring. In the case of single-core conductors in conduit, great care will be needed to ensure that the conductors connected are from opposite ends of the ring.

The readings at all sockets should be substantially similar except that those wired on spurs will be a little higher. If the readings are different, for example if they change steadily for sockets as you test round the ring, there is probably a bridge.

Now, repeat the process with phase and earth conductors from opposite ends of the ring connected together (Fig. 10a).

9 Test from phase to earth at socket to identify presence of "bridges"



Connect the two phase connectors to the two earth connectors (Fig. 10a).

This time, the test at each socket should be between phase and earth (Fig. 9). This test also confirms the correct polarity of connection to each socket.

Continued Overleaf....

10 Connection of conductors for test using disconnected crocodile clips (neutral)



10a Connection of conductors for test using disconnected crocodile clips (earth)



Successful completion of these tests shows that the ring circuit has been properly wired and has no bridges.

Don't forget to reconnect the conductors to the circuit breaker or the fuse exactly as they were removed.

Insulation resistance

This test ensures that the insulation of the electrical system is adequate. It involves connecting a 500V direct current supply between the points whose insulation resistance is required. The instrument reading is based on the leakage current through the insulation, the lower the current, the higher the insulation resistance. Tests are necessary between phase (live) and neutral, between phase and earth and between neutral and earth.

For all circuits the insulation resistance should be at least $0.5 \text{ M } \Omega$. However, this is a very low value, and if the reading is less than $2 \text{ M } \Omega$ there may be need for further investigation. The voltage used for testing can be lethal to electronic equipment so all vulnerable devices, such as fluorescent fittings, passive infra-red detectors (PIRs), touch switches, dimmer switches, power controllers, delay timers, electronic residual current devices, etc. must be disconnected before insulation testing takes place.

11 Testing insulation resistance



The Socket & See DIT 400 will automatically select the 500V insulation range when you first switch on so just connect your test clips to the conductors to be tested.

Make sure that your fingers are clear of the connections and then press the "TEST" button, when the insulation resistance will appear on the display (Fig. 11).

(If you require other test voltages such as 250V - for example testing low voltage lighting circuits this can be selected by pressing the "TEST VOLTS" button - the display will indicate the test voltage selected).

Lighting circuits

Lighting circuits are radial, not ring, circuits and so do not require testing for bridges. It is, however, most important to ensure that all single-pole switches are connected in the phase (live) conductor, rather than in the neutral. One simple method here is to make a temporary connection at the consumer's unit between the phase (red or brown) and earth (green/yellow) conductors. The DIT 400 is then set to the continuity range and used to test between the switch and earth at each position; a test should also be made between the centre contacts of ES lamp holders and earth.

For this test, the resistance reading is unimportant. As long as it is very low, the polarity is correct. Don't forget to remove the temporary phase/earth connection after the test!

Insulation tests are just as necessary on lighting circuits as on others. When testing a lighting circuit, ensure that fluorescent fittings are disconnected, filament lamps are removed from their holders and that all switches are closed. The procedure is the same as that given above for ring circuits, but perhaps even more care is needed to ensure that electronic devices are disconnected to make sure that they are not "killed" by the high test voltage.

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