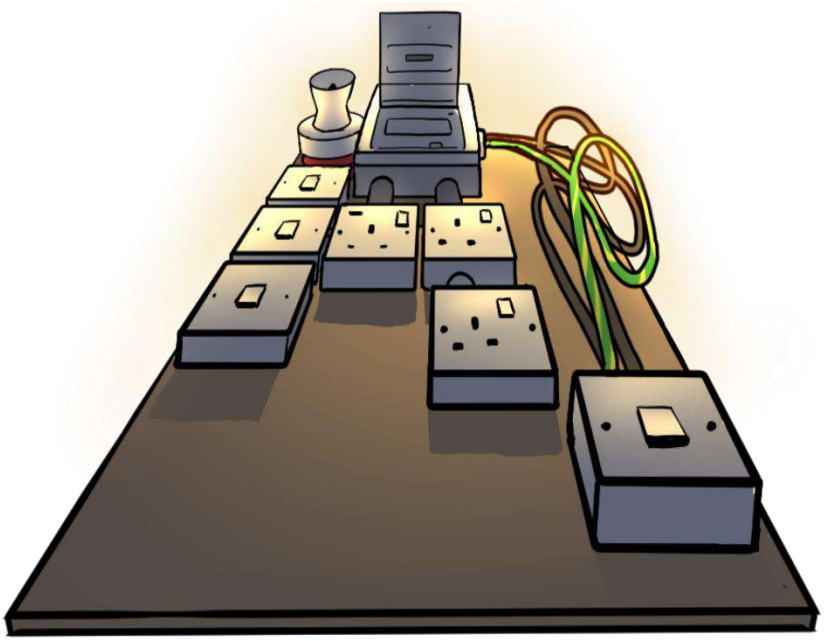
DSES.UK
ELECTRICAL CONTRACTOR

PORTABLE TRAINING TEST RIG



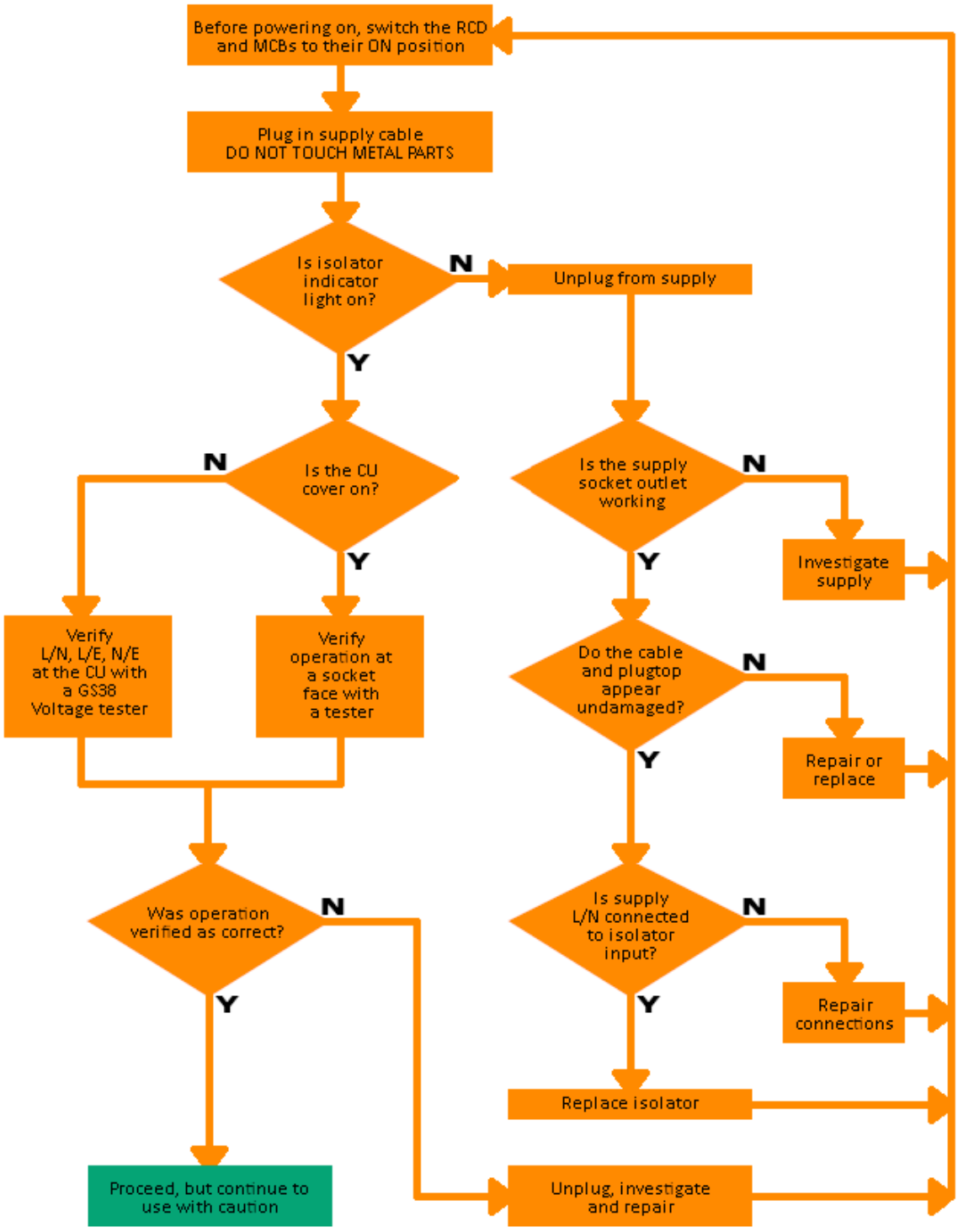
SUPPORTING DOCUMENTATION
15/01/23
REV 1.0

Always check dses.uk/testrig for the latest advice and information before construction.
This document contains the testing visual aids used in the video presentation.

SAFETY PROCEDURE FOR ENERGISING

When metal components such as a CU, metalclad accessories or galvanised couplers have been used, this apparatus should be treated as a non-earthed Class 1 appliance. A failure of the neutral will see metal accessories float to 230V with no earth fault path to protect against touch contact.

This safety procedure must always be adhered to when powering up the rig and before any contact is made with extraneous metallic parts, or before any Class 1 appliances are connected.



Refer to dses.uk/testrig for updated documentation and advice.

ISOLATOR CONNECTION

NOTES:

It is strongly recommended the isolator is double pole with a neon or other visual indicator.

The neutral tail and main earth are connected by a 16mm Sigma Safety Terminal, although any suitably sized connector may be employed.

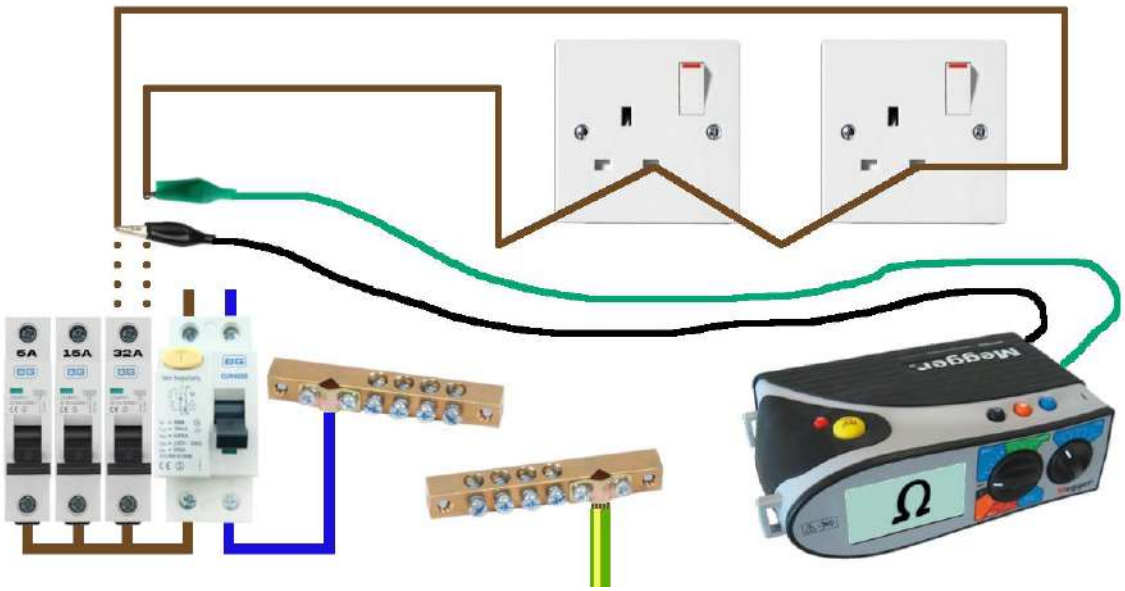
The supply flex is two-core with a 13A fuse in the plugtop. There is no connection to the supply earth.

It is recommended that the plug be inserted into an RCD protected outlet on the supply.

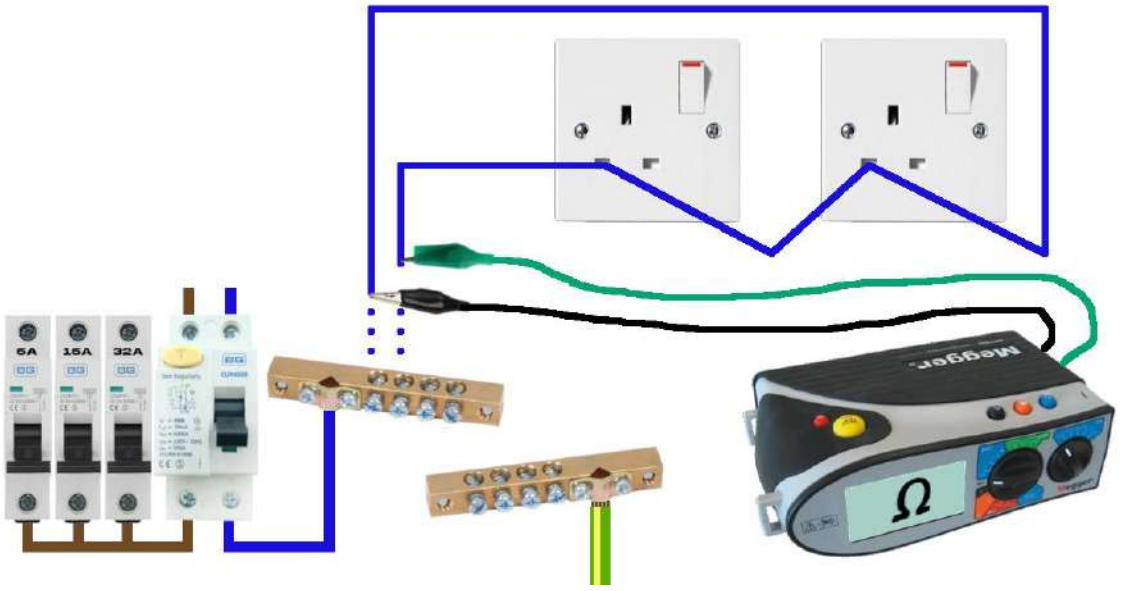
The isolator screws need not be earthed (see regulation 410.3.9 note iii).

This equipment should only be energised under controlled conditions and supervised by persons appropriately qualified and competent in electrical installation. It should always be unplugged any time live testing is not being undertaken, and it must not be used to routinely power appliances as though it's some kind of glorified extension lead.

RING END-TO-END TESTING - r1



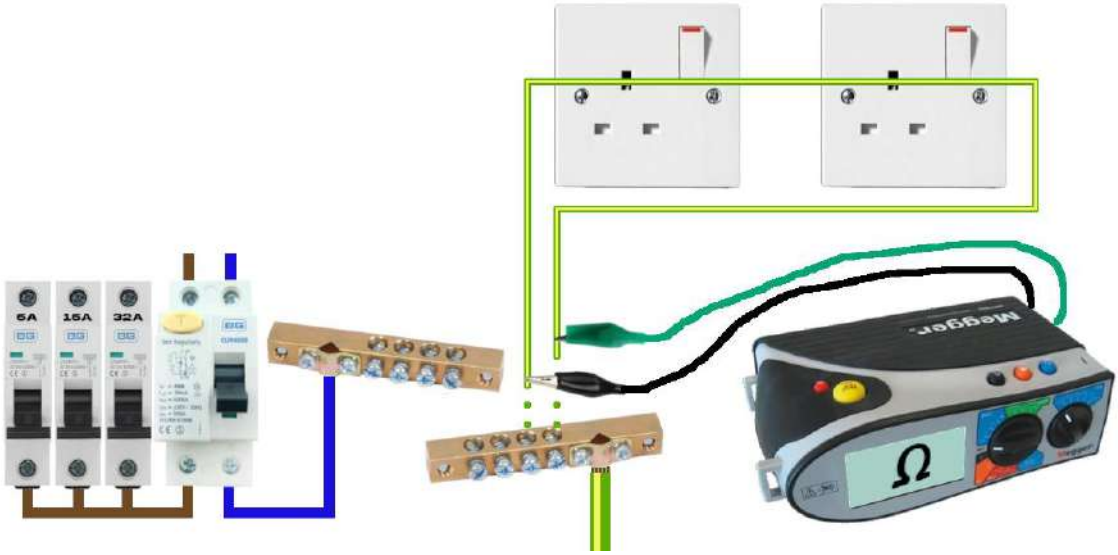
RING END-TO-END TESTING - rn



The measurement for r1 and rn should be largely the same as the wiring is of the same CSA and length. Al resistance readings should be within 0.05Ω of their expected result.

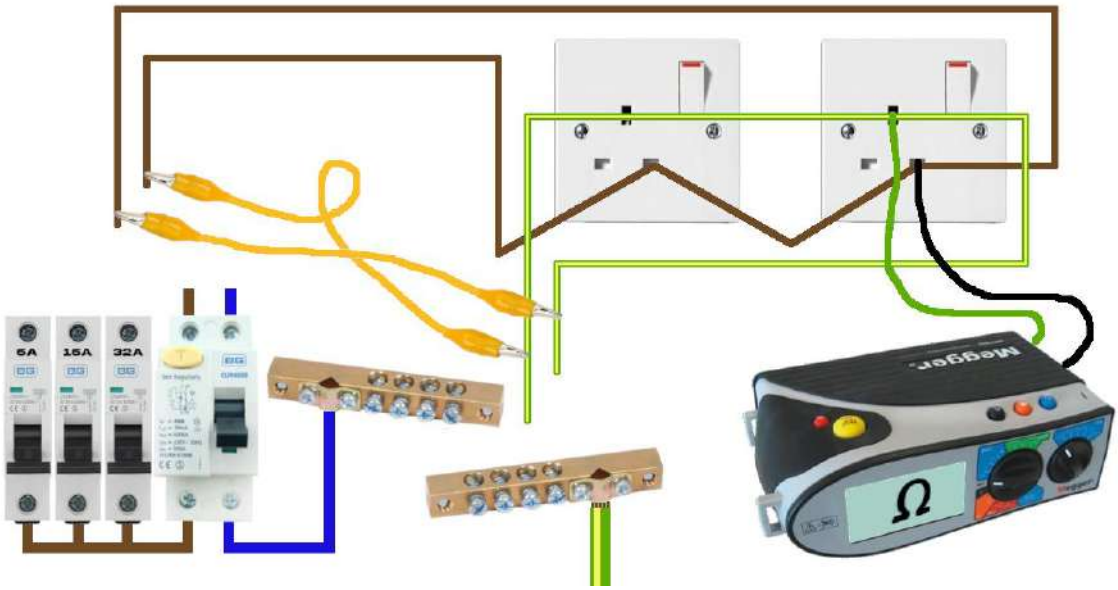
For 2.5mm^2 wiring, that result should be 7.41mΩ x the length of circuit.

RING END-TO-END TESTING - r2



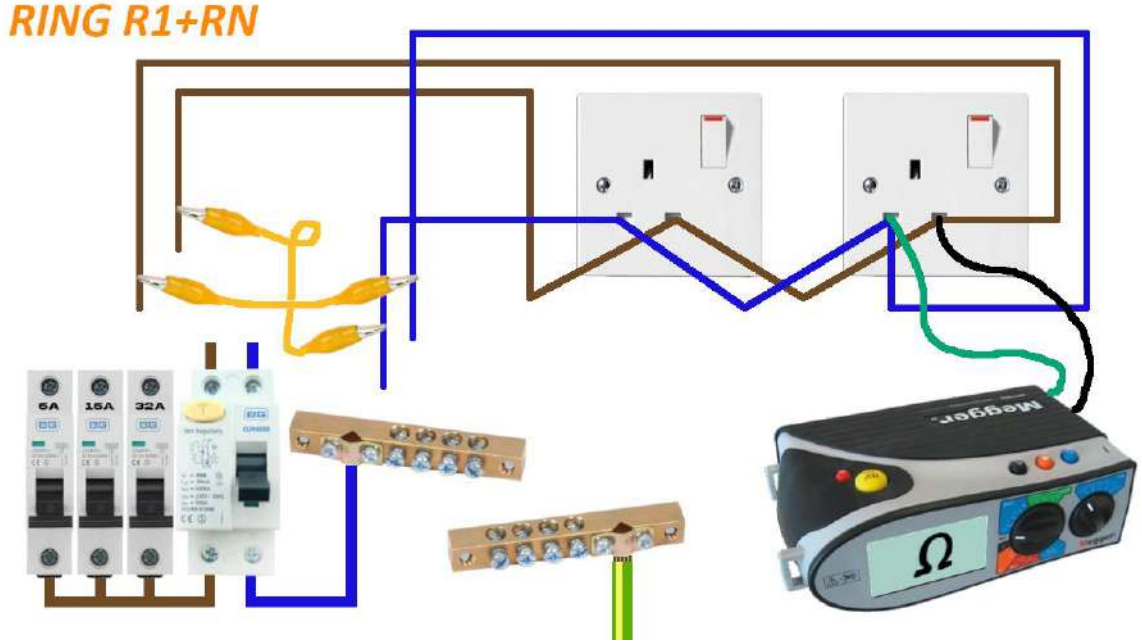
Where 1.5mm^2 wiring has been used, the result should be 1.67 times higher than r1 and rn because 2.5/1.5 = 1.67. With this wire being 1.67 times smaller, its resistance is 1.67 times higher. The result should also work out as 12.10mΩ x the length of circuit.

RING R1+R2



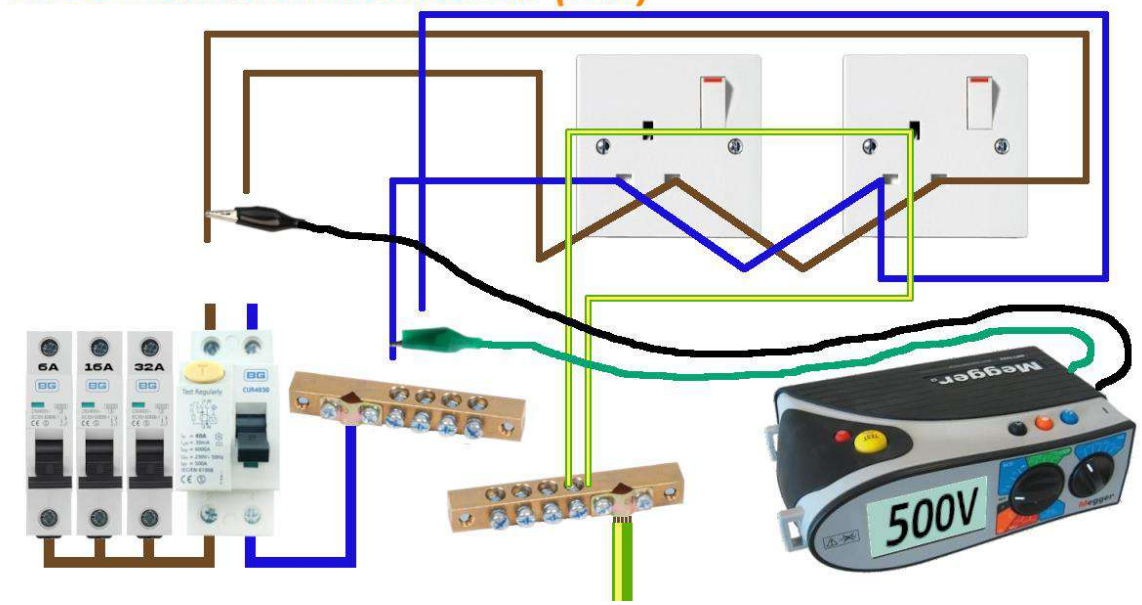
Line needs to be connected to its opposing CPC which are easy to tell apart as one LNE group will be going to the IP box that holds all the cables and the other LNE group to the socket accessories. The expected result should be (r1+r2) / 4.

RING R1+RN



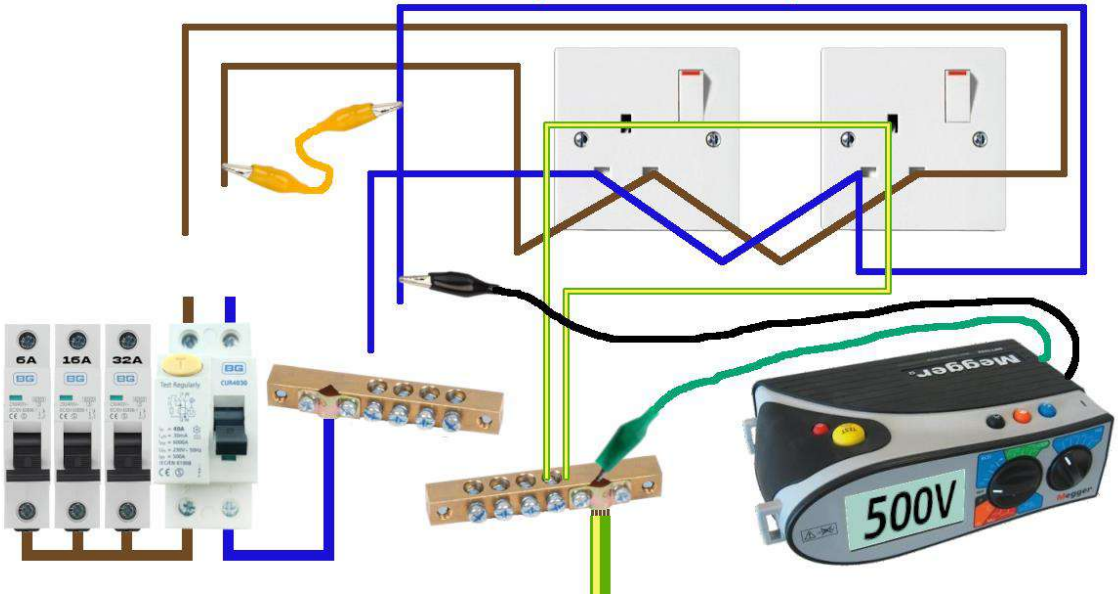
Line needs to be connected to its opposing neutral which, again, can be found by tracing which LNE group goes where. The expected result should be (r1+rn) / 4.

RING Insulation Resistance (L-N)



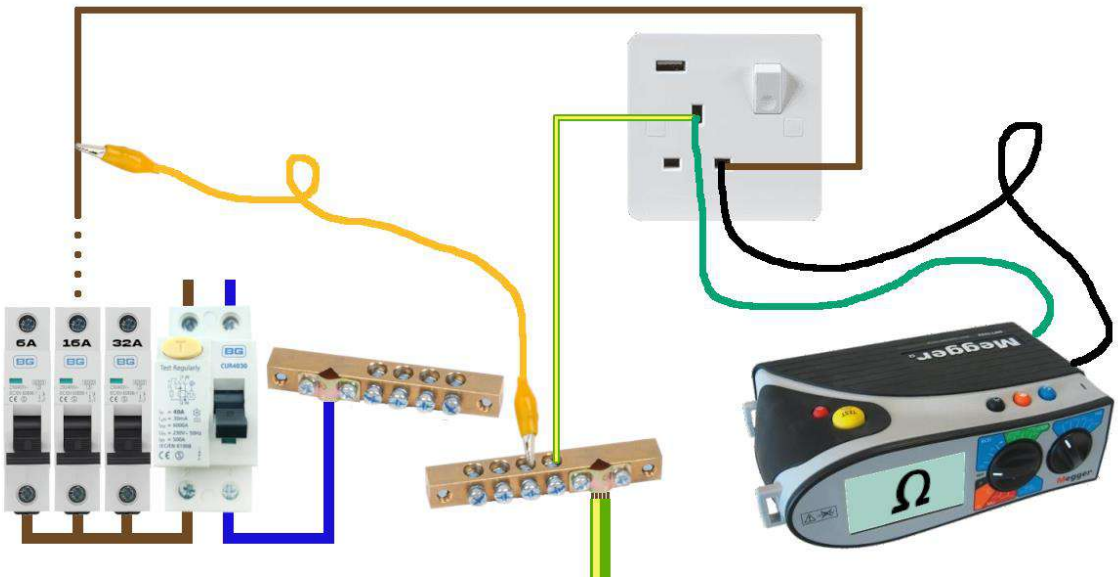
With no USB socket and no loads, there's no problem testing line to neutral at 500V. It is recommended line is disconnected from its protective device as some RCBOs (if used) can skew the test result. Neutral will need to be removed from the neutral bar for all IR tests. This image is in error because the line wires should be drawn over the 32A MCB rather than over the RCD. The tester only needs to be connected to one end of the wiring if continuity has been verified end-to-end prevously.

RING Insulation Resistance (L/N to Earth)

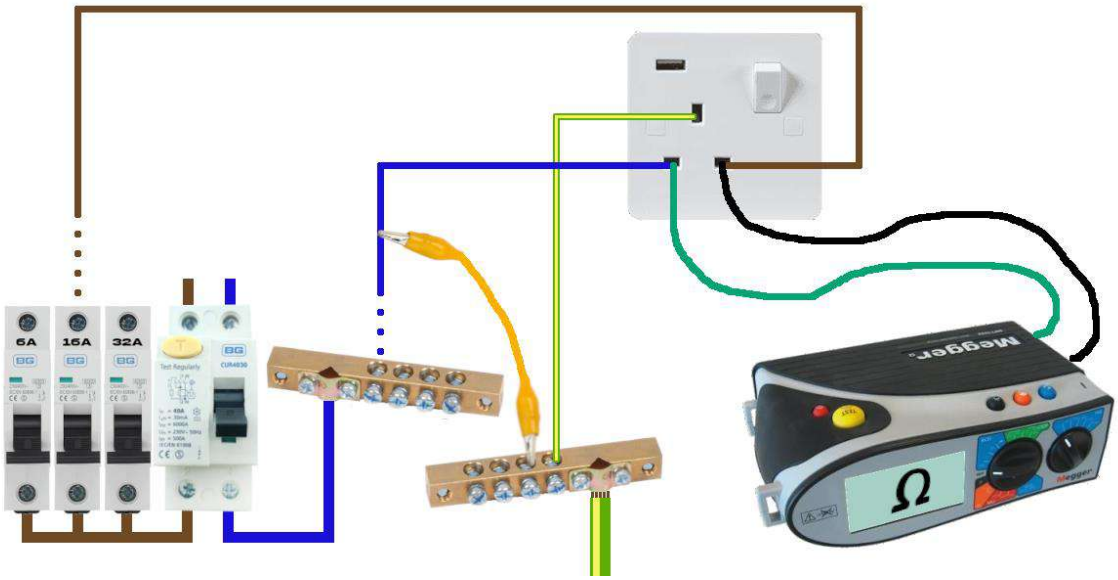


This image is also in error in that the line wires should be drawn over the 32A MCB rather than the RCD. When IR testing to earth, the CPC should be connected to the earth bar to bring in any potential parallel paths. Line and neutral can be tested individually to earth or together by being joined as shown.

RADIAL socket R1+R2

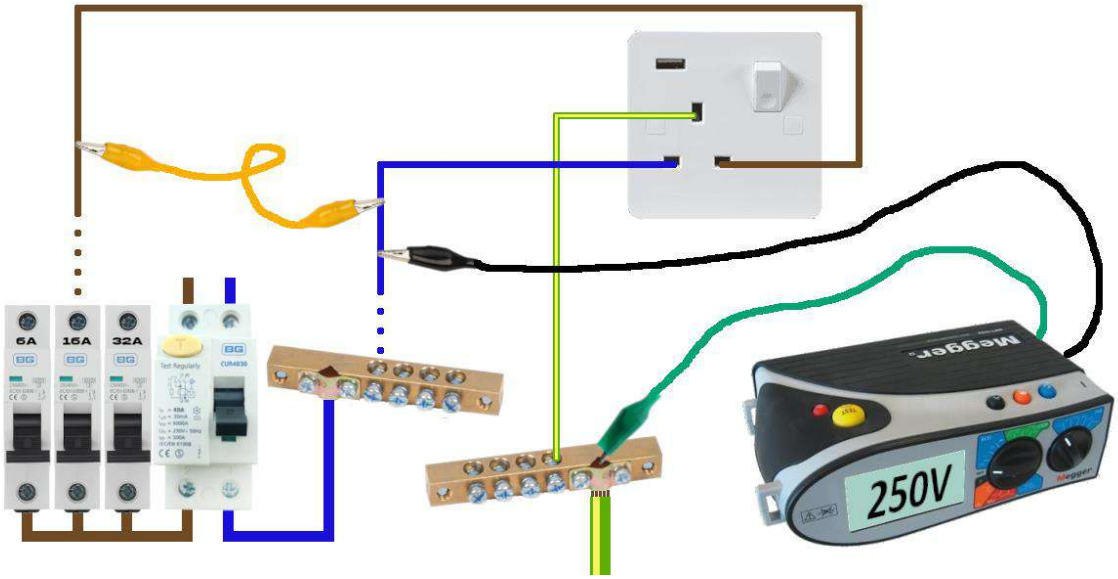


RADIAL socket RN+R2 (not in BS7671)



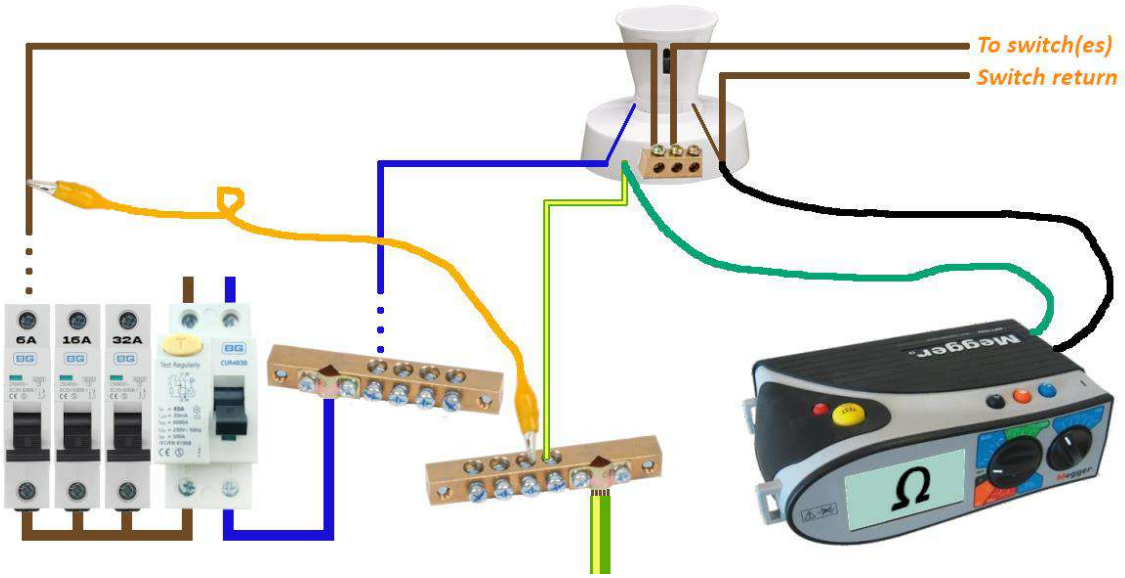
Although not required by BS7671, I would recommend RN+R2 also be verified, especially if AFDDs are to be fitted. This should match the R1+R2 result and so act as a checksum. If R1+R2 is significantly lower, then that indicates a loose neutral. Higher indicates a loose line. Both readings being unexpectedly high suggests a loose CPC.

RADIAL socket insulation resistance (L/N - E with load)



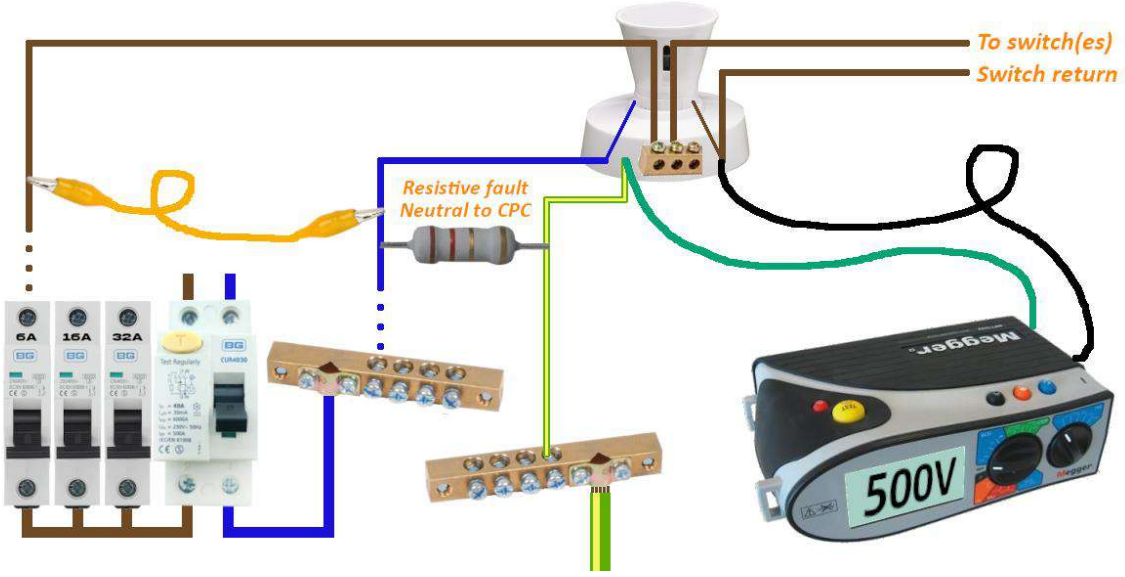
Because of the connected load (the USB charger electronics built into the socket), we can only test at 500V L-N with the socket removed. For our test environment, we can instead treat this circuit as a periodic inspection where existing loads are already present, skip LN testing altogether and instead test LN to E at 250V.

RADIAL lighting R1+R2



Switches have been omitted from this diagram for simplicity. The reading on switched line will be higher than at the loop terminal of the lampholder.

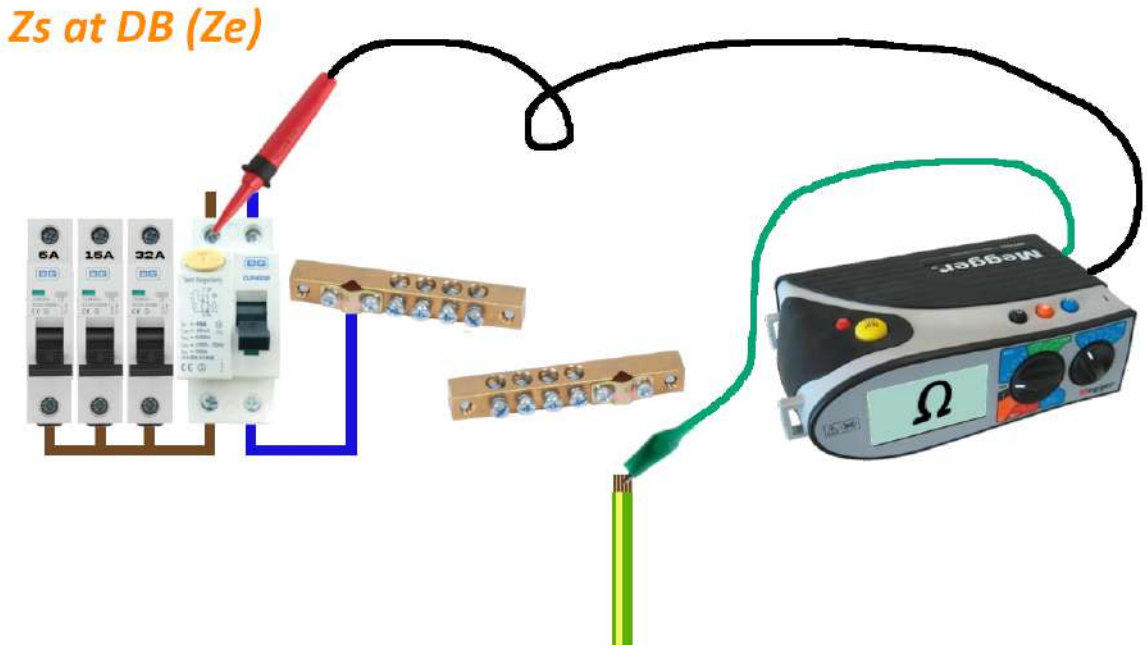
RADIAL lighting insulation resistance (with fault N-E)



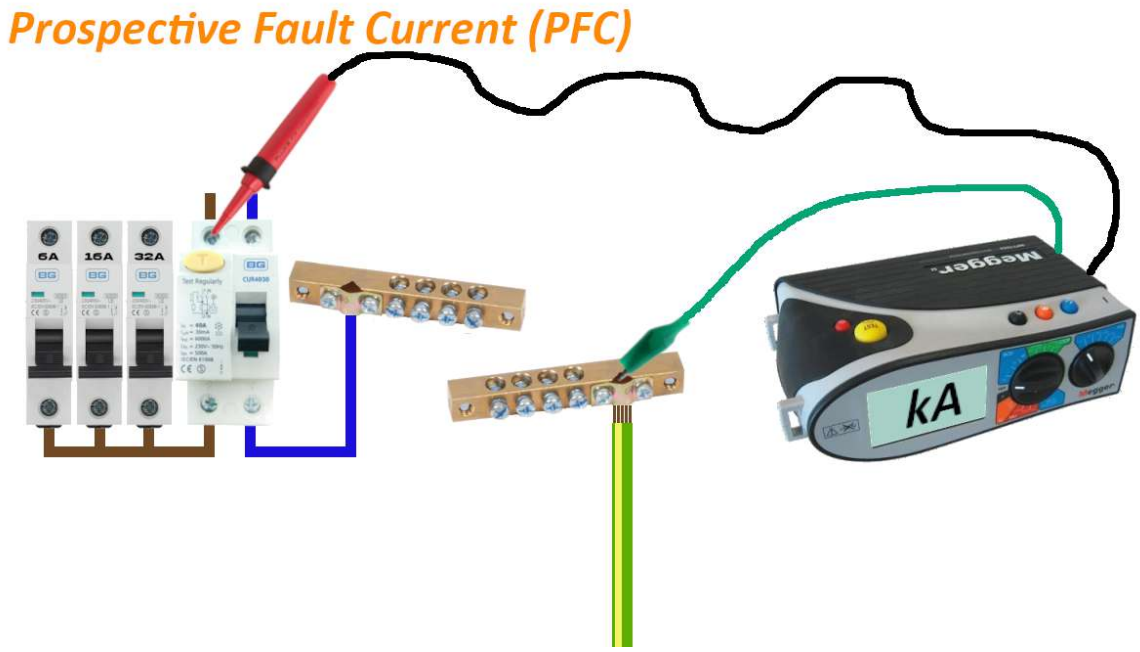
The resistive fault is within the batten lampholder as shown in the video. A 1R2 resistor has been used, but values up to ten Ohm may be needed for experimentation.

LIVE TESTING

Do not proceed with live testing without following the flowchart procedure given at the start of this document.

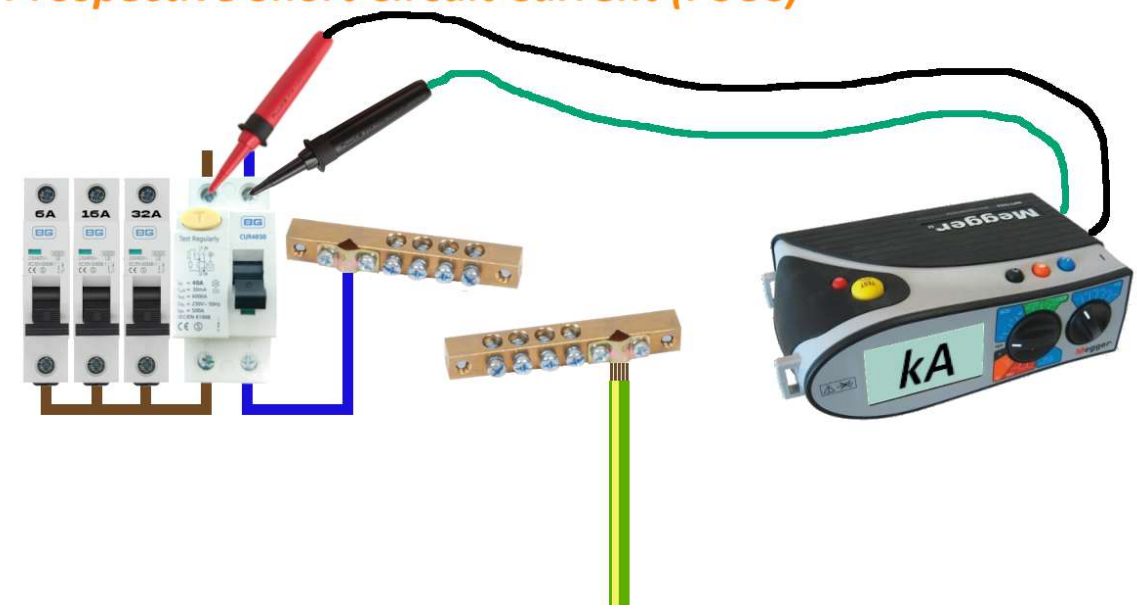


Although there are no parallel paths on the test rig, it is good practice to remove the supply earth as one would in the real world when checking the efficacy of the earthing arrangement. The two-lead “Hi-Loop” test would be selected on the Megger instrument shown.



The supply earth should be reconnected to bring parallel paths back into play. The two-lead “Hi-PFC” test would be selected on the Megger instrument shown.

Prospective Short Circuit Current (PSCC)



The two-lead “Hi-PFC” test would be selected on the Megger instrument shown. Some instruments have individual PFC and PSCC test options, however these tend to be the same test with the former using the green probe port and the latter the blue probe port. Either test can perform either function without the need to swap probe leads.

This document does not cover further testing such as earth leakage or clamp meter measurements.