

Service Connection Test – Multimeter Guide

Meters in Multiple Master Meter Panels

Form: Service Connection Test – Multimeter – Meters in Multiple Master Meter Panels
(DM# 11484590)

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Purpose

The purpose of this guide is to assist in the completion of the *Meters in Multiple Master Meter Panels SCT Form – Multimeter* (DM# 11484590). The reference for this document is *Australian Standard 4741-2010 (Testing of connections to low voltage electricity networks)*.

The test form is for use by licenced electricians using instruments with a built-in memory who are required to install kWh meters in Multiple master meter panels.

The focus is on proving that:

- all three phases are present (for 3- \emptyset only)
- phase rotation is correct
- line impedance (phase-neutral) < 1 Ω
- line phase-neutral polarity is correct
- neutral-earth polarity is correct
- the meter is correctly connected and records consumption
- the instrument used to perform the test is calibrated, and proven to operate correctly
- no hazardous touch potential exists on the installation on completion of the task

Scope

- This test form guide is for use in Multiple Master Meter (MMM) installations only.
- For Distributed Master Meter (DMM) installations, the use of the Service connection test form is recommended (direct wired meters)

Authorisation

- Electrical contractors must be authorised under Western Power's SACS or contractor connect schemes in order to access network apparatus. This authorisation must be endorsed on their Network authority card (NAC).
- For more information on SCT authorisation refer to Western Power's *Contactor Connect Scheme* document (on the Western Power website, DM# 3747498), or work practice 8.1 (Customers – managing connections to the network)

Work practices related to service connection tests

Personnel who are required to perform tests on any service where a customer receives a supply of electricity from Western Power must also refer to the following work practices in the Work Practice Manual.

- 8.1 (Customers – managing connections to the network)
- 8.4 (Sealing revenue meters, fuses and terminal blocks)
- 8.7 (Customer installation assets at the network interface)
- 8.11 (Consumer de-energisation/disconnection and re-energisation/reconnection)
- 8.12 (High network loop impedance (Z line) experienced during service connection testing)

This guide and the above work practices support the Western Power procedure *Management and assessment of private low voltage electrical installation assets procedure* (DM# 13102597).

Actions for 'failed' result

If 'failed' results are indicated during testing, and before disconnecting or issuing a Western Power Customer Pack;

- Recheck all supply connections to ensure their integrity
- Confirm the test results by retesting (ensure that test probes have made good contact, including crocodile clips and spring-loaded clips)

If the 'failed' results are confirmed after retesting,

- For faults on the Western Power side – Call Western Power's Customer Service Centre (131351) to initiate the TCS process. If possible, commence fault location and repair within limits of authority, perform a full retest.
- For faults on the customer's equipment – refer to the Work Practice Manual, work practice 8.6 (Customer connections – installation, testing and energising) for further action.
 - MEN can't be verified - Call Western Power's Customer Service Centre (131351) and issue the customer with a Western Power Customer Pack (Temporary disconnection).
 - High neutral-earth voltage - Call Western Power's Customer Service Centre (131351). If the fault cannot be identified, raise a fault via TCS and request a Fault response unit to attend.

Overview of the testing steps

Pre-testing verification and visual checks section

Record the service address, date and work order (w/o) number.

- This data is necessary to ensure the results of the all the tests and actions undertaken are recorded and traceable to a specific installation and work order.

1. Test instruments. Confirm the correct operation and record the calibration date (c/d) and serial number (s/n) of each test instrument.

- Confirm that the test instruments are functioning correctly on a known supply source; this can be the existing supply to the installation or by using a portable power source.
- Record the meter serial number (s/n) and date of next calibration (c/d) for each instrument.

2. Establish an Independent Earth (>2m separate from the installation).

- This is the requirement for the independent earth reference for testing. Note that it must be installed/established at least two meters away from the enclosure/board/panel.

- 3. Test for voltage between the meter panel/enclosure and the independent earth (< 6 V)**
 - This is only for metal enclosures/boards/panels to ensure that they are not energised and are safe for the tester to touch and access. If the meter box is non-metallic or there is no other earthed component available, write **N/A**.
 - If the enclosure has a voltage of greater than 6 volts, perform tests/fault-finding within the scope of your authority. If the problem cannot be found and corrected, call western Power's Customer Service Centre (131351) to initiate the TCS process.
- 4. Confirm that the installation has been energised.**
 - Testing the new meter requires the MMM board to be energised.
 - The MMM panel is commissioned, in service and ready to supply load
- 5. Record the label inscription on the customer main switch**
 - Record the relevant customer main switch name (premise number/unit/customer)
- 6. Ensure that the Customer main switch is OFF and has a "Do not access or alter" or "Out of service" warning tag is attached.**
 - Prevents the customer supply from being energised during commissioning of the meter.
 - Tagging informs unauthorised persons that the customer's main switch must not be operated.
- 7. Ensure that the meter protection fuses are removed and a "Do not access or alter" or "Out of service" warning tag is attached. Test for voltage at the meter tails.**
 - Provides de-energised access to the meter tails for connection. Tagging informs unauthorised persons that the SPD must not be replaced.
- 8. Fit the new meter. Connect the meter neutral into the line neutral terminal at the meter.**
 - Ensure that the new meter is connected correctly; the neutral tail is in the **line neutral** terminal. Make sure that both screws of the terminal are firmly clamping onto the conductor. Do not overtighten.
 - Perform a 'Pull test'.
- 9. Confirm continuity between the meter neutral terminal and the installation main neutral bar (should be 0 Ω)**
 - This proves that the meter neutral is connected to the main neutral of the installation (0Ω).

- 10. Test the MEN connection by confirming continuity between the meter neutral terminal and the installation main earth bar (should be 0.5 Ω).**
 - If the MEN connection cannot be confirmed, do not proceed until MEN connection has been installed and verified.
 - The MEN and the installation earth should have been confirmed/proven during the Customer mains SCT.
- 11. Check continuity per phase between Meter LINE active tails and the meter protection fuse(s).**
 - This will confirm correct wiring of the individual meter circuit from the meter protection fuses to the line active tails before connecting to the line active terminals of the meter.
- 12. Check continuity per phase between Meter LOAD active tails and consumer main switch.**
 - This will confirm correct wiring of the individual meter circuit from the load active tails to the consumer's main switch.

Energise and testing section

- 13. Connect LINE actives to the line active meter terminals.**
 - Line active tail(s) are correctly connected into the respective line terminal(s). Make sure that both screws of each terminal are firmly clamping onto the conductor. Do not overtighten.
 - Perform a 'Pull test'.
- 14. Remove the "Out of Service" warning tag or "Do not access or alter" warning tag. Energise the meter by replacing the meter protection fuse(s).**
 - The meter fuses are now replaced, energising the meter terminals. Testing of the supply side can now commence.
- 15. Test phase rotation and record the result.**
 - Correct phase rotation is clockwise (1, 2, 3). This test proves that the line active tails have not been transposed during the meter replacement.
- 16. Phase to phase voltages: Test and record at the kWh meter. Expected results 390-440 V.**
 - This test proves the presence of all three phases at the kWh meter line active terminals (in the case of 3 \emptyset) and the voltages are correct within supply standards.

Voltages: Test and record voltage between:

- 1. LINE Active(s) and Neutral at the kWh meter terminals (225-255V).**
 - This test proves the active voltages with respect to neutral are correct within supply standards. NB: The MMM installation and its mains supply are already tested and in commission.

2. LINE Active(s) at the kWh meter terminals and Independent earth (225-255V).

- This confirms the polarity of the active(s) with respect to the independent earth

Line Impedance: Test and record between the LINE Active(s) and the neutral at the kWh Meter terminals. Expected results <1 Ω.

- This is not a resistance test. This test proves the continuity of the AC supply circuit between the source and the meter terminals.

Note:

For all the tests at step 15; If any results are outside of the expected range, corrective actions must be performed to the service mains or supply network and fully retested before the customer's installation is energised.

17. Perform a load test on each phase at the kWh meter load terminals (active-neutral) to prove correct operation of the meter. Ensure the meter pulse indicator pulses when load is applied.

- Using a suitable load tester (approx. > 1000 watts) connect it at the load active (for each phase) and load neutral meter terminals and check that the meter is recording consumption.

18. Remove meter fuses and test that the meter is de-energised. (0V Active-Neutral)

- This confirms that the meter fuses are in circuit (not by-passed)
- This facilitates the connection of the load actives (meter terminals de-energised)

19. Connect LOAD actives to meter (Take care to ensure that the tails are NOT transposed).

20. Confirm new meter is wired correctly (1Ø – ANNA) or (3Ø – AA AA AA NN)

21. Ensure all the conductors are checked for tightness (pull test).

22. Replace the meter fuses

- Replacing the fuses energises the circuit up to the customer's main switch (tagged and off).

23. Test for voltage between the metal panel/enclosure and the independent earth (<6V). If equivalent to supply voltage, remove the meter protection fuses immediately.

- **This is a polarity/touch potential check.** Test for voltage on the meter panel/enclosure.
- Record the voltage in the space provided, it should be less than 6 volts
- For a voltage equivalent to supply voltage; this indicates wrong polarity. Immediately remove the meter protection fuses and thoroughly check all connections. Call CSC (131351) if required.

- De-energise if 6V or more (i.e. elevated neutral voltage); contact the CSC and report. Issue Customer Pack (Temporary Disconnection). Fault response may be required to determine the source of the voltage.
- If the panel/enclosure is non-metallic, test between a water tap or similar earthed component (if available) and the independent earth. Record N/A if no metallic test point is available.

24. Leave consumer main switch in 'OFF' position and attach an "Out of Service" warning tag.

- Although a notice of completion has been issued, it cannot be verified that any appliances etc. are not connected and switched 'ON' beyond the consumer's main switch. The consumer's main switch must therefore remain 'OFF' until the appropriate person(s) can switch the consumers' breaker 'ON'.

25. Ensure all covers have been reinstated and secured and all correct labels have been applied. Seal the KWh meter.

- Labelling of the consumer main switch is attached by the contractor, and identifies the premise number/unit/consumer. The SPD label must align and identify with the meter.
- Fit the Contractor Connect seal and record the seal number on the test form.

26. Confirm correct operation of each test instrument.

- Confirm that the test instruments are still functioning correctly on a known supply source; this can be done using the existing supply to the installation or a portable power source.

Declaration section

The declaration confirms that the tester has corrected any faults, completed and recorded all the tests/results, sealed the meter and endorsed the form with their signature, the date and their authority details.