Ballistic Testing

Tester SA 9083

The Tester SA9083 is a battery operated, multi-range, analogue portable tester and is primarily intended for use by Field Operation Technicians for the maintenance testing of customer's Telco lines.

A twelve position rotary switch enables selection of the following ranges:

Range 1	Measurement of 0 to 250 volts AC mains.
Range 2	Test for battery A/B.
Range 3	Test for earth A/B.
Range 4	Ohms x 100 for measurement of insulation resistance.
Range 5	Ohms loop for measurement of loop resistance.
Range 6	Measurement of 0 - 250 volts DC (Not used in Ballistic Testing).
Range 7	Measurement of 0 - 50 volts DC (Not used in Ballistic Testing).
Range 8	Measurement of 0 - 5 volts DC (Not used in Ballistic Testing).
Range 9	Measurement of 0 - 5 amps (Not used in Ballistic Testing).
Range 10	Measurement of 0 - 500 milliamps (Not used in Ballistic Testing).
Range 11	Measurement of 0 - 50 milliamps (Not used in Ballistic Testing).
Range 12	Megohms for measurement of insulation resistance.

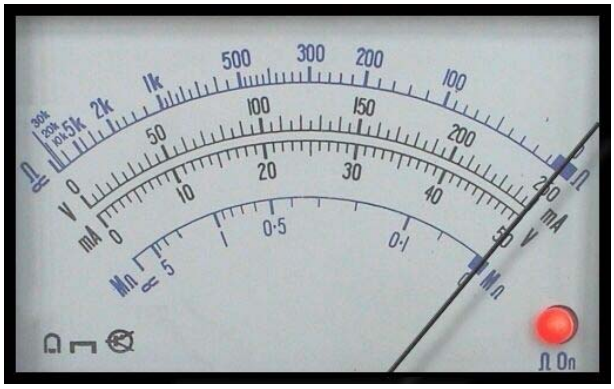
There is also a 'Press B-A Change' button to allow the internal reversing of the A and B wires without disconnecting and reversing the test leads.

It should be noted at this stage that the meter should not be set to any of the 'blue ranges' (Earth B, x 100, Loop or M) if it is suspected that there is power on the line as this may cause damage to the tester SA9083

Pre Test Checks

The following checks should be carried out prior to using the meter.

1. Check that the meter needle is pointing to zero on the voltage scale. This can be adjusted by using the centre screw if required.
2. Connect the red lead (A+) and the black lead (B-).
3. Fit a PP3 battery into the tester and check the battery condition as follows:
    - Set range to position 5 (ohms loop).
    - Ensure that the ‘ On’ LED is illuminated.
    - Hold red and black test leads together.
    - Observe the position of the meter needle. If the battery is in good condition the needle comes to rest in any part of the broad, blue segment on the right of the scale.
    - The above test will check the condition of the meter, the battery and the red and black leads. To check the green lead, replace either the black or red lead (with the green lead) and repeat the above test.



Immediately before and after use, set the range switch to the position marked 250 Vac. This position is known as the safe parking position for the following reasons.

- It provides some protection for the meter during transit.
- Should you overlook to set the meter to the correct range, no harm will come to the meter when you apply the test leads to the customer’s line.
- The tester is correctly set for the first test you should make on the customer’s line.

E-Side Tests

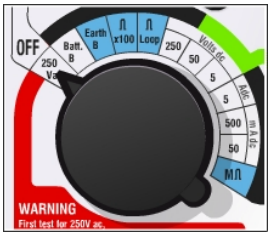
The equipment in the Cabinet will provide power to the customer's telephone line. These voltages should be checked on E-Side connector. Remember, these voltages can vary depending upon architecture and equipment type.

Testing For AC Mains

For safety reasons this must be the first test carried out on the customer's line. With the switch in position 1 (250Vac), connect the meter to the E-Side using the appropriate adapter or test lead.

AC Mains Test

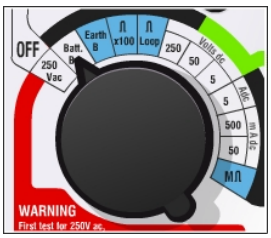
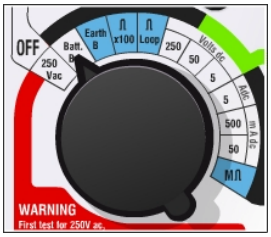
To check there's no unwanted AC voltage on the E-Side.

Test	Switch Position	B-A Pressed	Expected Result	Comments
AC Mains		N/A		Any reading on the meter indicates that an AC Voltage exists on the E-Side. This fault MUST be investigated and rectified before proceeding or damage to the meter may occur.

It should be noted that ringing voltage is approx 75 Vac. This should NOT be mistaken as a faulty E-Side

DC Voltage test

To check the DC Voltages on the E-Side.

Test	Switch Position	B-A Pressed	Expected Result	Comments
DC Voltage on B Leg		No		The meter should indicate a voltage of between 42 to 48 Vdc. A reading of less than 42 volts indicates a fault on the E-Side.
DC Voltage on A Leg		Yes		The meter should indicate a voltage of approx 4 Vdc. A reading greatly different to this indicates a faulty E-Side.

D-Side / Drop Cable Tests

Background

The industry standard for any incoming ringing circuit on the public switched telephone network (PSTN) is a 1.8µf capacitor in series with a bell or tone caller. ALL conforming Master Sockets connected to the PSTN shall have an incoming ringing circuit of this type. This gives us standard test conditions with which to test a customer's line from the cabinet all the way to the customer's equipment termination and inside their premises.

The test, which makes use of these conditions, is called the **BALLISTIC TEST**. A successful ballistic test will prove the following:

- Continuity of the A wire to the customer's premises.
- Continuity of the B wire to the customer's premises.
- Connection of the Network Terminating Equipment (NTE) box.
- Customer in service / unplugged.
- Absence of loop faults.
- Absence of rectified loop faults.
- Integrity of wire insulation.

It can be seen that this test has great value as a diagnostic tool. It can be carried out rapidly and it yields a great deal of information about the health of a customer's line. The ballistic test can be carried out at any point in the local network. As mentioned previously, when testing the customer's line, it must first be isolated from the switch by disconnecting the cabinet cross connection. It may also be prudent at this stage to isolate any internal wiring the customer may have.

To correctly check the customer's line from the DP to the home, it is necessary to disconnect the line at the cabinet (jumper wire). This removes the battery and earth conditions supplied by the E-Side so that an accurate analysis of the line can be carried out.

Line analysis is made from resistance, capacitance and voltage readings.

The tester SA9083 will not give an exact capacitance reading as such, but will produce a 'kick' under certain conditions. This kick can be interpreted with various degrees of accuracy depending on the experience of the operator

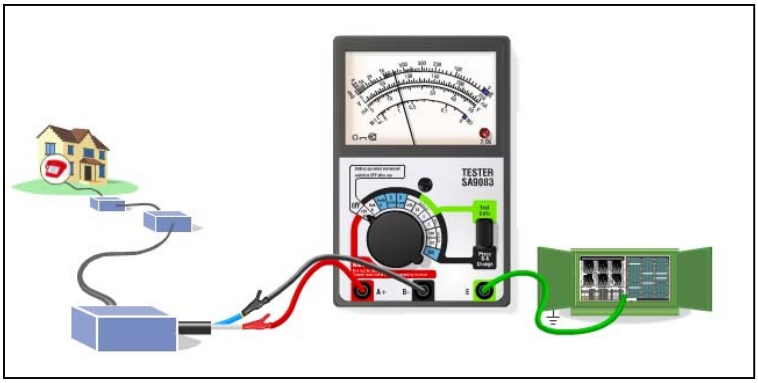
.

NOTE – the correct sequence for testing the customer's line is:

- AC Mains test
- DC Voltage test
- Earth test
- Loop test
- Capacitance test
- Continuity test
- Insulation test

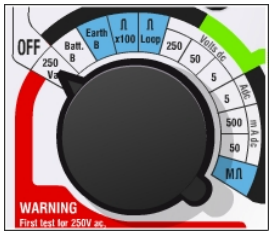
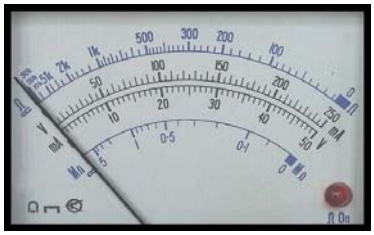
If a voltage is found on either the A leg or B leg, the checks for earth, loop and capacitance cannot be relied upon. The Tester SA9083 cannot make reliable resistance reading with a voltage present.

The following checks are carried out with the meter connected as shown (A, B and Earth leads all connected). Leave the meter connected this way until otherwise informed. **Ensure the test leads are not in contact with the ground as this will give false readings.**



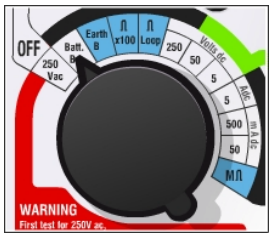
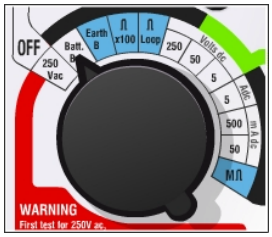
AC Mains Test

To check there's no unwanted AC voltage between the **<B Leg>** & **<A Leg>**.

Test	Switch Position	B-A Pressed	Expected Result	Comments
AC Mains		N/A		Any reading on the meter indicates that an AC Voltage exists. This fault MUST be investigated and rectified before proceeding or damage to the meter may occur.

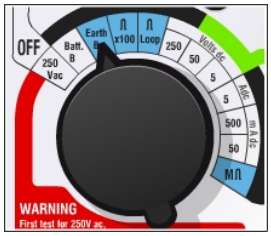
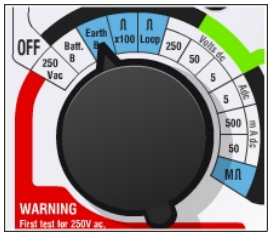
DC Voltage (battery) contact test

To check there's no unwanted DC voltage between the **<B Leg>** & **<Earth>** and the **<A Leg>** & **<Earth>**.

Test	Switch Position	B-A Pressed	Expected Result	Comments
DC Voltage on B Leg		No		Any reading on the meter indicates that a DC Voltage exists on the B Leg. This fault MUST be investigated and rectified before proceeding or damage to the meter may occur.
DC Voltage on A Leg		Yes		Any reading on the meter indicates that a DC Voltage exists on the A Leg. This fault MUST be investigated and rectified before proceeding or damage to the meter may occur.

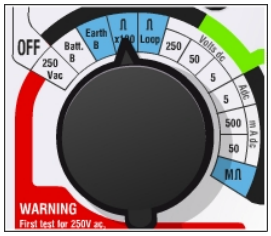
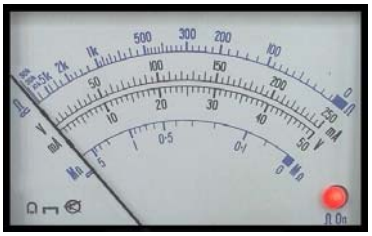
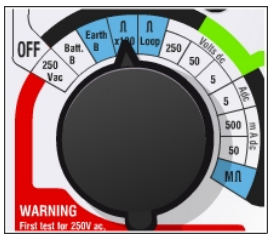
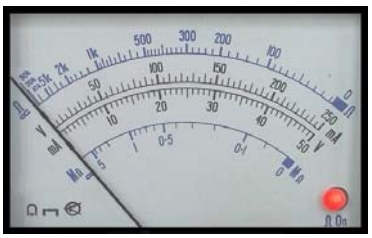
Earth test

To check there's no unwanted contact between the **<B Leg>** & **<Earth>** and the **<A Leg>** & **<Earth>**.

Test	Switch Position	B-A Pressed	Expected Result	Comments
Earth contact on B Leg		No		Any reading on the meter indicates fault conditions. I.e. An earth contact exists on the B Leg.
Earth contact on A leg		Yes		Any reading on the meter indicates fault conditions. I.e. An earth contact exists on the A Leg.

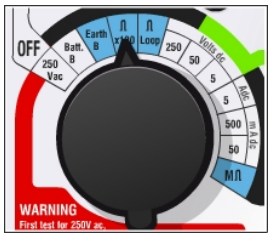
Loop test

To check there's no unwanted resistance / polarized loops between the **<B Leg>** & **<A Leg>**.

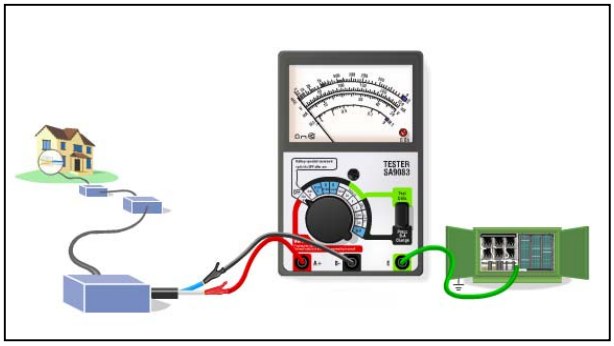
Test	Switch Position	B-A Pressed	Expected Result	Comments
Loop Test		No		Any reading on the meter indicates fault conditions. I.e. A resistive loop across the A and B legs (Ignore any 'kicks' at this stage – See Capacitance Tests)
Polarized Loop Test		Yes		Any reading on the meter indicates fault conditions. I.e. A resistive loop across the A and B legs (Ignore any 'kicks' at this stage – See Capacitance Tests).

Capacitance test

To check whether a Master Socket is connected to the line. If a master socket is present, a deflection (or kick) is observed across the **<B Leg>** & **<A Leg>**. This deflection is caused by charging and discharging the capacitor in the customer's Master Socket. Please note that the size of kick is dependant on the capacitance on the line. The more phones and master sockets connected to the line, the bigger the kick. The B-A Change button is pressed several times to ensure that the line is free from faults.

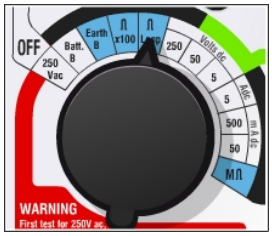
Test	Switch Position	B-A Pressed	Expected Result	Comments
Capacitance Test		Yes		If a master socket is present, a deflection (or kick) should be observed. If a master socket is present and there is no deflection, suspect a broken A or B leg.

The drop cable should now be disconnected at the customer's Master Socket and the A and B legs twisted together to carry out the following test.



Continuity test

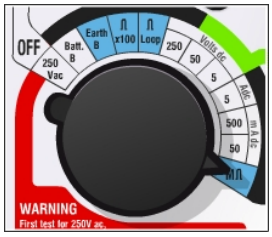
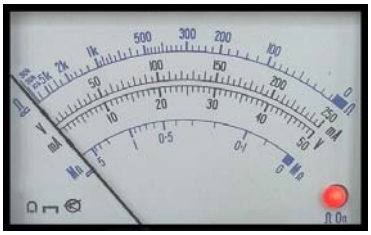
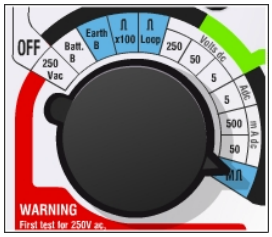
To check there's no breaks or disconnections on the **<B Leg>** & **<A Leg>**.

Test	Switch Position	B-A Pressed	Expected Result	Comments
Continuity Test		N/A		If the A and B legs are intact and continuous, there should be a (near) full-scale deflection (depending upon length of drop cable / D-Side). If a (near) full-scale deflection is not observed, suspect a broken wire or joint.

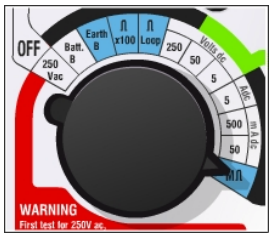
Insulation test

Note: The A and B legs must NO LONGER be twisted together.

To check there's no break down in insulation between the **<B Leg>** & **<Earth>** or the **<A Leg>** & **<Earth>**.

Test	Switch Position	B-A Pressed	Expected Result	Comments
B leg to Earth Insulation Test		No		Any reading on the meter indicates fault conditions I.e. A high resistance earth contact exists on the B Leg.
A leg to Earth Insulation Test		Yes		Any reading on the meter indicates fault conditions. I.e. A high resistance earth contact exists on the A Leg.

A final check that can be performed is that there's no insulation breakdown between the A and B legs. Remember, with the switch in MegOhms position, the meter is checking for a high resistance between the **<B Leg>** & **<Earth>**. To check between the A and B Legs, simply plug the A leg lead (red) into the Earth socket.

Test	Switch Position	B-A Pressed	Expected Result	Comments
Cross Pair Insulation Test		No		Any reading on the meter indicates fault conditions. I.e. A high resistance contact exists between the A and B legs.