CALIBRATION MANUAL

PRODUCT: Spark-e-mate 493 (DRWG SM-5135)

CALIBRATOR: Transmille 3200A

CUSTOMER: Scientific Devices Australia Pty Ltd

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Section 1 – Introduction

This manual describes the calibration procedure for the Spark-e-mate 493 and 493BTL Electrical Installation Tester, using a Transmille 3200A Series Electrical Test Equipment Calibrator.

1.1 Objective

- **Consistency.** Every Spark-e-mate shall be identical in performance with reliable test readings. Only the serial number shall be unique. Hardware and Firmware revision may differ depending on date of manufacture. ALL units returned for service and calibration must be brought up to the most recent standard.

In order to facilitate our objective, staff must be informed of:

- **Responsibility.** Staff involved in the testing process are responsible for the consistency of production. They must take pride in their work and demonstrate a sense of ownership.
- **Accountability.** Staff must be able to account for all actions during the testing process.
- **Traceability.** Staff must complete all necessary documentation, namely the product calibration certificate, history sheet, application of serialised compliance sticker and QC sticker, and report to the Supervisor, in order to facilitate tracking of all production, now and up to ten years in the future.

IMPORTANT NOTE

At all times, Anti-Static precautions must be followed in the handling of semi-conductors.

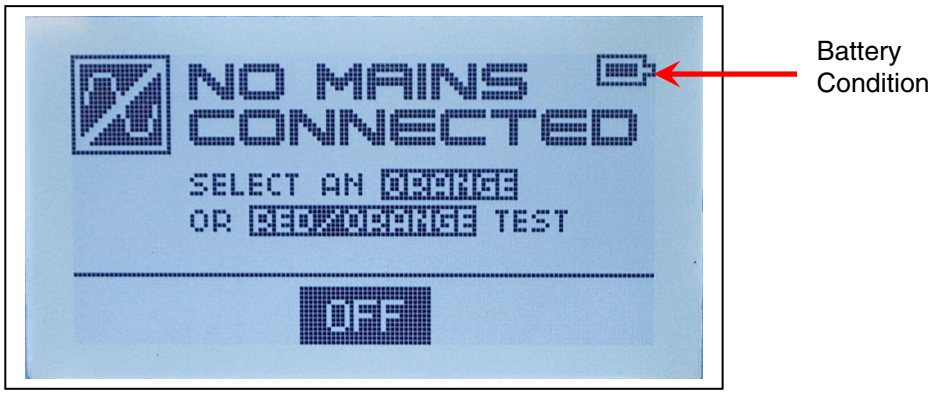
Before Starting Calibration:

- Inspect Spark-e-mate for general condition:
  Inspect enclosure & face for heavy impact, damage to Lexan front panel, damage to LCD screen

- Press the “ON” button:
  Note the version of Firmware & Hardware displayed on start up screen
  Any unit displaying V1.22 or earlier **MUST** be returned to the factory for Hardware & Firmware upgrade

Battery Check

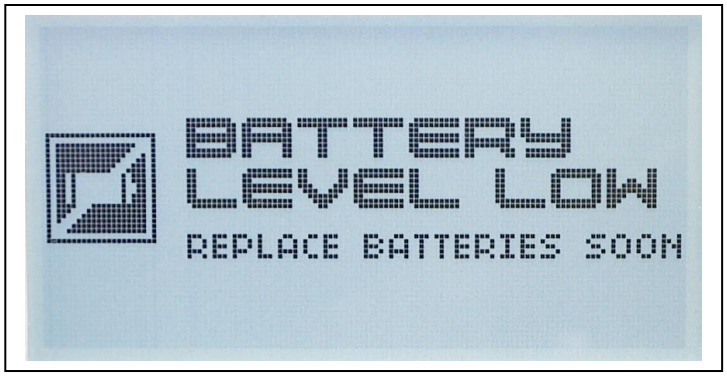
The condition of the internal 6 x AA alkaline batteries is indicated by the battery symbol in the top right hand corner of the display.



Battery Indicator

- Ensure that the battery indicator is at least half full

- If the battery level is poor, you will see:



Batteries are almost flat

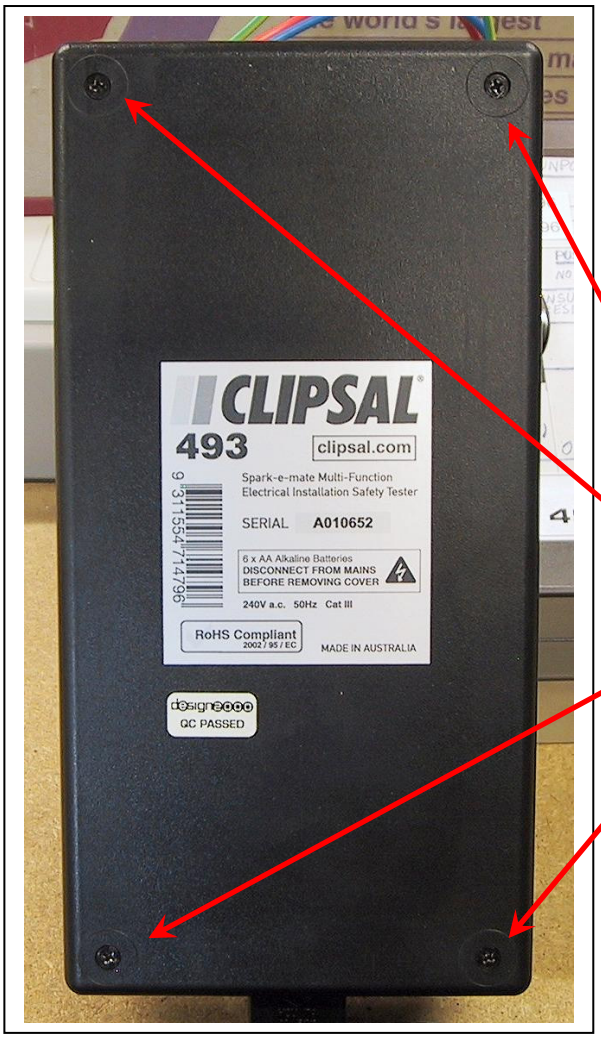
- “Battery Level Low”, OR

Batteries could be faulty if this is displayed with no power connected

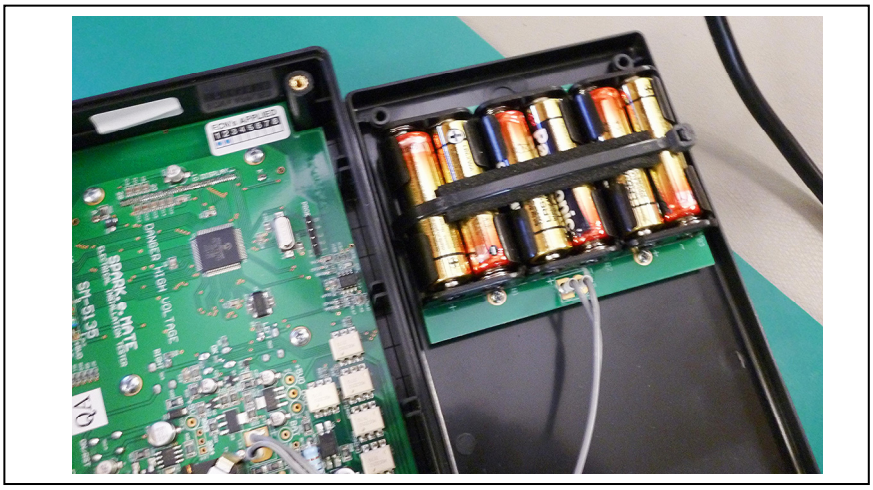
- Danger Voltage on Earth may be an indication that one or more of the batteries are reversed or there is a faulty cell.
- Rectify any battery fault or low charge before stating to calibrate
- Check the Spark-e-mate lead for any signs of damage or corrosion.
- Calibration **MUST** be performed using the supplied lead.

Removing the back Cover to Access the Batteries

If required, the Spark-e-mate batteries can be accessed, and the Circuit Board may be inspected, by removing the screws as shown below.



493 Rear



6 x AA Alkaline Batteries

- The Testing Officer can access the 6 x AA alkaline batteries by removing the back cover. The batteries are held in place with a 280mm cable tie. This is a preventative measure to stop the batteries from popping out if the unit is dropped.

- Cut the cable tie, replace batteries only with alkaline (noting correct orientation) and apply a new cable tie.

- The Testing Officer is required to screw the back cover into position using the 4 x countersunk M3 10mm cross recess screws supplied with the enclosure.

Test Button & Display Check

Spark-e-mate's User Interface consists of ten tactile test buttons and a graphical Liquid Crystal Display.

Spark-e-mate start-up display

- The Testing Officer is required check all test buttons for a tactile (soft click) feel.
- The Testing Officer is required to turn on Spark-e-mate and assess the Display contrast.

Display Contrast Adjust

The default Display contrast setting is 7 or 8 in the range 0 – 20. It's unlikely that this will require adjustment however if the display characters appear faint or the background is too dark (saturated) compared to the characters, you can use Spark-e-mate's CONFIG mode to increase or decrease the contrast respectively.

Accessing CONFIG mode

- The Testing Officer is required to press both the ON button and EARTH CONTINUITY button simultaneously so that Spark-e-mate shows the CONFIG prompt in the bottom left hand corner of the display.
- The Testing Officer presses the CONFIG button to bring up the menu.

CONFIG Menu

- The Testing Officer uses the **–** or **+** buttons to adjust the contrast.
- The NEXT button is used to exit the CONFIG mode.

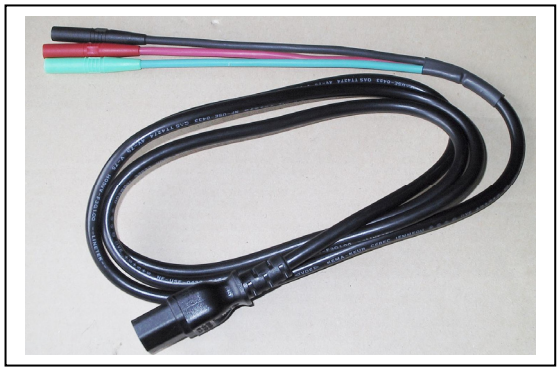
Section 3 – Test Equipment

Required Equipment

- A Transmille 3200A Series Electrical Test Equipment Calibrator, or similar.
  This Test Procedure assumes the Test Officer has been trained to use the Calibrator and has full understanding of it's operation

Transmille 3200A

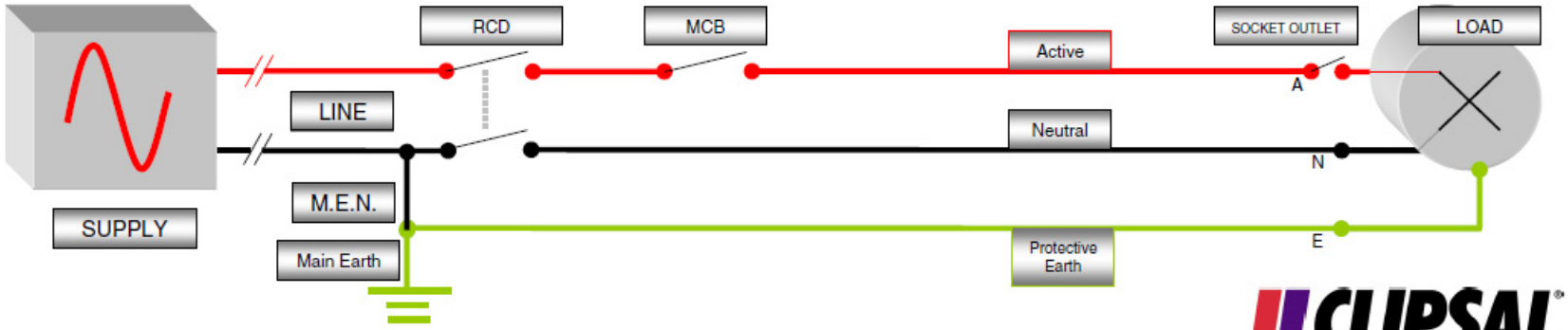
- A 493L Spark-e-mate Test Lead from Clipsal by Schneider Electric (available from Electrical Wholesalers).



493L

- The Testing Officer must familiarize themselves with AS/NZS 3000, Section 8 in particular. Refer to the next page for a simplified Electrical Circuit diagram.

2.1 Electrical Circuit diagram



CLIPSAL

spark-e-mate
ELECTRICAL INSTALLATION TESTER

AS/NZS 3000 Section 8 Verification

Spark-e-mate tests:

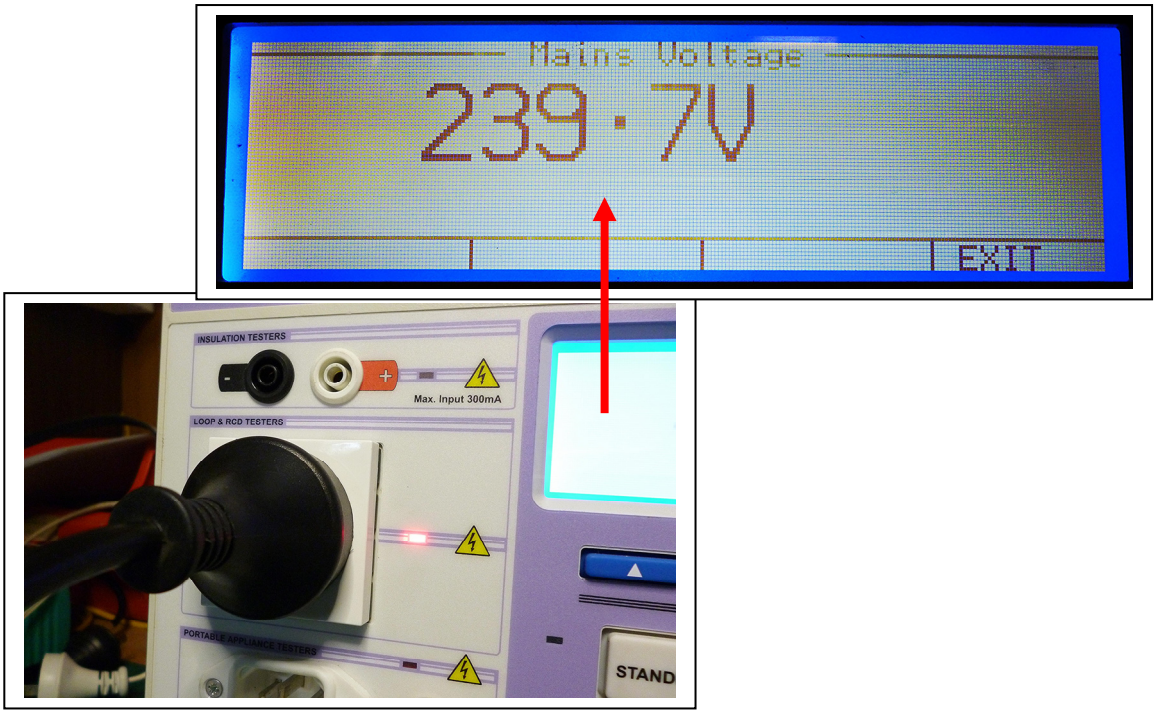
1. ***Earth Continuity***: Impedance or Resistance of — $R_e \leq 0.49\Omega$ for Type C 20A circuit. Refer to Table 8.2
2. ***Insulation Resistance***: No breakdown between — or — $\geq 1M\Omega$
3. ***Polarity***: — — — are in the correct place as shown above
4. ***Circuit Connections***: — does not carry any current $\leq 15mA$
5. ***Fault Loop***: Impedance or Resistance of — + — $R_{phe} \leq 0.98\Omega$ for Type C 20A circuit. Refer to Table 8.1 and 8.2
6. ***RCD Trip***: That the RCD trips and disconnects the supply when it should - within 300ms@ 30mA leakage current

Section 4 – Calibration Check

This section of the manual provides a detailed overview of Spark-e-mate tests and the test results that should be obtained.

Voltage & Frequency Test

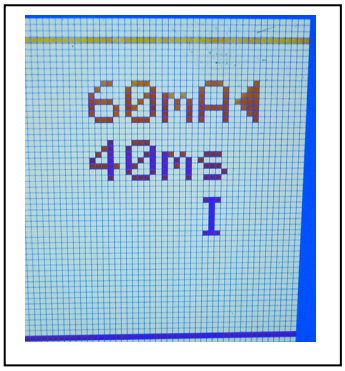
With The Transmille 3200A switched on,
Select the "MAINS V" button, and press the "OUTPUT ON" button.



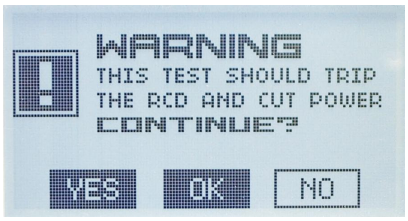
- With Spark-e-mate plugged into the "LOOP & RCD TESTERS" socket, the Testing Officer is required turn ON Spark-e-mate, read the Voltage & Frequency and refer the result to the Calibration Certificate.
- The Voltage should be nominally **equal to the 3200A displayed voltage ± 2V @ 50Hz ±1Hz**

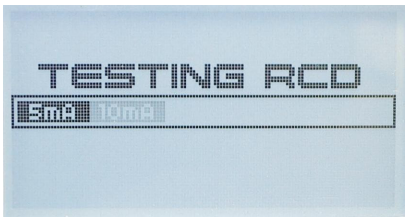
RCD Trip

With The Transmille 3200A switched on, Select the "RCD" button, and set the current to 60mA, single current, & the time to 40 mS
Then Press the TEST button

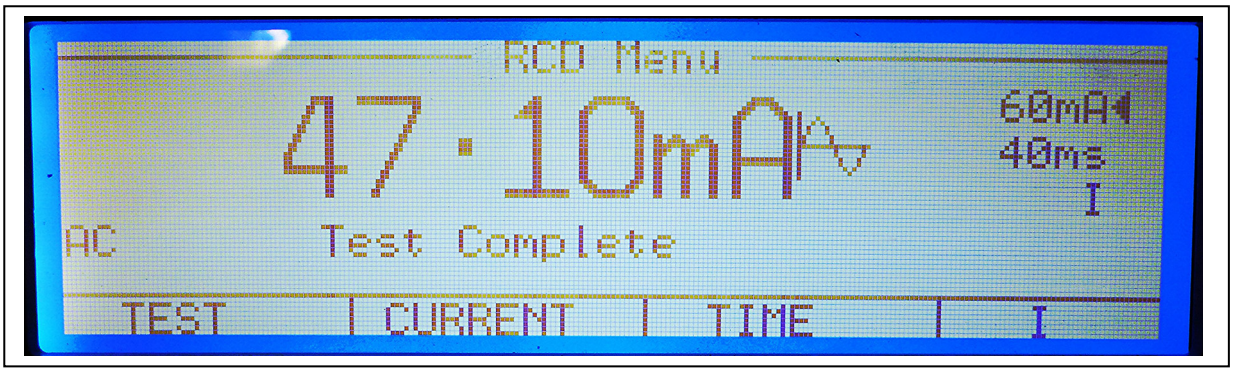


- With Spark-e-mate plugged into the "LOOP & RCD TESTERS" socket, the Testing Officer is required to press the RCD TRIP button, continue with the test, make sure the RCD trips and refer the result (both trip time and trip current) to the Calibration Certificate.





- The result should be **40ms ± 5ms @ 50mA ± 5mA (60mA on older models)**



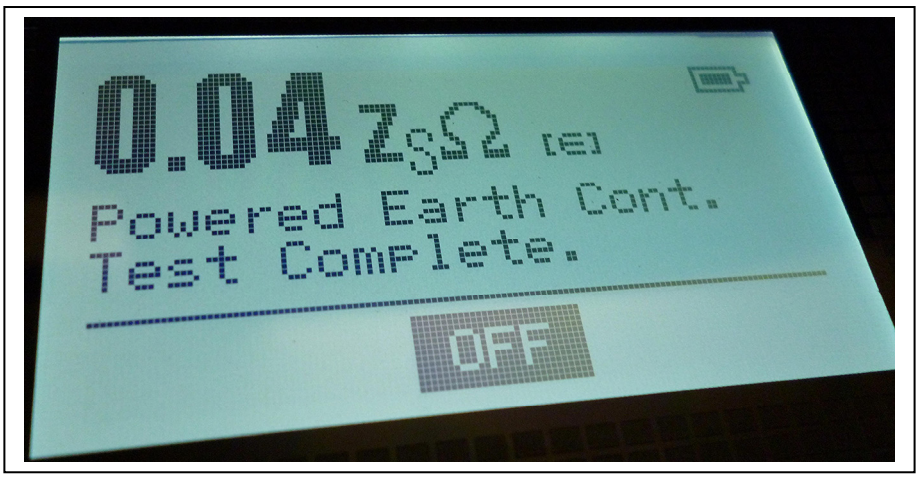
Please note that Spark-e-mate RCD Ramp Test applies the RCD test loads at 90° and the Transmille is expecting it to be applied at 0°. Therefore a ± 5ms discrepancy is to be expected.

Powered Earth Continuity

With The Transmille 3200A switched on,
Select the "MAINS V" button, and press the "OUTPUT ON" button.

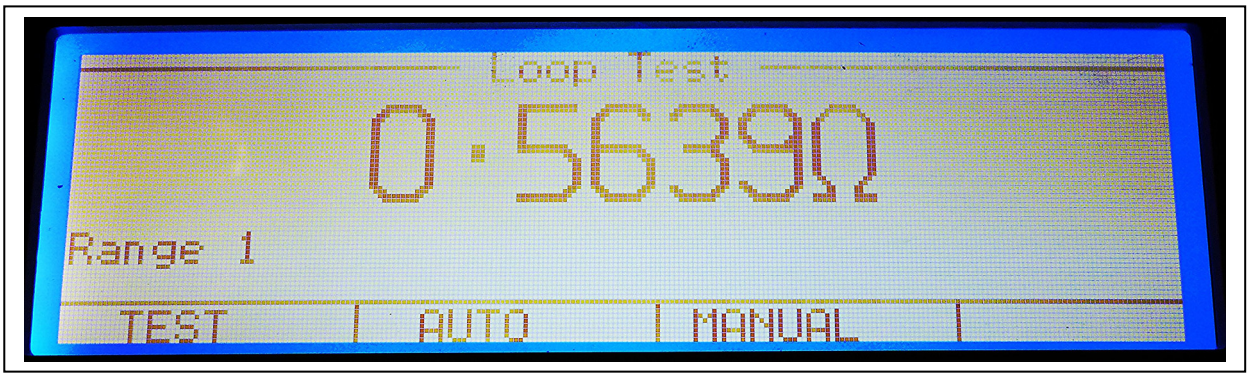
- With Spark-e-mate plugged into the "LOOP & RCD TESTERS" socket, the Testing Officer is required to press the EARTH CONTINUITY button and refer the result to the Calibration Certificate.

- The result should be 0.04 ZsΩ ± 0.02Ω



Powered Fault Loop

With The Transmille 3200A switched on, Select the "LOOP" button, and press the "AUTO" button.
Allow the Calibrator to self test.
Note the displayed impedance.
Then Press the TEST button



- With Spark-e-mate plugged into the "LOOP & RCD TESTERS" socket, the Testing Officer is required to press the FAULT LOOP button and refer the result to the Calibration Certificate.

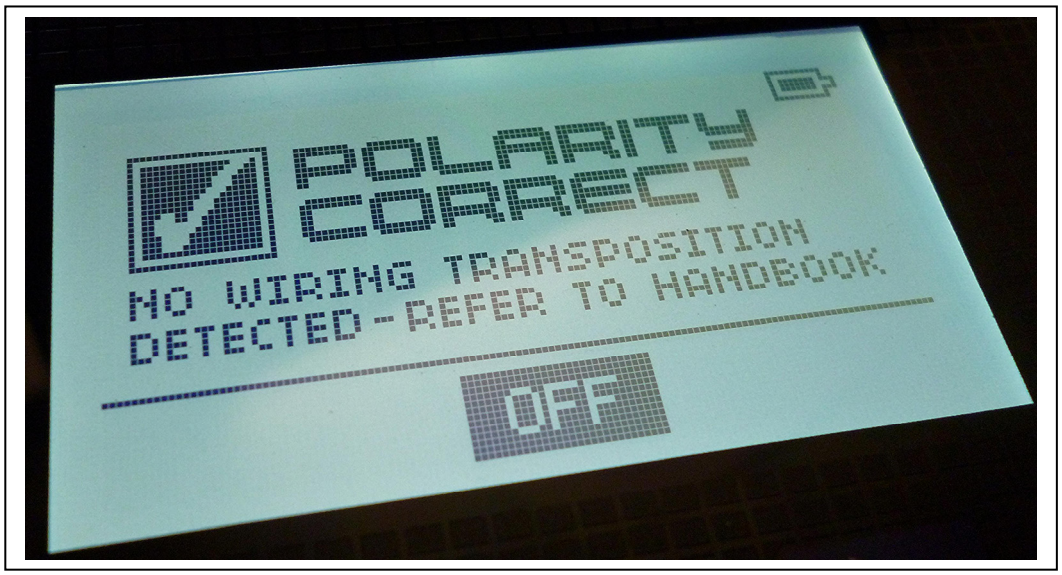
- The result should **equal the 3200A displayed impedance ± 0.10 ZsΩ**

Polarity Test

With The Transmille 3200A switched on,
Select the "MAINS V" button, and press the "OUTPUT ON" button.

- With Spark-e-mate plugged into the "LOOP & RCD TESTERS" socket, the Testing Officer is required to press the POLARITY button and refer the result to the Calibration Certificate.

- The result should show "POLARITY CORRECT"

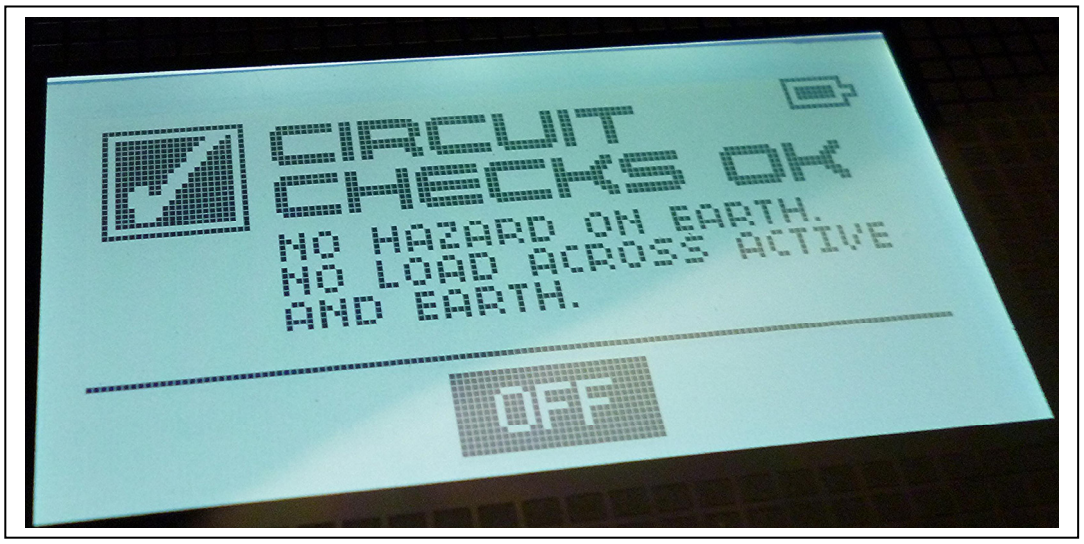


Circuit Connections Test

With The Transmille 3200A switched on,
Select the "MAINS V" button, and press the "OUTPUT ON" button.

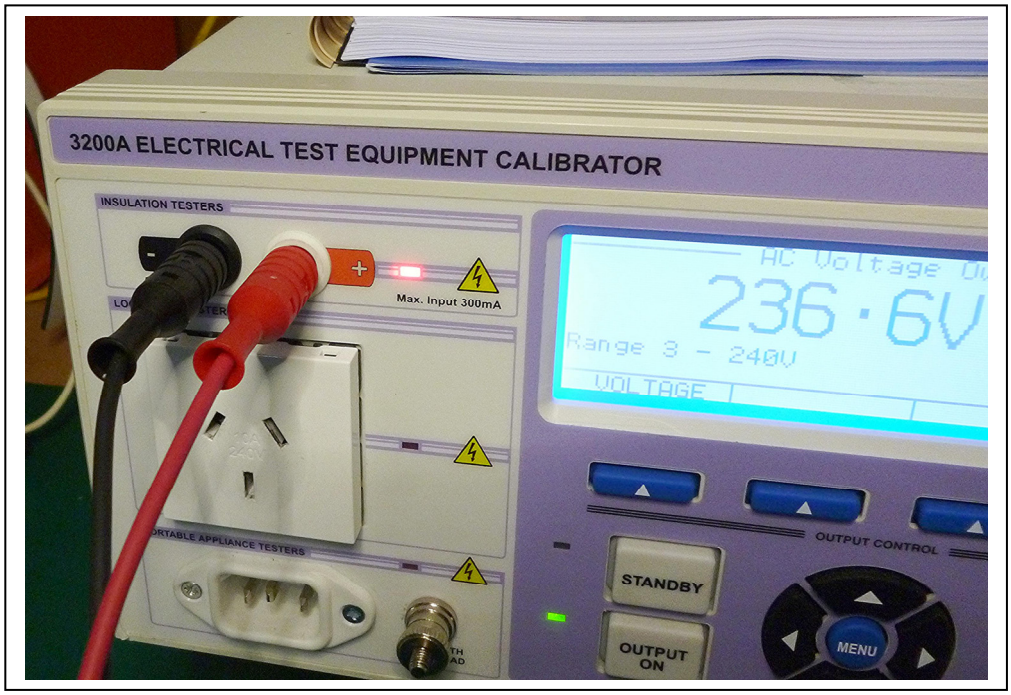
- With Spark-e-mate plugged into the "LOOP & RCD TESTERS" socket, the Testing Officer is required to press the CIRCUIT CONNECTIONS button and refer the result to the Calibration Certificate.

- The result should show "CIRCUIT CHECKS OK"



No Earth Detection

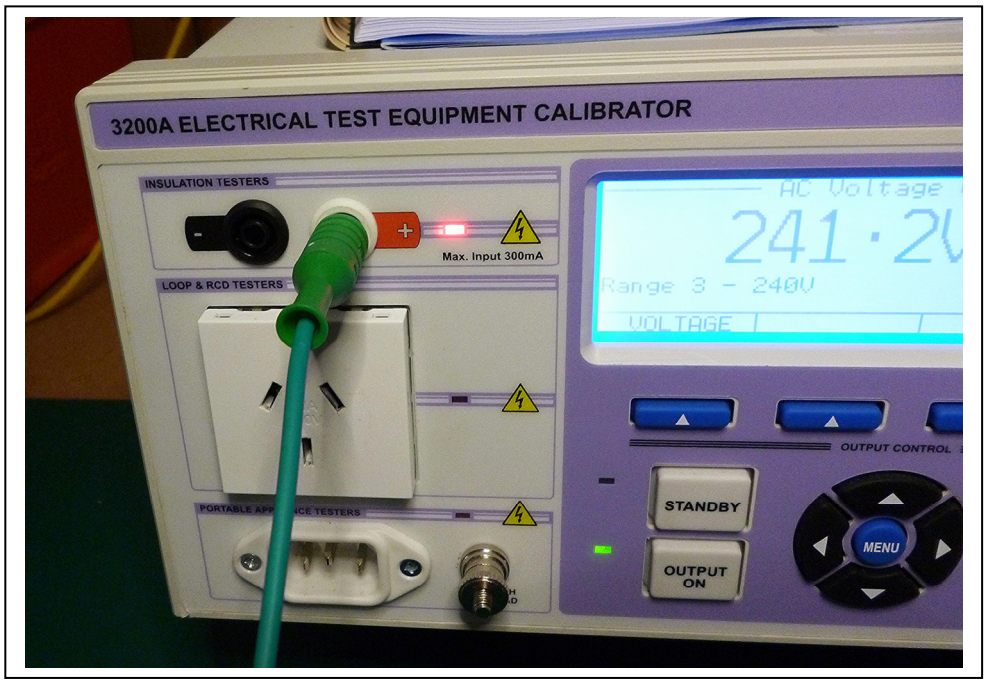
With The Transmille 3200A switched on, Select the “ACV O/P” button, set the voltage to Range 3 - 240V, and press the “OUTPUT ON” button



- With Spark-e-mate plugged into the INSULATION TESTING socket, **using the 493L test lead Black into Black, Red into White**, the Testing Officer is required to ensure that Spark-e-mate displays “NO EARTH”.

2.2 Voltage on Earth Detection with no Return Path – DANGER!

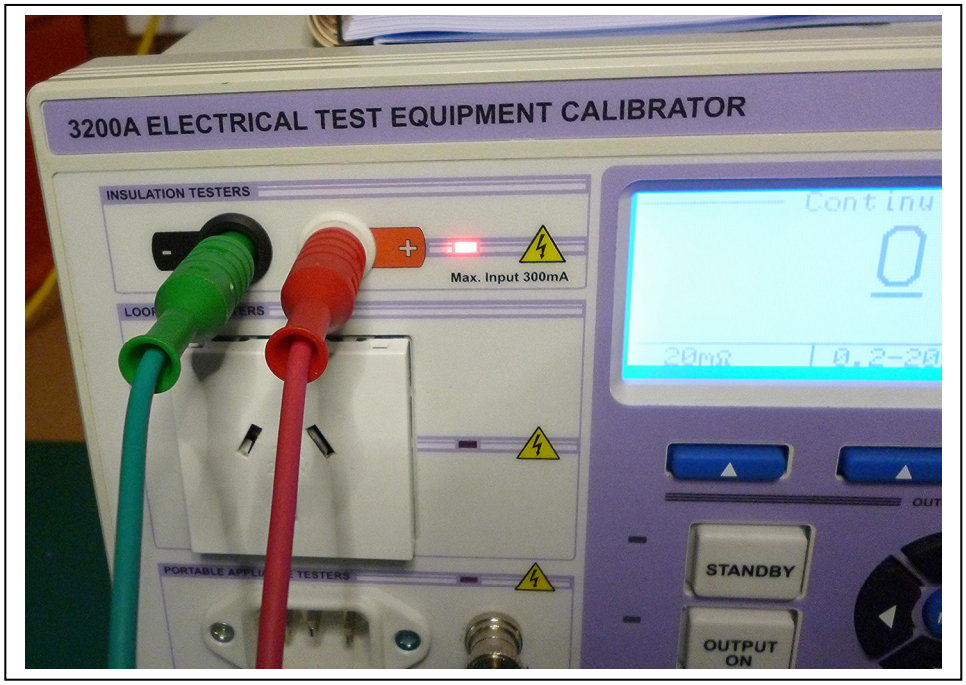
With The Transmille 3200A switched on, Select the "ACV O/P" button, set the voltage to Range 3 - 240V, and press the "OUTPUT ON" button



- With Spark-e-mate plugged into the INSULATION TESTING socket, **using the 493L test lead Green into Red only**, the Testing Officer is required to ensure that Spark-e-mate displays "DANGER, VOLTAGE ON E OR N…"

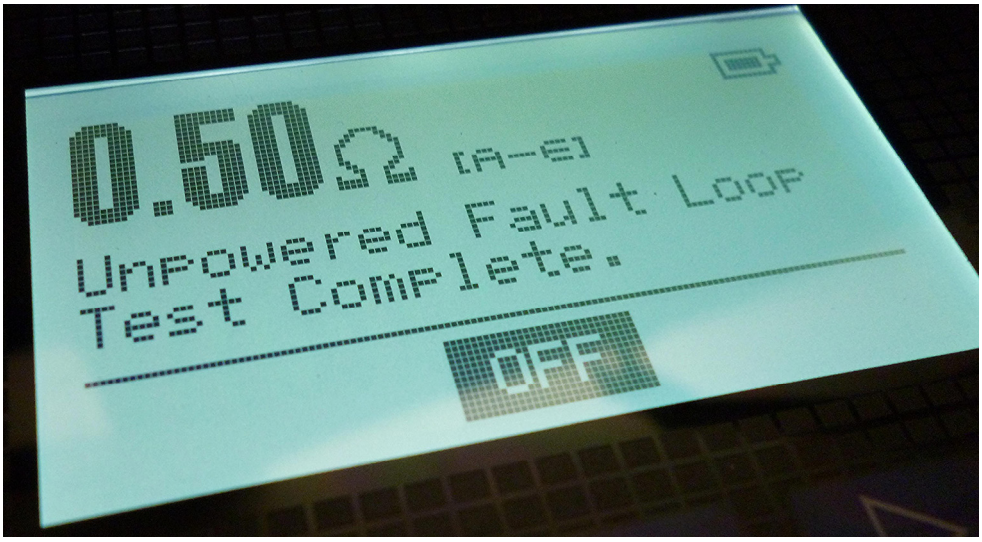
Unpowered Fault Loop

With The Transmille 3200A switched on, Select the "CONT RES" button, and set the resistance to 0.50Ω



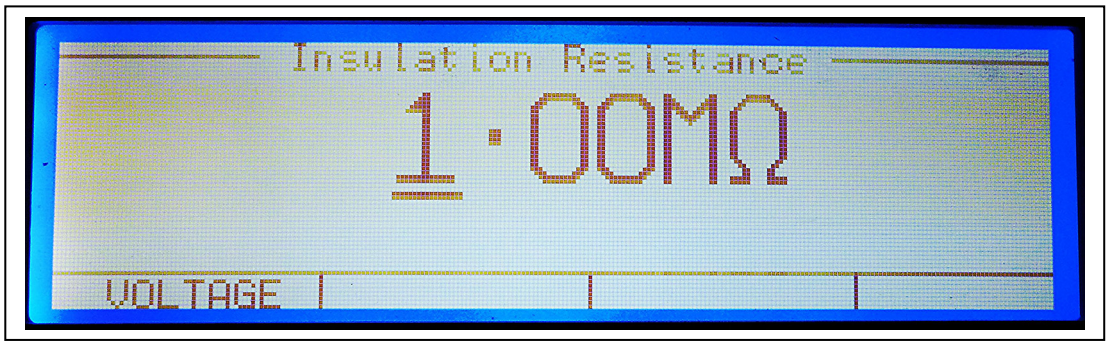
- With Spark-e-mate plugged into the INSULATION TESTING socket, **using the 493L test lead Green into Black, Red into White**, the Testing Officer is required to press the FAULT LOOP button and refer the result to the Test Procedure Table.

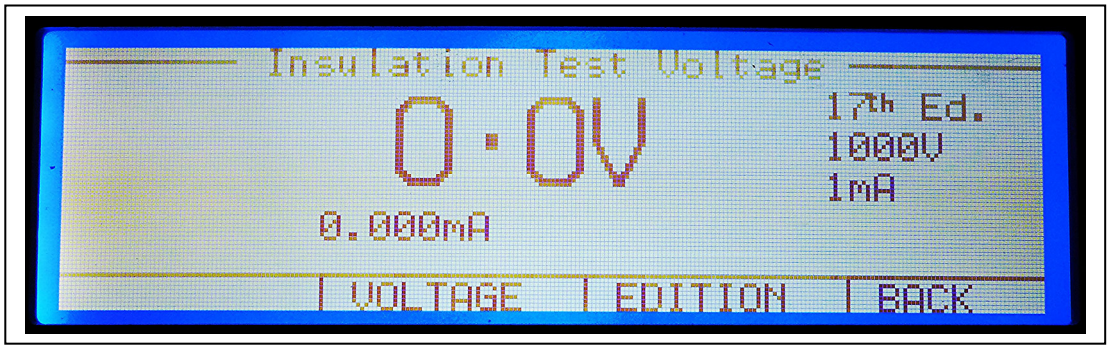
- The result should **match the set resistance of 0.50 Ω +/- 0.02 Ω**

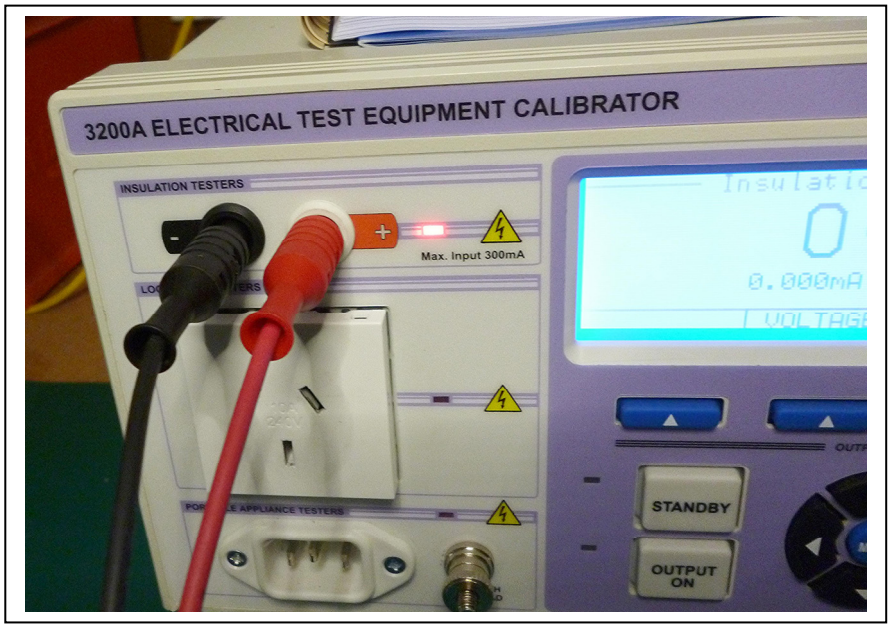


Insulation Resistance @ 250V d.c.

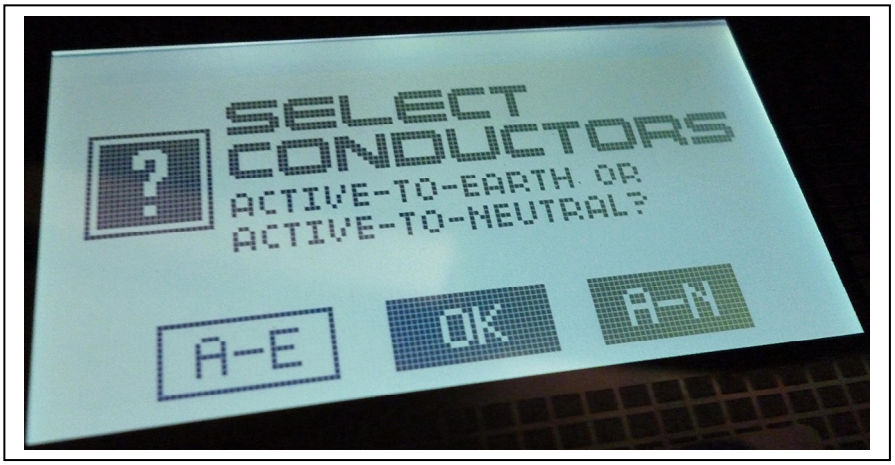
With The Transmille 3200A switched on, Select the "INS RES" button, and set the Resistance to 1MΩ, & the Voltage to 1000V

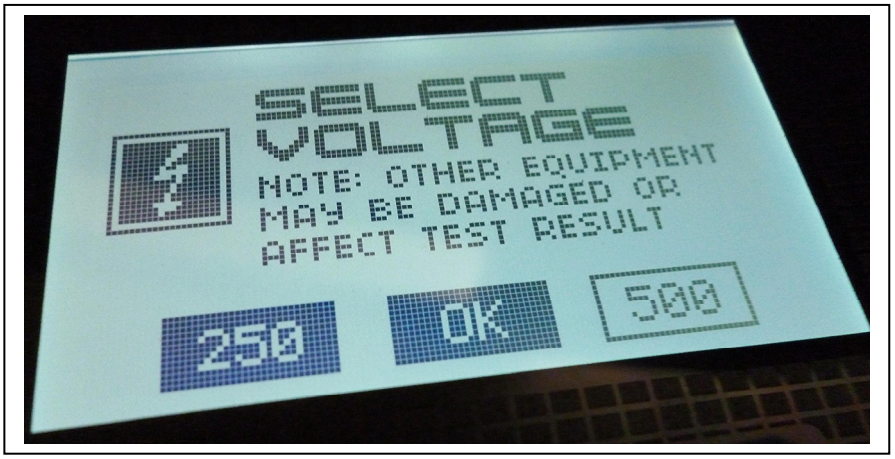


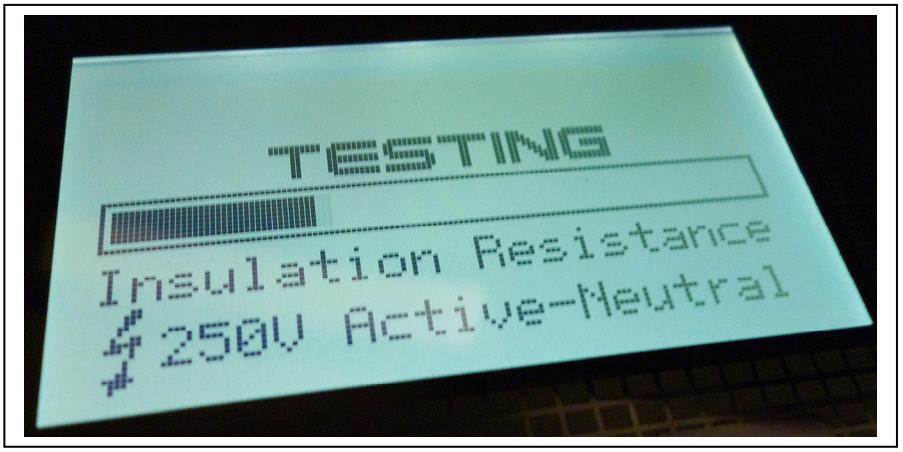


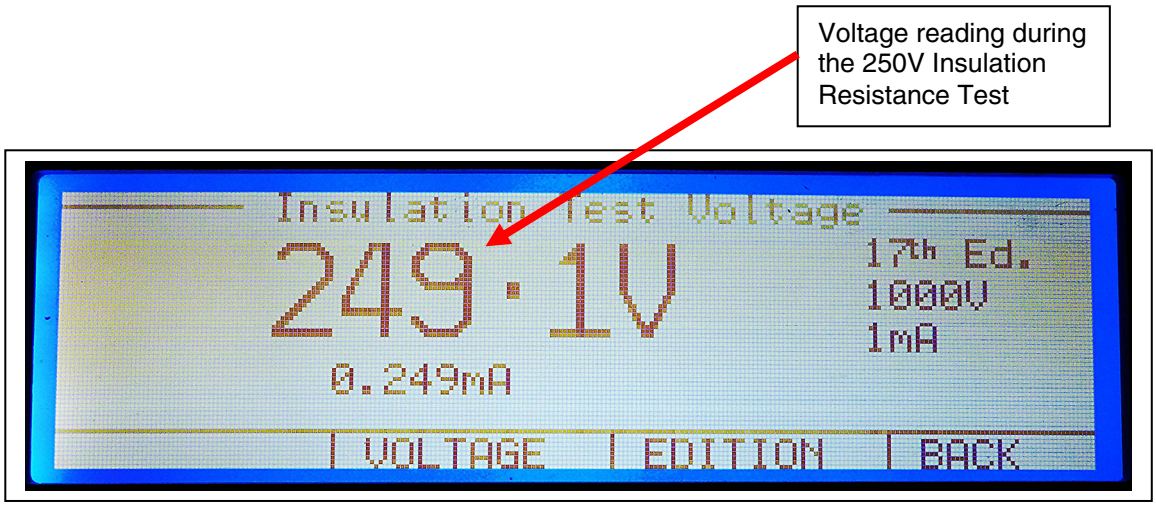


- With Spark-e-mate plugged into the INSULATION TESTING socket, **using the 493L test lead Black into Black, Red into White**, the Testing Officer is required to press the INSULATION RESISTANCE button, select the A-N conductors, select the **250V** test voltage and press OK. Refer the result to the result below.



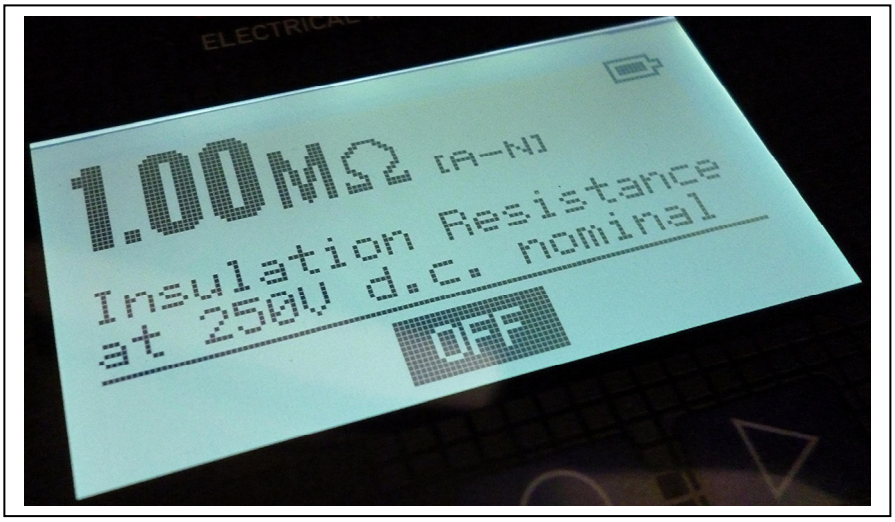






- The Testing Officer is required to check for correct insulation resistance test voltages DURING the Insulation Resistance tests.
- **The Voltage must be between 225V – 300V during the 250V test.**

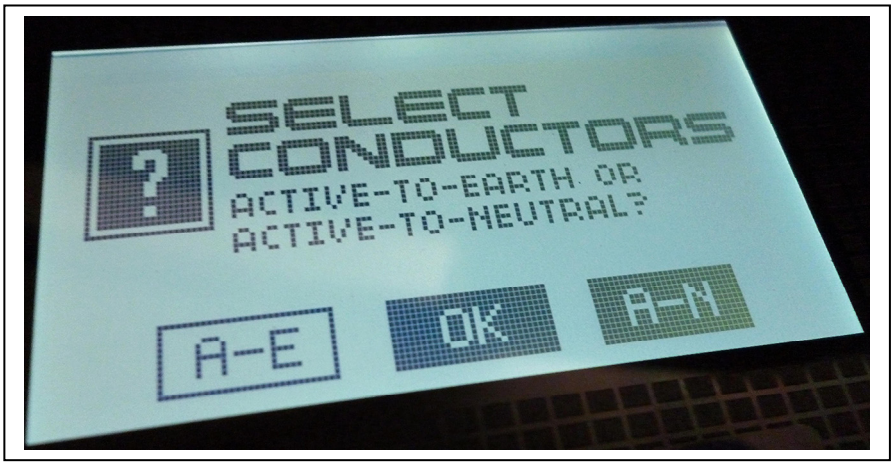
- The result should be **1.00 MΩ +/- 0.02MΩ**

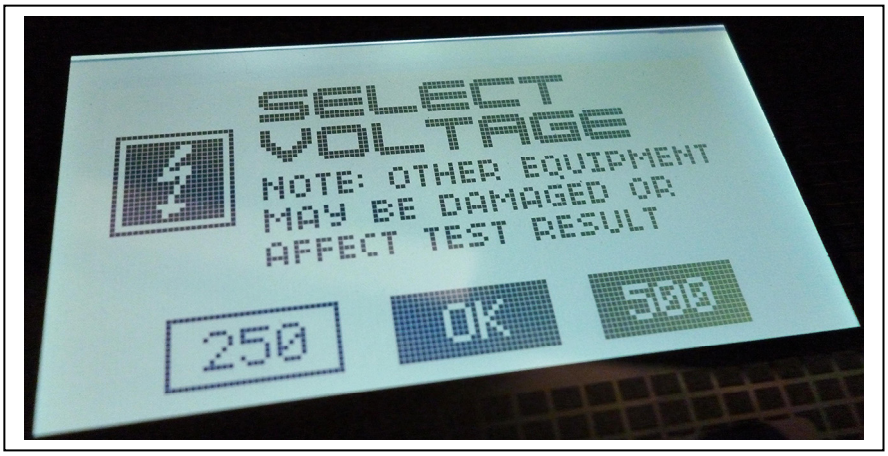


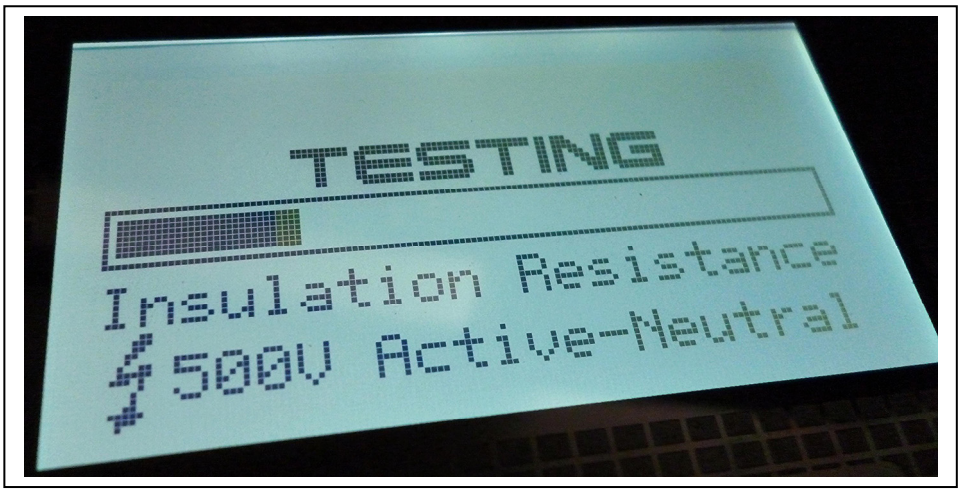
Insulation Resistance @ 500V d.c.

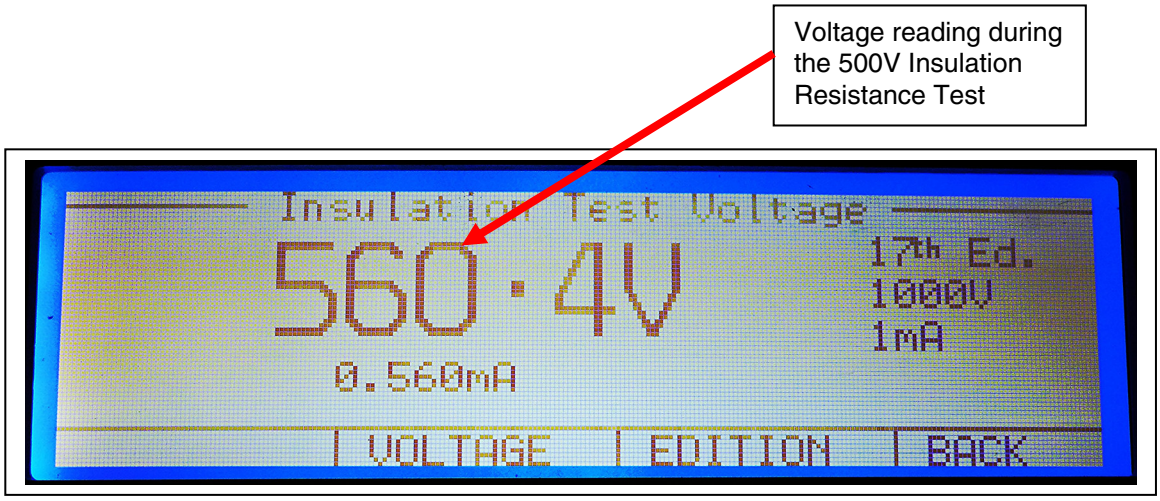
With The Transmille 3200A switched on, Select the "INS RES" button, and set the Resistance to 1MΩ, & the Voltage to 1000V

- With Spark-e-mate plugged into the INSULATION TESTING socket, **using the 493L test lead Black into Black, Red into White**, the Testing Officer is required to press the INSULATION RESISTANCE button, select the A-N conductors, select the **500V** test voltage and press OK. Refer the result to the result below.



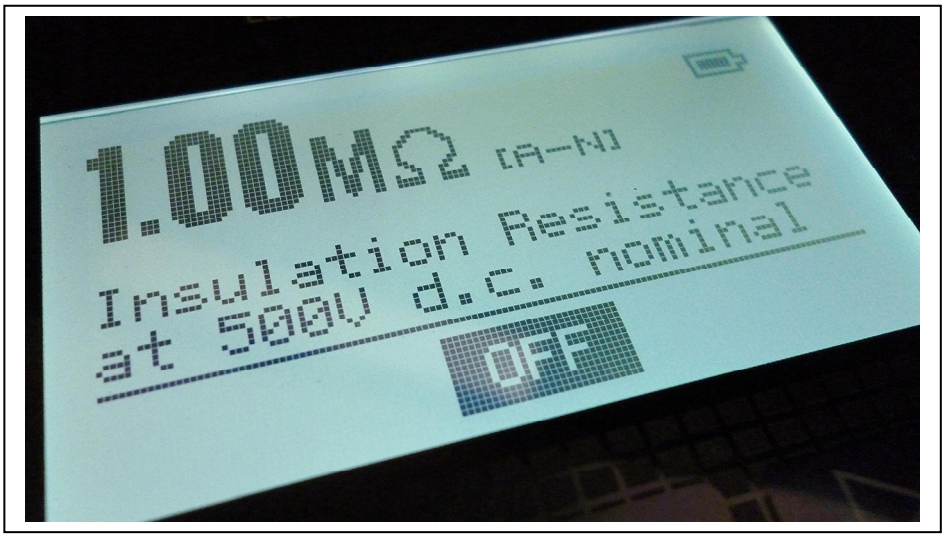






- The Testing Officer is required to check for correct insulation resistance test voltages DURING the Insulation Resistance tests.
- **The Voltage must be between 450V – 600V during the 500V test**

- The result should be **1.00 MΩ +/- 0.02MΩ**

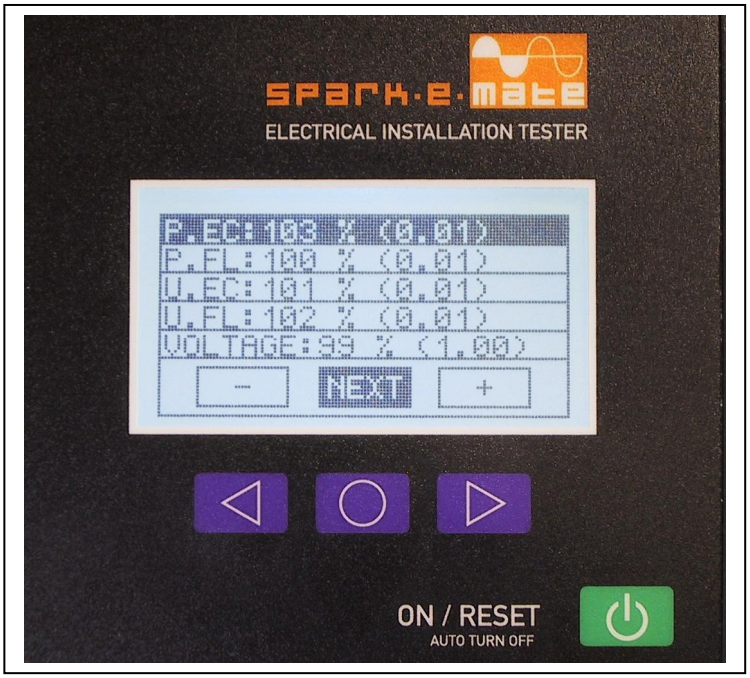


Section 5 – Calibration Mode

Accessing Calibration Mode

Accessing TUNE mode

- The Testing Officer is required to press both the ON button and the top three buttons simultaneously so that Spark-e-mate shows the TUNE prompt in the bottom left hand corner of the display.
- The Testing Officer presses the TUNE button to bring up the menu.



TUNE Menu

Note:

P.EC = Powered Earth Continuity
P.FL = Powered Fault Loop
U.EC = Un Powered Earth Continuity
U.FL = Un Powered Fault Loop

- The Testing Officer uses the **–** or **+** buttons to calibrate each of the tests as required.
- The NEXT button is used to move to the next test, and finally to exit the TUNE mode. Then turn off Spark-e-mate.
- Repeat tests to confirm adjustments have the desired results.

CALIBRATION CERTIFICATE

spark-e-mate
ELECTRICAL INSTALLATION TESTER

Product: CLIPSAL Catalogue No.: 493

Certificate No.: 25533-_____

This certificate certifies that Spark-e-mate with the unique serial number shown below has been calibrated in accordance with Scientific Devices Australia Pty Ltd testing equipment and procedures.

Manufacturer	Design 2000 Pty Ltd
Product Description	Spark-e-mate Electrical Installation Tester
Part Number	493 / 493BTL
Unit Serial Number	A0 / B0 _____
Validity	12 months from date duly signed below

	Test	Reference	Tolerance	Reading	Result
	MAINS VOLTAGE	3200A	± 2V		Pass / Fail
	MAINS FREQUENCY	50Hz	± 1Hz		Pass / Fail
	RCD TRIP	36ms @ 50mA, 90°	± 5ms, ± 5mA		Pass / Fail
	EARTH CONTINUITY	0.04Ω ± 1%	± 0.02Ω		Pass / Fail
	FAULT LOOP	3200A	± 0.10Ω		Pass / Fail
	POLARITY	3200A	N/A		Pass / Fail
	CIRCUIT CONNECTIONS	3200A	N/A		Pass / Fail

	Test	Reference Load	Tolerance	Reading	Result
	NO EARTH	N/A	N/A		Pass / Fail
	VOLTAGE ON EARTH	N/A	A/A		Pass / Fail

	Test	Reference Load	Tolerance	Reading	Result
	UNPOWERED FAULT LOOP	0.50Ω ± 1%	± 0.02Ω		Pass / Fail
	INSULATION RESISTANCE A-N @ 250V d.c.	1.00MΩ ± 1%	± 0.02MΩ		Pass / Fail
	Voltage output		225V – 300V		Pass / Fail
	INSULATION RESISTANCE A-N @ 500V d.c.	1.00MΩ ± 1%	± 0.02MΩ		Pass / Fail
	Voltage output		450V – 600V		Pass / Fail

Original Officially Stamped:

Tests Conducted on 3200A Serial Number: _____
Testing Officer: _____

Signature: _____
Authorised Test Centre: _____
Dated: _____