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2100 / 3200 / 3200A / 3200B

ELECTRICAL TEST EQUIPMENT CALIBRATOR

VERIFICATION AND CALIBRATION GUIDE

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2100 / 3200 Series Verification Sheets **Appendix A**

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SAFETY WARNINGS





HIGH VOLTAGES



CONNECTIONS TO LINE

THIS VERIFICATION AND CALIBRATION GUIDE INVOLVES CONNECTIONS TO LINE AND MEASUREMENT OF HIGH VOLTAGES

FOR THIS REASON VERIFICATION AND CALIBRATION SHOULD ONLY BE UNDERTAKEN BY QUALIFIED PERSONNEL

THIS VERIFICATION AND CALIBRATION KIT IS PROVIDED 'AS-IS' AND TRANSMILLE SHALL NOT BE LIABLE FOR ANY INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OR LOSS AS A RESULT OF USING THIS GUIDE OR VERIFICATION AND CALIBRATION LEAD SET.

General

The steps detailed below will allow adjustment of a 2100 / 3200 Series Electrical Test Equipment Calibrator.

This requires the use of the **2100 / 3200 Series Calibration Control Panel program**
(supplied digitally via email link) and the 2100 / 3200 Series calibration lead set kit supplied by Transmille.

Installing the 2100 / 3200 Series calibration control panel



Click OK to proceed



Click button to begin install



Click OK to complete installation

Calibrating 2100 / 3200 Series calibrator - Introduction

The 2100 / 3200 Series Calibration kit comprises of a set of test leads as follows :

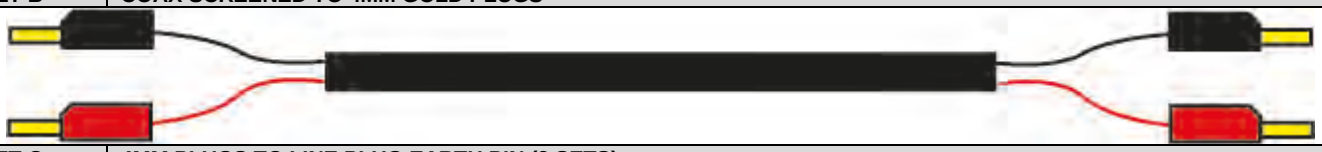
UK Leadset Configuration

UK LEADSET CONFIGURATION

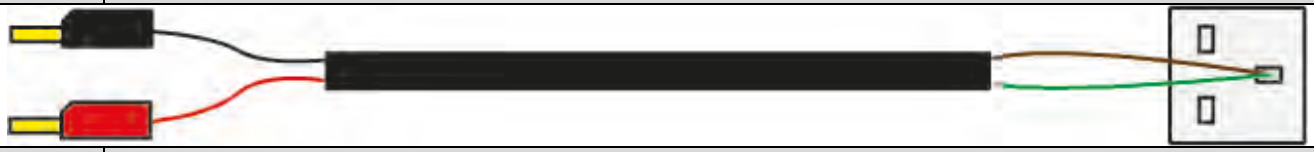
SET A	COAX SCREENED TO 4MM GOLD PLUGS



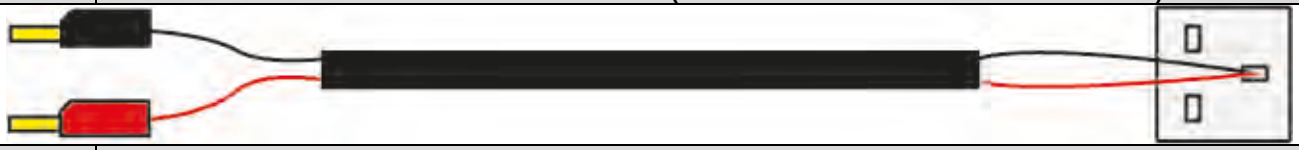
SET B	COAX SCREENED TO 4MM GOLD PLUGS



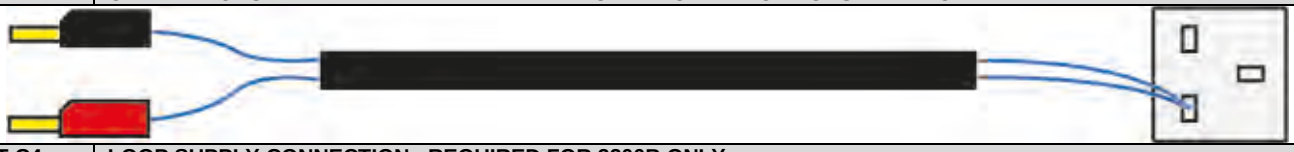
SET C	4MM PLUGS TO LINE PLUG EARTH PIN (3 SETS)
SET C1	COMMON SET FOR ALL CALIBRATORS



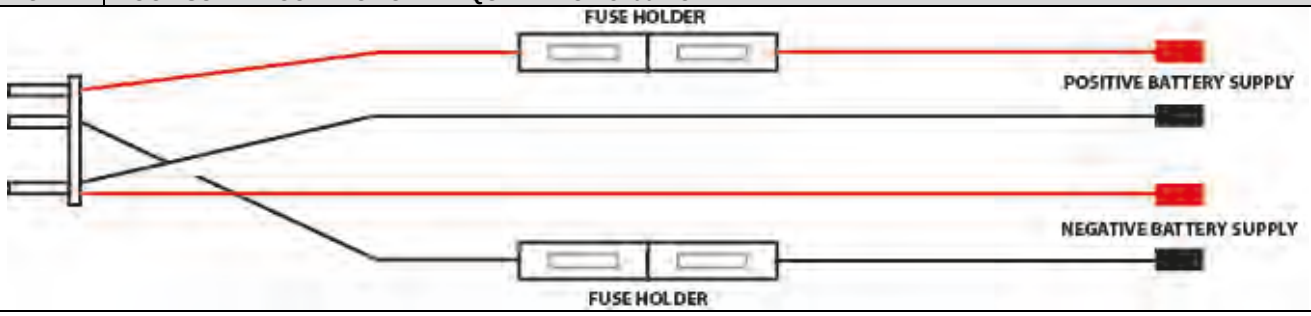
SET C2	LEAD FOR NORMAL EARTH-EARTH CONFIGURATION (FOR USE ON UNPROTECTED SUPPLIES ONLY)



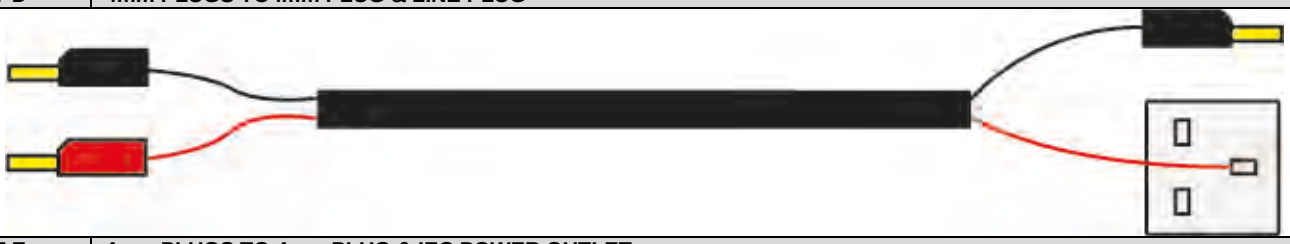
SET C3	LEAD FOR NO-TRIP EARTH-NEUTRAL CONFIGURATION (FOR USE ON PROTECTED SUPPLIES) NOTE : THESE CALIBRATORS WILL BE LABELLED EARTH-NEUTRAL ON THE OPTIONS LABEL ON THE REAR PANEL



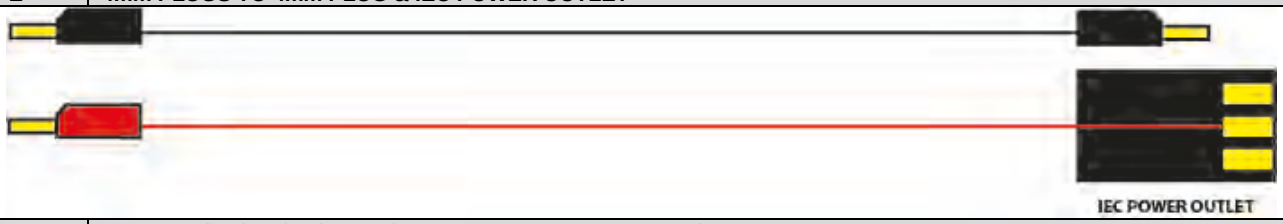
SET C4	LOOP SUPPLY CONNECTION : REQUIRED FOR 3200B ONLY



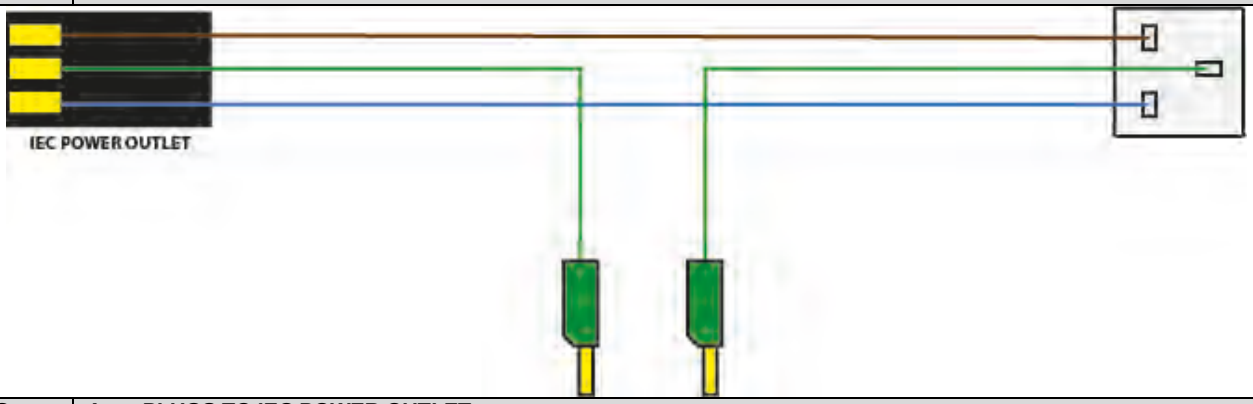
SET D	4mm PLUGS TO4mm PLUG & LINE PLUG



SET E	4mm PLUGS TO 4mm PLUG & IEC POWER OUTLET



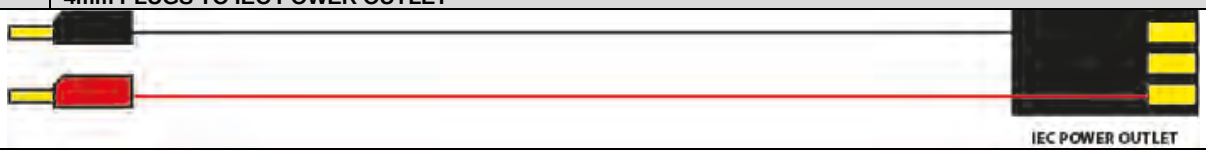
SET F	LINE PLUG TO IEC POWER OUTLET WITH EARTH BREAKOUT



SET G	4mm PLUGS TO IEC POWER OUTLET

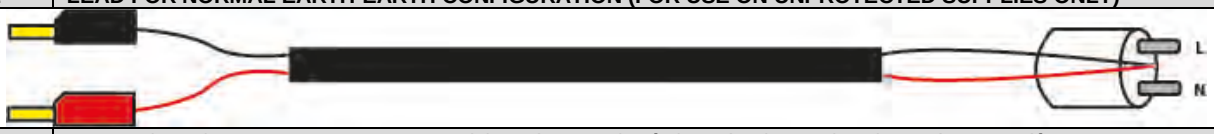
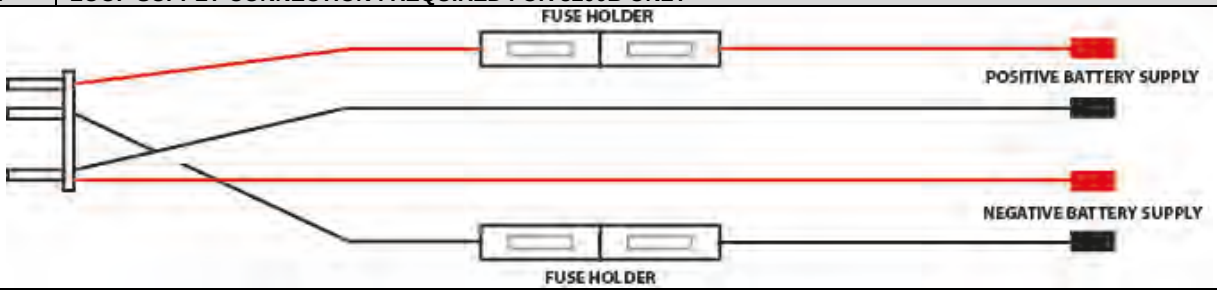


SET H	4mm PLUGS TO IEC POWER OUTLET

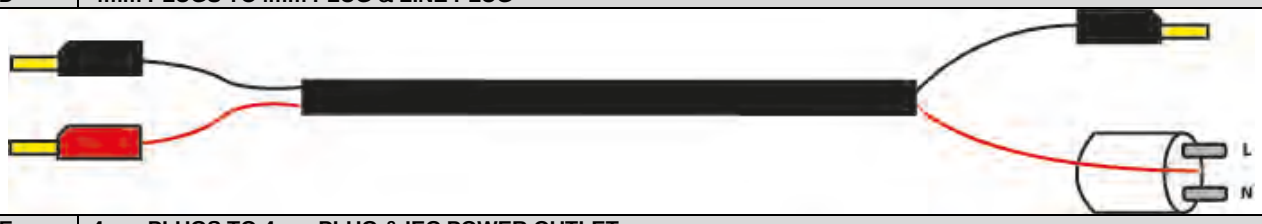


In addition a performance verification sheet is provided –
this allows the 2100 / 3200 Series to be compared against manufacturers specifications.

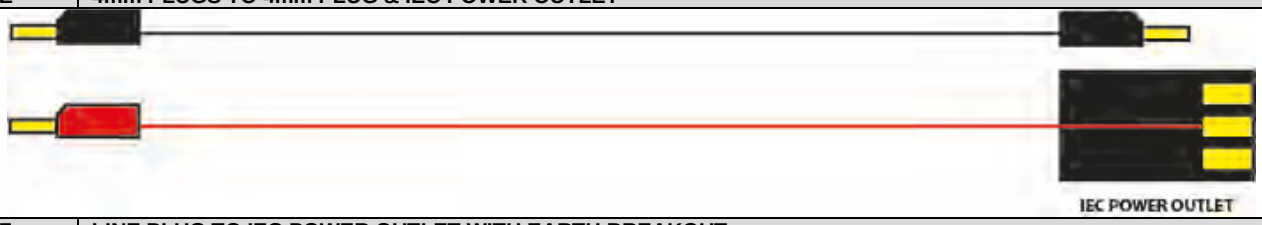
Euro Leadset Configuration

EURO LEADSET CONFIGURATION	
SET A	COAX SCREENED TO 4MM GOLD PLUGS
	
SET B	COAX SCREENED TO 4MM GOLD PLUGS
	
SET C	4MM PLUGS TO LINE PLUG EARTH PIN (3 SETS)
SET C1	COMMON SET FOR ALL CALIBRATORS
	
SET C2	LEAD FOR NORMAL EARTH-EARTH CONFIGURATION (FOR USE ON UNPROTECTED SUPPLIES ONLY)
	
SET C3	LEAD FOR NO-TRIP EARTH-NEUTRAL CONFIGURATION (FOR USE ON PROTECTED SUPPLIES) NOTE : THESE CALIBRATORS WILL BE LABELLED EARTH-NEUTRAL ON THE OPTIONS LABEL ON THE REAR PANEL
	 NOTE : THIS LEAD MUST BE CONNECTED AT THE LINE PLUG END IN THE CORRECT ORIENTATION – THIS IS INDICATED BY A LIT NEON BUILT INTO THE PLUG
SET C4	LOOP SUPPLY CONNECTION : REQUIRED FOR 3200B ONLY
	

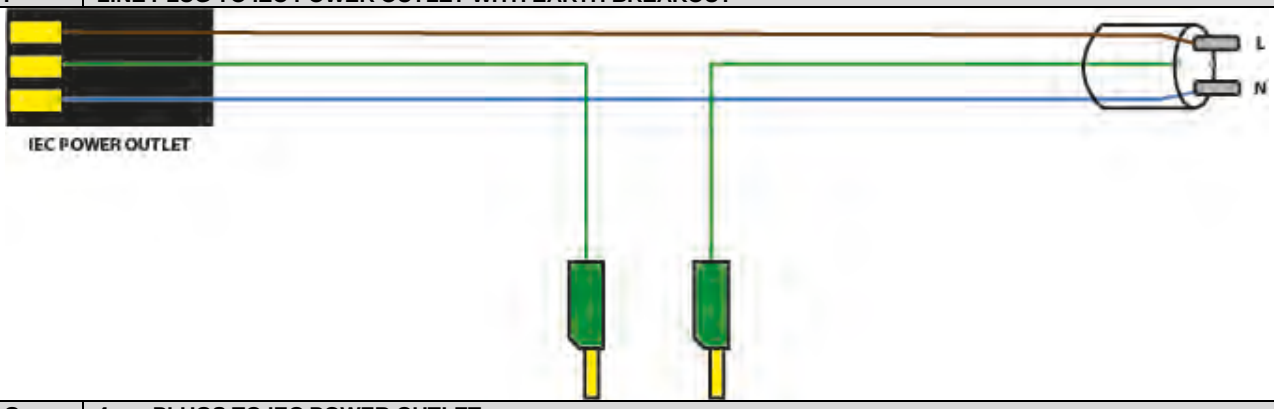
SET D	4mm PLUGS TO4mm PLUG & LINE PLUG



SET E	4mm PLUGS TO 4mm PLUG & IEC POWER OUTLET



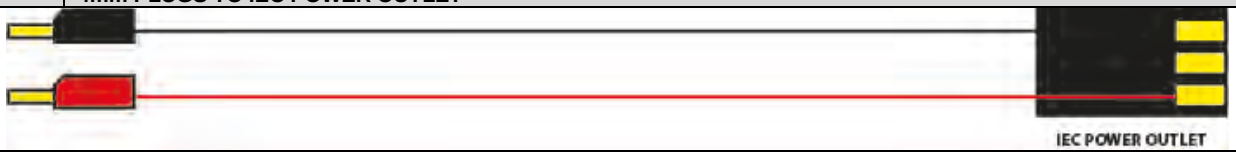
SET F	LINE PLUG TO IEC POWER OUTLET WITH EARTH BREAKOUT



SET G	4mm PLUGS TO IEC POWER OUTLET

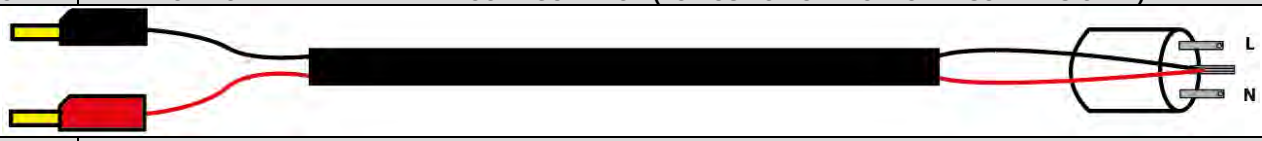
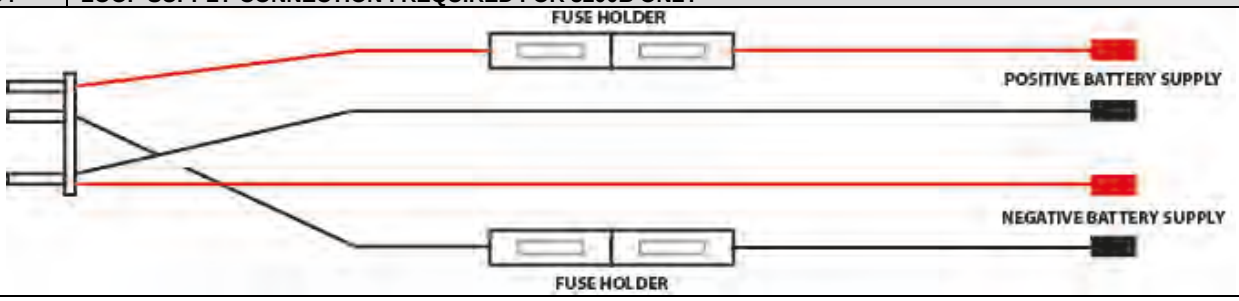


SET H	4mm PLUGS TO IEC POWER OUTLET

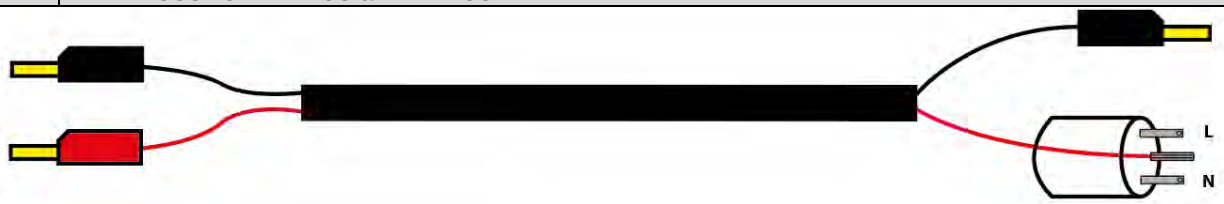


In addition a performance verification sheet is provided –
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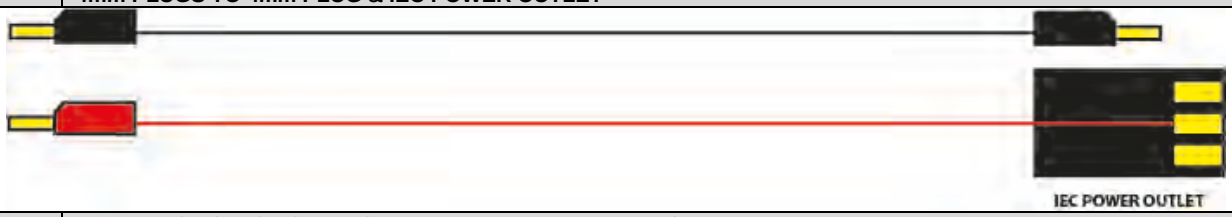
US Leadset Configuration

US LEADSET CONFIGURATION	
SET A	COAX SCREENED TO 4MM GOLD PLUGS
	
SET B	COAX SCREENED TO 4MM GOLD PLUGS
	
SET C	4MM PLUGS TO LINE PLUG EARTH PIN (3 SETS)
SET C1	COMMON SET FOR ALL CALIBRATORS
	
SET C2	LEAD FOR NORMAL EARTH-EARTH CONFIGURATION (FOR USE ON UNPROTECTED SUPPLIES ONLY)
	
SET C3	LEAD FOR NO-TRIP EARTH-NEUTRAL CONFIGURATION (FOR USE ON PROTECTED SUPPLIES) NOTE : THESE CALIBRATORS WILL BE LABELLED EARTH-NEUTRAL ON THE OPTIONS LABEL ON THE REAR PANEL
	
SET C4	LOOP SUPPLY CONNECTION : REQUIRED FOR 3200B ONLY
	

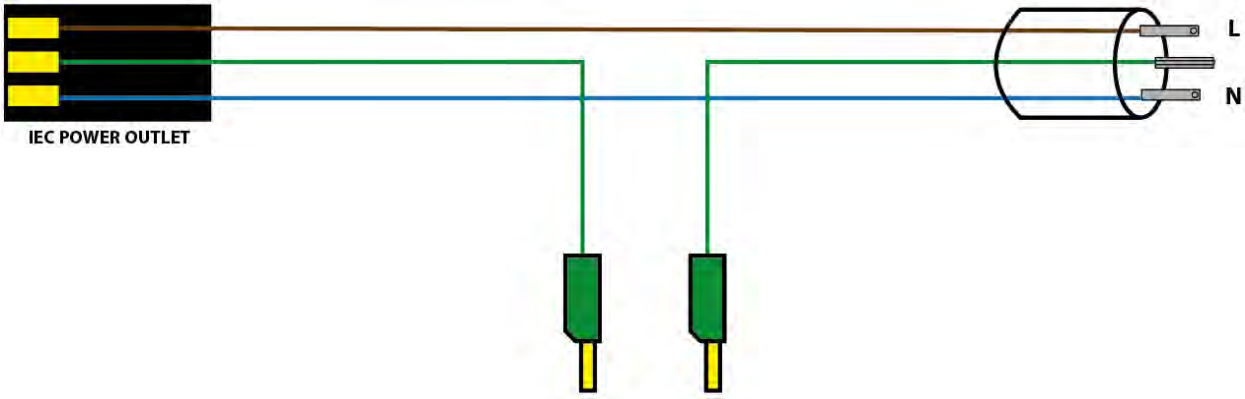
SET D	4mm PLUGS TO4mm PLUG & LINE PLUG



SET E	4mm PLUGS TO 4mm PLUG & IEC POWER OUTLET



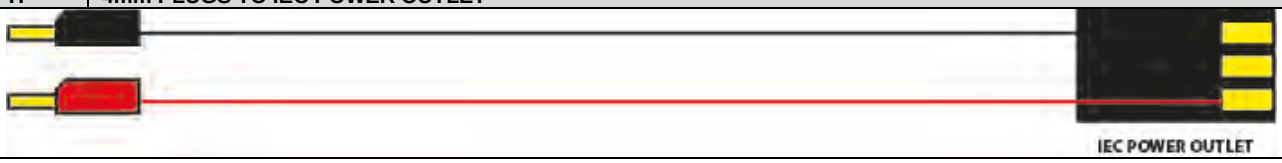
SET F	LINE PLUG TO IEC POWER OUTLET WITH EARTH BREAKOUT



SET G	4mm PLUGS TO IEC POWER OUTLET



SET H	4mm PLUGS TO IEC POWER OUTLET



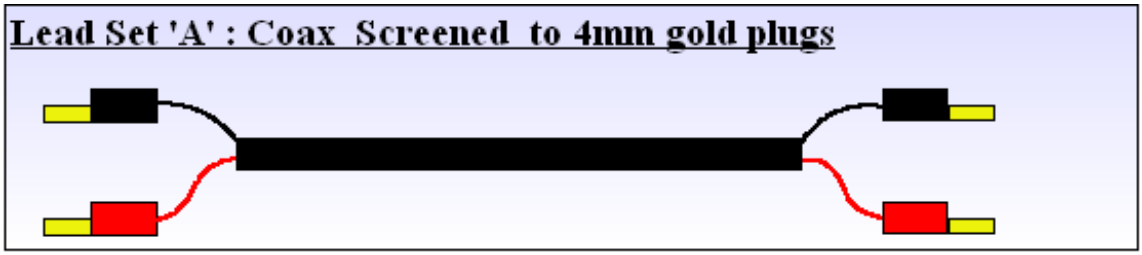
In addition a performance verification sheet is provided –
this allows the 2100 / 3200 Series to be compared against manufacturers specifications.

Insulation Resistance Function

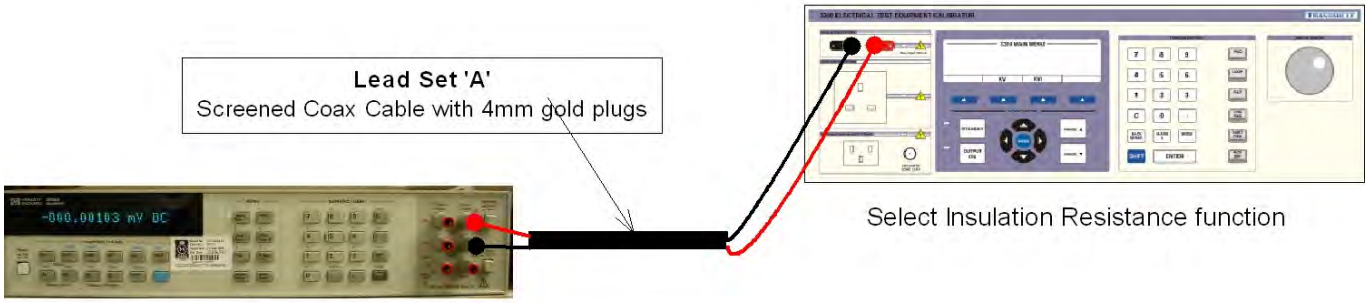
	VERIFICATION AND CALIBRATION PROCEDURES ARE FOR USE BY QUALIFIED TECHNICIANS ONLY – OBSERVE ALL PRECAUTIONS DURING CONNECTION AND MEASUREMENT OF LINE HIGH VOLTAGES

Equipment Required	Comments
Resistance meter	Capable of measuring 2GOhm (10GOhm if 10G Option fitted)

Connections



Connections for Insulation Resistance



Verification Method

1. Connect 2100 / 3200 Series to meter as per diagram using **LEAD SET A**

2. Select Insulation resistance mode and test points as per verification sheet using the 2100 / 3200 Series front panel and record measurement obtained using 2-wire connection.

Verification Test Points

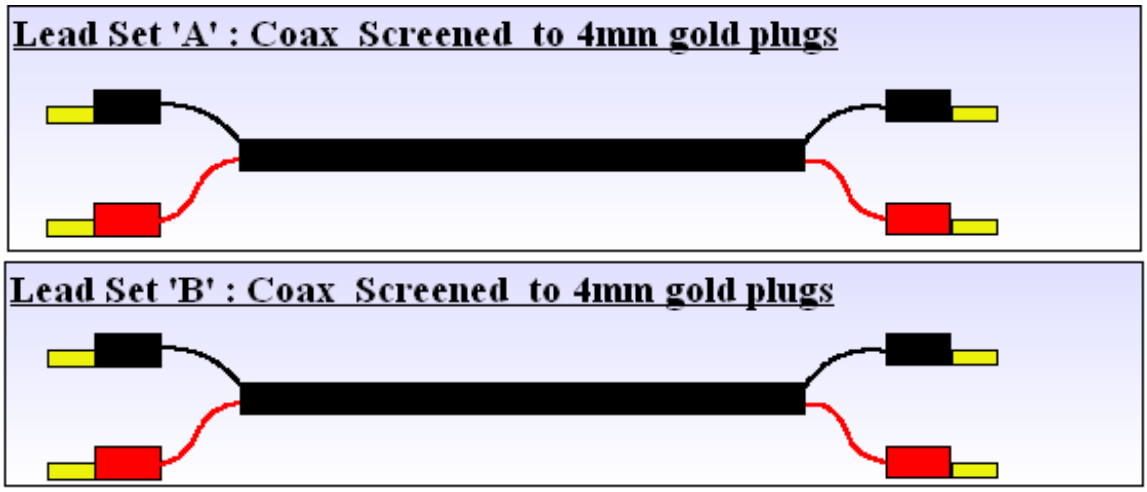
See Performance Verifications Sheet Page 1 & 2

Continuity Resistance Function

VERIFICATION AND CALIBRATION PROCEDURES ARE FOR USE BY QUALIFIED TECHNICIANS ONLY – OBSERVE ALL PRECAUTIONS DURING CONNECTION AND MEASUREMENT OF LINE HIGH VOLTAGES

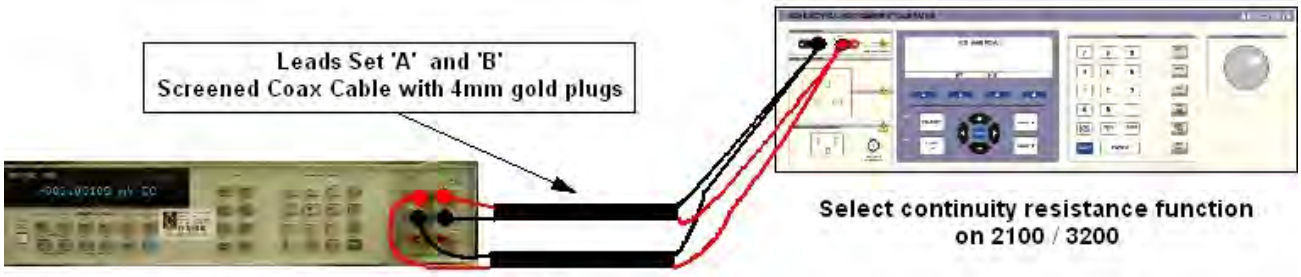
Equipment Required	Comments
Resistance meter	Capable of measuring 100mOhm to 1kOhm 4-Wire mode

Connections



Connections for Continuity Resistance

Use DMM to measure continuity resistance using 4 wire (Kelvin) connections



Measure resistance using 4 wire ohms function.

Verification Method

1. Connect 2100 / 3200 Series to meter as per diagram using **LEAD SET A** and **LEAD SET B**

2. Select test point as per verification sheet using the 2100 / 3200 Series front panel and record measurement obtained
using 4-wire connection.

Verification Test Points

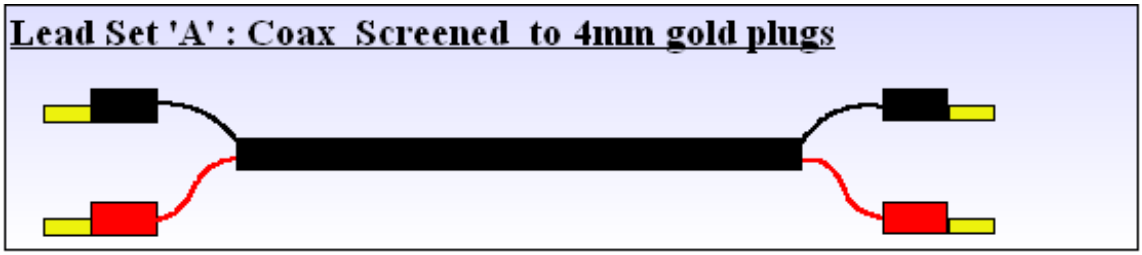
See Performance Verifications Sheet Page 2 & 3

Continuity Current Function

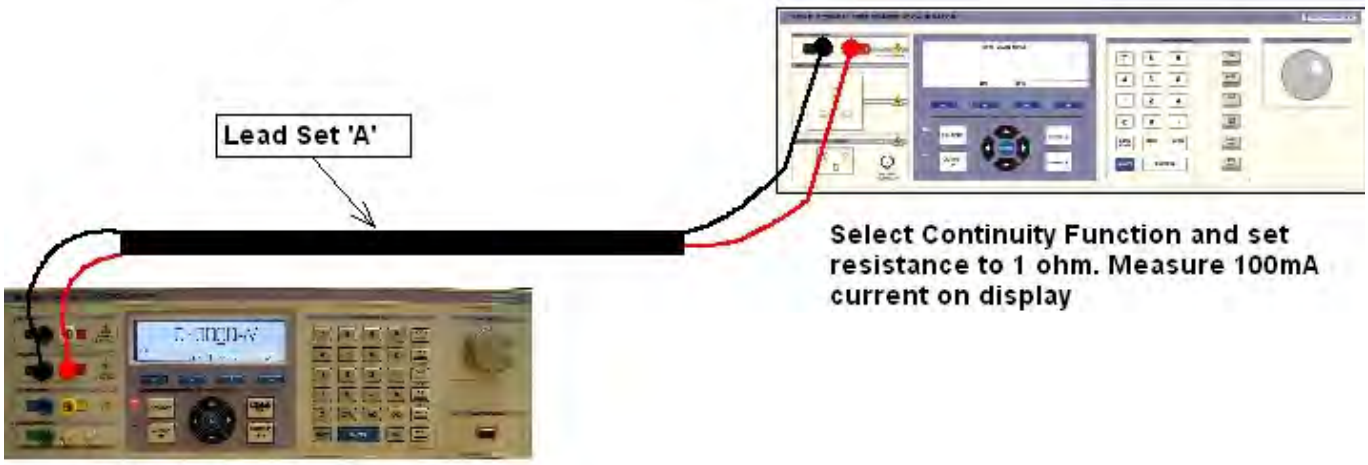
	VERIFICATION AND CALIBRATION PROCEDURES ARE FOR USE BY QUALIFIED TECHNICIANS ONLY – OBSERVE ALL PRECAUTIONS DURING CONNECTION AND MEASUREMENT OF LINE HIGH VOLTAGES

Equipment Required	Comments
DC Current Source eg. Multi Product Calibrator	Capable of sourcing 100mA DC

Connections



Continuity Current into 1 Ohm



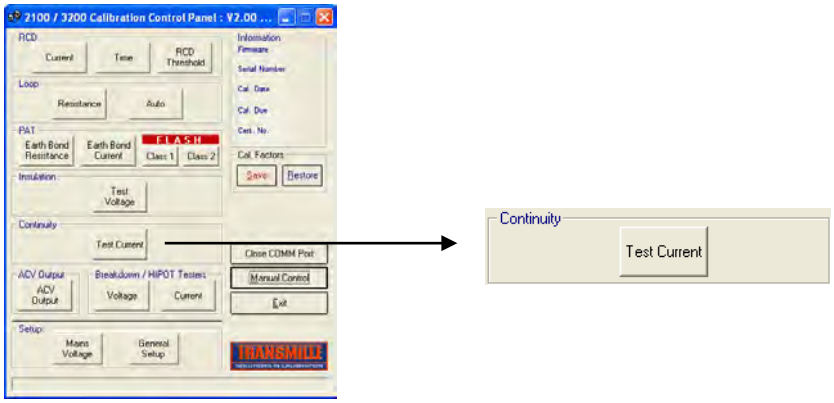
Select Continuity Function and set resistance to 1 ohm. Measure 100mA current on display

Set Calibrator to output 100mA DC

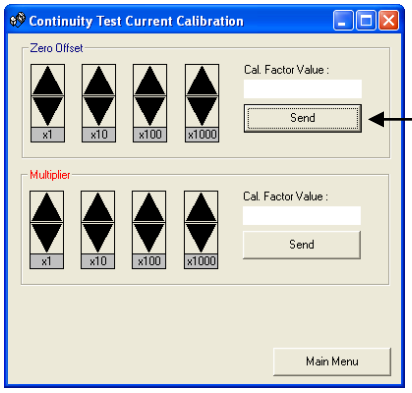
Calibration Method

1. Connect 2100 / 3200 Series to meter as per diagram using **LEAD SET A**

2. Select continuity test current mode on 2100 / 3200 Series CCP
   this will set the 2100 / 3200 Series to **1 Ohm output**



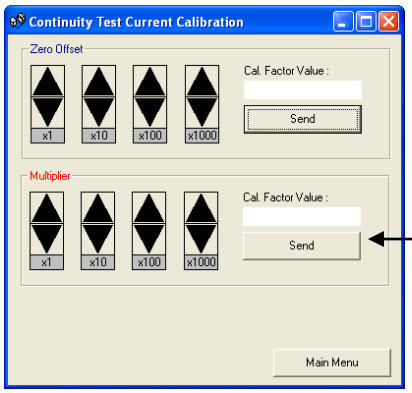
3. Set **0mA DC** output from current source
4. Adjust **ZERO OFFSET** using CCP software



ZERO OFFSET ADJUST

Adjust cal factor using up/down buttons – note using the up/down button automatically sends cal factor to calibrator, the send button is needed only if a cal factor is manually typed into the cal factor value box.

5. Set **100mA DC** output from current source
6. Adjust **MULTIPLIER (FULL SCALE)** using CCP software



MULTIPLIER ADJUST

Adjust cal factor using up/down buttons – note using the up/down button automatically sends cal factor to calibrator, the send button is needed only if a cal factor is manually typed into the cal factor value box.

Verification Test Points

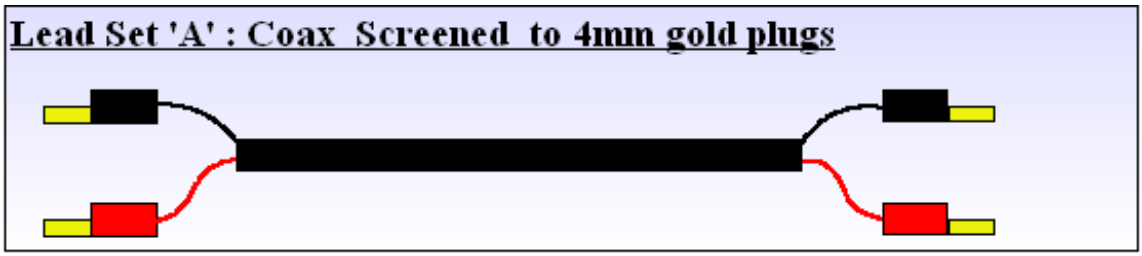
See Performance Verifications Sheet Page 4

AC Voltage Source Function

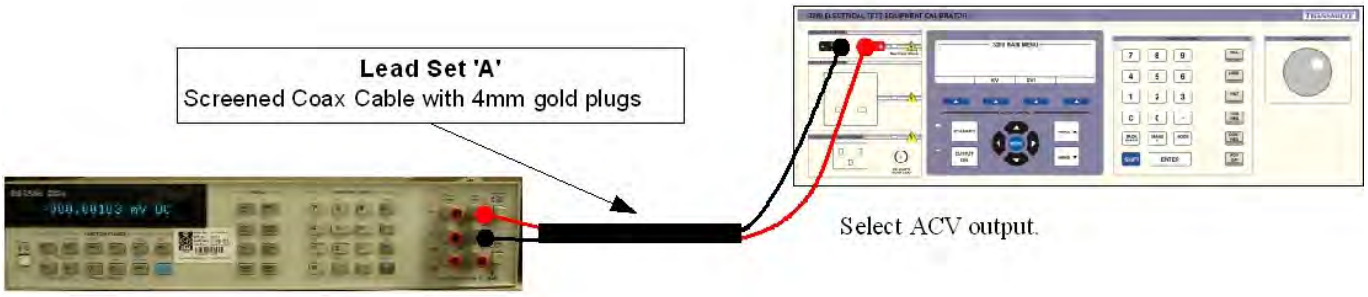
	VERIFICATION AND CALIBRATION PROCEDURES ARE FOR USE BY QUALIFIED TECHNICIANS ONLY – OBSERVE ALL PRECAUTIONS DURING CONNECTION AND MEASUREMENT OF LINE HIGH VOLTAGES

Equipment Required	Comments
AC Voltage meter	Capable of measuring up to 400V AC

Connections



Connections for ACV Output



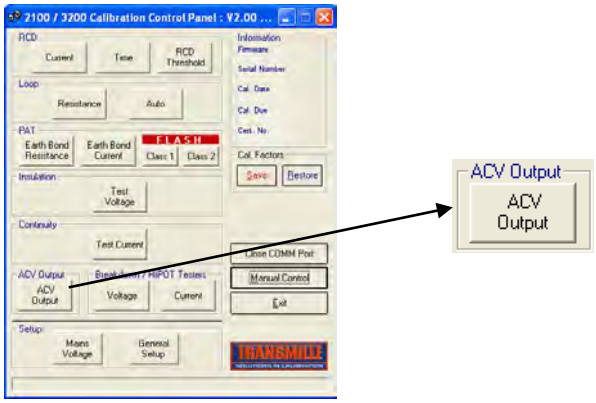
Select ACV output.

Read ACV output. Compare reading displayed on 2100 / 3200 with reading on DMM

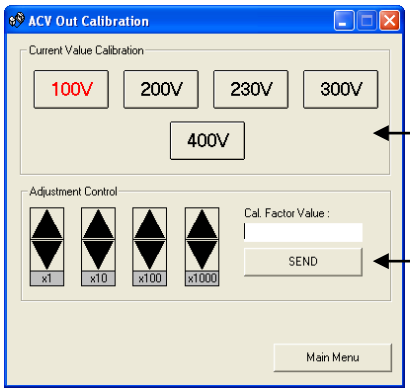
Calibration Method

1. Connect 2100 / 3200 Series to meter as per diagram using **LEAD SET A**

2. Select ACV Output mode on 2100 / 3200 Series CCP - this will set the 2100 / 3200 Series to **100V Output** initially



3. Adjust cal factor using CCP software adjustment control



RANGE SELECTION

Select range to be calibrated here

ADJUSTMENT CONTROL

Adjust cal factor using up/down buttons – note using the up/down button automatically sends cal factor to calibrator, the send button is needed only if a cal factor is manually typed into the cal factor value box.

4. Select 200V, 230V, 300V and 400V ranges in turn and adjust each range in turn

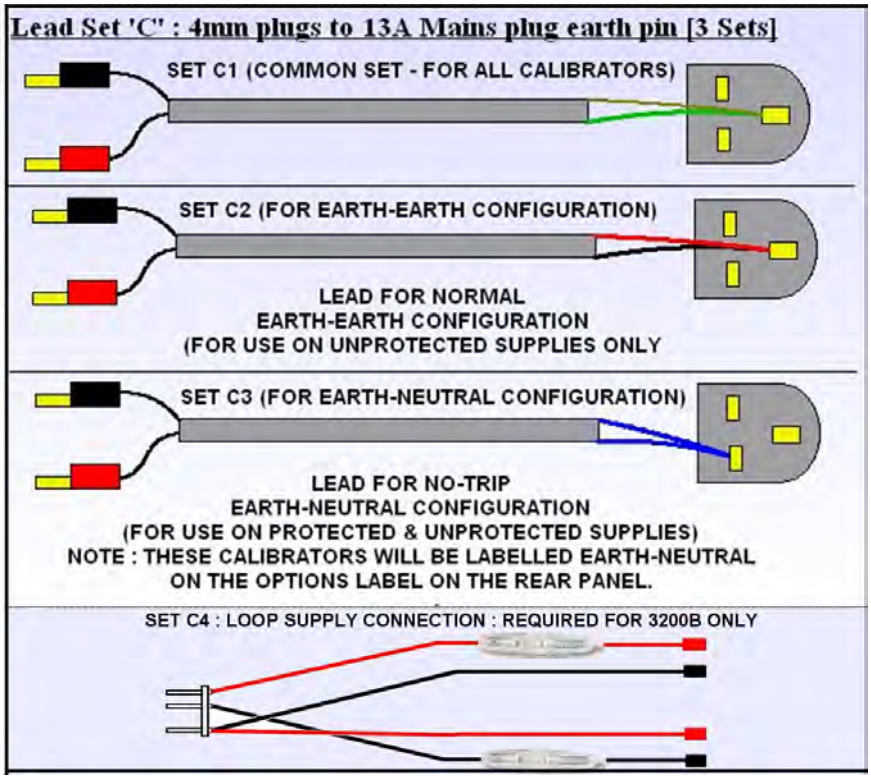
Verification Test Points

See Performance Verifications Sheet Page 4

Loop Resistance Function

	VERIFICATION AND CALIBRATION PROCEDURES ARE FOR USE BY QUALIFIED TECHNICIANS ONLY – OBSERVE ALL PRECAUTIONS DURING CONNECTION AND MEASUREMENT OF LINE HIGH VOLTAGES
Equipment Required	**Comments**
DC Voltage meter	
DC Current Source	**Capable of sourcing up to1A DC**
2x 12V LEAD ACID BATTERIES	**FOR 3200B ONLY : BATTERIES NOT SUPPLIED**

Connections



NOTES FOR USE WITH LEAD SET 'C'

Set C1
COMMON SET OF TEST LEADS (RED & BLACK LEADS) IS A COMMON SET FOR USE WITH ANY TYPE OF 2100 / 3200 CALIBRATOR.

DEPENDING ON THE CONFIGURATION OF THE 2100 / 3200 CALIBRATOR THE SECOND LEAD SHOULD BE EITHER :

Set C2
LEAD MARKED FOR 'NORMAL' CONFIGURATION EARTH-EARTH

OR

Set C3
LEAD MARKED FOR 'EARTH-NEUTRAL' (NO TRIP) CONFIGURATION –
NOTE THESE CALIBRATORS WILL BE MARKED AS EARTH-NEUTRAL ON THE REAR PANEL OPTION LABEL IF CONFIGURED THIS WAY.

Set C4
3200B ONLY : 12V SUPPLY CONNECTION : REQUIRES 2x 12V LEAD ACID BATTERIES (NOT SUPPLIED)

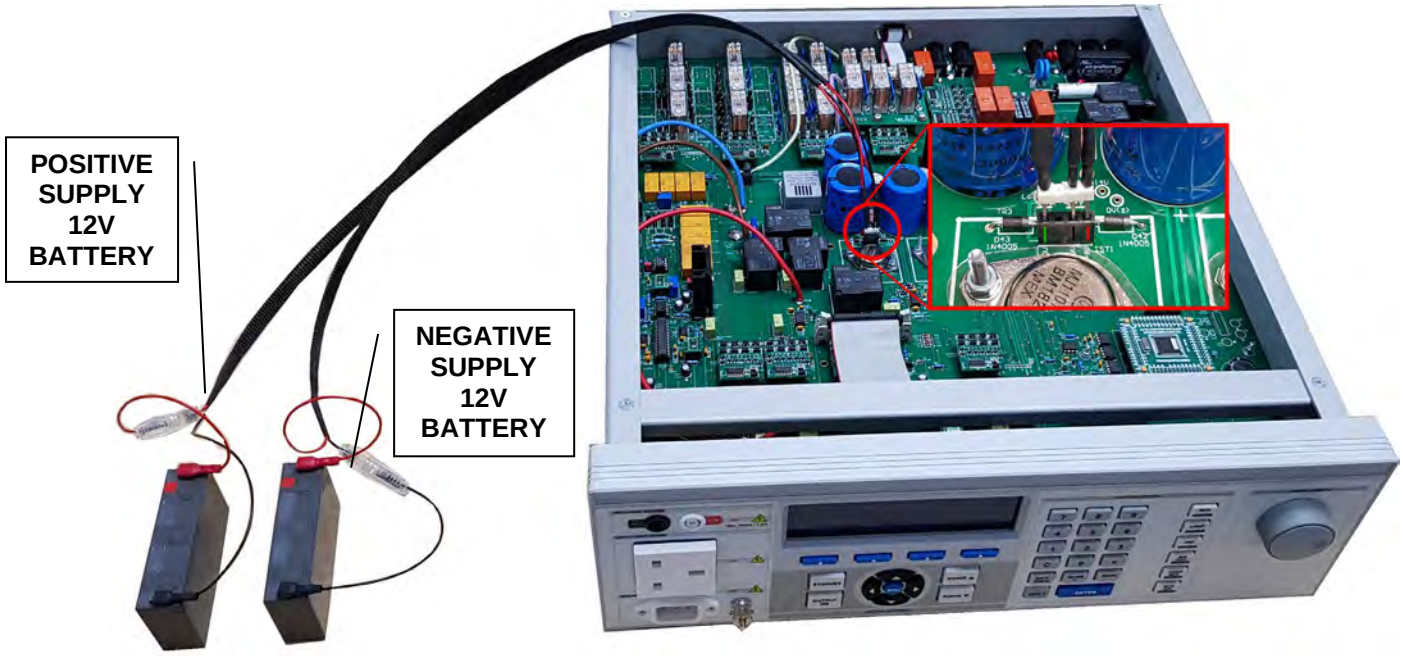
LOOP SUPPLY CONFIGURATION USING LEAD SET C4 : 3200B ONLY

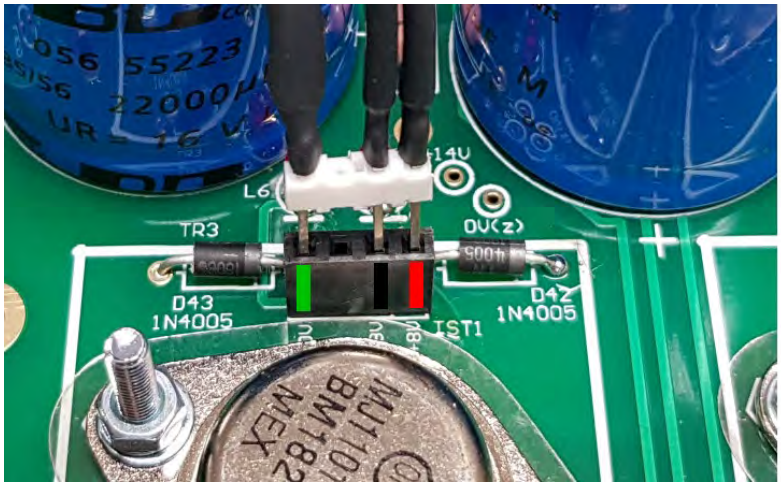
Danger – mains voltage potentials within the instrument on the main board, ensure the instrument is switched off and the mains plug removed from the supply.

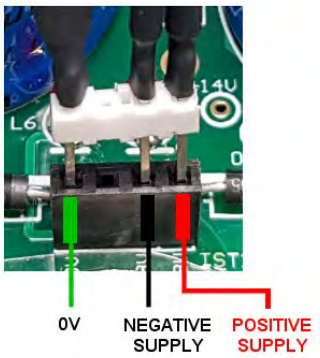
To calibrate the loop resistance values, an external isolated ± 12V power supply is required to energise the loop circuit for longer periods during testing. A supplied connection lead can be used with two 12V lead acid batteries (batteries not supplied). Alternatively an isolated power supply may be used – contact Transmille technical service for further assistance.

Remove the lid of the electrical test calibrator by removing the two hex screws on either side of the front panel and the six screws on the bottom of the unit. Slide the lid towards the back of the instrument and remove.

Use **lead set C4** to connect loop supply batteries **(2x 12V – not supplied)** to the connector just above the two TO3 transistors (TR2 & TR3), ensure that the connector is in the correct orientation :







SEE LEAD SET C4 LABELLING FOR CORRECT POSITIVE AND NEGATIVE 12V SUPPLY CONNECTION

2100 / 3200 / 3200A / 3200B

SETTING UP FOR LOOP FUNCTION CALIBRATION

Connect the instrument to mains supply and switch on, allow the instrument to warm up and stabilise prior to calibration of the loop resistance. (maximum 20 minutes)

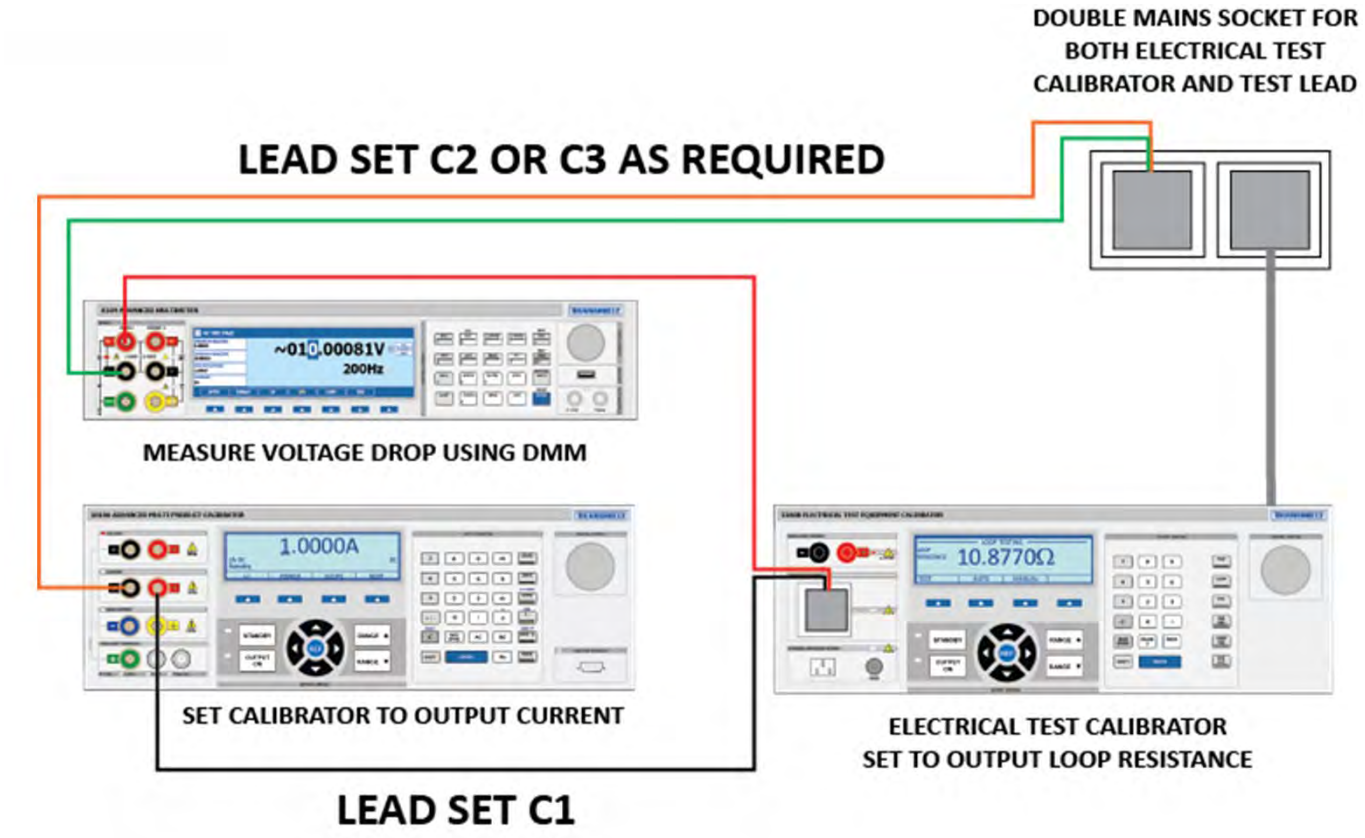
Connect the **Electrical Calibrator** (2100/3200/3200A/3200B)
to the multi product calibrator as per the diagram using **LEAD SET C1**

Connect the **Electrical Calibrator** to the multi meter as per the diagram using
LEAD SET as per guidance below :

Set C2
LEAD FOR NORMAL EARTH-EARTH CONFIGURATION (FOR USE ON UNPROTECTED SUPPLIES ONLY)
LEAD MARKED FOR 'NORMAL' CONFIGURATION EARTH-EARTH

OR

Set C3
LEAD FOR NO-TRIP EARTH-NEUTRAL CONFIGURATION (FOR USE ON PROTECTED SUPPLIES) NOTE : THESE CALIBRATORS WILL BE LABELLED EARTH-NEUTRAL ON THE OPTIONS LABEL ON THE REAR PANEL
LEAD MARKED FOR 'EARTH-NEUTRAL' (NO TRIP) CONFIGURATION – NOTE THESE CALIBRATORS WILL BE MARKED AS EARTH-NEUTRAL ON THE REAR PANEL OPTION LABEL IF CONFIGURED THIS WAY.



Loop resistance should be measured by passing current through a resistor and measuring the voltage drop, then calculate the resistance using ohms law V/I = R

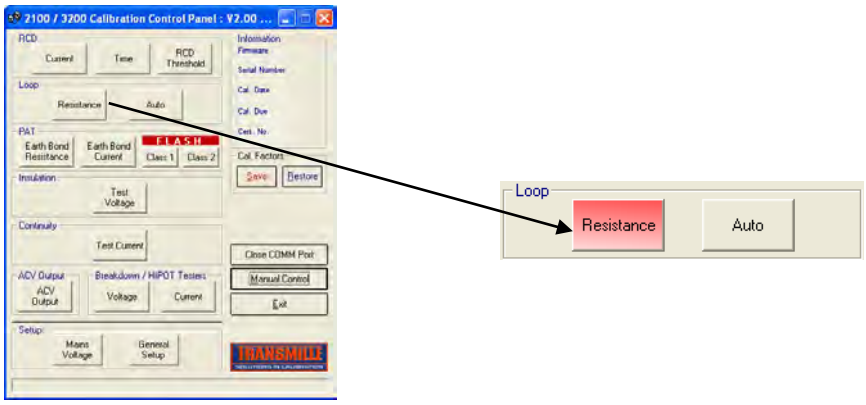
The 4 terminal resistance measurement is made from the earth of the mains input to the 3200B to the Earth pin of the output socket of the 3200B.

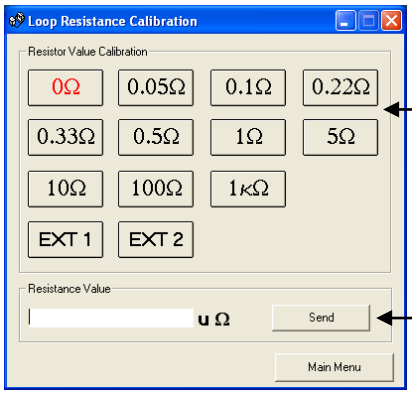
Note : The measurement of loop resistance is the difference between 'Range 1', Zero and the selected range

Calibration Method : 2100 / 3200 (NOT 3200A or 3200B)

1. Select LOOP resistance function on the 3200B and select MANUAL – type '0.0001' and then press enter to reset the loop impedance compensation to ZERO before calibrating the loop resistance values.

2. Select loop resistance mode on the 3200B control panel, this will set the 3200B to **0 Ohms** output initially.





RANGE SELECTION

Select range to be calibrated here

ADJUSTMENT CONTROL

Adjust cal factor using up/down buttons – note using the up/down button automatically sends cal factor to calibrator, the send button is needed only if a cal factor is manually typed into the cal factor value box.

3. Set the current source (calibrator DC current) to 1A and measure the voltage drop.

Loop Resistance Value	Current Setting
1 kOhm	1mA
100 Ohms	10mA
10 Ohms	100mA
< 5 Ohms	1A

1000Ω range on models up to and including version 10.4.0
900Ω range on models above version 10.4.0 (10.4.1 onwards)

4. Calculate the zero resistance value (X) of the system using Ohms law (V / I = Ω).

5. Select the next value on the control panel (0.05Ω) and apply the current as stated in the table.

6. Calculate the value as before using Ohms law (Y) and then subtract the **zero** resistance value (X) from this new value (Y) to arrive at the value for that resistor (Z)
i.e. Z = Y – X

7. Enter the calculated value in uOhms into the resistance value box on the control panel and click 'Set Value'

8. Repeat this process (steps 11 to 13 inclusive) for each value (0.1Ω, 0.22Ω, 0.33Ω, 0.5Ω and 1Ω

9. Select 0Ω and set the current source to 100mA and measure the voltage drop.

10. Calculate the zero resistance value (X) of the system using Ohms law (V / I = Ω).

11. Select the next value on the control panel 5Ω and apply the current as stated in the table.

12. Calculate the value as before using Ohms law (Y) and then subtract the **zero** resistance value (X) from this new value (Y) to arrive at the value for that resistor (Z)
i.e. Z = Y – X

13. Enter the calculated value in uOhms into the resistance value box on the control panel and click 'Set Value'

14. Repeat this process (steps 17 to 19 inclusive) for the 9Ω range.

15. Select 0Ω and set the current source to 10mA and measure the voltage drop.

16. Calculate the zero resistance value (X) of the system using Ohms law (V / I = Ω).

17. Select the next value on the control panel 90Ω and apply the current as stated in the table.

18. Calculate the value as before using Ohms law (Y) and then subtract the **zero** resistance value (X) from this new value (Y) to arrive at the value for that resistor (Z)
i.e. Z = Y – X

19. Enter the calculated value in uOhms into the resistance value box on the control panel and click 'Set Value'

20.Select 0Ω and set the current source to 1mA and measure the voltage drop.

21. Calculate the zero resistance value (X) of the system using Ohms law (V / I = Ω).

22. Select the next value on the control panel 900Ω or 1000Ω depending on the version you have) and apply the current as stated in the table.

23. Calculate the value as before using Ohms law (Y) and then subtract the **zero** resistance value (X) from this new value (Y) to arrive at the value for that resistor (Z)
i.e. Z = Y – X

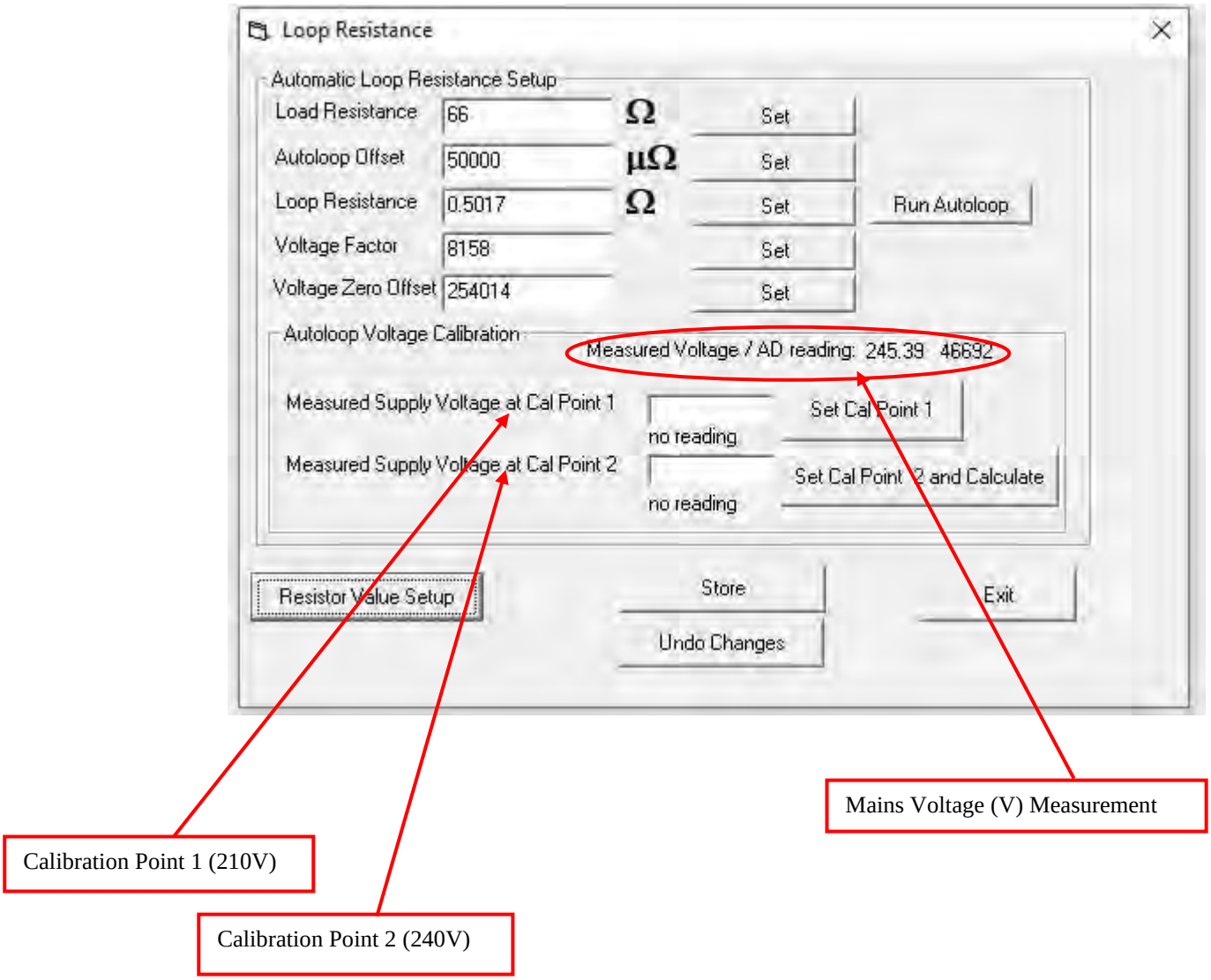
Verification Test Points

See Performance Verifications Sheet Page 5

3200A / 3200B Autoloop Adjustment [Requires 3200A / 3200B Autoloop adjust software]

1. Connect the 3200A/B to the mains voltage (AC) supply via an adjustable source i.e. via a Regavolt or Variac, as the supply needs to be varied between 210V and 240V, monitor the supply with a True RMS voltmeter and set the supply to 240V.

2. Start the calibration software and select the 'Loop Resistance' button, followed by the 'Autoloop Setup' button, the following screen will appear.



3. The mains voltage as measured by the 3200A/B will be displayed (Mains Voltage (V) Measurement) as shown above.

4. To adjust the Autoloop, the 3200A/B must be able to measure the mains voltage accurately, this is achieved by entering two calibration point values.

5. Adjust the input supply (mains) to 210V and enter the measured value in the calibration point 1 box (no units) and click the 'Set Cal Point 1' button.

6. Adjust the input supply to 240V and enter the measured value in the calibration point 2 box (no units) and click the 'Set Cal Point 2' button.

7. Adjust the input supply to 225V and check that the 'Mains Voltage (V) Measurement' is within ± 0.5V of the measured value on the reference voltmeter.

8. If the value is outside ± 0.5V, repeat steps 5 to 7 until the desired value is achieved.

9. Check the values at 210V and 240V are within ± 0.5V of the measured values, if this is not the case repeat steps 5 to 8.

10. When the measurements have been completed click the 'Store' button.

11. 'Exit' the screen and then exit the 'Loop Resistance' screen.

12. Disconnect the instrument from the variable mains supply (Regavolt / Variac) and plug the instrument directly into the mains source.

13. Select the loop function and set to Range 1 and switch on the output. Measure the loop impedance of the system at the output mains (on the front panel) socket.

14. Run the 'Autoloop' function using the softkey and compare the value on the 3200A/B with the measured loop impedance, the values should be within ± 18mΩ.

15. If there is a slight discrepancy the autoloop value can be adjusted by changing the offset impedance (Autoloop Offset, default 5000uΩ) via the software. (run the software again, change the offset value, click 'Set' and then 'Store'), the value on the front panel will change depending on the value of the offset, repeat steps 13 and 14.

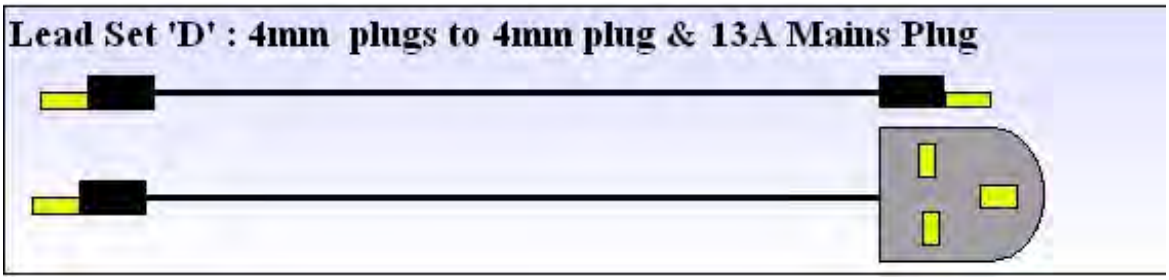
16. Check the loop impedance at approximately 0.3Ω and 0.6Ω to ensure that the system is linear.

RCD (Residual Current Device) Current Function

	VERIFICATION AND CALIBRATION PROCEDURES ARE FOR USE BY QUALIFIED TECHNICIANS ONLY – OBSERVE ALL PRECAUTIONS DURING CONNECTION AND MEASUREMENT OF LINE HIGH VOLTAGES

Equipment Required	Comments
AC Current Source	Capable of sourcing up to 3A AC 50Hz

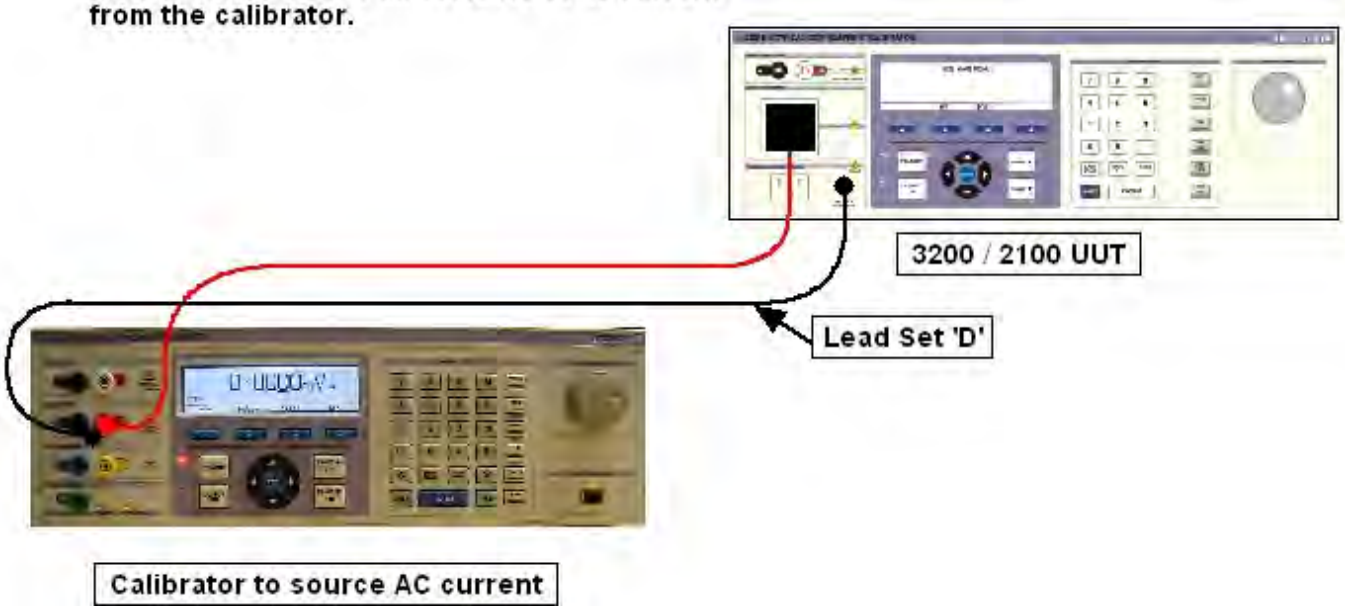
Connections



RCD Current Calibration Connections

To Calibrate RCD Current Measurement the 3200 / 2100 must be set to 'Calibration' mode using either Procal or the CCP program. In this mode the 3200 / 2100 will read/display the measured current continuously.

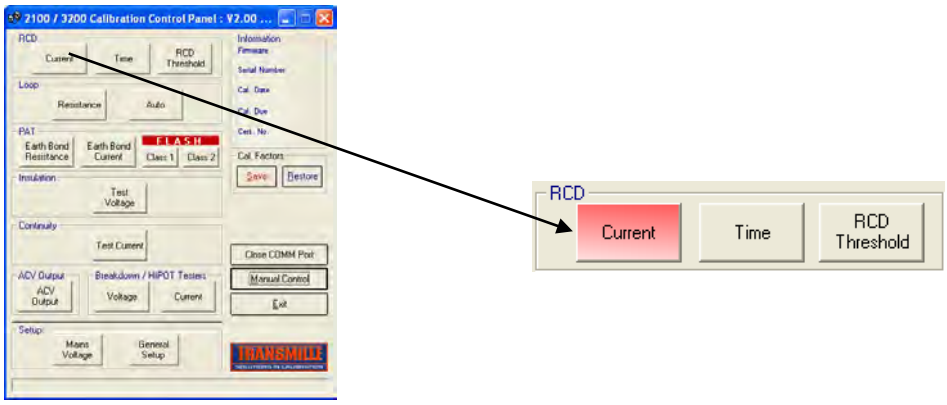
Using Lead set 'D' connect the calibrator to the 2100, as shown below. Select the required RCD current range on the 2100 and inject the Full scale AC 50Hz current from the calibrator.



Calibration Method

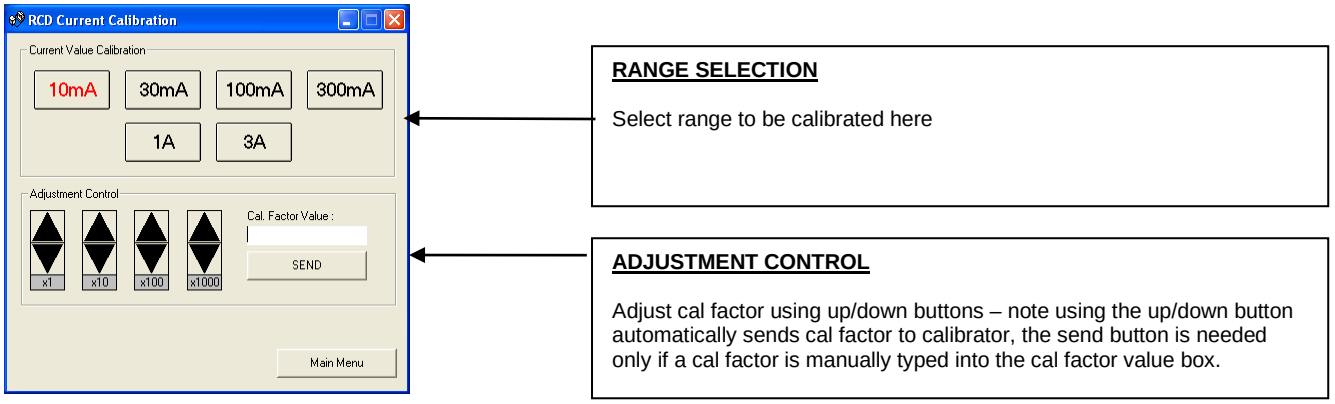
1. Connect 2100 / 3200 Series to meter as per diagram using **LEAD SET D**

2. Select RCD Current mode on 2100 / 3200 Series CCP
   this will set the 2100 / 3200 Series to **10mA Range** in calibration mode (continuous reading)



3. Set the current source to the current range full scale

4. Adjust cal factor using CCP software adjustment control



5. Repeat process for each RCD current range

Verification Test Points

See Performance Verifications Sheet Page 6

RCD (Residual Current Device) Trip Time Function

	VERIFICATION AND CALIBRATION PROCEDURES ARE FOR USE BY QUALIFIED TECHNICIANS ONLY – OBSERVE ALL PRECAUTIONS DURING CONNECTION AND MEASUREMENT OF LINE HIGH VOLTAGES

Equipment Required	Comments
Digital Storage Oscilloscope	
RCD & oscilloscope Trigger Box	Supplied with calibration kit

Connections

RCD TIMING MEASUREMENT

Connect up the 3200 / 2100, RCD Trip Adapter and Oscilloscope as shown below.
The test box will both trigger the oscilloscope and the 3200 / 2100.
Select the RCD function on the 3200 / 2100 and select :

For 230V Line Voltage : 20mA Trip Current
For 110V Line Voltage : 10mA Trip Current

Adjust settings on the scope for storage mode and use external trigger input.
Select 'Test' on the 3200 / 2100, then switch the RCD Trip Box to START.
Read timing from the oscilloscope.



Verification Method

1. Connect 2100 / 3200 Series to meter as per diagram using **RCD & OSCILLOSCOPE TRIGGER BOX**

2. Select RCD Function on 2100 / 3200 Series :

   230V Line Voltage : Set **20mA / 40ms** trip current / time

   110V Line Voltage : Set **10mA / 40ms** trip current / time

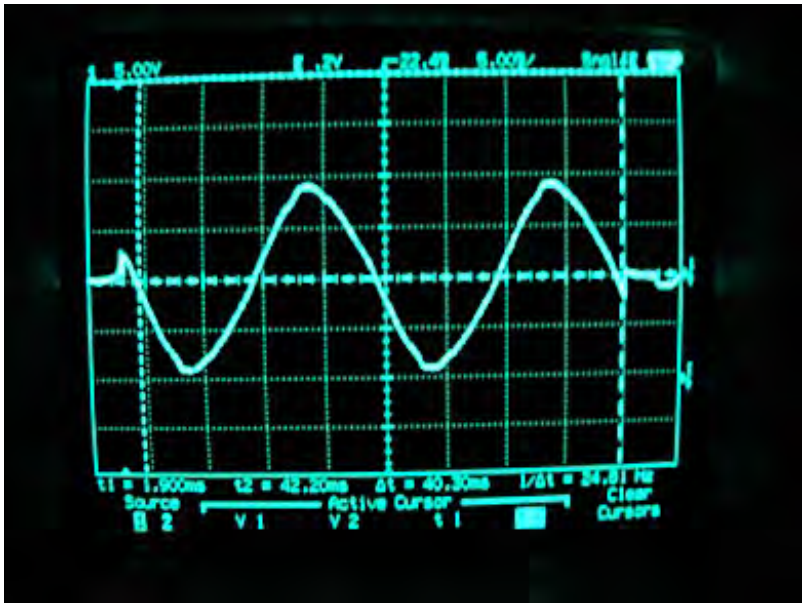
3. Adjust setting on oscilloscope for storage mode and to use external trigger input

   Set 5V/Div Amplitude, 5ms Timebase.
   Select external trigger and single shot storage mode as to view waveform as shown in screenshot below.
   Adjust to trigger oscilloscope on a 5V rising edge.

4. Press the **TEST** soft key on the 2100 / 3200 Series to begin the test

If the button is pressed at the wrong part of the mains cycle an obviously incorrect time period will result. Simply reset the oscilloscope / 2100 / 3200 Series and press button again to retest.

5. Read the timing from the oscilloscope – target value is 40ms ± 0.7ms



Verification Test Points

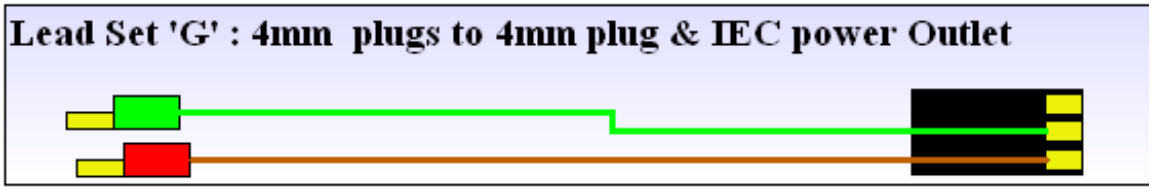
See Performance Verification Sheet Page 6

PAT Insulation Resistance Function

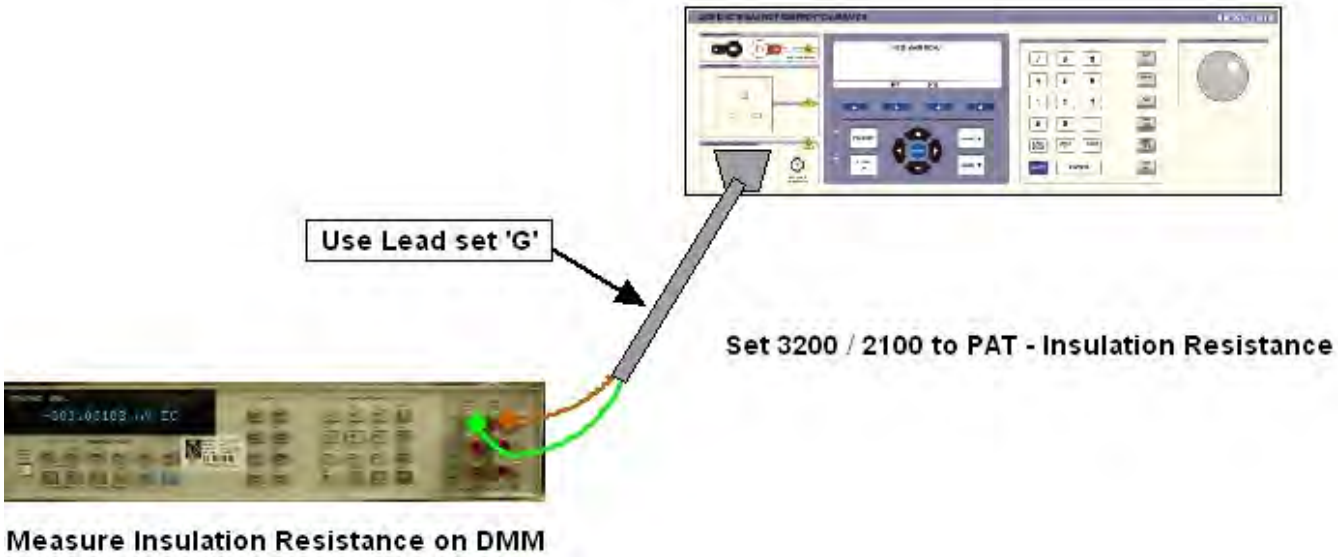
	VERIFICATION AND CALIBRATION PROCEDURES ARE FOR USE BY QUALIFIED TECHNICIANS ONLY – OBSERVE ALL PRECAUTIONS DURING CONNECTION AND MEASUREMENT OF LINE HIGH VOLTAGES

Equipment Required	Comments
Resistance Meter	Capable of measuring up to 1kOhm

Connections



PAT Insulation Lead Connections



Verification Method

1. Connect 2100 / 3200 Series to meter as per diagram using **LEAD SET G**

2. Select PAT Insulation Resistance mode and test points as per verification sheet using the 2100 / 3200 Series front panel and record measurement obtained using 2-wire connection.

Verification Test Points

See Performance Verifications Sheet Page 6

PAT Earth Bond Resistance Function

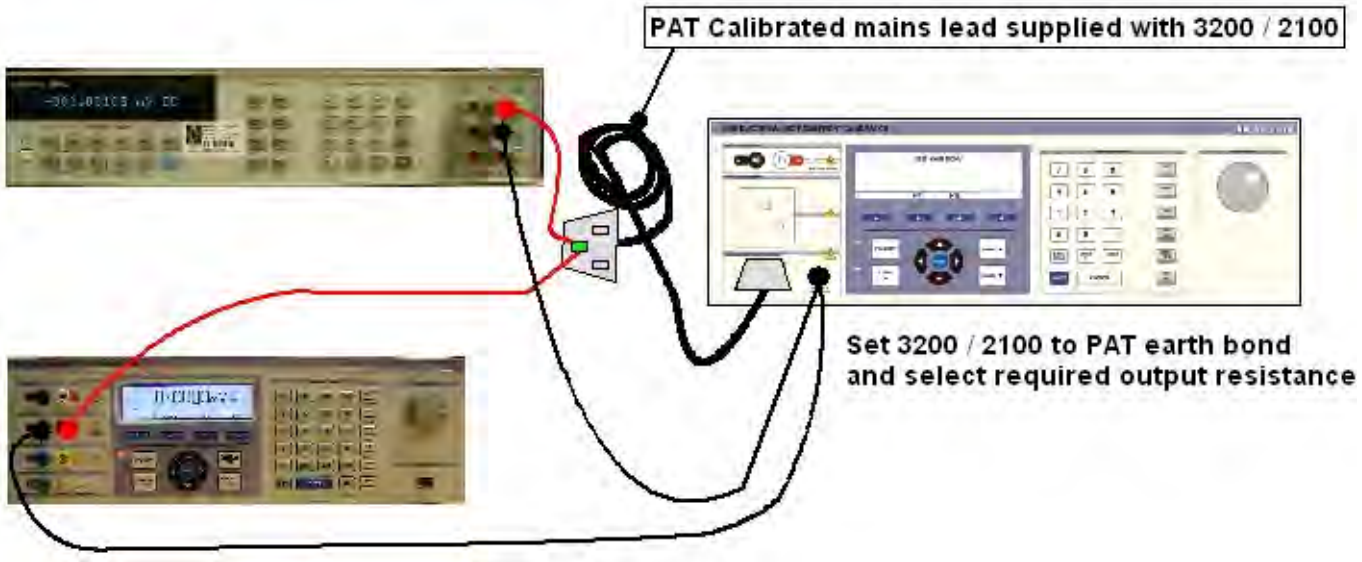
	VERIFICATION AND CALIBRATION PROCEDURES ARE FOR USE BY QUALIFIED TECHNICIANS ONLY – OBSERVE ALL PRECAUTIONS DURING CONNECTION AND MEASUREMENT OF LINE HIGH VOLTAGES

Equipment Required	Comments
DC Voltage meter	
DC Current Source	Capable of sourcing up to1A DC

Connections

PAT Earth Bond Resistance

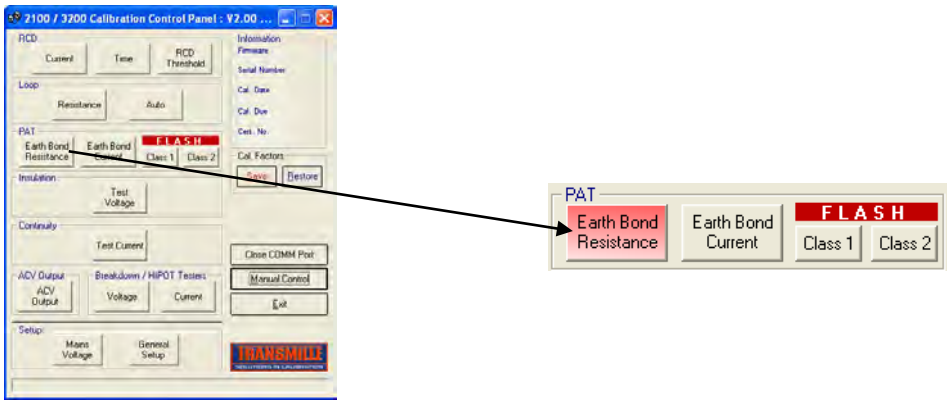
Earth bond resistance should be measured by passing a known current through the resistor and measuring the voltage drop. Resistance can be calculated using ohms law, V/I=R. The connection must be as shown below, measured using 4 terminals method, (Kelvin) from the earth bond terminal on the front of the 3200 / 2100 to the Earth pin on the end of the calibrated lead supplied



Calibration Method

1. Connect 2100 / 3200 Series to meter as per diagram using **LEAD SET G**

2. Select PAT Earth Bond Resistance mode on 2100 / 3200 Series CCP
   this will set the 2100 / 3200 Series to **0Ohms Output** initially

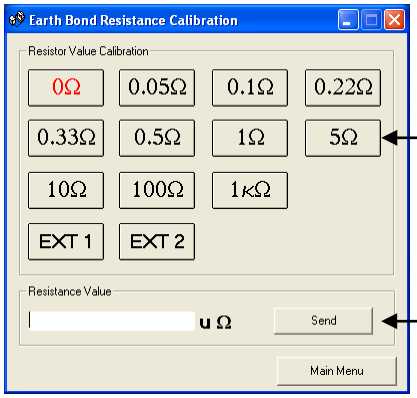


3. Set the current source to the current as specified in the table below and measure **voltage drop**

Loop Resistance Value	Current Setting
1 kOhm	1mA
100 Ohms	10mA
10 Ohms	100mA
< 5 Ohms	1A

4. Calculate resistance value using Ohms Law (V/I = R)

5. Enter calculated resistance into resistance value box on CCP <u>in uOhms</u> and click **SEND**



<u>RANGE SELECTION</u>

Select range to be calibrated here

<u>ADJUSTMENT CONTROL</u>

Adjust cal factor using up/down buttons – note using the up/down button automatically sends cal factor to calibrator, the send button is needed only if a cal factor is manually typed into the cal factor value box.

6. Repeat steps 3 to 5 for all resistance values.

Verification Test Points

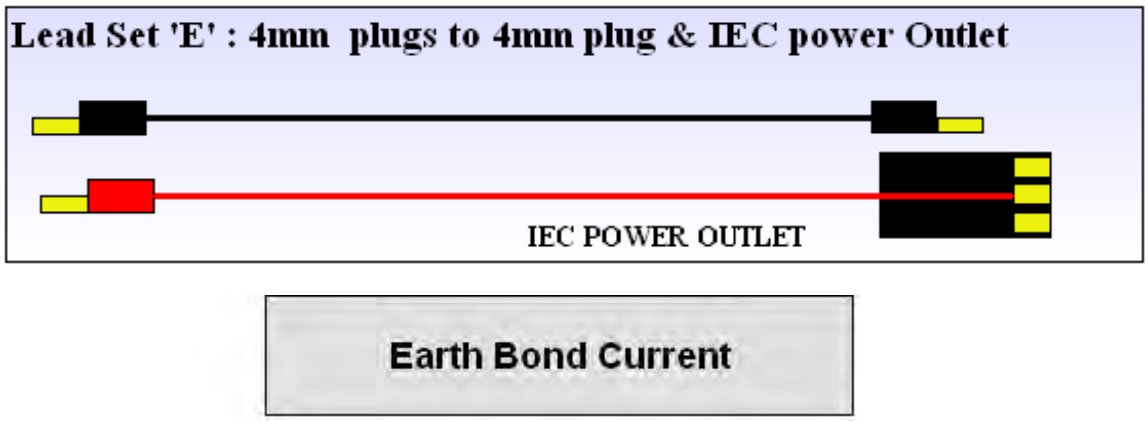
See Performance Verifications Sheet Page 7

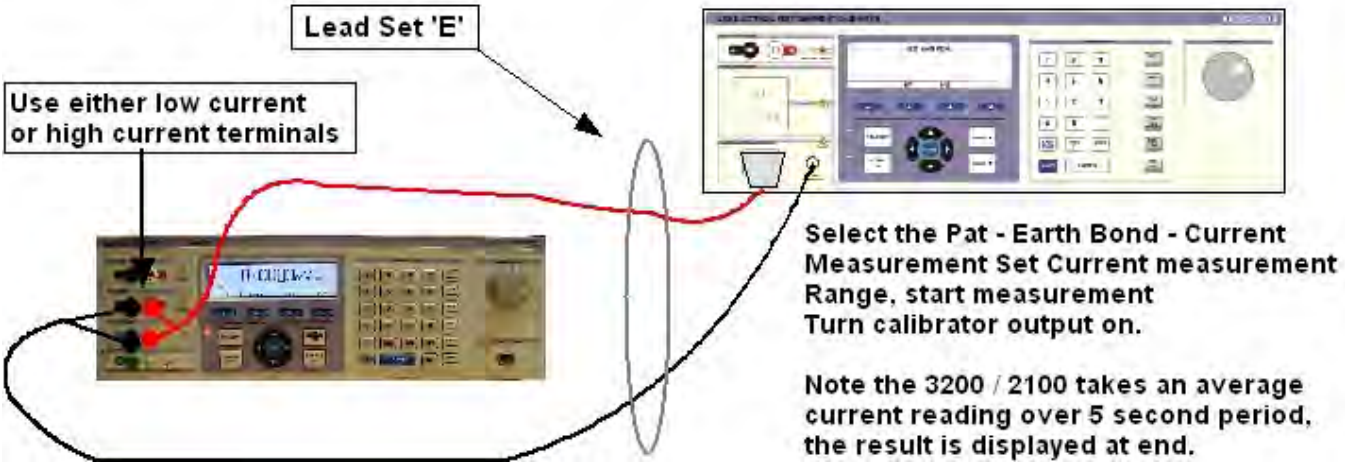
PAT Earth Bond Current Function

	VERIFICATION AND CALIBRATION PROCEDURES ARE FOR USE BY QUALIFIED TECHNICIANS ONLY – OBSERVE ALL PRECAUTIONS DURING CONNECTION AND MEASUREMENT OF LINE HIGH VOLTAGES

Equipment Required	Comments
DC Current Source	Capable of sourcing up to 20A DC

Connections

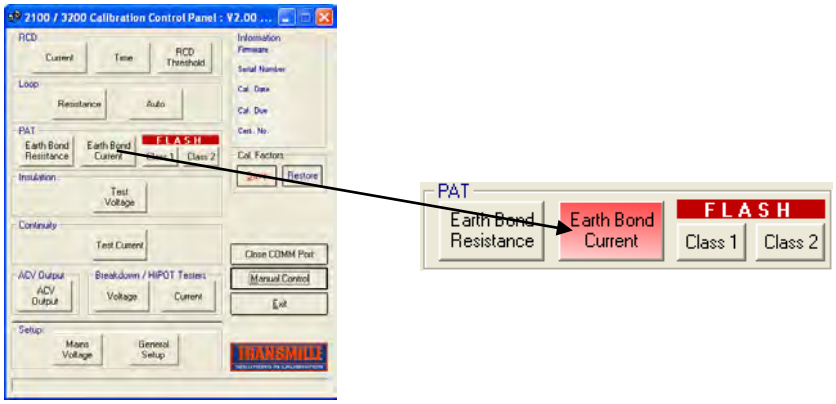




Calibration Method

1. Connect 2100 / 3200 Series to meter as per diagram using **LEAD SET E**

2. Select PAT Earth Current mode on 2100 / 3200 Series CCP
   this will set the 2100 / 3200 Series to **100mA Range** initially



3. Set the current source to the current as specified in the table below :

Earth Bond current Range	Current Setting
100mA	100mA
10A	10A
30A	20A

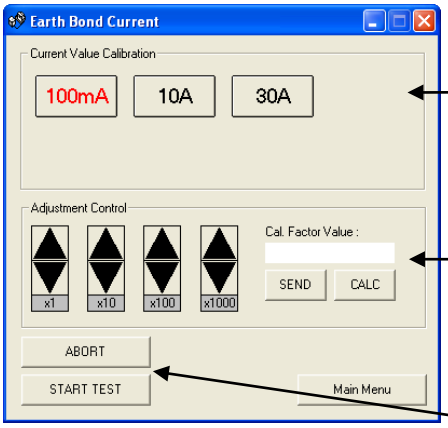
4. Press the START TEST button on the 2100/3200 CCP PAT Earth Bond Current screen to begin the 5s test.

Note : To abort the test at any time press ABORT

5. When the test has completed check the measured value displayed by the 2100 / 3200 Series.

If adjustment is required use CALC the button to automatically calculate the cal factor.

6. Press START TEST to re-run the test to confirm the cal factor is correct



RANGE SELECTION

Select range to be calibrated here

ADJUSTMENT CONTROL

Adjust cal factor using up/down buttons – note using the up/down button automatically sends cal factor to calibrator, the send button is needed only if a cal factor is manually typed into the cal factor value box.

START/ABORT TEST CONTROL

Use these buttons to start or stop the Earth Bond Current test sequence.

7. Repeat steps 3 to 6 for all current ranges.

Verification Test Points

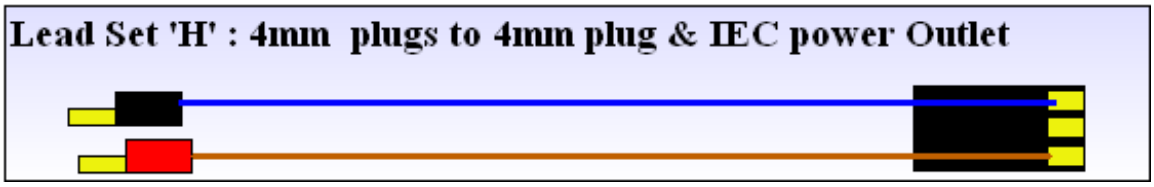
See Performance Verifications Sheet Page 7

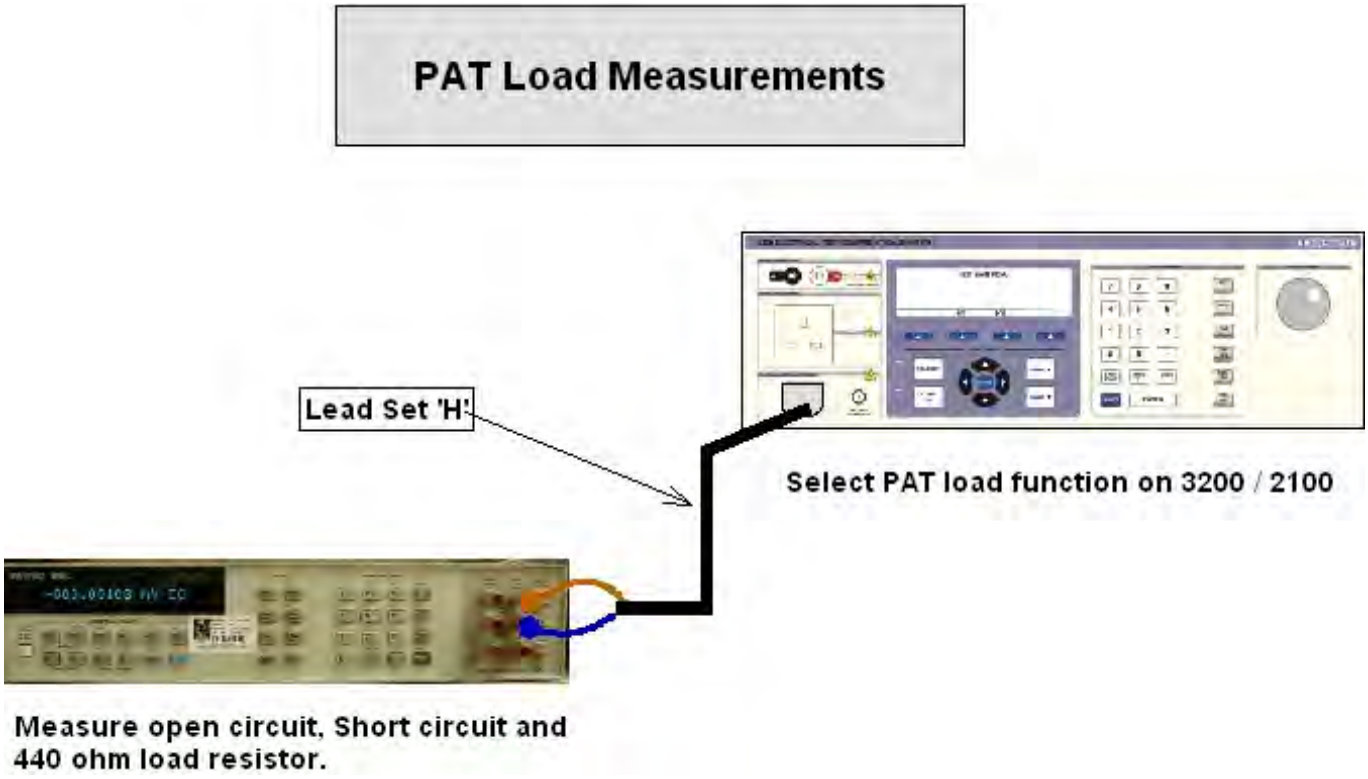
PAT Load Function

	VERIFICATION AND CALIBRATION PROCEDURES ARE FOR USE BY QUALIFIED TECHNICIANS ONLY – OBSERVE ALL PRECAUTIONS DURING CONNECTION AND MEASUREMENT OF LINE HIGH VOLTAGES

Equipment Required	Comments
Resistance Meter	

Connections





Verification Method

1. Connect 2100 / 3200 Series to meter as per diagram using **LEAD SET H**

2. Select PAT mode on 2100 / 3200 Series using front panel

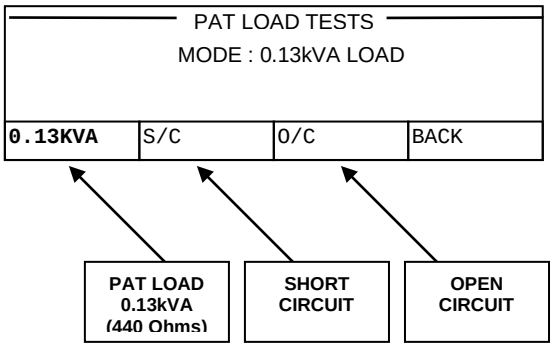
3. Select the **NEXT** button to move to the next menu

PAT TESTING			
CONNECT PAT TO IEC INLET SOCKET			
BOND RES	BOND I	INS RES	**NEXT**

4. Select the **LOAD** function using the soft key on the 2100 / 3200 Series

PAT TESTING			
CONNECT PAT TO IEC INLET SOCKET			
LOAD	FLASH	LEAKAGE	BACK

5. Select **0.13kVA** – reading on meter should be **440kOhms**
6. Select **S/C** (short circuit)
7. Select **O/C** (open circuit)



Verification Test Points

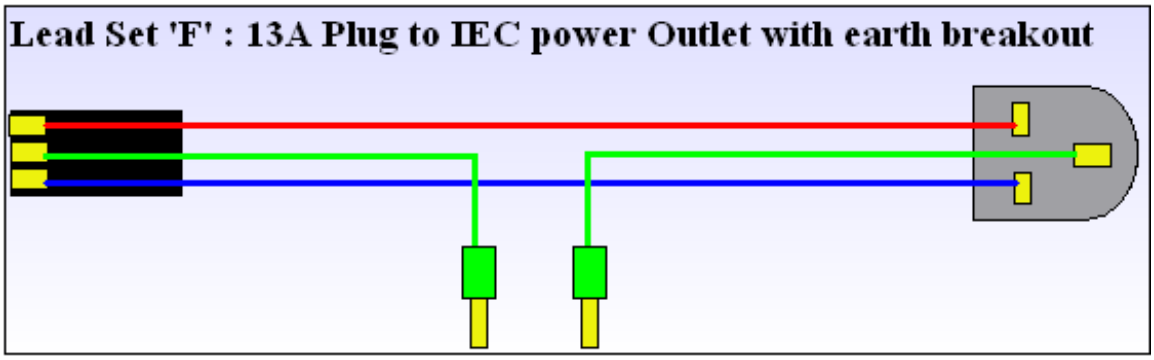
See Performance Verifications Sheet Page 7

PAT Leakage Current Function

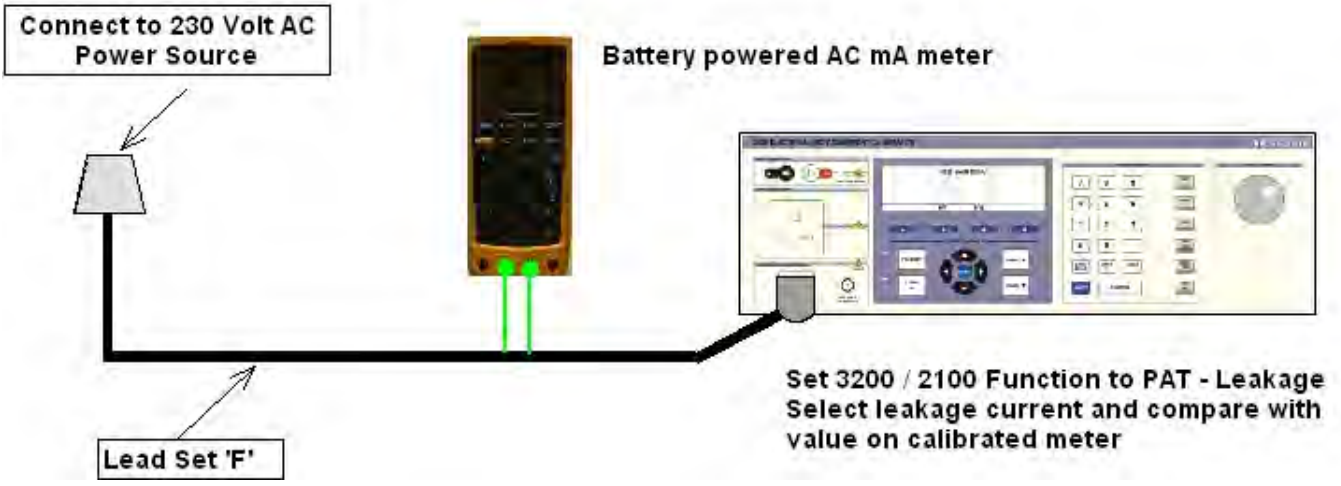
VERIFICATION AND CALIBRATION PROCEDURES ARE FOR USE BY QUALIFIED TECHNICIANS ONLY – OBSERVE ALL PRECAUTIONS DURING CONNECTION AND MEASUREMENT OF LINE HIGH VOLTAGES

Equipment Required	Comments
AC Current Meter	Battery powered meter required

Connections



PAT Leakage Current



Verification Method

1. Connect 2100 / 3200 Series to meter as per diagram using **LEAD SET F**

2. Select PAT mode on 2100 / 3200 Series using front panel

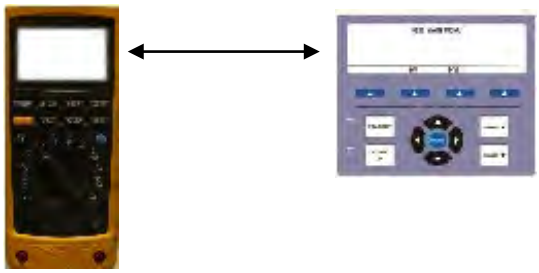
3. Select the **NEXT** button to move to the next menu

PAT TESTING			
CONNECT PAT TO IEC INLET SOCKET			
BOND RES	BOND I	INS RES	**NEXT**

4. Select the **LEAKAGE** using soft key

PAT TESTING			
CONNECT PAT TO IEC INLET SOCKET			
LOAD	FLASH	**LEAKAGE**	BACK

4. Compare current measured on battery powered meter with value displayed on 2100 / 3200 Series calibrator



Verification Test Points

See Performance Verifications Sheet Page 8

APPENDIX A

Transmille 3200A Electrical Test Calibrator

PERFORMANCE VERIFICATION

SERIAL NUMBER

DATE 12-October-2011

TESTED BY

No	TITLE	TEST	FREQ	ACCURACY % READING	% FS	ZERO	=	TOTAL	READING	CONNECTIONS / NOTES
	Insulation Resistance									
4	10kR	10kR		0.1%	-	-	=	**10R**		Connect to 3200 for Insulation Tests
5	20kR	20kR		0.1%	-	-	=	**20R**		
6	30kR	30kR		0.1%	-	-	=	**30R**		
7	40kR	40kR		0.1%	-	-	=	**40R**		
8	60kR	60kR		0.1%	-	-	=	**60R**		
9	100kR	100kR		0.1%	-	-	=	**100R**		
10	200kR	200kR		0.1%	-	-	=	**200R**		
11	400kR	400kR		0.1%	-	-	=	**400R**		
12	600kR	600kR		0.1%	-	-	=	**600R**		
13	1MR	1MR		0.1%	-	-	=	**1kR**		
14	2MR	2MR		0.1%	-	-	=	**2kR**		
15	3MR	3MR		0.1%	-	-	=	**3kR**		
16	4MR	4MR		0.1%	-	-	=	**4kR**		
17	5MR	5MR		1%	-	-	=	**50kR**		
18	6MR	6MR		1%	-	-	=	**60kR**		
19	7MR	7MR		1%	-	-	=	**70kR**		
20	8MR	8MR		1%	-	-	=	**80kR**		
21	9MR	9MR		1%	-	-	=	**90kR**		
22	10MR	10MR		1%	-	-	=	**100kR**		
23	20MR	20MR		1%	-	-	=	**200kR**		
24	30MR	30MR		1%	-	-	=	**300kR**		
25	40MR	40MR		1%	-	-	=	**400kR**		
26	50MR	50MR		1%	-	-	=	**500kR**		

No	TITLE	TEST	FREQ	ACCURACY % READING	% FS	ZERO	=	TOTAL	READING	CONNECTIONS / NOTES
27	60MR	60MR		1%	-	-	=	**600kR**		
28	70MR	70MR		1%	-	-	=	**700kR**		
29	80MR	80MR		1%	-	-	=	**800kR**		
30	90MR	90MR		1%	-	-	=	**900kR**		
31	100MR	100MR		1%	-	-	=	**1MR**		
32	200MR	200MR		1%	-	-	=	**2MR**		
33	400MR	400MR		1%	-	-	=	**4MR**		
34	600MR	600MR		1%	-	-	=	**6MR**		
35	800MR	800MR		1%	-	-	=	**8MR**		
36	1GR	1GR		1%	-	-	=	**10MR**		
37	2GR#	2GR		1%	-	-	=	**20MR**		
	10G Ohm Option									
40	4GR#	4GR		5%	-	-	=	**200MR**		
41	6GR#	6GR		5%	-	-	=	**300MR**		
42	8GR#	8GR		5%	-	-	=	**400MR**		
43	10GR#	10GR		5%	-	-	=	**500MR**		
	Continuity Resistance									
	Connection to the 3200 insulation test terminals was made using 4 wire ohms									
	with the system nulled when shorted at the terminals. The readings									
	recorded are the resistance measured at the terminals and include									
	any residual resistance of the 3200.									
51	20mR	20mR		0.25%	-	25mR	=	**25.1mR**		Connect in 4-wire configuration
53	200mR	200mR		0.25%	-	25mR	=	**25.5mR**		Continuity 0.2R - 1kR
54	210mR	210mR		0.25%	-	25mR	=	**25.5mR**		
55	220mR	220mR		0.25%	-	25mR	=	**25.6mR**		

				ACCURACY						
No	*TITLE*	*TEST*	*FREQ*	*% READING*	*% FS*	*ZERO*	=	*TOTAL*	*READING*	*CONNECTIONS / NOTES*
56	230mR	230mR		0.25%	-	25mR	=	**25.6mR**		
57	240mR	240mR		0.25%	-	25mR	=	**25.6mR**		
58	250mR	250mR		0.25%	-	25mR	=	**25.6mR**		
59	260mR	260mR		0.25%	-	25mR	=	**25.7mR**		
60	270mR	270mR		0.25%	-	25mR	=	**25.7mR**		
61	280mR	280mR		0.25%	-	25mR	=	**25.7mR**		
62	290mR	290mR		0.25%	-	25mR	=	**25.7mR**		
63	300mR	300mR		0.25%	-	25mR	=	**25.8mR**		
64	400mR	400mR		0.25%	-	25mR	=	**26mR**		
65	500mR	500mR		0.25%	-	25mR	=	**26.3mR**		
66	600mR	600mR		0.25%	-	25mR	=	**26.5mR**		
67	700mR	700mR		0.25%	-	25mR	=	**26.8mR**		
68	800mR	800mR		0.25%	-	25mR	=	**27mR**		
69	900mR	900mR		0.25%	-	25mR	=	**27.3mR**		
70	1R	1R		0.25%	-	25mR	=	**27.5mR**		
71	2R	2R		0.25%	-	25mR	=	**30mR**		
72	4R	4R		0.25%	-	25mR	=	**35mR**		
73	6R	6R		0.25%	-	25mR	=	**40mR**		
74	8R	8R		0.25%	-	25mR	=	**45mR**		
75	10R	10R		0.25%	-	25mR	=	**50mR**		
76	20R	20R		0.25%	-	25mR	=	**75mR**		
77	100R	100R		0.25%	-	25mR	=	**275mR**		
78	1kR	1kR		0.25%	-	25mR	=	**2.5R**		
	Continuity Current									
84	50mA	50mA		1.3%	-	-	=	**1.3mA**		
85	100mA	100mA		1.3%	-	-	=	**1.9mA**		
86	200mA	200mA		1.3%	-	-	=	**3.2mA**		

No	TITLE	TEST	FREQ	ACCURACY % READING	% FS	ZERO	=	TOTAL	READING	CONNECTIONS / NOTES
87	300mA	300mA		1.3%	-	-	=	**4.5mA**		
	AC Voltage Output									
96	100 Volts Nom @ 50Hz	100V		0.2%	-	-	=	**200mV**		Measure 100V A.C. O/P from 3200 with DMM
97	200 Volts Nom @ 50Hz	200V		0.2%	-	-	=	**400mV**		Measure 200V A.C. O/P from 3200 with DMM
98	Line Volts @ 50Hz	240V		0.2%	-	-	=	**480mV**		Measure 240V A.C. O/P from 3200 with DMM
99	300 Volts Nom @ 50Hz	300V		0.2%	-	-	=	**600mV**		Measure 300V A.C. O/P from 3200 with DMM
100	400 Volts Nom @ 50Hz	400V		0.2%	-	-	=	**800mV**		Measure 400V A.C. O/P from 3200 with DMM
	Insulation Resistance Voltage Measurement									
	Insulation Resistance Voltage Measurement -16th Edition									
110	50V	50V		1%	-	-	=	**1.3V**		Connect calibrator to 3200 insulation terminals
111	100V	100V		1%	-	-	=	**1.8V**		Connect calibrator to 3200 insulation terminals
112	250V	150V		1%	-	-	=	**2.3V**		Connect calibrator to 3200 insulation terminals
113	250V	200V		1%	-	-	=	**2.8V**		Connect calibrator to 3200 insulation terminals
114	250V	250V		1%	-	-	=	**3.3V**		Connect calibrator to 3200 insulation terminals
115	500V	500V		1%	-	-	=	**5.8V**		Connect calibrator to 3200 insulation terminals
116	1000V	1000V		1%	-	-	=	**10.8V**		Connect calibrator to 3200 insulation terminals
	Insulation Resistance Current Measurement -16th Edition 500V / 1000V Ranges									
119	1.0mA @ 500V	1.000mA		1%	-	-	=	**18uA**		Connect calibrator to 3200 insulation terminals use current meter
120	1.0mA @ 1000V	1.000mA		1%	-	-	=	**18uA**		Connect calibrator to 3200 insulation terminals use current meter
	Insulation Resistance Voltage Measurement -17th Edition									
123	50V	50V		1%	-	-	=	**1.3V**		Connect calibrator to 3200 insulation terminals
124	100V	100V		1%	-	-	=	**1.8V**		Connect calibrator to 3200 insulation terminals
125	250V	150V		1%	-	-	=	**2.3V**		Connect calibrator to 3200 insulation terminals
126	250V	200V		1%	-	-	=	**2.8V**		Connect calibrator to 3200 insulation terminals
127	250V	250V		1%	-	-	=	**3.3V**		Connect calibrator to 3200 insulation terminals

				ACCURACY						
No	*TITLE*	*TEST*	*FREQ*	*% READING*	*% FS*	*ZERO*	=	*TOTAL*	*READING*	*CONNECTIONS / NOTES*
128	500V	500V		1%	-	-	=	**5.8V**		Connect calibrator to 3200 insulation terminals
129	1000V	1000V		1%	-	-	=	**10.8V**		Connect calibrator to 3200 insulation terminals
	Insulation Resistance Current Measurement -17th Edition 500V / 1000V Range									
132	0.5mA @ 500V	0.500mA		1%	-	-	=	**13uA**		Connect calibrator to 3200 insulation terminals use current meter
133	1.0mA @ 1000V	1.000mA		1%	-	-	=	**18uA**		Connect calibrator to 3200 insulation terminals use current meter
	Loop Resistance									
	Loop impedance was measured using 4 wire ohms connections									
	between the earth pin of the 3200 loop test socket and the earth pin of the									
	3200 mains supply lead. The supply loop impedance was manually entered as									
	zero and the measurement system was nulled. The recorded readings are the									
	differences recorded from the zero value.									
158	Loop Res.	0.05R		0.5%	-	4mR	=	**4.3mR**		Use High Current Terminals - 0.05R
159	Loop Res.	0.1R		0.5%	-	4mR	=	**4.5mR**		Use High Current Terminals - 0.1R
160	Loop Res.	0.22R		0.5%	-	4mR	=	**5.1mR**		Use High Current Terminals - 0.22R
161	Loop Res.	0.33R		0.5%	-	4mR	=	**5.7mR**		Use High Current Terminals - 0.33R
162	Loop Res.	0.50R		0.5%	-	4mR	=	**6.5mR**		Use High Current Terminals - 0.50R
164	Loop Res.	1R		0.5%	-	4mR	=	**9mR**		Use Low Current Terminals - 1R
166	Loop Res.	5R		0.5%	-	4mR	=	**29mR**		Use Low Current Terminals - 5R
167	Loop Res.	10R		0.5%	-	4mR	=	**54mR**		Use Low Current Terminals - 10R
169	Loop Res.	100R		0.5%	-	4mR	=	**504mR**		Use Low Current Terminals - 100R
171	Loop Res.	1000R		0.5%	-	4mR	=	**5R**		Use Low Current Terminals - 1000R
	RCD Current									
183	10mA @ 50Hz	10mA	50	1%	-	0.1mA	=	**200uA**		Connect 2100 to calibrator using RCD lead (custom test lead)
184	30mA @ 50Hz	30mA	50	1%	-	0.1mA	=	**400uA**		

No	TITLE	TEST	FREQ	ACCURACY % READING	% FS	ZERO	=	TOTAL	READING	CONNECTIONS / NOTES
185	100mA @ 50Hz	90mA	50	1%	-	0.1mA	=	**1000uA**		
186	100mA @ 50Hz	100mA	50	1%	-	0.1mA	=	**1.1mA**		
187	100mA @ 50Hz	110mA	50	1%	-	0.1mA	=	**1.2mA**		
188	300mA @ 50Hz	300mA	50	1%	-	1mA	=	**4mA**		
189	1000mA @ 50Hz	1000mA	50	1%	-	1mA	=	**11mA**		
190	2000mA @ 50Hz	2000mA	50	1%	-	1mA	=	**21mA**		
	RCD Trip current									
195	150mA @ 300mA Range	150mA	50	1%	-	1mA	=	**2.5mA**		
	RCD Trip time									
198	20ms	20ms		-	-	0.7ms	=	**700us**		
199	40ms	40ms		-	-	0.7ms	=	**700us**		
200	200ms	200ms		-	-	0.7ms	=	**700us**		
201	390ms	390ms		-	-	0.7ms	=	**700us**		
202	900ms	900ms		-	-	0.7ms	=	**700us**		
	PAT : Insulation Resistance									
	The PAT Insulation Resistance is produced from the same decade resistance arm									
	as used for the Insulation Resistance output. The following Tests are only to									
	confirm the operation of the output switching. For the Full range of values,									
	use the Insulation measurements on this certificate.									
209	1MR	1MR		0.1%	-	-	=	**1kR**		
210	2MR	2MR		0.1%	-	-	=	**2kR**		
211	4MR	4MR		0.1%	-	-	=	**4kR**		
212	6MR	6MR		1%	-	-	=	**60kR**		
213	8MR	8MR		1%	-	-	=	**80kR**		
214	10MR	10MR		1%	-	-	=	**100kR**		

No	TITLE	TEST	FREQ	ACCURACY % READING	% FS	ZERO	=	TOTAL	READING	CONNECTIONS / NOTES
	PAT : Earth Bond Resistance									
	The resistances recorded include the resistance of the									
	PAT test mains lead (approx 25milliohms)									
219	PAT Lead No	1000a		-	-	10000	=	**10000a**		Loop Lead No: <Q>
220	PAT Lead Resistance	25mR		100%	-	-	=	**25mR**		PAT Lead Resistance: <Q>
233	Bond Res.	0.00R		0.5%	-	4mR	=	**4mR**		Connect using Earth bond lead to meter negs (connect both meter pos to PAT GND)
234	Bond Res.	0.05R		0.5%	-	4mR	=	**4.3mR**		0.05R nominal resistor
235	Bond Res.	0.1R		0.5%	-	4mR	=	**4.5mR**		0.1R nominal resistor
236	Bond Res.	0.22R		0.5%	-	4mR	=	**5.1mR**		0.22R nominal resistor
237	Bond Res.	0.33R		0.5%	-	4mR	=	**5.7mR**		0.33R nominal resistor
238	Bond Res.	0.5R		0.5%	-	4mR	=	**6.5mR**		0.5R nominal resistor
239	Bond Res.	1R		0.5%	-	4mR	=	**9mR**		1R nominal resistor low current terminals
240	Bond Res.	5R		0.5%	-	4mR	=	**29mR**		5R nominal resistor low current terminals
241	Bond Res.	10R		0.5%	-	4mR	=	**54mR**		10R nominal resistor low current terminals
242	Bond Res.	100R		0.5%	-	4mR	=	**504mR**		100R nominal resistor low current terminals
243	Bond Res.	1000R		0.5%	-	4mR	=	**5R**		1000R nominal resistor low current terminals (A.C. @ 53Hz)
	PAT : Earth Bond Current									
252	500mA Rng @ 50Hz	100mA	50	1.5%	-	-	=	**7.5mA**		Connect to Calibrator 2A (Use Thick Test Leads between PAT Earth & PAT GND)
253	500mA Rng @ 50Hz	200mA	50	1.5%	-	-	=	**9mA**		Connect to Calibrator 2A (Use Thick Test Leads between PAT Earth & PAT GND)
254	500mA Rng @ 50Hz	400mA	50	1.5%	-	-	=	**12mA**		Connect to Calibrator 2A (Use Thick Test Leads between PAT Earth & PAT GND)
255	10A Rng @ 50Hz	4A	50	1.5%	-	-	=	**120mA**		CONNECT TO CALIBRATOR 20 AMP TERMINALS
256	10A Rng @ 50Hz	8A	50	1.5%	-	-	=	**180mA**		CONNECT TO CALIBRATOR 20 AMP TERMINALS
257	10A Rng @ 50Hz	10A	50	1.5%	-	-	=	**210mA**		CONNECT TO CALIBRATOR 20 AMP TERMINALS
258	30A Rng @ 50Hz	20A	50	1.5%	-	-	=	**360mA**		CONNECT TO CALIBRATOR 30 AMP TERMINALS
	PAT: LOAD TESTS									

No	TITLE	TEST	FREQ	ACCURACY % READING	% FS	ZERO	=	TOTAL	READING	CONNECTIONS / NOTES
261	S/C TEST	0R		-	-	0.50R	=	**500mR**		
262	O/C TEST	PASS		-	-	-	=			IS O/C AT O/C
263	0.13kVA TEST	440R		5%	-	-	=	**22R**		
	PAT: LEAKAGE CURRENT TEST									
266	Leakage @ 240V	2.0mA		1.5%	-	-	=	**32uA**		Use Variac and current meter
267	Leakage @ 240V	4.7mA		1.5%	-	-	=	**72.5uA**		Use Variac and current meter
268	Leakage @ 240V	7.7mA		1.5%	-	-	=	**117.5uA**		Use Variac and current meter
	End of results									

Transmille 3200A Electrical Test Calibrator

PERFORMANCE VERIFICATION

SERIAL NUMBER

DATE 12-October-2011

TESTED BY

No	TITLE	TEST	FREQ	ACCURACY % READING	% FS	ZERO	=	TOTAL	READING	CONNECTIONS / NOTES
	Insulation Resistance									
4	10kR	10kR		0.1%	-	-	=	**10R**		Connect to 3200 for Insulation Tests
5	20kR	20kR		0.1%	-	-	=	**20R**		
6	30kR	30kR		0.1%	-	-	=	**30R**		
7	40kR	40kR		0.1%	-	-	=	**40R**		
8	60kR	60kR		0.1%	-	-	=	**60R**		
9	100kR	100kR		0.1%	-	-	=	**100R**		
10	200kR	200kR		0.1%	-	-	=	**200R**		
11	400kR	400kR		0.1%	-	-	=	**400R**		
12	600kR	600kR		0.1%	-	-	=	**600R**		
13	1MR	1MR		0.1%	-	-	=	**1kR**		
14	2MR	2MR		0.1%	-	-	=	**2kR**		
15	3MR	3MR		0.1%	-	-	=	**3kR**		
16	4MR	4MR		0.1%	-	-	=	**4kR**		
17	5MR	5MR		1%	-	-	=	**50kR**		
18	6MR	6MR		1%	-	-	=	**60kR**		
19	7MR	7MR		1%	-	-	=	**70kR**		
20	8MR	8MR		1%	-	-	=	**80kR**		
21	9MR	9MR		1%	-	-	=	**90kR**		
22	10MR	10MR		1%	-	-	=	**100kR**		
23	20MR	20MR		1%	-	-	=	**200kR**		
24	30MR	30MR		1%	-	-	=	**300kR**		
25	40MR	40MR		1%	-	-	=	**400kR**		
26	50MR	50MR		1%	-	-	=	**500kR**		

No	TITLE	TEST	FREQ	ACCURACY % READING	% FS	ZERO	=	TOTAL	READING	CONNECTIONS / NOTES
27	60MR	60MR		1%	-	-	=	**600kR**		
28	70MR	70MR		1%	-	-	=	**700kR**		
29	80MR	80MR		1%	-	-	=	**800kR**		
30	90MR	90MR		1%	-	-	=	**900kR**		
31	100MR	100MR		1%	-	-	=	**1MR**		
32	200MR	200MR		1%	-	-	=	**2MR**		
33	400MR	400MR		1%	-	-	=	**4MR**		
34	600MR	600MR		1%	-	-	=	**6MR**		
35	800MR	800MR		1%	-	-	=	**8MR**		
36	1GR	1GR		1%	-	-	=	**10MR**		
37	2GR#	2GR		1%	-	-	=	**20MR**		
	10G Ohm Option									
40	4GR#	4GR		5%	-	-	=	**200MR**		
41	6GR#	6GR		5%	-	-	=	**300MR**		
42	8GR#	8GR		5%	-	-	=	**400MR**		
43	10GR#	10GR		5%	-	-	=	**500MR**		
	Continuity Resistance									
	Connection to the 3200 insulation test terminals was made using 4 wire ohms									
	with the system nulled when shorted at the terminals. The readings									
	recorded are the resistance measured at the terminals and include									
	any residual resistance of the 3200.									
51	20mR	20mR		0.25%	-	25mR	=	**25.1mR**		Connect in 4-wire configuration
53	200mR	200mR		0.25%	-	25mR	=	**25.5mR**		Continuity 0.2R - 1kR
54	210mR	210mR		0.25%	-	25mR	=	**25.5mR**		
55	220mR	220mR		0.25%	-	25mR	=	**25.6mR**		

				ACCURACY						
No	*TITLE*	*TEST*	*FREQ*	*% READING*	*% FS*	*ZERO*	=	*TOTAL*	*READING*	*CONNECTIONS / NOTES*
56	230mR	230mR		0.25%	-	25mR	=	**25.6mR**		
57	240mR	240mR		0.25%	-	25mR	=	**25.6mR**		
58	250mR	250mR		0.25%	-	25mR	=	**25.6mR**		
59	260mR	260mR		0.25%	-	25mR	=	**25.7mR**		
60	270mR	270mR		0.25%	-	25mR	=	**25.7mR**		
61	280mR	280mR		0.25%	-	25mR	=	**25.7mR**		
62	290mR	290mR		0.25%	-	25mR	=	**25.7mR**		
63	300mR	300mR		0.25%	-	25mR	=	**25.8mR**		
64	400mR	400mR		0.25%	-	25mR	=	**26mR**		
65	500mR	500mR		0.25%	-	25mR	=	**26.3mR**		
66	600mR	600mR		0.25%	-	25mR	=	**26.5mR**		
67	700mR	700mR		0.25%	-	25mR	=	**26.8mR**		
68	800mR	800mR		0.25%	-	25mR	=	**27mR**		
69	900mR	900mR		0.25%	-	25mR	=	**27.3mR**		
70	1R	1R		0.25%	-	25mR	=	**27.5mR**		
71	2R	2R		0.25%	-	25mR	=	**30mR**		
72	4R	4R		0.25%	-	25mR	=	**35mR**		
73	6R	6R		0.25%	-	25mR	=	**40mR**		
74	8R	8R		0.25%	-	25mR	=	**45mR**		
75	10R	10R		0.25%	-	25mR	=	**50mR**		
76	20R	20R		0.25%	-	25mR	=	**75mR**		
77	100R	100R		0.25%	-	25mR	=	**275mR**		
78	1kR	1kR		0.25%	-	25mR	=	**2.5R**		
	Continuity Current									
84	50mA	50mA		1.3%	-	-	=	**1.3mA**		
85	100mA	100mA		1.3%	-	-	=	**1.9mA**		
86	200mA	200mA		1.3%	-	-	=	**3.2mA**		

No	TITLE	TEST	FREQ	ACCURACY % READING	% FS	ZERO	=	TOTAL	READING	CONNECTIONS / NOTES
87	300mA	300mA		1.3%	-	-	=	**4.5mA**		
	AC Voltage Output									
96	100 Volts Nom @ 50Hz	100V		0.2%	-	-	=	**200mV**		Measure 100V A.C. O/P from 3200 with DMM
97	200 Volts Nom @ 50Hz	200V		0.2%	-	-	=	**400mV**		Measure 200V A.C. O/P from 3200 with DMM
98	Line Volts @ 50Hz	240V		0.2%	-	-	=	**480mV**		Measure 240V A.C. O/P from 3200 with DMM
99	300 Volts Nom @ 50Hz	300V		0.2%	-	-	=	**600mV**		Measure 300V A.C. O/P from 3200 with DMM
100	400 Volts Nom @ 50Hz	400V		0.2%	-	-	=	**800mV**		Measure 400V A.C. O/P from 3200 with DMM
	Insulation Resistance Voltage Measurement									
	Insulation Resistance Voltage Measurement -16th Edition									
110	50V	50V		1%	-	-	=	**1.3V**		Connect calibrator to 3200 insulation terminals
111	100V	100V		1%	-	-	=	**1.8V**		Connect calibrator to 3200 insulation terminals
112	250V	150V		1%	-	-	=	**2.3V**		Connect calibrator to 3200 insulation terminals
113	250V	200V		1%	-	-	=	**2.8V**		Connect calibrator to 3200 insulation terminals
114	250V	250V		1%	-	-	=	**3.3V**		Connect calibrator to 3200 insulation terminals
115	500V	500V		1%	-	-	=	**5.8V**		Connect calibrator to 3200 insulation terminals
116	1000V	1000V		1%	-	-	=	**10.8V**		Connect calibrator to 3200 insulation terminals
	Insulation Resistance Current Measurement -16th Edition 500V / 1000V Ranges									
119	1.0mA @ 500V	1.000mA		1%	-	-	=	**18uA**		Connect calibrator to 3200 insulation terminals use current meter
120	1.0mA @ 1000V	1.000mA		1%	-	-	=	**18uA**		Connect calibrator to 3200 insulation terminals use current meter
	Insulation Resistance Voltage Measurement -17th Edition									
123	50V	50V		1%	-	-	=	**1.3V**		Connect calibrator to 3200 insulation terminals
124	100V	100V		1%	-	-	=	**1.8V**		Connect calibrator to 3200 insulation terminals
125	250V	150V		1%	-	-	=	**2.3V**		Connect calibrator to 3200 insulation terminals
126	250V	200V		1%	-	-	=	**2.8V**		Connect calibrator to 3200 insulation terminals
127	250V	250V		1%	-	-	=	**3.3V**		Connect calibrator to 3200 insulation terminals

				ACCURACY						
No	*TITLE*	*TEST*	*FREQ*	*% READING*	*% FS*	*ZERO*	=	*TOTAL*	*READING*	*CONNECTIONS / NOTES*
128	500V	500V		1%	-	-	=	**5.8V**		Connect calibrator to 3200 insulation terminals
129	1000V	1000V		1%	-	-	=	**10.8V**		Connect calibrator to 3200 insulation terminals
	Insulation Resistance Current Measurement -17th Edition 500V / 1000V Range									
132	0.5mA @ 500V	0.500mA		1%	-	-	=	**13uA**		Connect calibrator to 3200 insulation terminals use current meter
133	1.0mA @ 1000V	1.000mA		1%	-	-	=	**18uA**		Connect calibrator to 3200 insulation terminals use current meter
	Loop Resistance									
	Loop impedance was measured using 4 wire ohms connections									
	between the earth pin of the 3200 loop test socket and the earth pin of the									
	3200 mains supply lead. The supply loop impedance was manually entered as									
	zero and the measurement system was nulled. The recorded readings are the									
	differences recorded from the zero value.									
158	Loop Res.	0.05R		0.5%	-	4mR	=	**4.3mR**		Use High Current Terminals - 0.05R
159	Loop Res.	0.1R		0.5%	-	4mR	=	**4.5mR**		Use High Current Terminals - 0.1R
160	Loop Res.	0.22R		0.5%	-	4mR	=	**5.1mR**		Use High Current Terminals - 0.22R
161	Loop Res.	0.33R		0.5%	-	4mR	=	**5.7mR**		Use High Current Terminals - 0.33R
162	Loop Res.	0.50R		0.5%	-	4mR	=	**6.5mR**		Use High Current Terminals - 0.50R
164	Loop Res.	1R		0.5%	-	4mR	=	**9mR**		Use Low Current Terminals - 1R
166	Loop Res.	5R		0.5%	-	4mR	=	**29mR**		Use Low Current Terminals - 5R
167	Loop Res.	10R		0.5%	-	4mR	=	**54mR**		Use Low Current Terminals - 10R
169	Loop Res.	100R		0.5%	-	4mR	=	**504mR**		Use Low Current Terminals - 100R
171	Loop Res.	1000R		0.5%	-	4mR	=	**5R**		Use Low Current Terminals - 1000R
	RCD Current									
183	10mA @ 50Hz	10mA	50	1%	-	0.1mA	=	**200uA**		Connect 2100 to calibrator using RCD lead (custom test lead)
184	30mA @ 50Hz	30mA	50	1%	-	0.1mA	=	**400uA**		

No	TITLE	TEST	FREQ	ACCURACY % READING	% FS	ZERO	=	TOTAL	READING	CONNECTIONS / NOTES
185	100mA @ 50Hz	90mA	50	1%	-	0.1mA	=	**1000uA**		
186	100mA @ 50Hz	100mA	50	1%	-	0.1mA	=	**1.1mA**		
187	100mA @ 50Hz	110mA	50	1%	-	0.1mA	=	**1.2mA**		
188	300mA @ 50Hz	300mA	50	1%	-	1mA	=	**4mA**		
189	1000mA @ 50Hz	1000mA	50	1%	-	1mA	=	**11mA**		
190	2000mA @ 50Hz	2000mA	50	1%	-	1mA	=	**21mA**		
	RCD Trip current									
195	150mA @ 300mA Range	150mA	50	1%	-	1mA	=	**2.5mA**		
	RCD Trip time									
198	20ms	20ms		-	-	0.7ms	=	**700us**		
199	40ms	40ms		-	-	0.7ms	=	**700us**		
200	200ms	200ms		-	-	0.7ms	=	**700us**		
201	390ms	390ms		-	-	0.7ms	=	**700us**		
202	900ms	900ms		-	-	0.7ms	=	**700us**		
	PAT : Insulation Resistance									
	The PAT Insulation Resistance is produced from the same decade resistance arm									
	as used for the Insulation Resistance output. The following Tests are only to									
	confirm the operation of the output switching. For the Full range of values,									
	use the Insulation measurements on this certificate.									
209	1MR	1MR		0.1%	-	-	=	**1kR**		
210	2MR	2MR		0.1%	-	-	=	**2kR**		
211	4MR	4MR		0.1%	-	-	=	**4kR**		
212	6MR	6MR		1%	-	-	=	**60kR**		
213	8MR	8MR		1%	-	-	=	**80kR**		
214	10MR	10MR		1%	-	-	=	**100kR**		

No	TITLE	TEST	FREQ	ACCURACY % READING	% FS	ZERO	=	TOTAL	READING	CONNECTIONS / NOTES
	PAT : Earth Bond Resistance									
	The resistances recorded include the resistance of the									
	PAT test mains lead (approx 25milliohms)									
219	PAT Lead No	1000a		-	-	10000	=	**10000a**		Loop Lead No: <Q>
220	PAT Lead Resistance	25mR		100%	-	-	=	**25mR**		PAT Lead Resistance: <Q>
233	Bond Res.	0.00R		0.5%	-	4mR	=	**4mR**		Connect using Earth bond lead to meter negs (connect both meter pos to PAT GND)
234	Bond Res.	0.05R		0.5%	-	4mR	=	**4.3mR**		0.05R nominal resistor
235	Bond Res.	0.1R		0.5%	-	4mR	=	**4.5mR**		0.1R nominal resistor
236	Bond Res.	0.22R		0.5%	-	4mR	=	**5.1mR**		0.22R nominal resistor
237	Bond Res.	0.33R		0.5%	-	4mR	=	**5.7mR**		0.33R nominal resistor
238	Bond Res.	0.5R		0.5%	-	4mR	=	**6.5mR**		0.5R nominal resistor
239	Bond Res.	1R		0.5%	-	4mR	=	**9mR**		1R nominal resistor low current terminals
240	Bond Res.	5R		0.5%	-	4mR	=	**29mR**		5R nominal resistor low current terminals
241	Bond Res.	10R		0.5%	-	4mR	=	**54mR**		10R nominal resistor low current terminals
242	Bond Res.	100R		0.5%	-	4mR	=	**504mR**		100R nominal resistor low current terminals
243	Bond Res.	1000R		0.5%	-	4mR	=	**5R**		1000R nominal resistor low current terminals (A.C. @ 53Hz)
	PAT : Earth Bond Current									
252	500mA Rng @ 50Hz	100mA	50	1.5%	-	-	=	**7.5mA**		Connect to Calibrator 2A (Use Thick Test Leads between PAT Earth & PAT GND)
253	500mA Rng @ 50Hz	200mA	50	1.5%	-	-	=	**9mA**		Connect to Calibrator 2A (Use Thick Test Leads between PAT Earth & PAT GND)
254	500mA Rng @ 50Hz	400mA	50	1.5%	-	-	=	**12mA**		Connect to Calibrator 2A (Use Thick Test Leads between PAT Earth & PAT GND)
255	10A Rng @ 50Hz	4A	50	1.5%	-	-	=	**120mA**		CONNECT TO CALIBRATOR 20 AMP TERMINALS
256	10A Rng @ 50Hz	8A	50	1.5%	-	-	=	**180mA**		CONNECT TO CALIBRATOR 20 AMP TERMINALS
257	10A Rng @ 50Hz	10A	50	1.5%	-	-	=	**210mA**		CONNECT TO CALIBRATOR 20 AMP TERMINALS
258	30A Rng @ 50Hz	20A	50	1.5%	-	-	=	**360mA**		CONNECT TO CALIBRATOR 30 AMP TERMINALS
	PAT: LOAD TESTS									

No	TITLE	TEST	FREQ	ACCURACY % READING	% FS	ZERO	=	TOTAL	READING	CONNECTIONS / NOTES
261	S/C TEST	0R		-	-	0.50R	=	**500mR**		
262	O/C TEST	PASS		-	-	-	=			IS O/C AT O/C
263	0.13kVA TEST	440R		5%	-	-	=	**22R**		
	PAT: LEAKAGE CURRENT TEST									
266	Leakage @ 240V	2.0mA		1.5%	-	-	=	**32uA**		Use Variac and current meter
267	Leakage @ 240V	4.7mA		1.5%	-	-	=	**72.5uA**		Use Variac and current meter
268	Leakage @ 240V	7.7mA		1.5%	-	-	=	**117.5uA**		Use Variac and current meter
	End of results									

APPENDIX B

APPENDIX B

TRANSMILLE
SOLUTIONS IN CALIBRATION



TRANSMILLE 3200B ELECTRICAL TEST EQUIPMENT CALIBRATOR

EXTENDED SPECIFICATIONS

Warm Up Time	Double the time since last used up to 20 minutes maximum	
Standard Interfaces	USB (Universal Serial Bus)	
Temperature Performance	Storage : -5°C to +60°C Operation : 0°C to +50°C	
Relative Humidity	Operation : <80% to 30°C, <70% to 40°C, <40% to 50°C Storage : <95%, non-condensing	
Altitude	Operation : 3000m (10,000ft) Maximum Transit : 12000m (40,000ft) Maximum	
EMC & Safety	The calibrator line input plug must be earthed See D.O.C for full details	
Line Power	Line Voltage : 100V or 110V or 230V Line Frequency : 50Hz / 60Hz Line Voltage Variation : -6% +10%	
Power Consumption	100 Watts	
Connections	PAT Testing Connection	1x IEC Plug
	LOOP & RCD Testing Connection	1x UK / European / Australian / USA type socket
	Insulation Tester Connection	1xBlack : 1xRed 4mm Low Thermal Sockets
	PAT Ground Connection	1x 4mm terminal post
	USB Interface	1x Female 'B' type socket
Display Information	Type	Blacklit blue on white STN Type
	Viewing Area	133mm * 39mm
	Resolution	240 x 64 dots
	Backlight Type	LED
	Brightness	230 to 260 cd/m^2
Indicators	PAT Testing Connection	Red LED above plug
	LOOP & RCD Testing Connection	Red LED above socket
	Insulation Tester Connection	Red LED above terminals
Keyboard	Rubber Key	
Fuses	Loop (Live)	5A Anti-Surge
	Mains	2A
	Loop (Neutral)	5A Anti-Surge
	RCD	2A
	ACV	100mA
	PAT	1A
	Insulation Resistance	100mA
Isolation	Outputs are opto-isolated from mains earth and the USB interface Maximum common mode voltage between earth and the low terminals 30 Volts ac/dc.	
Dimensions & Weights	Calibrator Only	43cm x 46cm x 14cm : 12kgs
	Calibrator in Shipping Box	81cm x 60cm x 35cm : 15kgs
Warranty Period	1 Year	
Recommended Service Interval	1 Year	
Supplied Connections	1x USB Interface Lead 1x 1m PAT Test Lead	
Mounting Kit (optional)	3U rack mount kit	
Case Colour	Cream (RAL9002)	

Continuity Resistance

Standard Accuracy†

Range	Type	Resolution	1 Year Accuracy		
			%	±	mΩ
0 - 9.999 Ω	Continuously Variable	1mΩ	1	±	25
10 - 99.99Ω	Continuously Variable	10mΩ	1	±	25
100 - 999.9 Ω	Continuously Variable	100mΩ	1	±	250
1 - 4.999 kΩ	Continuously Variable	1Ω	1	±	2500
5 - 50 kΩ	Continuously Variable	10Ω	1	±	25000

High Accuracy (Option)†

Range	Type	Resolution	1 Year Accuracy		
			%	±	mΩ
0 - 9.999 Ω	Continuously Variable	1mΩ	0.25	±	10
10 - 99.99Ω	Continuously Variable	10mΩ	0.25	±	10
100 - 999.9 Ω	Continuously Variable	100mΩ	0.25	±	100
1 - 4.999 kΩ	Continuously Variable	1Ω	0.25	±	1000
5 - 50 kΩ	Continuously Variable	10Ω	0.25	±	10000

Maximum Test Current 300mA
Test current maximum can be exceeded for a maximum of 5 seconds

Continuity Current Measurement

Accuracy†

Range	Load	Accuracy		
		%	±	Counts
0 to 320mA	1Ω	1.3	±	6

† Note : All specifications specified relative to calibration standards

Insulation Resistance

Standard Accuracy†

Range	Type	Resolution	Maximum Voltage/Power[1]	1 Year Accuracy %
0.01Ω to 5MΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	0.3
5.01MΩ to 2GΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	3

High Accuracy (Option)†

Range	Type	Resolution	Maximum Voltage/Power[1]	1 Year Accuracy %
0.01Ω to 5MΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	0.1
5.01MΩ to 2GΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	1

Note 1 : An option is available to increase the maximum insulation test voltage for Testers incorporating Active Guard.

IOGΩ Range (Option)†

Range	Type	Resolution	Maximum Voltage/Power[1]	1 Year Accuracy %
2GΩ to 10GΩ (Option)	Continuously Variable	10kΩ	1.1kV or 1 Watt	5

Note : Can be fitted to Standard or High accuracy models

Insulation Test Voltage Measurement

Accuracy†

Ranges	Current Load	Resolution	1 Year Accuracy %	±	Counts
50V • 100V • 250V • 500V • 1kV	0.5mA / 1mA	0.1V	1	±	8

AC Voltage Output

Accuracy†

Ranges	Resolution	1 Year Accuracy %	±	Counts
100V • 200V • 230V • 300V • 400V	0.1V	0.2	±	1

† Note : All specifications specified relative to calibration standards

RCD Trip Time

RCD Time can be selected from pre-set points or via keyboard in 10ms steps

Accuracy†

Range	Resolution	Accuracy
20ms to 5s	10ms	±0.7ms

RCD (Residual Current Device) Current Measurement

Trip Current Range 2mA to 3000mA
Current Multiplier 0.5, 1, 2, 5
3200 Keypad Input : 2mA to 1000mA in 1mA steps

Accuracy†

Range	Resolution	Series Resistance	1 Year Accuracy		
			%	±	Counts
2mA to 10mA	0.01mA	100 Ohms	1.2	±	6
10.01mA to 30mA		100 Ohms	1.2	±	6
30.1mA to 100mA		10 Ohms	1.2	±	6
100.1mA to 300mA		10 Ohms	1.2	±	6
300.1mA to 1A		1 Ohm	1.2	±	6
1.01A to 3A		0.1 Ohm	1.2	±	6

Range selection automatic, depending on trip value : All ranges 15% Overrange

Additional Features	
Current Modes	½I • I •2I •5I
Display Modes	0°, 180° of Phase & Half Wave / DC

Intelligent Protection :

The 3200 incorporates a pre-test scan where power is ramped up to the UUT - the test is automatically aborted if a faulty UUT is detected.
This avoids further damage to the UUT and safeguards the 3200.

Current measurement :

DC coupled True RMS allowing accurate measurement of both sinusoidal current and half wave (positive or negative)

Intelligent firmware captures and analyses the current waveform automatically discarding pre-test (no-trip) currents and switch on spikes automatically capturing and measuring only the true test current.

RCD Current Duration

RCD current duration is the measurement of the period the fault current flows

RCD Current Duration	
Measurement Range	10ms to 5s
Resolution	0.1ms
1 Year Timing Accuracy†	0.4ms

† Note : All specifications specified relative to calibration standards

Loop Resistance

Accuracy†

Nominal Resistance Values	Resolution	1 Year Accuracy %	±	mΩ
0.05Ω	0.1mΩ	0.5	±	4
0.1Ω	0.1mΩ	0.5	±	4
0.22Ω	0.1mΩ	0.5	±	4
0.33Ω	0.1mΩ	0.5	±	4
0.5Ω	0.1mΩ	0.5	±	4
1Ω	0.1mΩ	0.5	±	4
5Ω	0.1mΩ	0.5	±	4
10Ω	0.1mΩ	0.5	±	4
100Ω	1mΩ	0.5	±	4
1kΩ	1mΩ	0.5	±	4

Power Dissipation :

All resistors are 50W : Maximum test current for 200ms = 40A
Thermal protection is provided in the event of overheating.

Intelligent Protection :

The 3200 incorporates a pre-test scan where power is ramped up to the UUT - the test is automatically aborted if a faulty UUT is detected.
This avoids further damage to the UUT and safeguards the 3200.

Manual Loop Correction

Correction range 0.001 to 2 Ohms - manually entered using 3200 keypad

Auto Loop (Option)

The auto loop function automatically corrects for supplied loop impedance.

Maximum Correction	2Ω
Resolution	100uΩ
Accuracy	±18mΩ
Measurement Current	4A

† Note : All specifications specified relative to calibration standards

All PAT functions are isolated from mains earth to enable calibration of PAT testers which cannot function with connections to ground.

PAT Earth Bond Resistance

Accuracy†

Nominal Resistance Values	Resolution	1 Year Accuracy %	±	mΩ
0.05Ω	0.1mΩ	0.5	±	4
0.1Ω	0.1mΩ	0.5	±	4
0.22Ω	0.1mΩ	0.5	±	4
0.33Ω	0.1mΩ	0.5	±	4
0.5Ω	0.1mΩ	0.5	±	4
1Ω	0.1mΩ	0.5	±	4
5Ω	0.1mΩ	0.5	±	4
10Ω	0.1mΩ	0.5	±	4
100Ω	1mΩ	0.5	±	4
1kΩ	1mΩ	0.5	±	4

PAT Earth Bond Current Measurement

Range	Resolution	1 Year Accuracy %	±	Counts
100mA	1mA	1.5	±	6
10A	10mA	1.5	±	6
30A	10mA	1.5	±	6

Load Resistance : 0.1Ω or 0.02Ω

PAT Insulation Resistance

Standard Accuracy†

Range	Type	Resolution	Maximum Voltage/Power[1]	1 Year Accuracy %
0Ω to 5MΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	0.3
5MΩ to 2GΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	3

High Accuracy (Option)†

Range	Type	Resolution	Maximum Voltage/Power[1]	1 Year Accuracy %
0Ω to 5MΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	0.1
5MΩ to 2GΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	1

† Note : All specifications specified relative to calibration standards

PAT Leakage Current

Accuracy†

Range	Resolution	1 Year Accuracy		
		%	±	Counts
2mA	1uA	1.5	±	2
4.7mA	1uA	1.5	±	2
7.7mA	1uA	1.5	±	2

PAT Leakage Test Voltage

Accuracy†

Range (RMS)	Resolution	1 Year Accuracy		
		%	±	Counts
100V to 300V	0.01V	1.5	±	9

PAT Load Testing

Accuracy†

Range	1 Year Accuracy		
	Ohms	±	%
Short Circuit	-	-	-
Open Circuit	-	-	-
0.13kΩ	440Ω	±	5

PAT Flash Voltage Measurement (Accessory)

Accuracy†

Class	Range	Resolution	Load Resistance	1 Year Accuracy		
				%	±	Counts
Class 1 (1.5kV)	1kV to 1.8kV	1V	600kΩ (2.5mA@1.5kV)	4	±	10
Class 2 (3kV)	2kV to 3.6kV	1V	1.2MΩ (2.5mA@3kV)	4	±	10

PAT Flash Current Measurement (Accessory)

Accuracy†

Range	Resolution	1 Year Accuracy
		%
1mA to 3mA	10uA	5

† Note : All specifications specified relative to calibration standards

AC Voltage Output

Accuracy†

Ranges	Resolution	1 Year Accuracy		
		%	±	Counts
100V • 200V • 230V • 300V • 400V	0.1V	0.2	±	1

Line Voltage Measurement

Accuracy†

Range	Resolution	1 Year Accuracy		
		%	±	Counts
Nominal Line Voltage ± 30V*	0.1V	0.8	±	6

* Example - For 230V Line voltage, range is 200V to 260V

† Note : All specifications specified relative to calibration standards

AC/DC VOLTAGE MEASUREMENT

Range	Resolution	Accuracy (1 Year Rel.)		
		%	±	Counts
3kV	10V	0.5	±	3
12kV	10V	0.5	±	3

AC/DC CURRENT MEASUREMENT

Range	Resolution	Accuracy (1 Year Rel.)		
		%	±	Counts
200uA	100nA	0.5	±	4
2mA	1uA	0.5	±	3
20mA	10uA	0.5	±	3

Due to continuous development specifications may be subject to change.

We truly believe in offering Solutions in Calibration, offering bespoke solutions for calibration laboratories and manufacturers across the globe. Our mission statement is not just a phrase, it is our design and support philosophy, offering support and advice that cannot be found elsewhere with a friendly atmosphere.

Transmille was founded in 1995 as a commercial calibration service, and soon after began to develop and manufacture a range of electrical calibration products and software to answer a growing requirement for solutions to common problems. Following this small beginning, Transmille has worked year on year to provide unique equipment and software to benefit calibration laboratories and manufacturers across the globe.

Ever since releasing the very first products Transmille have continued to innovate and develop new products for the metrology community, from world first products such as the 2100 Electrical Test Equipment calibrator, through to the worlds lowest cost multi product calibrator the 1000 series.

Transmille now produce over 600+ calibration instruments per year, shipping instruments to customers ranging from National Standards Laboratories and manufacturers through to small calibration test houses around the world.

An unrivalled commitment to quality and innovation drives Transmille forwards, with a dedicated design and support team in house with a combined experience of over 60 years in manufacture and design of electrical calibration products and software.

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EXTENDED SPECIFICATIONS



3200 SERIES

ELECTRICAL TEST EQUIPMENT CALIBRATOR

TRANSMILLE
SOLUTIONS IN CALIBRATION

DECLARATION OF CONFORMITY CE

Manufacturer's Name: Transmille Ltd.
Manufacturer's Address: Unit 4, Select Business Centre
Lodge Road
Staplehurst
TN12 0QW.
United Kingdom.

Declares, that the product

Product Name: Electrical Test Calibrator
Model Number: 3200
Product Options:
This declaration covers all options of the above product(s)

Conforms with the following European Directives:

The product herewith complies with the requirements of the Low Voltage Directive 73/73EEC and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE Marking accordingly

Conforms with the following product standards:

EMC
IEC616326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998 EN55011:1991

Standard	Limit
IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995	*Group 1Class A*
IEC 61000-4-3:1995 / EN 61000-4-3:1995	*4kV CD, 8kV AD*
IEC 61000-4-4:1995 / EN 61000-4-4:1995	*3 V/m, 80-1000 MHz*
IEC 61000-4-5:1995 / EN 61000-4-5:1995	*0.5kV signal lines, 1kV power lines*
IEC 61000-4-6:1996 / EN 61000-4-6:1996	*0.5kV line-line, 1kV line-ground*
IEC 61000-4-11:1994 / EN 61000-4-11:1994	*3V, 0.15-80 MHz I cycle, 100%*
	Dips: 30% 10ms; 60% 100ms
	Interrupt > 95%@5000ms

SAFETY
IEC 61010-1:1990+A1:1992+A2:1995 / EN 61010-1:1993+A2:1995

06/03/2006

Date Of Issue

Managing Director

Revision No: 1.10 : 06/03/2006

Warm Up Time	Double the time since last used up to 20 minutes maximum	
Standard Interfaces	RS232	
Optional Interfaces	USB (Universal Serial Bus)	
Temperature Performance	Storage : -5°C to +60°C Operation : 0°C to +50°C	
Relative Humidity	Operation : <80% to 30°C, <70% to 40°C, <40% to 50°C Storage : <95%, non-condensing	
Altitude	Operation : 3000m (10,000ft) Maximum Transit : 12000m (40,000ft) Maximum	
EMC & Safety	The calibrator line input plug must be earthed See D.O.C for full details	
Line Power	Line Voltage Selectable : 110V / 230V Line Frequency : 50Hz to 60Hz Line Voltage Variation : -6% +10%	
Power Consumption	28 Watts	
Connections	PAT Testing Connection	1x IEC Plug
	LOOP & RCD Testing Connection	1x UK / European / Australian type socket
	Insulation Tester Connection	1xBlack : 1xRed 4mm Low Thermal Sockets
	PAT Ground Connection	1x 4mm terminal post
	RS232 Interface	1x Female 'D' type socket
RS232 Settings	Baud Rate	9600
	Parity	None
	Data Bits	8
	Stop Bits	1
Display Information	Type	Backlit Black on white film STN type
	Viewing Area	124.3mm * 34mm
	Resolution	256 * 94 dots
	Backlight Type	Cold fluorescent lamp
	Brightness	70 to 90 cd/m^2
Indicators	PAT Testing Connection	Red LED above plug
	LOOP & RCD Testing Connection	Red LED above socket
	Insulation Tester Connection	Red LED above terminals
Keyboard	Membrane type with tactile feedback	
Fuses	Loop (Live)	5A Anti-Surge
	Mains	2A
	Loop (Neutral)	5A Anti-Surge
	RCD	2A
	ACV	100mA
	PAT	1A
	Insulation Resistance	100mA
Isolation	Outputs are opto-isolated from mains earth and the RS-232 interface Maximum common mode voltage between earth and the low terminals 30 Volts ac/dc.	
Dimensions & Weights	Calibrator Only	45cm x 44cm x 14cm : 10kgs
Warranty Period	1 Year	
Recommended Service Interval	1 Year	
Supplied Connections	1x Serial Interface Connection 1x 1m PAT Test Lead	
Mounting Kit (optional)	3U rack mount kit	
Case Colour	Cream (RAL9002)	

Due to continuous development specifications may be subject to change.

Continuity Resistance*

Standard Accuracy - Relative to Calibration Standards Specifications

Range	Type	Resolution	Accuracy		
			%	±	mΩ
0.2Ω to 20Ω	Continuously Variable	10mΩ	1	±	25
100Ω	Fixed	10mΩ	1	±	25
1kΩ	Fixed	10mΩ	1	±	25

High Accuracy (option) - Relative to Calibration Standards Specifications

Range	Type	Resolution	Accuracy		
			%	±	mΩ
0.2Ω to 20Ω	Continuously Variable	10mΩ	0.25	±	25
100Ω	Fixed	10mΩ	0.25	±	25
1kΩ	Fixed	10mΩ	0.25	±	25

*** Maximum Test Current 300mA**
Test current maximum can be exceeded for a maximum of 5 seconds

Continuity Current Measurement

Accuracy - Relative to Calibration Standards Specifications

Range	Load	Accuracy		
		%	±	Counts
0 to 320mA	1Ω	1.3	±	6

Due to continuous development specifications may be subject to change.

Insulation Resistance

Standard Accuracy - Relative to Calibration Standards Specifications

Range	Type	Resolution	Maximum Voltage/Power[1]	Accuracy %
0Ω to 5MΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	0.3
5MΩ to 2GΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	3

High Accuracy (option) - Relative to Calibration Standards Specifications

Range	Type	Resolution	Maximum Voltage/Power[1]	Accuracy %
0Ω to 5MΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	0.1
5MΩ to 2GΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	1

Note 1 : A 5kV option is available for Insulation Testers incorporating *Active Guard* .

10GΩ Range (Option) - Relative to Calibration Standards Specifications

Range	Type	Resolution	Maximum Voltage/Power[1]	Accuracy %
2GΩ to 10GΩ (Option)	Continuously Variable	10kΩ	1.1kV or 1 Watt	5

Note : Can be fitted to Standard or High accuracy models

Insulation Test Voltage Measurement

Accuracy - Relative to Calibration Standards Specifications

Ranges	Current Measurement	Resolution	Accuracy %	±	Counts
50V • 100V • 250V • 500V • 1kV	0.5mA • 1mA	0.1V	1	±	8

AC Voltage Output

Accuracy - Relative to Calibration Standards Specifications

Ranges	Accuracy %	±	Counts
100V • 200V • 230V • 300V • 400V	0.2	±	1

Resistance Multiplier Option 5KV

Multiplies resistance output of 3200 by 100

Accuracy - Relative to Calibration Standards Specifications

Range	Resolution	Maximum Voltage Peak AC+DC	Accuracy
1GOhm to 1TOhm[1]	1MOhm	10kV	1.50% ± R^{CAL}

[1]Requires 10GOhm Option fitted to 3200, otherwise maximum resistance = 200GOhms

R^{CAL} = Resistance set on 3200

Due to continuous development specifications may be subject to change.

RCD Time

Accuracy - Relative to Calibration Standards Specifications

Range	Resolution
20ms to 5s	10ms

RCD (Residual Current Device) Current

Trip Current Range 0.5 to 3000mA
Current Multiplier 0.5, 1, 2, 5
3200 Keypad Input : 1mA to 1000mA in 1mA steps

Accuracy - Relative to Calibration Standards Specifications

Range	Resolution	Time Interval*	Series Resistance	Accuracy		
	to 200mA			%	±	Counts
3mA to 10mA	0.01mA	up to 5s	100Ohms	1.2	±	6
		<190ms		5	±	20
10.1mA to 100mA	0.01mA	up to 5s	10Ohms	1.2	±	6
		<190ms		5	±	20
101mA to 1A	0.1mA	up to 5s	1Ohm	1.2	±	6
		<190ms		5	±	20
1.01A to 3A	1mA	up to 5s	0.1Ohm	1.2	±	6
		<190ms		5	±	20

Range selection automatic, depending on trip value : All ranges 15% Overrange

Additional Features	
Timing Modes	Immediate • Zero Crossing
Current Modes	½I • I •2I •5I
Display Modes	0°, 180° of Phase & Half Wave / DC

Intelligent Protection :

The 3200 incorporates a pre-test scan where power is ramped up to the UUT - the test is automatically aborted if a faulty UUT is detected.
This avoids further damage to the UUT and safeguards the 3200.

**Current measurement modes :*

Above 200ms : DC coupled True RMS allowing accurate measurement of both sinusoidal current and half wave (positive or negative)

Intelligent firmware captures and analyses the current waveform automatically discarding pre-test (no-trip) currents and switch on spikes automatically capturing and measuring only the true test current.

Fast Mode (Below 200ms) : Peak capture divided by 1.41 to give mathematically calculated RMS for sinusoidal only

RCD Current Duration

RCD current duration is the measurement of the period the fault current flows

RCD Current Duration	
Measurement Range	10ms to 5s
Resolution	0.1ms
Timing Accuracy	0.4ms

Due to continuous development specifications may be subject to change.

Loop Resistance

Accuracy - Relative to Calibration Standards Specifications

Nominal Resistance Values	Resolution	Accuracy %	±	mΩ
0.05Ω	0.1mΩ	0.5	±	4
0.1Ω	0.1mΩ	0.5	±	4
0.22Ω	0.1mΩ	0.5	±	4
0.33Ω	0.1mΩ	0.5	±	4
0.5Ω	0.1mΩ	0.5	±	4
1Ω	0.1mΩ	0.5	±	4
5Ω	0.1mΩ	0.5	±	4
10Ω	0.1mΩ	0.5	±	4
100Ω	1mΩ	0.5	±	4
1kΩ	1mΩ	0.5	±	4

Power Dissipation :

All resistors are 50W : Maximum test current for 200ms = 40A
Thermal protection is provided in the event of overheating.

Intelligent Protection :

The 3200 incorporates a pre-test scan where power is ramped up to the UUT - the test is automatically aborted if a faulty UUT is detected.
This avoids further damage to the UUT and safeguards the 3200.

Manual Loop Correction

Correction range 0.001 to 2 Ohms - manually entered using 3200 keypad

Auto Loop (Option)

The auto loop function automatically corrects for supplied loop impedance.

Maximum Correction	2Ω
Resolution	100uΩ
Accuracy	±18mΩ
Measurement Current	4A

Due to continuous development specifications may be subject to change.

All PAT functions are isolated from mains earth to enable calibration of PAT testers which cannot function with connections to ground.

PAT Earth Bond Resistance

Accuracy - Relative to Calibration Standards Specifications

Nominal Resistance Values	Resolution	Accuracy %	±	mΩ
0.05Ω	0.1mΩ	0.5	±	4
0.1Ω	0.1mΩ	0.5	±	4
0.22Ω	0.1mΩ	0.5	±	4
0.33Ω	0.1mΩ	0.5	±	4
0.5Ω	0.1mΩ	0.5	±	4
1Ω	0.1mΩ	0.5	±	4
5Ω	0.1mΩ	0.5	±	4
10Ω	0.1mΩ	0.5	±	4
100Ω	1mΩ	0.5	±	4
1kΩ	1mΩ	0.5	±	4

PAT Earth Bond Current Measurement

Range	Resolution	Accuracy %	±	Counts
100mA	1mA	1.5	±	6
10A	10mA	1.5	±	6
30A	10mA	1.5	±	6

PAT Insulation Resistance

Standard Accuracy - Relative to Calibration Standards Specifications

Range	Type	Resolution	Maximum Voltage/Power[1]	Accuracy %
0Ω to 5MΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	0.3
5MΩ to 2GΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	3

High Accuracy (Option) - Relative to Calibration Standards Specifications

Range	Type	Resolution	Maximum Voltage/Power[1]	Accuracy %
0Ω to 5MΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	0.1
5MΩ to 2GΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	1

PAT Leakage Current

Range	Resolution	Accuracy %	±	Counts
2mA	1uA	1.5	±	2
4.7mA	1uA	1.5	±	2
7.7mA	1uA	1.5	±	2

Due to continuous development specifications may be subject to change.

PAT Leakage Test Voltage

Range (RMS)	Resolution	Accuracy		
		%	±	Counts
100V to 300V	0.1V	1.5	±	9

PAT Load Testing

Range	Accuracy		
	Ohms	±	%
Short Circuit	-	-	-
Open Circuit	-	-	-
0.13kW	440Ω	±	5

PAT Flash Voltage Measurement

Class	Range	Resolution	Load Resistance	Accuracy		
				%	±	Counts
Class 1 (1.5kV)	1kV to 1.8kV	1V	600kΩ (2.5mA@1.5kV)	4	±	10
Class 2 (3kV)	2kV to 3.6kV	1V	1.2MΩ (2.5mA@3kV)	4	±	10

PAT Flash Current Measurement

Range	Resolution	Accuracy
		%
1mA to 3mA	10uA	5

Line Voltage Measurement

Range	Resolution	Accuracy
200V to 260V	0.1V	0.8% ± 6 Counts

Due to continuous development specifications may be subject to change.

AC/DC VOLTAGE MEASUREMENT

Range	Resolution	Accuracy (1 Year Rel.)		
		%	±	Counts
3kV	10V	0.5	±	3
12kV	10V	0.5	±	3

AC/DC CURRENT MEASUREMENT

Range	Resolution	Accuracy (1 Year Rel.)		
		%	±	Counts
200uA	100nA	0.5	±	4
2mA	1uA	0.5	±	3
20mA	10uA	0.5	±	3

Due to continuous development specifications may be subject to change.

2100 ELECTRICAL TEST EQUIPMENT CALIBRATOR

INTEGRATED ELECTRICAL EQUIPMENT CALIBRATION SOLUTION



EXTENDED SPECIFICATIONS

TRANSMILLE LTD., UNIT 4 SELECT BUSINESS CENTRE, LODGE ROAD, STAPLEHURST, KENT. TN12 0QW. UK.
www.transmille.com : sales@transmille.com : Tel : +44 (0) 1580 890700 : Fax : +44 (0) 1580 890711

DECLARATION OF CONFORMITY CE

Manufacturer's Name: **Transmille Ltd.**
Manufacturer's Address: **Unit 4, Select Business Centre**
Lodge Road
Staplehurst
TN12 0QW

Declares, that the product

Product Name: **Electrical Test Calibrator**
Model Number: **2100**
Product Options: **This declaration covers all options of the above product(s)**

Conforms with the following European Directives:

The product herewith complies with the requirements of the Low Voltage Directive 73/73EEC and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE Marking accordingly

Conforms with the following product standards:

EMC

Standard	**Limit**
IEC616326-1:1997+A1:1998 / EN 61326-1 :1997+A1:1998 EN55011:1991	
IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995	*Group 1 Class A*
IEC 61000-4-3:1995 / EN 61000-4-3:1995	*4kV CD, 8kV AD*
IEC 61000-4-4:1995 / EN 61000-4-4:1995	*3 V/m, 80-1000 MHz*
IEC 61000-4-5:1995 / EN 61000-4-5:1995	*0.5kV signal lines, 1kV power lines*
IEC 61000-4-6:1996 / EN 61000-4-6:1996	*0.5kV line-line, 1kV line-ground*
IEC 61000-4-11:1994 / EN 61000-4-11:1994	*3V, 0.15-80 MHz I cycle, 100%*
	Dips: 30% 10ms; 60% 100ms
	Interrupt > 95%@5000ms

SAFETY
IEC 61010-1:1990+A1:1992+A2:1995 / EN 61010-1:1993+A2:1995



12/12/2001

Revision No: 1.1
Date :12/12/2001

Managing Director

2100 General Specifications

TRANSMILLE
Solutions In Calibration

Warm Up Time	Double the time since last used up to 20 minutes maximum	
Standard Interfaces	RS232	
Optional Interfaces	USB (Universal Serial Bus)	
Temperature Performance	Storage : -5°C to +60°C Operation : 0°C to +50°C	
Relative Humidity	Operation : <80% to 30°C, <70% to 40°C, <40% to 50°C Storage : <95%, non-condensing	
Altitude	Operation : 3000m (10,000ft) Maximum Transit : 12000m (40,000ft) Maximum	
EMC & Safety	The calibrator line input plug must be earthed See D.O.C for full details	
Line Power	Line Voltage Selectable : 110V / 230V Line Frequency : 50Hz to 60Hz Line Voltage Variation : -6% +10%	
Power Consumption	28 Watts	
Connections	PAT Testing Connection	1x IEC Plug
	LOOP & RCD Testing Connection	1x IEC Socket
	Insulation Tester Connection	1xBlack : 1xRed 4mm Low Thermal Sockets
	PAT Ground Connection	1x Blue 4mm terminal post
	RS232 Interface	1x Female 'D' type socket
RS232 Settings	Baud Rate	9600
	Parity	None
	Data Bits	8
	Stop Bits	1
Display Information	Type	Backlit Black on white film STN type
	Viewing Area	124.3mm * 34mm
	Resolution	256 * 94 dots
	Backlight Type	Cold fluorescent lamp
	Brightness	70 to 90 cd/m^2
Indicators	PAT Testing Connection	Red LED above plug
	LOOP & RCD Testing Connection	Red LED above socket
	Insulation Tester Connection	Red LED above terminals
Keyboard	Membrane type with tactile feedback	
Fuses	Loop (Live)	5A Anti-Surge
	Mains	2A
	Loop (Neutral)	5A Anti-Surge
	RCD	2A
	ACV	100mA
	PAT	1A
	Insulation Resistance	100mA
Isolation	Outputs are opto-isolated from mains earth and the RS-232 interface Maximum common mode voltage between earth and the low terminals 30 Volts ac/dc.	
Dimensions & Weights	Calibrator Only	14cm x 43cm x 46cm : 8kgs
	Calibrator in Shipping Box	58cm x 56cm x 37cm : 10.5kgs
	Calibrator in Soft Carry Case	49cm x 50cm x 19cm : 11.5kgs
	Calibrator in Hard Transit case	55cm x 56cm x 26cm : 19kgs
Warranty Period	3 Years (Parts & Labour)	
Recommended Service Interval	1 Year	
Supplied Connections	1x Serial Interface Connection 1x RCD / LOOP Adaptor Lead ; 1x 1m PAT Test Lead	
Mounting Kit (optional)	3U rack mount kit	
Case Colour	Matt Dark Grey (RAL7016)	

Due to continuous development specifications may be subject to change.

Continuity Resistance

Standard Accuracy - Relative to Calibration Standards Specifications

Range	Type	Resolution	Accuracy		
			%	±	mΩ
0.1Ω to 20Ω	Continuously Variable	10mΩ	1	±	25
100Ω	Fixed	10mΩ	1	±	25
1kΩ	Fixed	10mΩ	1	±	25

High Accuracy (option) - Relative to Calibration Standards Specifications

Range	Type	Resolution	Accuracy		
			%	±	mΩ
0.1Ω to 20Ω	Continuously Variable	10mΩ	0.25	±	25
100Ω	Fixed	10mΩ	0.25	±	25
1kΩ	Fixed	10mΩ	0.25	±	25

Continuity Current Measurement

Accuracy - Relative to Calibration Standards Specifications

Range	Load	Accuracy		
		%	±	Counts
0 to 320mA	1Ω	1.3	±	6

Due to continuous development specifications may be subject to change.

Insulation Resistance

Standard Accuracy - Relative to Calibration Standards Specifications

Range	Type	Resolution	Maximum Voltage/Power[1]	Accuracy %
0Ω to 5MΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	0.3
5MΩ to 2GΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	3

High Accuracy (option) - Relative to Calibration Standards Specifications

Range	Type	Resolution	Maximum Voltage/Power[1]	Accuracy %
0Ω to 5MΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	0.1
5MΩ to 2GΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	1

Note 1 : A 5kV option is available for Insulation Testers incorporating *Active Guard* .

10GΩ Range (Option) - Relative to Calibration Standards Specifications

Range	Type	Resolution	Maximum Voltage/Power[1]	Accuracy %
2GΩ to 10GΩ (Option)	Continuously Variable	10kΩ	1.1kV or 1 Watt	5

Note : Can be fitted to Standard or High accuracy models

Insulation Test Voltage Measurement

Accuracy - Relative to Calibration Standards Specifications

Ranges	Current Measurement	Resolution	Accuracy		
			%	±	Counts
50V • 100V • 250V • 500V • 1kV	0.5mA • 1mA	0.1V	1	±	8

AC Voltage Output

Accuracy - Relative to Calibration Standards Specifications

Ranges	Accuracy		
	%	±	Counts
100V • 200V • 230V • 300V • 400V	0.2	±	1

RCD Time

Accuracy - Relative to Calibration Standards Specifications

Range	Resolution	Accuracy
20ms to 5s	10ms	± 0.7ms

RCD Current

Accuracy - Relative to Calibration Standards Specifications

Range	Resolution		Accuracy			
	to 200mA	to 3A	Setting	%	±	Counts
3mA to 3A	0.01mA	0.1mA	<190ms	5	±	20
			up to 5s	1.2	±	6

Additional Features	
Timing Modes	Immediate • Zero Crossing
Current Modes	½I • I •2I •5I
Display Modes	0° and 180° of Phase

Due to continuous development specifications may be subject to change.

Loop Resistance

Standard Accuracy - Relative to Calibration Standards Specifications

Nominal Resistance Values	Resolution	Accuracy		
		%	±	mW
0.05Ω	0.1mΩ	0.5	±	4
0.1Ω	0.1mΩ	0.5	±	4
0.22Ω	0.1mΩ	0.5	±	4
0.33Ω	0.1mΩ	0.5	±	4
0.5Ω	0.1mΩ	0.5	±	4
1Ω	0.1mΩ	0.5	±	4
5Ω	0.1mΩ	0.5	±	4
10Ω	0.1mΩ	0.5	±	4
100Ω	1mΩ	0.5	±	4
1kΩ	1mΩ	0.5	±	4

Auto Loop (Option)

The auto loop function automatically corrects for supplied loop impedance.

Maximum Correction	2Ω
Resolution	100uΩ
Accuracy	±18mΩ
Measurement Current	4A

Due to continuous development specifications may be subject to change.

PAT Earth Bond Resistance

Standard Accuracy - Relative to Calibration Standards Specifications

Nominal Resistance Values	Resolution	Accuracy		
		%	±	mΩ
0.05Ω	0.1mΩ	0.5	±	4
0.1Ω	0.1mΩ	0.5	±	4
0.22Ω	0.1mΩ	0.5	±	4
0.33Ω	0.1mΩ	0.5	±	4
0.5Ω	0.1mΩ	0.5	±	4
1Ω	0.1mΩ	0.5	±	4
5Ω	0.1mΩ	0.5	±	4
10Ω	0.1mΩ	0.5	±	4
100Ω	1mΩ	0.5	±	4
1kΩ	1mΩ	0.5	±	4

PAT Earth Bond Current Measurement

Range	Resolution	Accuracy		
		%	±	Counts
100mA	1mA	1.5	±	6
10A	10mA	1.5	±	6
30A	10mA	1.5	±	6

PAT Insulation Resistance

Standard Accuracy - Relative to Calibration Standards Specifications

Range	Type	Resolution	Maximum Voltage/Power[1]	Accuracy %
0Ω to 5MΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	0.3
5MΩ to 2GΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	3

High Accuracy (Option) - Relative to Calibration Standards Specifications

Range	Type	Resolution	Maximum Voltage/Power[1]	Accuracy %
0Ω to 5MΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	0.1
5MΩ to 2GΩ	Continuously Variable	10kΩ	1.1kV or 1 Watt	1

PAT Leakage Current

Range	Resolution	Accuracy		
		%	±	Counts
240uA	1uA	1.5	±	2
1mA	1uA	1.5	±	2
3mA	1uA	1.5	±	2

PAT Leakage Test Voltage

Range (RMS)	Resolution	Accuracy		
		%	±	Counts
100V to 300V	0.1V	1.5	±	9

PAT Load Testing

Range	Accuracy		
	Ohms	±	%
Short Circuit	-	-	-
Open Circuit	-	-	-
0.13kW	440Ω	±	5

PAT Flash Voltage Measurement

Class	Range	Resolution	Load Resistance	Accuracy		
				%	±	Counts
Class 1 (1.5kV)	1kV to 1.8kV	1V	600kΩ (2.5mA@1.5kV)	4	±	10
Class 2 (3kV)	2kV to 3.6kV	1V	1.2MΩ (2.5mA@3kV)	4	±	10

PAT Flash Current Measurement

Range	Resolution	Accuracy
		%
1mA to 3mA	10uA	5

Due to continuous development specifications may be subject to change.

Line Voltage Measurement

Range	Resolution	Accuracy
200V to 260V	0.1V	0.8% ± 6 Counts

Due to continuous development specifications may be subject to change.

TRANSMILLE

www.transmille.com

We truly believe in offering Solutions in Calibration, offering bespoke solutions for calibration laboratories and manufacturers across the globe.

Our mission statement is not just a phrase, it is our design and support philosophy, offering support and advice that cannot be found elsewhere with a friendly atmosphere.

Transmille was founded over 20 years ago as a commercial calibration service, and soon after began to develop and manufacture a range of electrical calibration products and software to answer a growing requirement for solutions to common problems. Following this small beginning, Transmille has worked year on year to provide unique equipment and software to benefit calibration laboratories and manufacturers across the globe.

Ever since releasing the very first products Transmille have continued to innovate and develop new products for the metrology community, from world first products such as the 2100 Electrical Test Equipment calibrator, through to the worlds lowest cost multi product calibrator the 1000 series.

Transmille now produce over 600+ calibration instruments per year, shipping instruments to customers ranging from National Standards Laboratories and manufacturers through to small calibration test houses around the world.

An unrivalled commitment to quality and innovation drives Transmille forwards, with a dedicated design and support team in house with a combined experience of over 60 years in manufacture and design of electrical calibration products and software.

With local distributors across the globe, we can offer one to one personalised support, no matter how large or small the customer.



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