3200A Series

Electrical Test Equipment Calibrator

Operation Manual

Version 7.00: Nov 2013

IMPORTANT NOTICE

THIS CALIBRATOR WILL REQUIRE AN UNLOCK CODE AFTER THE EVALUATION PERIOD HAS EXPIRED.

(60 Days after invoice date)

AFTER THE EVALUATION PERIOD HAS EXPIRED THE OPERATION OF THE CALIBRATOR IS LOCKED AND THE DISPLAY SHOWS A NUMBER WHICH MUST BE QUOTED TO TRANSMILLE TO RECEIVE THE UNLOCK CODE

THE UNLOCK CODE IS AVAILALBLE FROM TRANSMILLE ONLYAFTER PAYMENT HAS BEEN RECEIVED.

This code is only needs to be entered once in the life of the instrument.

Please contact Transmille or use the form in the back of the manual to obtain the code.

Transmille Ltd.
Staplehurst, Kent.
Tel: 44 (0)1580 890700 Fax: 44(0)1580 890711
Email: sales@transmille.com

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: 3200A
Product Options: This declaration covers all options of the above product(s)

Conforms to 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 to the following product standards:

EMC

EN 61326-1:1997+A1:1998 • EN55011:1991 (Group 1: Class A)

Standard	Limit
IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995	*4kV CD, 8kV AD*
IEC 61000-4-3:1995 / EN 61000-4-3:1995	*3 V/m, 80-1000 MHz*
IEC 61000-4-4:1995 / EN 61000-4-4:1995	*0.5kV signal lines, 1kV power lines*
IEC 61000-4-5:1995 / EN 61000-4-5:1995	*0.5kV line-line, 1kV line-ground*
IEC 61000-4-6:1996 / EN 61000-4-6:1996	*3V, 0.15-80 MHz / cycle, 100%*
IEC 61000-4-11:1994 / EN 61000-4-11:1994	*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

Revision No: 1.1
Date 06/03/2006

Managing Director

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3200A Electrical Test Equipment Calibrator Introduction

The 3200 Electrical Test Equipment Calibrator is a breakthrough in electrical test equipment calibration providing a complete solution for testing:

- Insulation Testers
- RCD Testers
- LOOP Testers
- Portable Appliance Testers (PATs)

Extended Functionality

The 3200A Calibrator can be enhanced with options to provide high accuracy resistance, increased resistance range (up to 10GΩ) for Insulation testers, auto loop measurement and two external resistance inputs to extend the range of available resistors.

A complete electrical test equipment calibration solution

Designed to provide an accurate cost effective portable instrument for the calibration of Insulation & Continuity testers, RCD testers, LOOP testers, Multifunction testers and Portable Appliance Testers (PAT), the 3200A calibrator can be combined with the **ProCal** Calibration System to allow automated calibration.

⚠ IMPORTANT OPERATIONAL NOTE

For correct operation the Phase (Live) and Phase (Neutral) MUST be connected round the correct way (some plugs used in non-UK countries can be connected either way round, therefore this check is necessary) For International models the 3200A automatically detects incorrect polarity and will not power on until this is corrected (function not required for UK models).

Installation & Power Requirements for the 3200A

It is necessary that for correct operation the Phase (Live) and Phase (Neutral) **MUST** be connected correctly (some plugs used in non-UK countries can be connected either way round, therefore this check will be necessary). There should only be a small voltage between Phase (Neutral) and Phase (Earth).

To keep the LOOP impedance value to a minimum, the mains input to the 3200A is hardwired to the instrument. This avoids any introduction of unnecessary impedance. It is desirable that the 3200A is connected to a supply point with low LOOP impedance as this will limit the lowest value available LOOP impedance from the 3200A using as good a quality outlet (contact wise) as possible.

Designed for use in the laboratory or portable on-site calibration.

The 3200A calibrator is suitable for use in the standards laboratory. The fast warm up time combined with the small case and low weight make the 3200A series calibrator also ideal for onsite calibration. The serial interface allows direct connection to a PC/laptop.

Retro fit options allow extra functions to be added.

Several internal retro fit options including increased resistance range (up to 10GΩ) for Insulation testers, auto loop, high accuracy resistance and external resistance input allow the user to select the most cost effective solution for the calibration work with the ability to add extra functions at a later date.

USB Interface as standard.

All functions and outputs of the 3200 calibrator are fully programmable over the USB interface. The use of the USB interface saves the cost of fitting GPIB cards to the PC, and also allows easy connection to portable PC's, reducing the set up time for on-site calibration.

Input / Output Connection

The input and output terminal configuration has been designed to enable simple connection to a full range of instrumentation. Use of a dedicated socket directly on the front panel allows resistance measurement functions such as LOOP testing to be calibrated to include residual values right up to the socket.

All outputs are isolated when not in use, with an LED indicator showing the active input / output terminal(s).

Preparing the calibrator for use.

Initial Inspection.

After shipment the calibrator should be inspected for any signs of external damage. Should external damage be found contact the carrier immediately. Do not connect a damaged instrument to the line power as this may result in internal damage. Please retain the original packaging; this should be used when returning the calibrator for service and recalibration.

Shipping Checklist

1 x USB interface lead

1 x Operation manual (this document)

1 x PAT Test Lead

1 x Adapter Connection Lead (only if option FLASH or BREAKD fitted)

Lifting and carrying the calibrator

The calibrator can be carried by one person supporting the underneath (note: observe all normal practices for health and safety when carrying). A custom carry case with shoulder strap is available if the calibrator is to be regularly transported - see options list. The calibrator should always be placed down on a firm flat surface on its base feet. Avoid knocking or banging the calibrator and always place down smoothly.

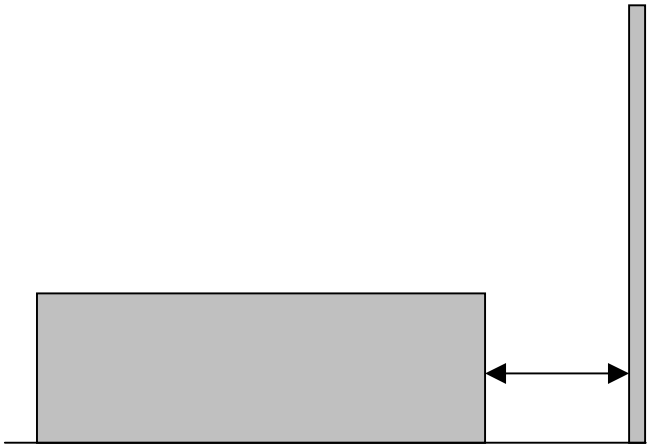
Warning

DO NOT DROP THE CALIBRATOR – This may cause internal damage

Positioning the Calibrator.

The calibrator can be used free standing on a bench or mounted in a standard 19” rack enclosure. The calibrator can be operated at any angle; the two front feet have tilt legs for bench operation.

A 2” (5cm) space behind the instrument is also required for line and interface connections (See diagram):

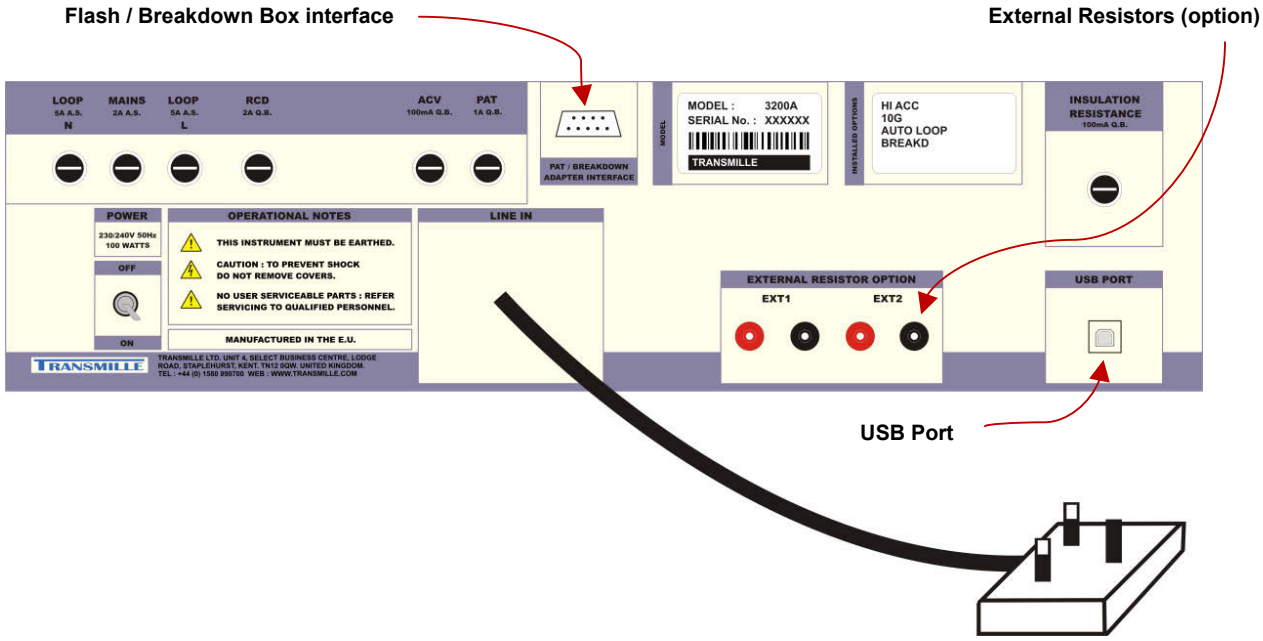


Minimum 2” (5cm) Clearance

Rear Panel Connections and Controls

Connections on the rear panel consist of a 9 Pin Serial interface connector for the computer interface; this is optically isolated from the calibrator outputs.

Fuse holders for individual instrument functions are accessible from the back of the calibrator. These are bayonet type fuse holders which allow a screwdriver to be used to turn the fuse carrier until it ‘pops’ out of the fuse holder body. The fuse carrier can then be withdrawn from the fuse holder body for inspection / replacement.



Fuse Description	Fuse Value
LOOP N (Neutral)	5A Anti Surge
MAINS	2A Anti Surge
LOOP L (Live)	5A Anti Surge
RCD	2A Quick Blow
ACV	100mA Quick Blow
PAT	100mA Quick Blow
INSULATION RESISTANCE	100mA Quick Blow

Setting and Checking the Line Voltage.

Warning

The line power cord must have an earth conductor to avoid the risk of shock. This instrument must be correctly earthed.

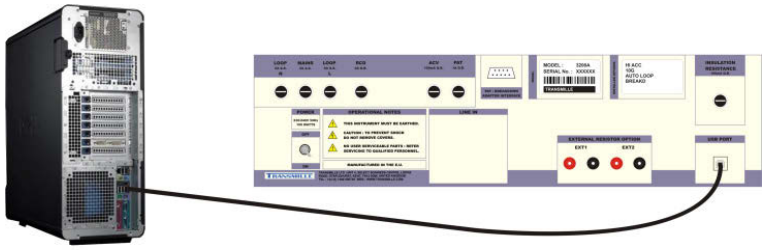
The calibrator has been designed to work from either 100-120 Volt line supply or 200 - 240 Volt line supply. Check Supply voltage as marked on the rear panel before connecting to power line. Connecting the calibrator to the wrong supply will cause internal damage to the instrument. To change the line voltage it is necessary to remove the instrument covers and rewire the transformer. The calibrator has been shipped wired for 110V operation in the USA, 230V operation in the UK and Europe.

Connecting to a computer

A USB cable (supplied) should be used to connect the calibrator to a USB port on the PC.

Connection Details

Connection from calibrator to PC :



3200 Series to PC USB Connection

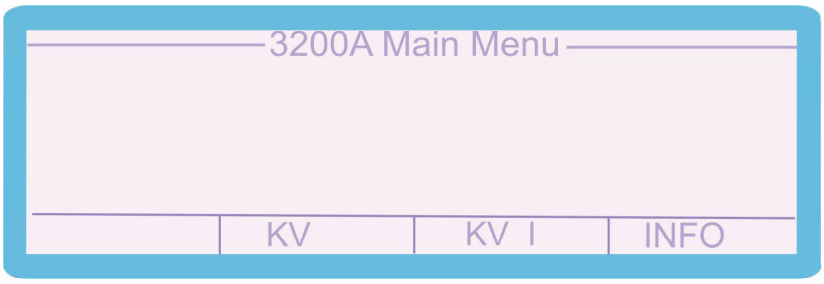
Also supplied is a USB driver on CD :

For details on installing USB driver see appendix A.

Powering up the calibrator

After connecting line power, the calibrator can be switched on with the line power switch on the rear panel.

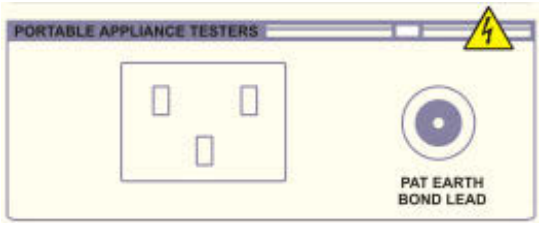
The front panel display will illuminate indicating power. The display will show program version number and after a short delay, during which time the processor performs a self-test of the instrument, the display will show the default start-up display:



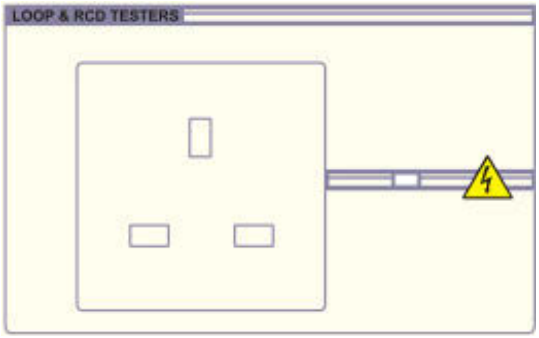
Output Connections

Warning - Risk of shock.
High voltages may be present on the output sockets.

Output sockets comprise of the following types:

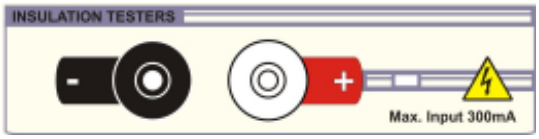


IEC 3-Pin Socket:
For use with the supplied PAT test lead.



13A Socket (UK)*:
For use directly with LOOP / RCD tester or EURO Socket* or Australian Socket*

* Fitted depending on country



4mm Safety Sockets: For connection to Insulation and Continuity Testers

Operation

SAFETY WARNINGS

This instrument is capable of generating high voltages

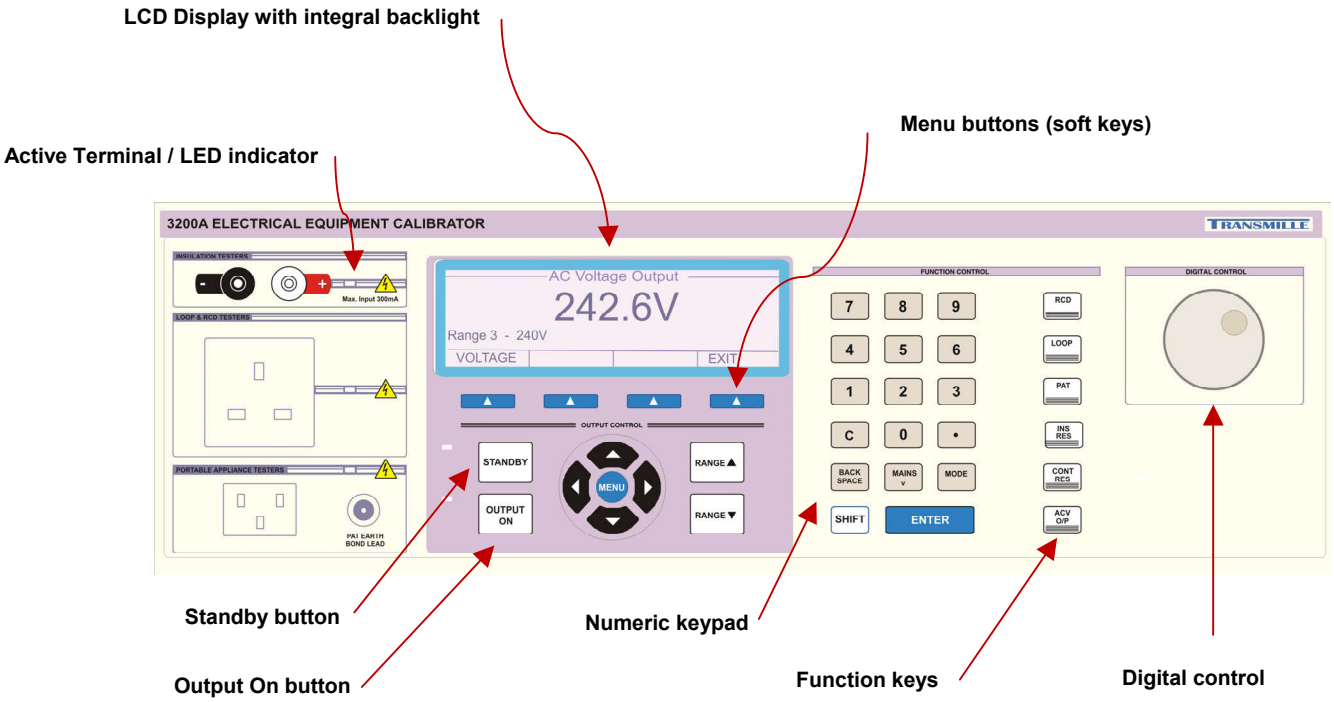
WARNING

The information in this section is intended only for qualified personnel. The user must at all times be adequately protected from electric shock. Qualified personnel must ensure that operators of the equipment are adequately insulated from connection points.

A carry-case is available for regular transportation of the calibrator.

Introduction to Operation

All functions of the 3200A Calibrator can be controlled from the front panel or controlled remotely by a computer over the USB interface.



Front Panel Keyboard

The front panel of the 3200A Calibrator utilises a high quality custom rubber keyboard with tactile feel buttons and integral display window. The front panel is therefore sealed against the ingress of moisture and dirt enabling the calibrator to be used in most working environments without risk of early failure of the operating buttons. The front panel can easily be wiped clean with a soft cloth. Care should be taken not scratch the display window. All graphics are ‘under printed’ making them rugged and durable.

IMPORTANT NOTE
The front panel key buttons are for use with fingers only - do not press the key with hard or sharp objects e.g. Ball-point pens, pencils, screwdrivers etc. Repeated actions like this will almost certainly cause the keyboard to fail. (This will not be covered under warranty). Care should also be taken when transporting the instrument, do not place test leads or other objects on top of the panel which may come into contact with the display area and cause damage.

The Keyboard is divided into sections to allow rapid operation.

The Numeric section *allowing values to be entered,*

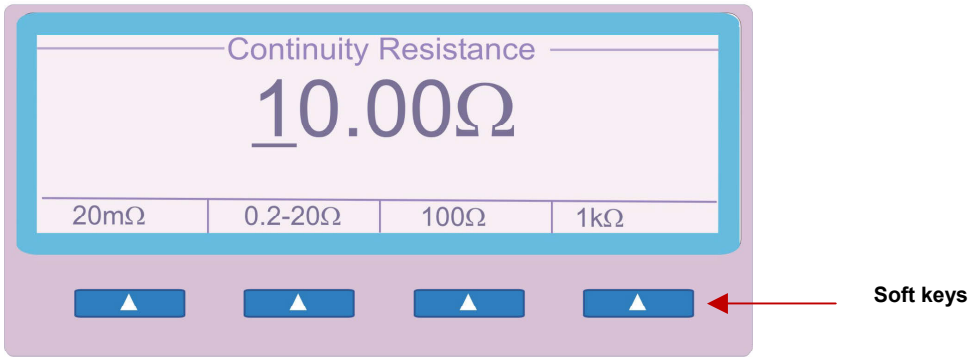
Functions keys *for RCD, LOOP, PAT, Insulation Resistance, Continuity Resistance and ACV Output*

Range up and range down keys allows range changing for the currently selected function

Left/right arrow keys select the digit to be controlled by the digital control knob.

Output on / Standby keys allow the calibrator output to be disconnected from the terminals. Led indicators are incorporated in these switches to clearly show the output status.

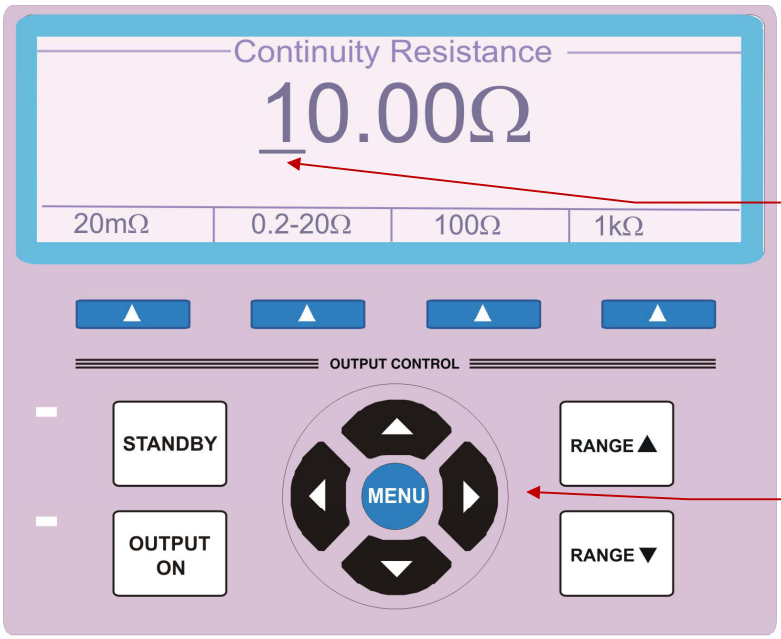
Graphic LCD Display

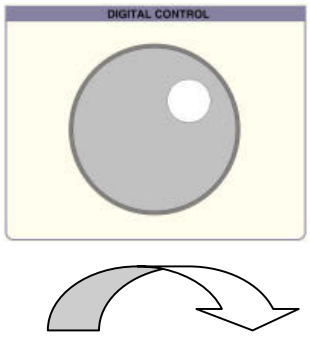
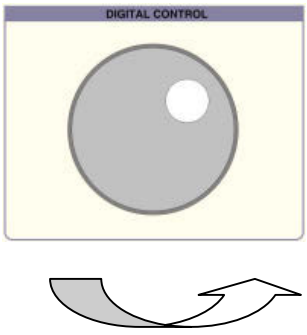


A back lit graphic LCD display shows the present setting and instrument status. The bottom line of the display is used to assign the function of the four soft keys immediately under the display. The displays back light automatically turns off if no activity takes place. The back light turns on as soon as a key is pressed or a command is received.

Using the Digital Control

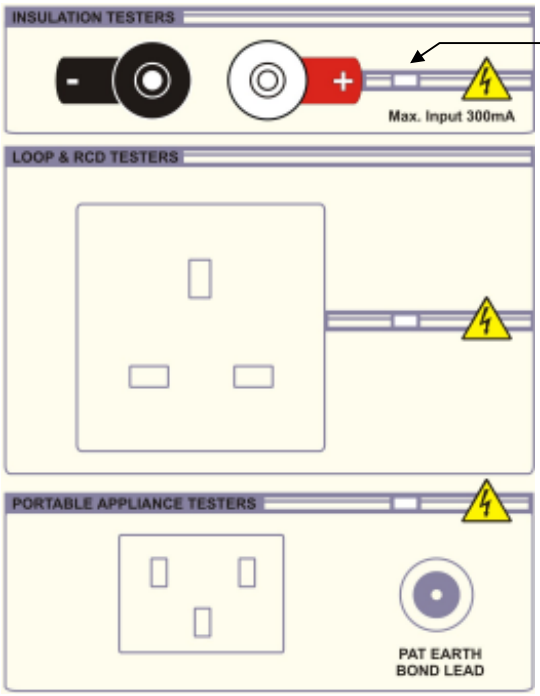
A digital potentiometer allows the 'highlighted digit' on the display to be incremented (turning clockwise) or decrement (turning anti-clockwise).



	
Clockwise Rotation (Increment Digit)	**Anti-Clockwise Rotation (Decrement Digit)**

Terminal status LEDs

LED's above the terminals indicate the active input / output.



Active terminals indicated by illuminated LED

PAT Test IEC Socket

> ***WARNING***
> **Dangerous voltage may be present on these terminals.**

LOOP & RCD TEST Socket

> ***WARNING***
> **Dangerous voltage may be present on these terminals.**

INSULATION TEST 4mm terminals

> ***WARNING***
> **Dangerous voltage may be present on these terminals.**

PAT GND Terminal Post

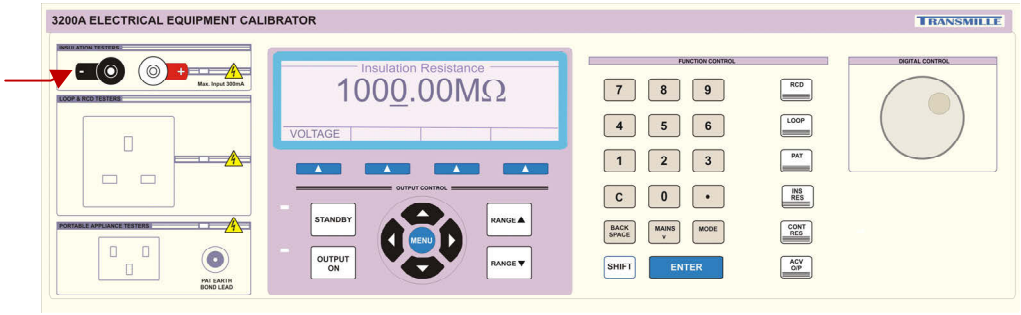
Calibrating Instruments Using the 3200A

Calibrating Insulation Testers

The 3200A has six functions for calibrating insulation and continuity testers:

1. Resistance output for insulation testing (0MΩ to 2GΩ, option to 10GΩ)
2. Measurement of insulation test voltage; ranges 50V, 100V, 250V, 500V & 1000V
3. Measurement of insulation test current (16th and 17th edition standards)
4. Resistance output for continuity testing (0.2Ω - 20.0Ω Variable, 100Ω & 1kΩ)
5. Measurement of continuity current (@ 1Ω)
6. A.C. voltage output at 100V, 200V, 240V, 300V and 400V

Use the 4mm sockets labelled INSULATION TESTERS for all insulation meter tests.



1. High Value Resistance for Insulation Testing

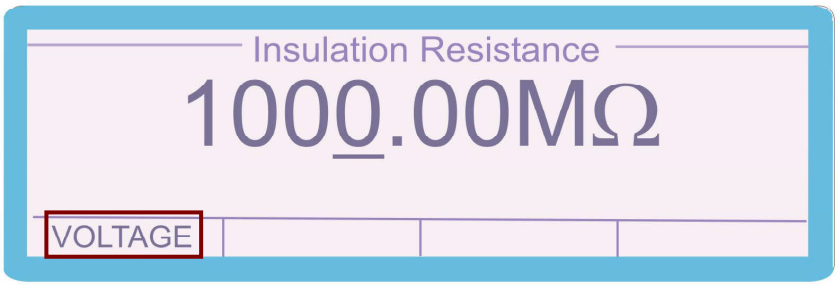
Step 1 Select ‘INS RES’ from the function key section of the 3200 front panel

Step 2 Connect the insulation tester to the Black & Red 4mm terminals.

Step 3 Enter the required resistance in MΩ from 10kΩ to 10,000MΩ on the keyboard followed by Enter. An alternative way to select the required resistance is to use the digital Control to increment / decrement the digit indicated by the cursor. The Left and Right arrow keys allow the selected digit to be changed

2. Measuring Insulation Test Voltages & Current

Step 1 From the Insulation Resistance menu displayed on the 3200A, select the VOLTAGE function using the soft key.



Step 2 Select the required voltage range using either the digital Control or the up / down arrow keys. Ranges include 50V, 100V, 250V, 500V and 1000V. The impedance of each range is automatically set to give the correct load 1mA / 0.5mA (see test current below) at the applied nominal voltage range.

RANGE	INPUT IMPEDANCE	
	1mA	0.5mA
50V	50 kOhm	100 kOhm
100V	100 kOhm	200 kOhm
250V	250 kOhm	500 kOhm
500V	500 kOhm	1 MOhm
1000V	1 MOhm	2 MOhm

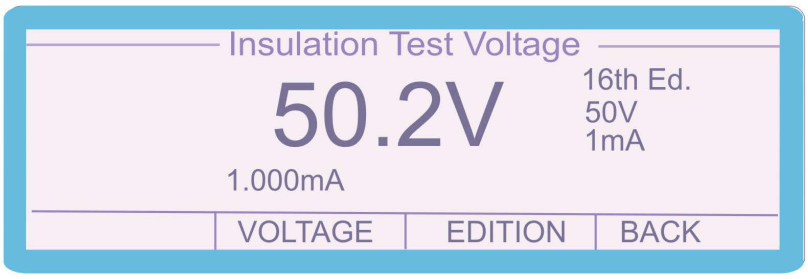
Step 3

Select the required measurement current using the Soft Keys.

The default setting for current load is 0.5mA nominal which is the correct load/test current for the 17th Edition equipment - e.g. must be able to supply 0.5mA at the specified test voltage.

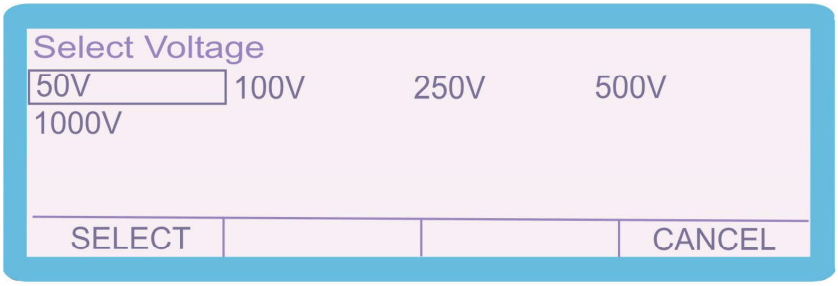
Older insulation testers (16th Edition) produced 1mA current at the specified test voltage. The 3200A should be set to 1mA current for these instruments. Very old testers may only produce a very small current and the voltage will collapse under any load – these should be tested using additional equipment.

The instruments input impedance setting can be change by pressing the EDITION soft key.



Step 4

Press the test button on the insulation tester to apply the insulation test voltage and read the voltage and current on the 3200A display. To return from the Voltage measurement screen to the insulation resistance select the BACK menu item using the soft key. To change the voltage range on the 3200A press the VOLTAGE soft key and select the required voltage as shown:



Highlight the required voltage by using the curser keys and or the digital control and then press the SELECT soft key.

If the voltage applied by the tester is less than 30% of the range or the polarity is incorrect, the display will show 0V (note some tester's 'positive' red terminals are supplying negative voltage and need to have test leads reversed).

NOTE:- NEGATIVE INPUT OF 3200A (BLACK) IS CONNECTED TO SUPPLY EARTH.

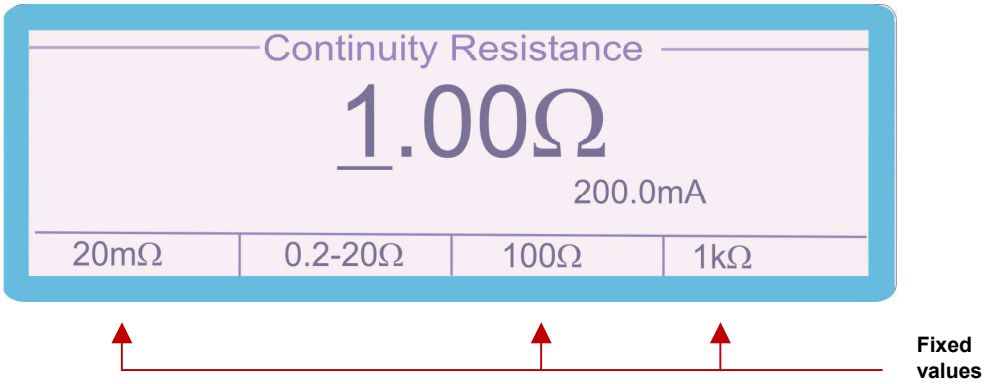
Warning : The maximum input voltage is 1100 volts

The correct polarity must be applied to obtain a reading

3. Low Value Resistance for Continuity Testing

Step 1 Connect the insulation tester to the Black & Red 4mm sockets

Step 2 Select 'CONT RES' from the function keys on the 3200A



Step 3 Select the required resistance in Ω from 20mΩ to 1kΩ on the 3200A keyboard followed by Enter, or by using the soft keys. An alternative way to select the required resistance is to use the digital Control to increment / decrement the digit indicated by the cursor. The Left and Right arrow keys allow the selected digit to be changed.

NOTE: 20mΩ, 100Ω and 1kΩ are fixed values.
0.2Ω to 20Ω is a variable range in 0.01Ω steps.

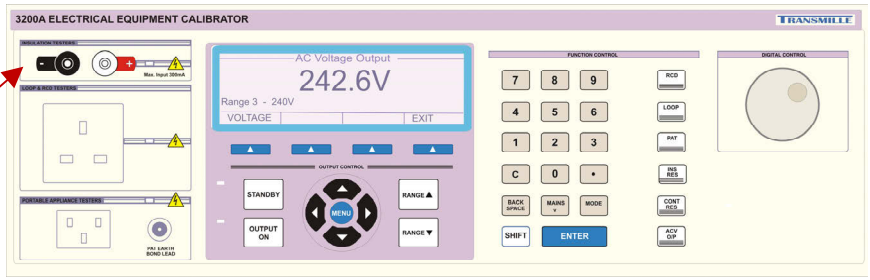
The measured current is also displayed when a resistance of 1Ω is set.

4. A.C. Voltage Output

Notes on ACV Output

To provide the power necessary for some insulation testers, the AC output from the 3200A is derived from transformer tapping's. The output is *unregulated* and will vary with line voltage and loading. The actual output voltage at any time is measured and displayed by the 3200A which can be compared to the displayed value on the UUT.

Use the 4mm sockets labelled INSULATION TESTERS for all insulation meter tests

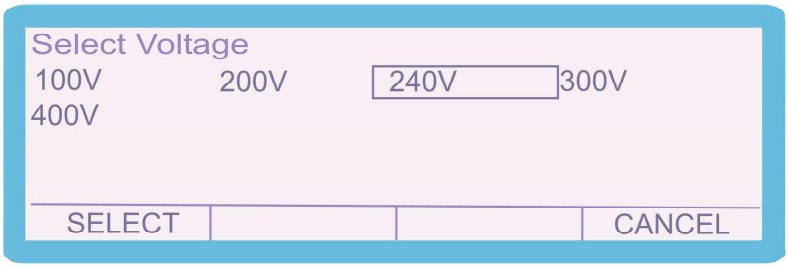


Example: 3200A set to 240V range, measures mains/line voltage and displays a measured value of 232.6V. The UUT is compared to check its accuracy at this value.

Step 1 Connect the insulation tester to the Black & Red 4mm sockets.

Step 2 Select 'ACV O/P' from the function key section of the 3200A front panel

Step 3 Select the required voltage output by pressing the VOLTAGE soft key and choose the required voltage as shown, then press the SELECT soft key



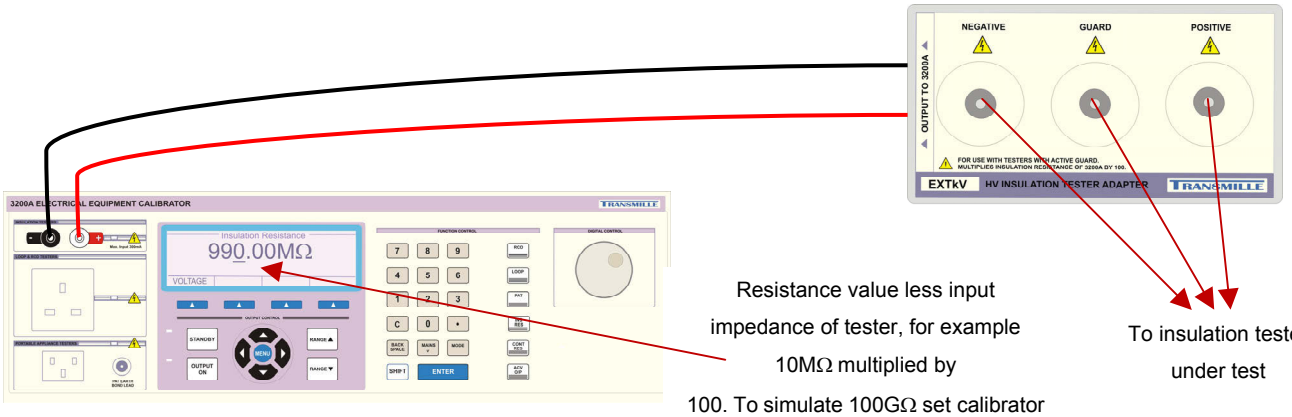
Step 4 Read the voltage displayed on the insulation tester meter. and compare it with the value displayed on the 3200A

*Use the **Output Standby** and **Output On** buttons to control the output.*

5. High Voltage Insulation Tester Adapter [OPTION EXTHV]

This option allows the testing of Insulation Testers with test voltages of greater than 1kV and an insulation range up to 200GΩ (1TΩ with OPTION 10G fitted).

Connect the EXTHV adaptor and insulation tester under test as shown:



The insulation tester must have a built in guard terminal for this adapter to function correctly.

Step 1 Select 'INS RES' from the function key section of the 3200A front panel

Step 2 Connect the EXTkV Adapter flying leads to the 3200A Insulation tester terminals (observing correct polarity)

Step 3 Calculate the value needed to be entered in order to give the required resistance (this will be 100th of the actual required resistance less the input impedance of the tester - typically 10MΩ, example to simulate 100GΩ select 990MΩ on the 3200A)

In most cases it is not necessary to allow for the input impedance of the tester.

This value can be entered on the keyboard followed by Enter. An alternative way to select the required resistance is to use the digital Control to increment / decrement the digit indicated by the cursor. The Left and Right arrow keys allow the selected digit to be changed.

Introduction to RCD Testers

Increasingly in modern installations, earth leakage circuit breakers are used to provide protection in addition to conventional fuses and circuit breakers. These devices are referred to by a variety of names including RCD (Residual Current Devices), RCCB (Residual Current Circuit Breaker), ELCB (Earth Leakage Circuit Breaker) and GFI (Ground Fault Interrupt).

The devices operate by sensing when the current in the phase and neutral conductors within an installation are not equal and opposite. Any imbalance would imply that an additional path existed for the current to flow, invariably through the earth due to excessive leakage and/or fault situation.

RCD testers are designed to simulate a range of fault currents, with restrictions on the duration of the fault current, and to time the operation of the device. This will indicate the ability of the RCD to interrupt a particular fault current within certain time limits to ensure protection against fire, damage and electrocution.

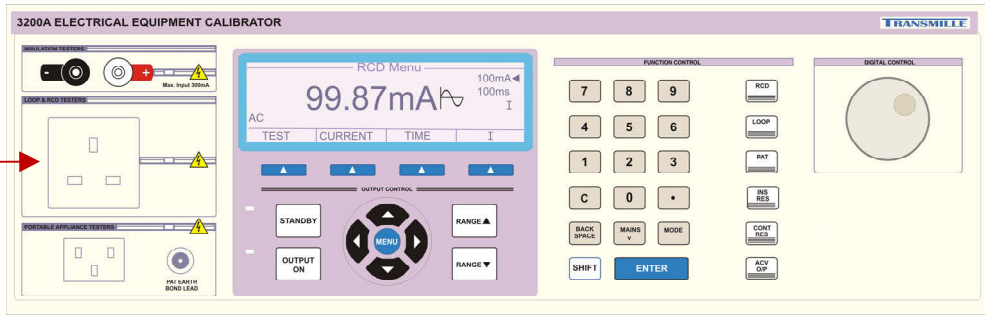
It is important to understand that an RCD tester does not generate the current, but acts as a resistor allowing current to flow from the live to earth, simulating a fault. The 3200A measures the current flowing back to earth.

Calibrating RCD Testers using the 3200A

The 3200A has two functions which can be used for complete testing of an RCD tester:

1. RCD Current measurement
2. RCD Trip Time measurement

Use the socket marked Loop & RCD Testers to perform RCD tests.



1. RCD Current Measurements

Warning: Mains output is present during RCD testing

Some RCD testers may require a settling delay between the application of mains from the 3200A calibrator and pressing of the TEST button on the RCD tester. This may be indicated by a symbol on the display of the RCD tester.

Certain manufacturers RCD testers may also require the user to ***keep the TEST button depressed*** *for the duration of the test.*

The current measured by the 3200A is the true current drawn by the RCD tester with no allowance for the mains voltage at the time of test. Most RCD testers current specifications apply at a specific mains voltage and their current will be dependant upon mains voltage.

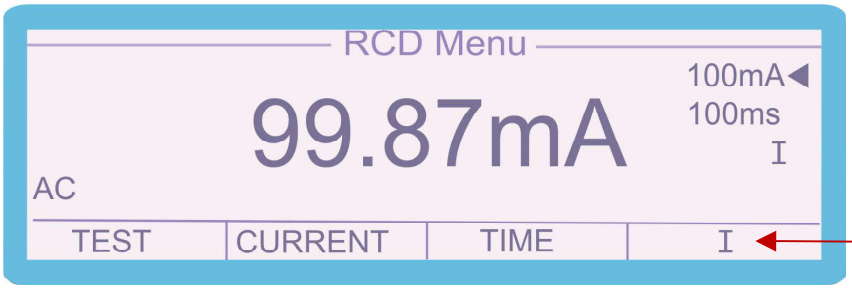
In this case a linear correction can be made to obtain the current at a specific mains voltage or the 3200A may be run from a variac (variable voltage transformer).

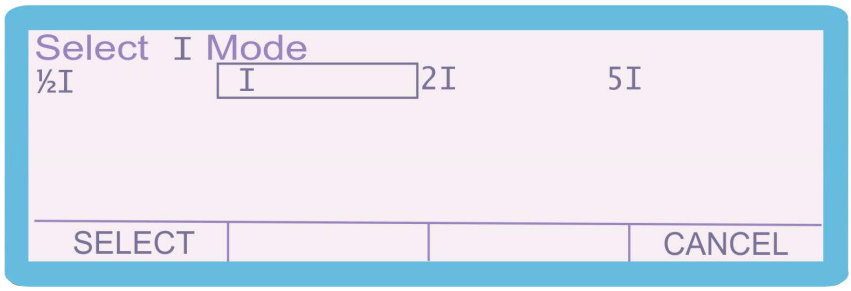
In practice most manufacturers now specify the voltage as 230V. If these RCD testers are then tested at 240V this may result in readings being out of specification.

Step 1 Connect the RCD tester to the LOOP & RCD TESTER socket

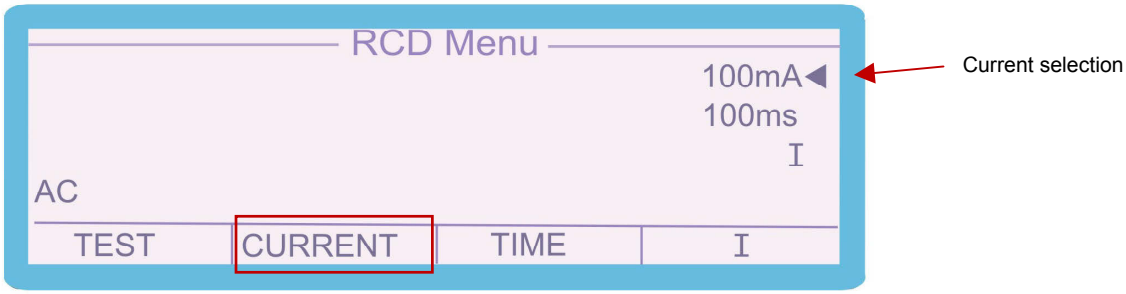
Step 2 Select 'RCD' from the function key section of the 3200A front panel

Step 3 Press the soft key I and choose the required current mode as shown then press SELECT





Step 4 Press the soft key CURRENT, use either the range up / range down buttons or the digital control to select the required current setting of the RCD tester.



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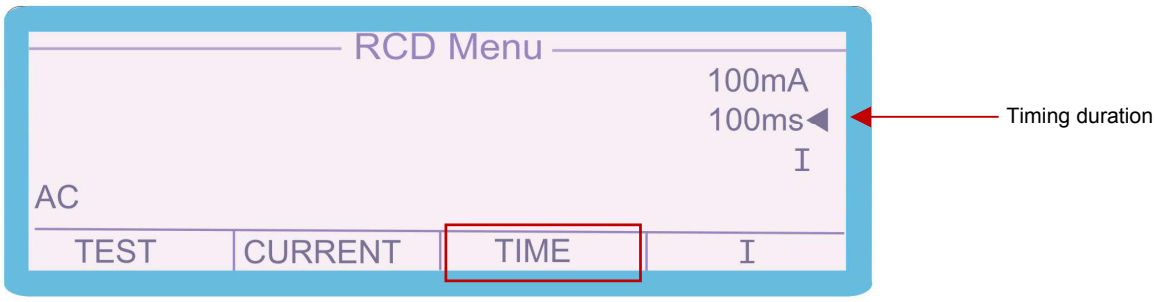
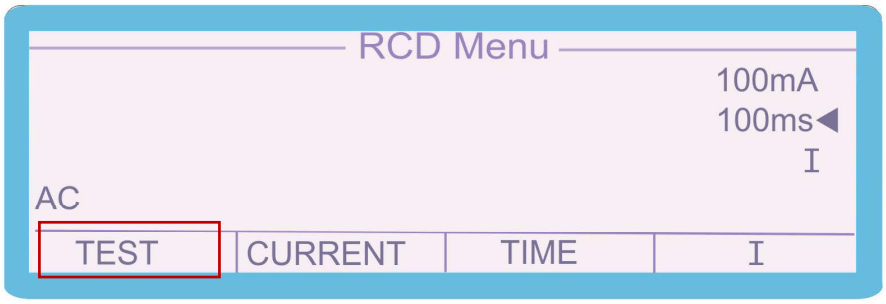
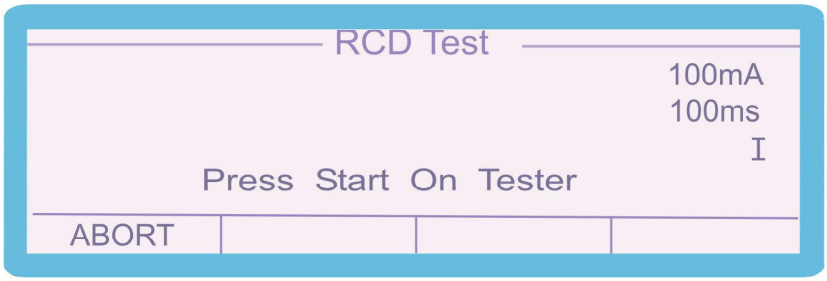
Step 5 Press the soft key TIME, use the range up / range down buttons, digital control or enter the required time via the numeric keypad and press enter.



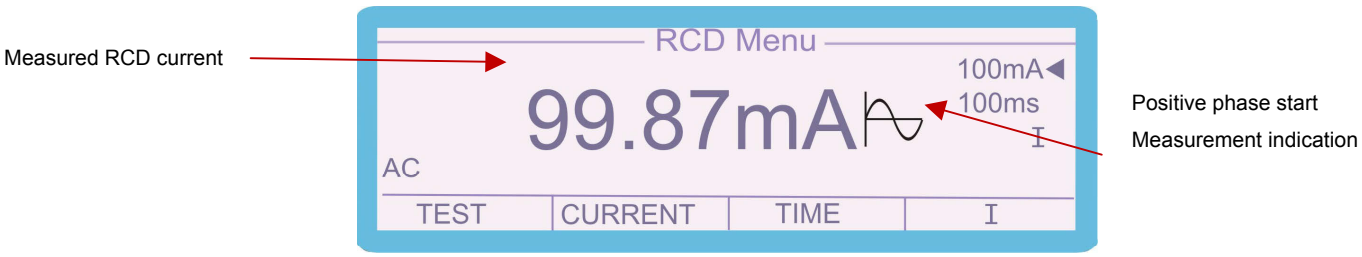
Step 6 Press the soft key TEST



The following screen will appear



Step 7 Press the test button on the RCD tester to allow the 3200A to measure the current.



Step 8 Read the measured current from the display of the 3200A.

2. RCD Trip Time Measurements

Warning: Mains output is present during RCD testing

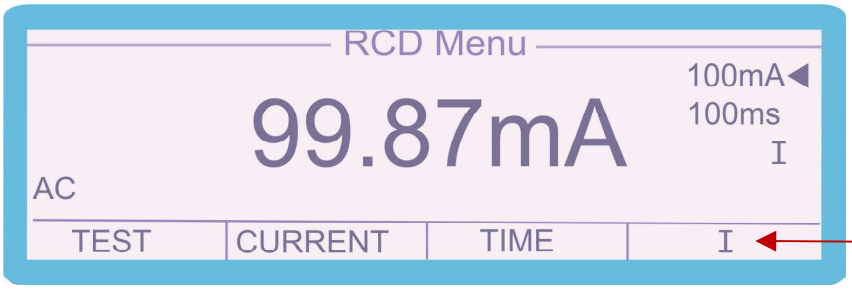
Some RCD testers may require a settling delay between the application of mains from the 3200A calibrator and pressing of the TEST button on the RCD tester. This may be indicated by a symbol on the display of the RCD tester.

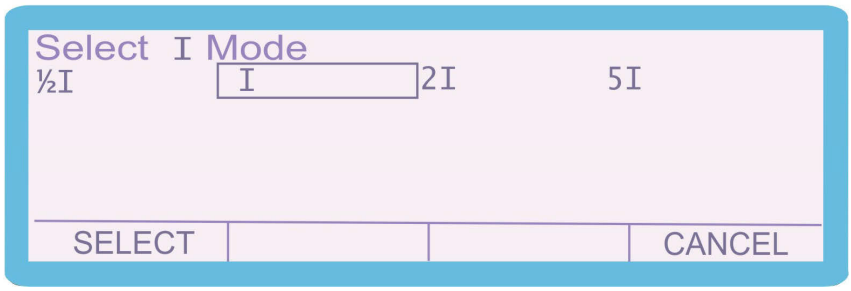
Certain manufacturers RCD testers may also require the user to ***keep the TEST button depressed*** *for the duration of the test.*

Step 1 Connect the RCD tester to the LOOP & RCD TESTER socket

Step 2 Select ‘RCD’ from the function key section of the 3200A front panel

Step 3 Press the soft key I and choose the required current mode as shown then press SELECT





Step 4 Press the soft key CURRENT, use either the range up / range down buttons or the digital control to select the required current setting of the RCD tester.

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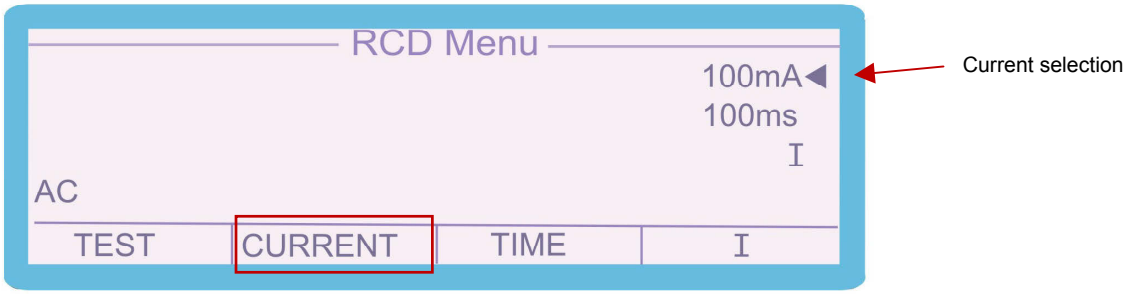
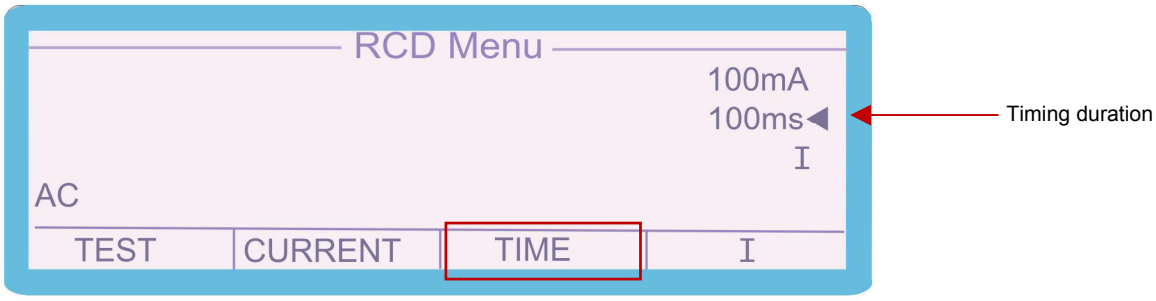
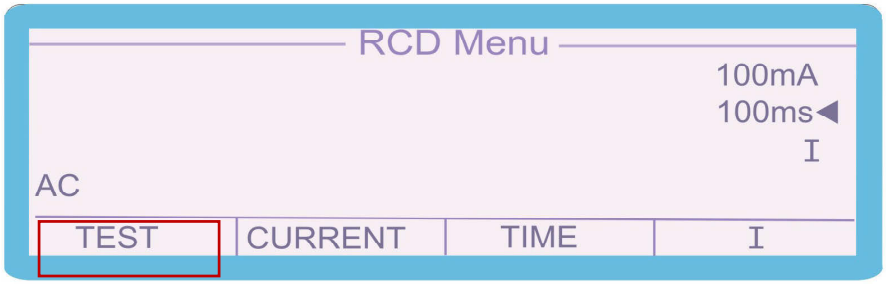


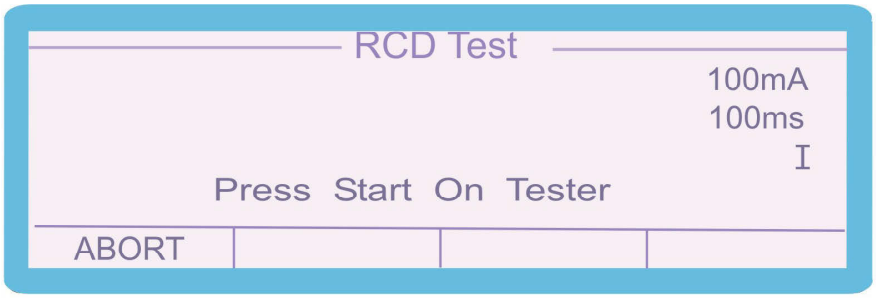
Step 5 Press the soft key TIME, use either the range up / range down buttons, digital control or enter the required time via the numeric keypad and press enter.



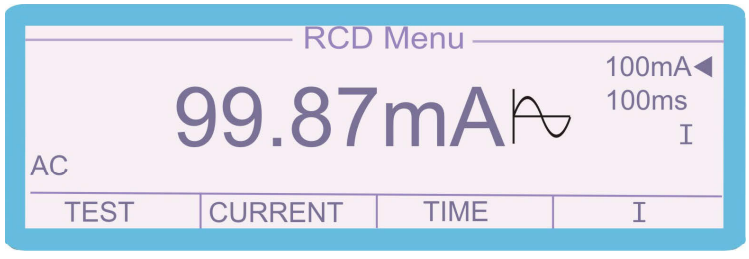
Step 6 Press the soft key TEST



The following screen will appear



Step 7 Press the test button on the RCD tester to allow the 3200A to Perform the test.



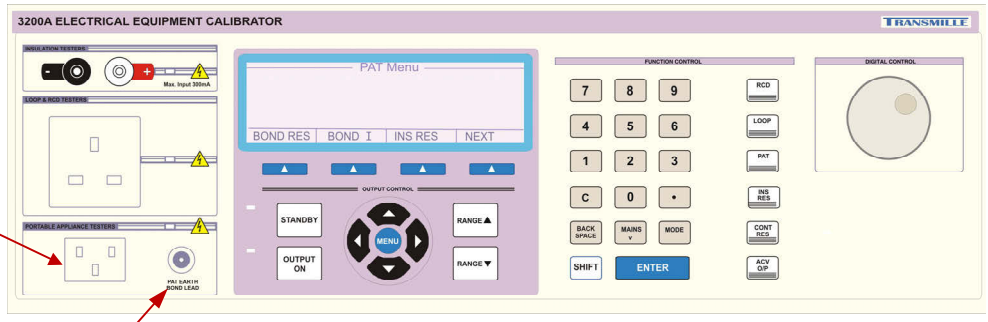
Step 8 Record the trip time as indicated on the RCD tester display.

Calibrating Portable Appliance Testers (PATs)

The 3200A has six functions which can be used for testing of Portable Appliance Testers (PATs):

1. Earth Bond Resistance measurement
2. Earth Bond Current measurements
3. Insulation testing
4. Load testing
5. Flash Testing (Option)
6. Leakage Testing

Use the IEC socket labelled PAT TESTERS for PAT testing together with the PAT lead provided with the 3200A



Use the PAT EARTH BOND LEAD terminal for earth bond current testing.

1. PAT: Earth Bond Resistance

Step 1

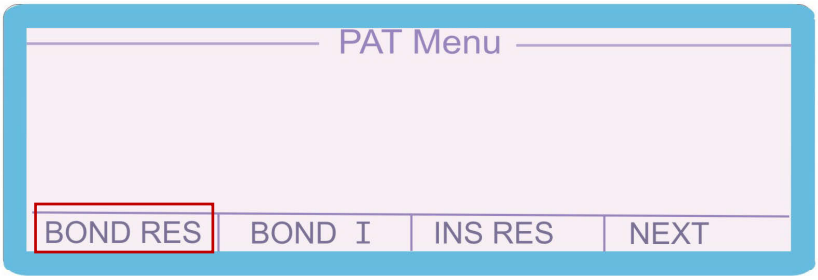
Connect the PAT tester to the PAT TEST IEC socket using using the test lead supplied.

Connect the PAT tester earth lead to the PAT EARTH BOND LEAD terminal on the 3200A using the lead supplied with the PAT.

Clip onto the PAT EARTH BOND LEAD terminal with The large crocodile type clips commonly used by PAT manufacturers.

Step 2 Select 'PAT' from the function key section of the 3200 front panel

Step 3 Press the soft key **BOND RES** to select the earth bond resistance measurement.



Step 4 Select the required resistance value using either the range up / range down buttons or by incrementing / decrementing the range using the digital control.

Step 5 Press the test button on the PAT to begin testing.

Step 6 Read the measured resistance value from the display of the PAT.

Notes on the PAT Earth Bond Function
The 3200A uses a fixed set of resistors to produce the earth bond resistances. The value displayed by the 3200A is the measured value as determined during the calibration of the 3200A. This calibrated value also includes the resistance of the PAT lead supplied with the 3200A.
IT IS IMPORTANT THAT THIS SUPPLIED LEAD IS USED FOR ALL PAT EARTH BOND TESTING.

2. PAT: Earth Bond Current

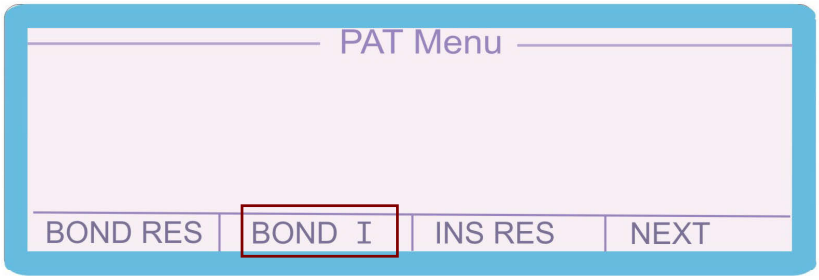
Step 1 Connect the PAT tester to the PAT TEST IEC socket using the test lead supplied.

Connect the PAT tester earth lead to the PAT EARTH BOND LEAD terminal on the 3200 using the lead supplied with the PAT.

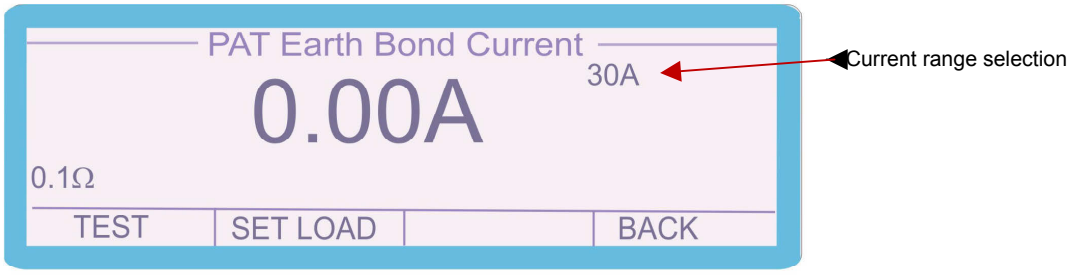
Clip onto the PAT EARTH BOND LEAD terminal with The large crocodile type clips commonly used by PAT manufacturers.

Step 2 Select 'PAT' from the function key section of the 3200 front panel

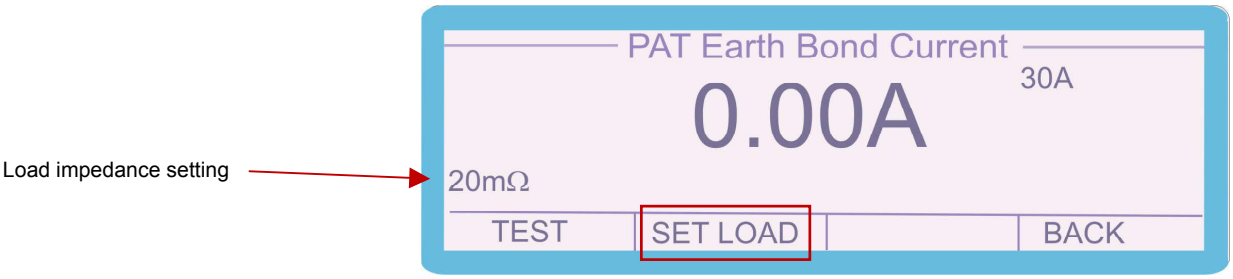
Step 3 Press the soft key BOND I to select the earth bond current measurement.



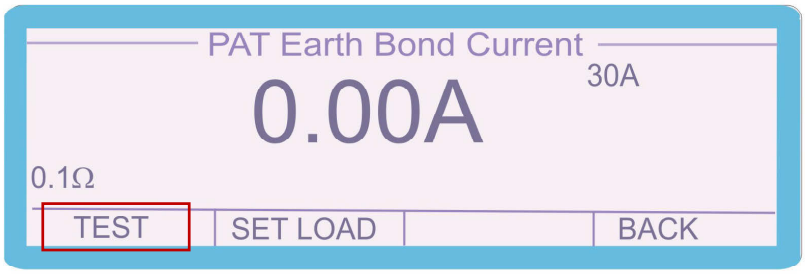
Step 4 Using the RANGE UP and RANGE DOWN buttons, select the required current range (500mA, 10A or 30A).



Step 5 Press the soft key SET LOAD to set the load presented to the PAT under test of 0.1Ω or 20mΩ.

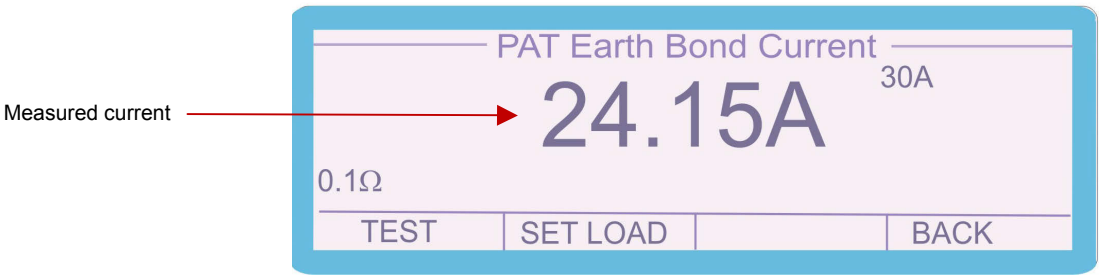


Step 6 Press the soft key **TEST** to allow the 3200A to begin detecting the PAT output current.



Step 7 Press the PAT under test 'TEST' button to output current from the PAT.

Step 8 The 3200A will sample the current and then return and display The measured current value.

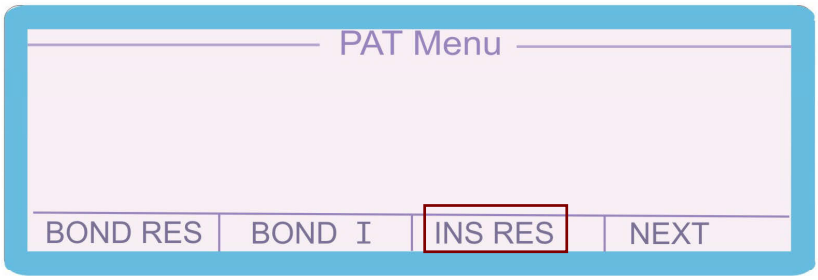


3. PAT: Insulation Testing

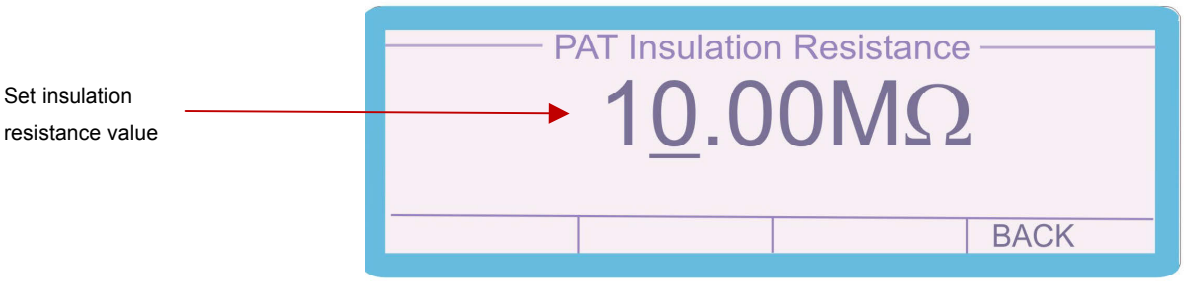
Step 1 Connect the PAT tester to the PAT TEST IEC socket.

Step 2 Select ‘PAT’ from the function key section of the 3200A front panel

Step 3 Press the soft key INS RES to select insulation resistance testing.



Step 4 Enter the required resistance in MΩ from 0Ω to 2,000MΩ (option 10,000MΩ) on the 3200A keyboard followed by Enter. Alternatively select the required resistance by using the digital control to increment / decrement the digit indicated by the cursor. The left and right arrow keys allow the selected digit to be changed.



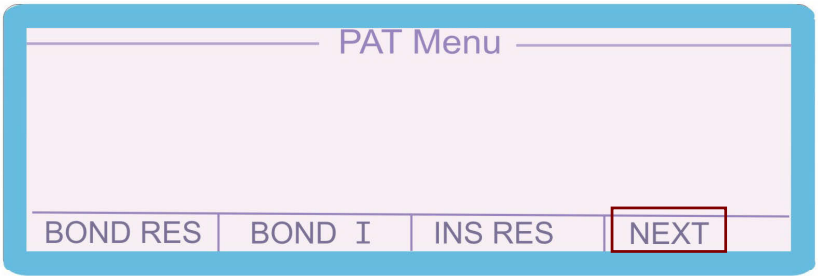
Step 5 Press the ‘TEST’ button on the PAT under test and record the value.

4. PAT : Load Testing

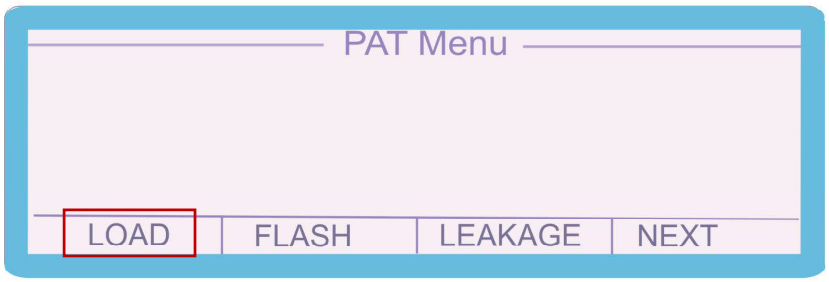
Step 1 Connect the PAT tester to the PAT TEST IEC socket.

Step 2 Select ‘PAT’ from the function key section of the 3200A front panel

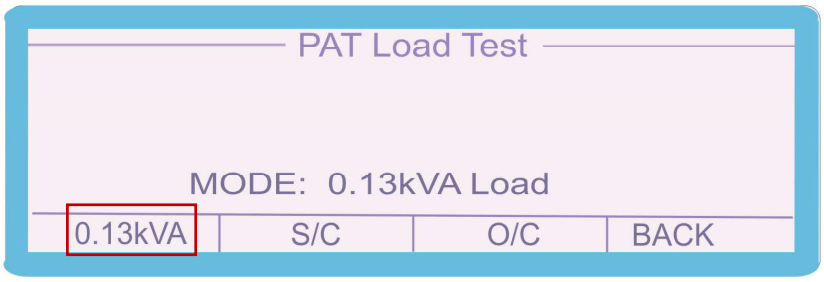
Step 3 Press the soft key NEXT from the PAT Menu screen



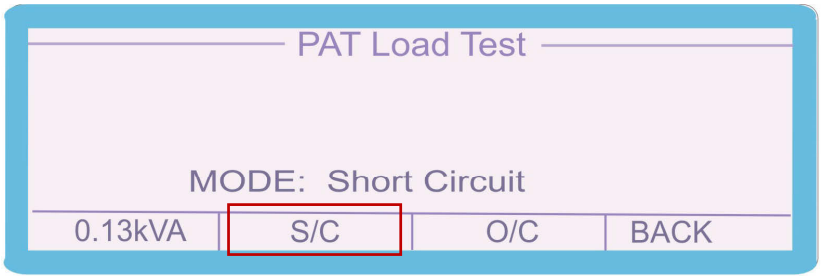
Step 4 Press the soft key LOAD from the PAT Menu screen



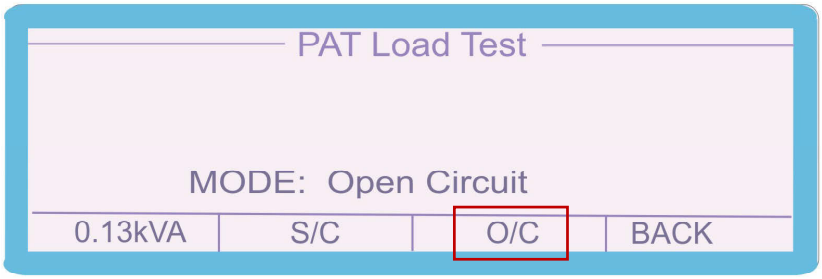
Step 5 Press the soft keys beneath the on-screen PAT Load Test menu to select the required mode:



Applies a load of 0.13kVA between live and neutral of the PAT under test.



Applies a short circuit between live and neutral of the PAT under test.



Open circuits the live and neutral connections of the PAT under test.

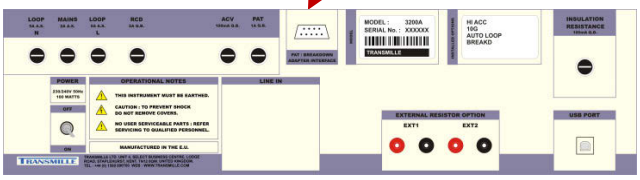
Step 6 Read the value from the display of the PAT under test.

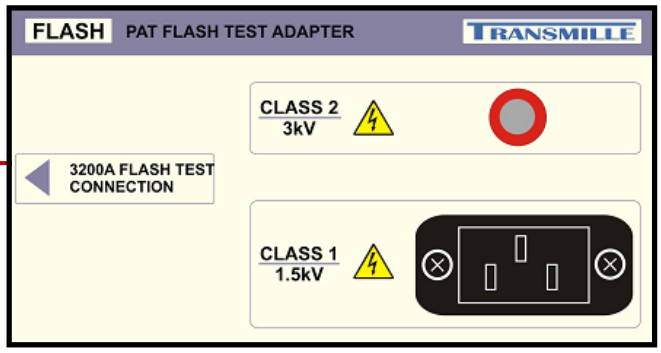
5. PAT : Flash Testing [OPTION]

The PAT Flash testing mode is an option which requires use of the PAT Flash adapter pod.

Step 1 Connect the PAT Flash test adapter to the 3200A back panel socket.

3200A Rear Panel



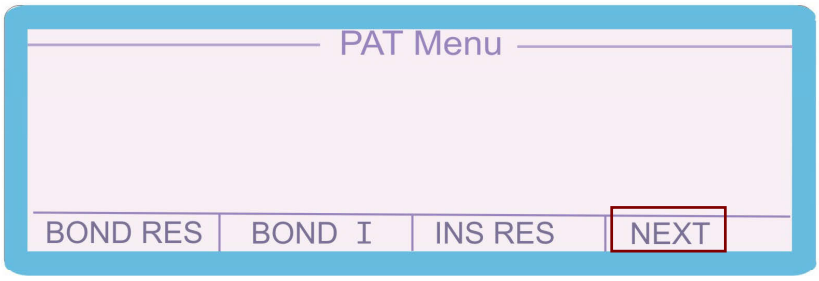


PAT Flash Test Adapter

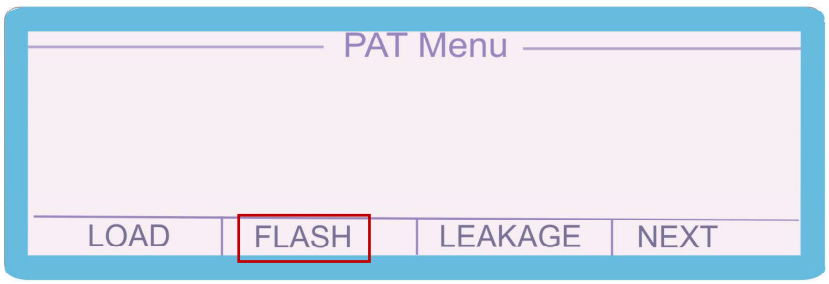
Step 2 Connect the PAT under test to the flash adaptor, using the 3200A PAT lead to connect to 'Class 1' and the PAT tester probe to connect to 'Class 2'.

Step 3 Select 'PAT' from the function key section of the 3200A front panel

Step 4 Press the soft key NEXT from the PAT Menu screen



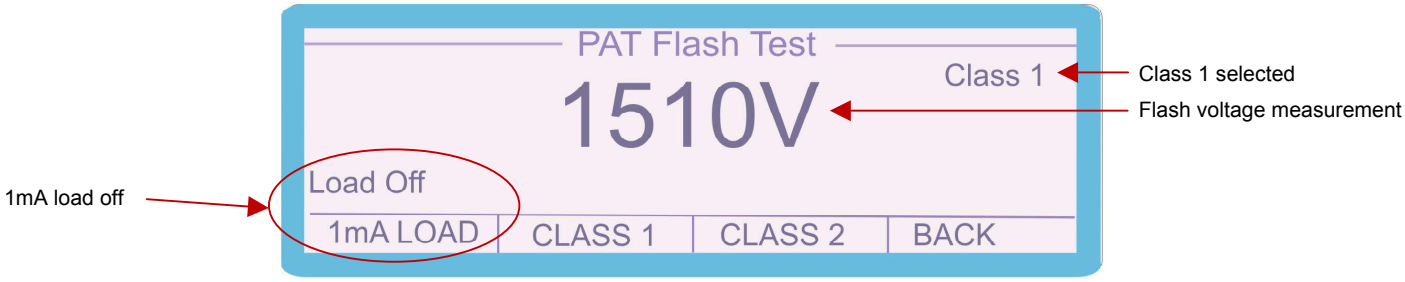
Step 5 Press the soft key FLASH from the PAT Menu screen



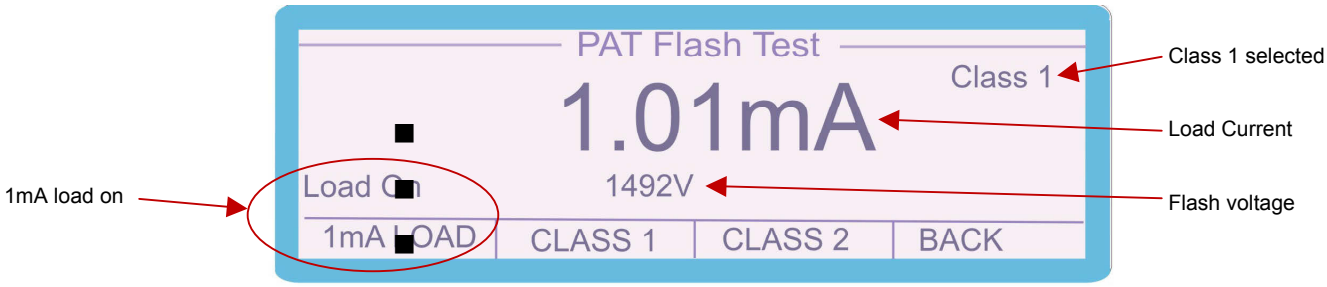
Step 6

Press the soft keys CLASS 1 and CLASS 2 to select the required flash test mode either 1.5kV (class 1) or 3kV (class 2)

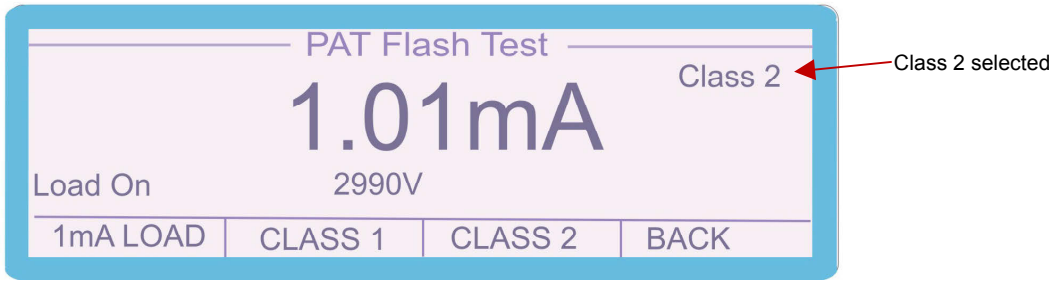
The 'FLASH' Voltage generated by the PAT under test can either be measured under a nominal 1mA load or measured as the 'open circuit' voltage. Use the soft key 1mA LOAD to select the load ON or OFF as required.



The Flash voltage for **CLASS 1** is measured between **LIVE** and **EARTH** on the IEC socket of the flash adapter.



The Flash voltage for **CLASS 2** is measured between the **LIVE** of the IEC socket and the **3kV TEST POINT** of the flash adapter.



THE EARTH OF THE IEC SOCKET MUST BE LEFT OPEN CIRCUIT TO OBTAIN CORRECT READINGS FOR THIS TEST.

Step 7

Apply the Flash test voltage from the PAT under test.
Read the voltage and current displayed on the 3200A

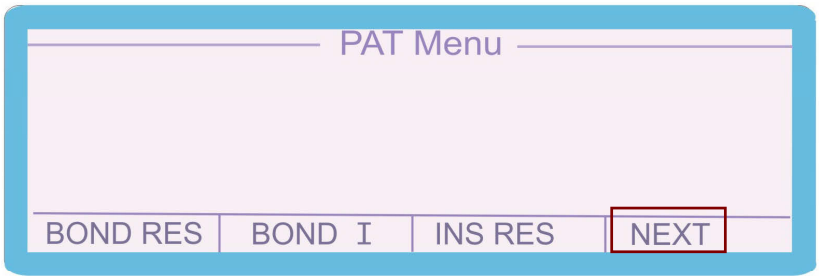
Warning : High voltages are present during PAT Flash testing

6. PAT: Leakage

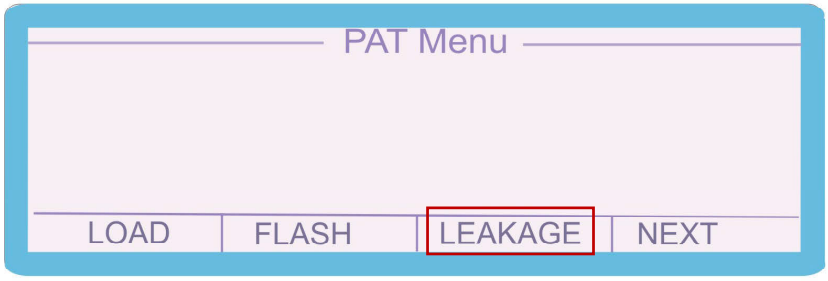
Step 1 Connect the PAT tester to the PAT TEST IEC socket using using the test lead supplied.

Step 2 Select ‘PAT’ from the function key section of the 3200A front panel

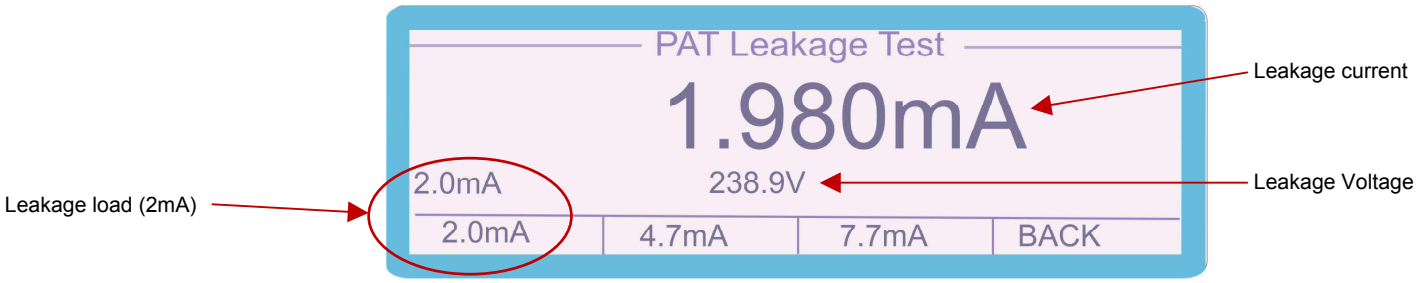
Step 3 Press the soft key NEXT from the PAT Menu screen



Step 4 Press the soft key LEAKAGE from the PAT Menu screen



Step 5 Press the soft keys beneath the on-screen PAT menu to select the Required leakage current range (2mA, 4.7mA or 7.7mA)



Step 6 Set the PAT under test to leakage mode and instigate the leakage test. Read the leakage measurement from the 3200A display.

Introduction to LOOP Testers

What is the loop?

When an appliance is connected to the mains supply a circuit is made. It completes the loop current flow round the circuit loop from the power station in the live wire through the appliance and then back to the power station in the neutral wire. Voltage is dropped around the loop due to the resistance of the cables etc. in which the current is flowing.

What is the loop resistance?

The resistance of the cables etc. connecting your appliance to the power station.

There are two loop's connecting to the power station

1: The Phase-live to Phase-neutral loop.

2: The Phase-live to earth loop

Normally current will flow round the live to neutral loop but in a fault condition current from the live could return to the power station through the EARTH conductor,

What is PSCC and why is loop resistance important?

Using ohms law the loop resistance will determine the maximum current that can possibly flow round a circuit, as an example if the loop resistance is 1Ω and the supply voltage 230 Volts using ohms law where:

VOLTAGE / RESISTANCE = CURRENT

(230V / 1Ω) = 230A

It can be seen that the maximum current that could flow would be 230 Amps even if the appliance was a dead short circuit. A fuse or protection device lower than 230 amps would be needed to protect this circuit. It should be noted that some testers take the lowest loop, either live/neutral or live/phase to calculate the PSCC while others will use only the live/earth loop resistance.

Why is it normal to get large variations in PSCC measurements?

PSCC is calculated by dividing the mains voltage by loop resistance. Loop resistance's are often very low, 0.1Ω to 0.5Ω and the accuracy , resolution & repeatability possible when measuring loop resistance will give rise to large variation in PSCC as the supply voltage is being divided by a number approaching zero.

Examples

A 230 volt supply with loop resistance of **0.2Ω**
(230V / 0.2Ω) = **PSCC of 1150A**

Were if the loop resistance was only 0.05Ω less at **0.15Ω**
(230V / 0.15Ω) = **PSCC of 1533A**

What is a Loop tester measuring?

Loop testers measure the resistance in ohms of the mains supply at a power socket, most loop testers only measure the resistance of the live(Phase) to earth resistance, some testers can measure also the resistance from the live to neutral circuit. Some loop testers can also display the PSCC (Prospective Short circuit current) or sometimes called the PFC (Prospective fault current)

***How do they work*?**

Loop testers work by applying a heavy load, usually around 23A for a short duration and measuring the drop in voltage when the load is applied, then using ohms law display the loop resistance.

What happens on an RCD protected circuit when using a loop tester?

As the test current (23A) flows down the earth conductor any current RCD (Residual current breaker) in the circuit will trip out. To test loop impedance on protected circuits the breaker must either be temporally wired out or a loop tester with a ***no trip*** range must be used. On the 'No Trip' range the testers load current is much lower and only loads the supply for a very short period of time so to prevent the RCD from operating. In this mode the tester will internally repeat the measurement several times and take an average. As a result the measurement takes longer and the measurement is less accurate, especially if the supply in noisy. As any PSCC calculation is a reciprocal of the loop resistance (Volts/Resistance) and error in the reading of resistance can make big differences in the PSCC value.

How do I Calibrate a Loop Testers?

To calibrate a Loop tester first the loop impedance of the supply must be known, then several known values of resistance must be inserted in the loop to increase the loop resistance so the tester can be calibrated at several points. The resistance can either be in the live or earth return. (It is common practice to place the resistors in the earth return for safety reasons). The value displayed on the tester can then be compared to that of the known value of the resistor, plus the loop resistance of the supply.

The 3200A has 8 calibrated resistance values which are non-inductive and are able to withstand the 23A.

How can I accurately measure the loop impedance of my Test Socket?

Firstly it is important to define what is the test socket. This is the socket into which the **Instrument being calibrated will be directly plugged into**. This is not the same as the socket on the wall which then has an extension lead to run it down to the test bench first, remember every length of cable, plug, fuse etc. is adding resistance.

IMPORTANT SAFETY WARNING

THE FOLLOWING PROCEDURE MAKES CONNECTION DIRECTLY TO MAINS LINE VOLTAGES WHICH ARE UNPROTECTED BY AN RCD BREAKER - THERE IS EXTREME RISK OF ELECTRIC SHOCK UNLESS PROPER SAFETY PRECAUTIONS ARE TAKEN.

THIS PROCEDURE MUST ONLY BE PERFORMED BY QUALIFIED ENGINEERS.

Equipment Required.

Loop resistance can be measured using a DMM calibrated on AC volts, a DMM calibrated on AC amps and a load resistor, which can easily be switched on/off, capable of taking around 10amps for a minute without a large change in value, an electric kettle can be used if nothing else is available which will take the power.

Connections

First connect the amp meter in series with the load to enable measurement of the current taken by the load. Then connect both the switched load in series with the amp meter & the AC volts measuring DMM between the **live and earth** pins in a mains plug. *(**NOTE** Do not connect the load at the DMM terminals otherwise the resistance of the test leads will also be measured, both leads must go to the plug.)*

Measurement Method.

Insure all connections are insulated and the load is off.

Connect the measurement Plug in to the test socket.

1: Record the off load voltage measured by the DMM.

2: Switch on the load and record

3: The current taken by the load

4: The AC volts under load.

Repeat several times and calculate the average.

Use the formula below to calculate loop resistance:

Loop resistance = (Off load Voltage - On load voltage)

Load Current in Amps

When using the 3200A it is important to remember the test socket is the socket at the end of the adapter cable, *NOT THE RESISTANCE OF THE SOCKET INTO WHICH THE 3200A IS PLUGGED*. The loop value measured at this test socket can then be manually entered into the 3200A which will add this value to the calibrated values.

The AUTOLOOP option measures the loop resistance of the supply internally by performing automatically the procedure above, the internal load of the 3200A is approximately 4 Amps and the on/off load voltage measurements are taken 32 times, with noisy readings caused by mains spikes etc. being discarded. The 3200A then adds the supply loop value it has measured plus a small correction for the resistance of the test adapter (Note: This is not the value of the socket the 3200A is plugged in to but the value at the test socket, which is always greater due to the resistance added by the 3200A wiring.)

How can I calibrate a Loop Tester at Zero?

It is desirable when calibrating loop testers to calibrate at as near to zero as possible. However practical limitations govern how low a value can be achieved.

NOTE: It is not possible to get a calibration point lower than the resistance of the supply test socket itself. Typically the 3200A will add 0.15Ω to the resistance of the socket which the 3200A is plugged into.

The lowest value will be obtained near where the supply enters the building. Remember every switch, fuse socket; even the 3200A will add resistance. If it is required to calibrate at values below that available from of the 3200A then a short length of extension cable of which the resistance of the live + earth conductors have been measured by a 4 wire DMM can be used.

Generally however it is not necessary to calibrate at values below a normal supply. If 3 points spread across the instruments range can be achieved and the linearity can be verified it can be assumed that the zero will be correct. (The manufacturers would after all have verified that the design is linear on the lowest part of the scale.)

Other Problems with calibrating Loop testers.

Loop testers measure resistance down to milli ohm levels using two wire connections, it is well understood that connection/lead resistance etc. at this level make a significant difference.
The instrument specifications assume all nice new clean contacts in to tightly fitting sockets, and we all know plugs, sockets etc. get dirty and worn. This obviously increases the resistance which can easily put the instrument out of specification.
It is very difficult to achieve reliable 2 wire connection when measuring milli ohms, simply plugging in and out can change a connection resistance by 100mΩ so this is the first place to look. Also check the lead is the same as the lead supplied with the instrument; even the fuse will make a difference.
The 3200A is supplied with good quality sockets to help maintain a low contact resistance; also the mains lead is directly connected to avoid another possible problem. It is however to be expected that variation in the order of tens of mΩ will be present in two wire systems.

The other main problem with loop testers is they often fail short circuit resulting in a big bang when plugged in. The 3200A first checks the tester for this by checking the current flowing with 1 kOhm in the earth line before a full power test. If the 3200A detects a faulty instrument the test is automatically aborted.

Calibrating LOOP Testers using the 3200A

Loop testing using the 3200A is performed using a fixed set of resistance ranges, with auto (optional extra) and manual loop measurement.

■ Auto Loop Measurement

NOTE: Auto loop measurement is an option specified when a 3200A is ordered.

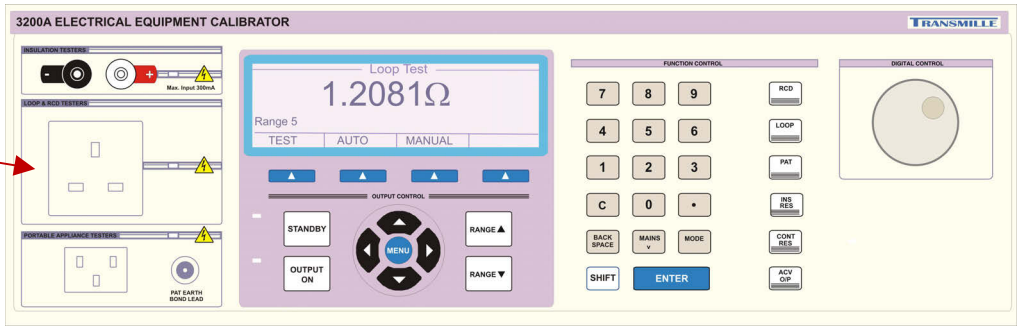
The auto loop measurement allows the 3200A to automatically measure the loop resistance of the mains supply to the 3200A. THE RESISTANCE MEASURED IS NOT THE RESISTANCE AT THE SOCKET INTO WHICH THE 3200 IS PLUGGED, BUT THE RESISTANCE AT THE TEST ADAPTER SOCKET INTO WHICH THE LOOP TESTER BEING CALIBRATED IS PLUGGED. This measurement incorporates the resistance of the mains circuit to provide the value at the test socket.

The 3200A will then incorporate this value into its displayed loop resistance values.

■ Manual Loop Entry

This standard function allows the user to enter a loop resistance measurement manually by typing the figure in using the keyboard **NOTE THIS MUST BE THE VALUE OF THE LOOP RESISTANCE MEASURED AT THE TEST SOCKET**. The 3200A will then incorporate this value into its displayed loop resistance values.

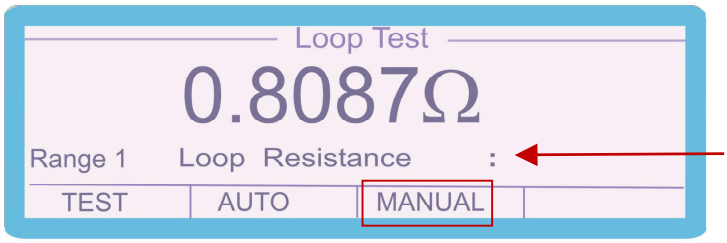
Use the socket marked Loop & RCD Testers to perform RCD tests.



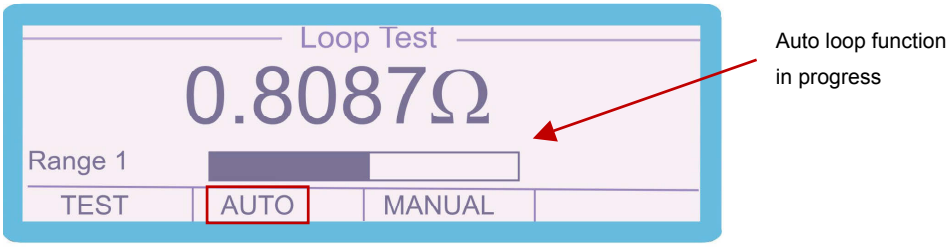
*When the TEST soft key is pressed on the 3200A front panel, the 3200A **pre-tests** the LOOP tester to detect faulty devices. Should a faulty device be detected the output will be automatically switched off and a fault message will be displayed on the 3200A display.*

Step 1 Select 'LOOP' from the function key section of the 3200A front panel

Step 2 For manual loop input press soft key MANUAL and enter the measured loop resistance value as measured at the 3200A output socket using the numeric keypad followed by the enter key.



Step 3 For Auto Loop measurement ensure that the output socket of the 3200A Is not connected to any instrument i.e. loop tester, press the soft key AUTO the instrument will perform the auto loop function as shown below the 3200A is then ready to be used.



Step 4 Connect the LOOP tester to the LOOP & RCD TESTER socket. Select the required resistance value using either the range up / range down buttons or by incrementing / decrementing the range using the digital control.

Step 5 Press the TEST soft key on the 3200A to apply mains to the LOOP tester

Step 6 Press the TEST button on the LOOP tester to begin testing.

Step 7 Read the loop resistance from the display of the LOOP tester.

Notes on the LOOP Function

By incorporating the supply loop impedance into the displayed value, this allows direct comparison to the value displayed on the loop tester being calibrated. The resistance value displayed by the 3200A is comprised of the following:

1. The **measured value of the resistor**
   (as measured during 3200A calibration)
2. The **supply loop impedance**
   (measured by the 3200A via manual / auto loop function)

The loop impedance of a supply will change over time, therefore it is important that the loop impedance value is checked regularly by running the auto loop function or updating the manual loop resistance.

If the 3200A is moved to another location or plugged into a different socket, this will have an impact on the loop impedance – the auto loop function will need to be used or the specific socket's impedance measured and entered manually.

PSCC (Prospective Short Circuit Current) Testing

Some LOOP / Installation testers have the capability to measure PSCC (Prospective Short Circuit Current) which is the largest Prospective Fault Current (PFC) which could flow.

This current is limited by the LOOP resistance of the circuit and can be calculated for either:

- Phase (Live) to Earth
- Phase (Live) to Phase (Neutral)

The more usual is Phase (Live) to Phase (Neutral)
The LOOP / Installation testers calculate this measurement from the measured LOOP resistance using the following sum:

PSCC is calculated as:

$$\frac{\text{Nominal Supply Voltage}}{\text{LOOP Resistance}}$$

This function can be calibrated with the 3200A by using the LOOP function
The 3200A is able to simulate Phase (Live) to Phase (Neutral) PSCC.

To calibrate, compare the reading obtained on the Installation tester with the value calculated from the formula above using the LOOP impedance displayed on the 3200A.

Introduction to Breakdown / Hipot Testers

Breakdown / Hipot testers come in various configurations, from a simple AC high voltage source (which is generated by a step up transformer) to more complex units which generate both AC and DC voltages with leakage current measurement capabilities. Leakage current is the output current being drawn at the set voltage from uA levels up to around 20mA. The majority of instruments include a trip circuit which turns the instrument off when a preset current is exceeded.

From the calibration viewpoint, breakdown / hipot testers can be considered as power supplies, with the exception of the *safety issues* caused by the higher voltages being generated.

The calibration of breakdown testers involves:

1. Measuring the high voltage output at several points on each range (both AC and DC).

2. Calibrate the leakage current meter if fitted - this is calibrated by comparing the current displayed on the tester against the current indicated by a calibrated meter. An appropriate load resistor is used to draw the current at an output voltage of between 500V and 1kV.

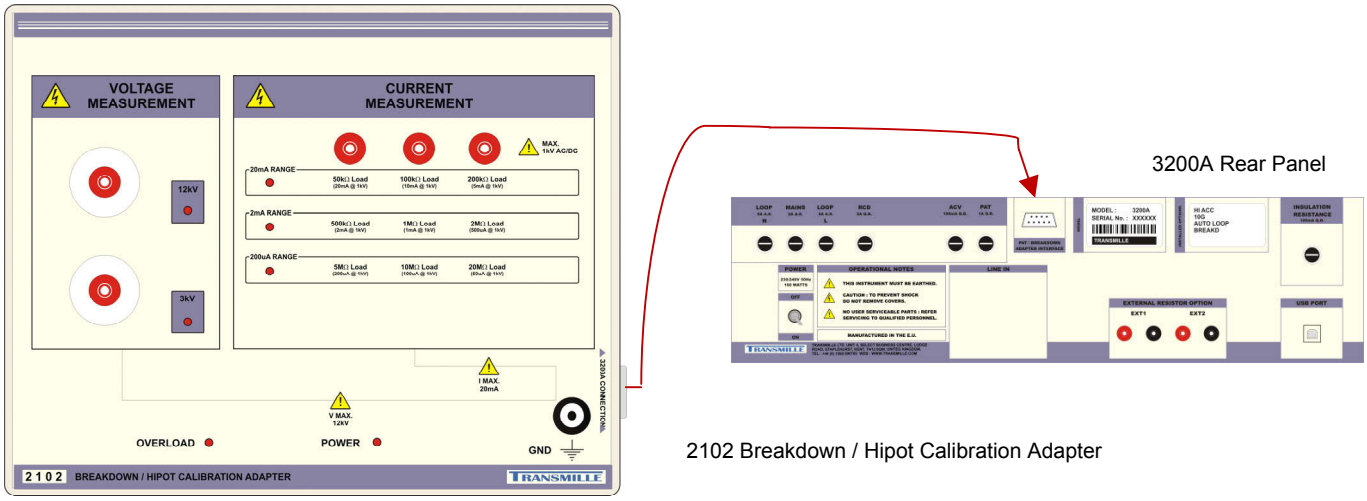
3. Confirming correct operation of the current trip.

The 3200A calibrator with breakdown tester adaptor provides the capability to perform all of the above testing in one simple solution with AC/DC voltage measurement up to 12kV and current measurement up to 20mA.

Calibrating BREAKDOWN / HIPOT Testers using the 3200A & 2102 adapter [OPTION]

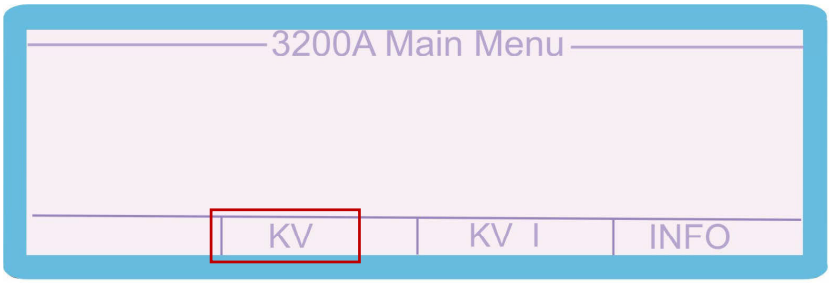
The Breakdown / Hipot tester testing mode is an option which requires use of the 2102 Breakdown / Hipot Calibration Adaptor.

Step 1 Connect the 2102 adapter to the 3200A back panel socket.

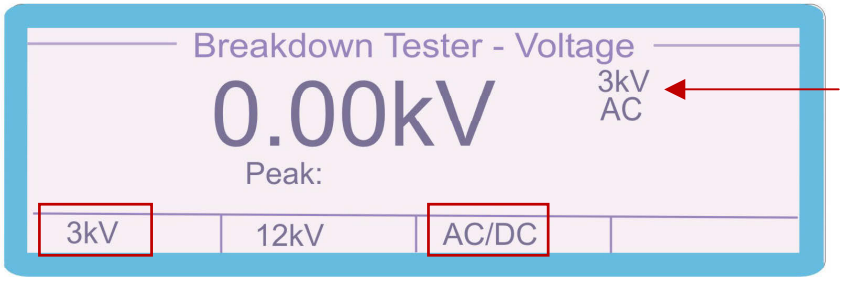


Step 2 Connect the Breakdown / Hipot tester to the 2102 high voltage AC/DC 'Voltage Measurement' Inputs as required (3kV or 12kV) and the testers low output to the ground terminal on the 2102.

Step 3 Press the soft key KV from the 3200A Main Menu screen, the main menu screen can be accessed by pressing the blue MENU key located between the four arrow (cursor) keys.

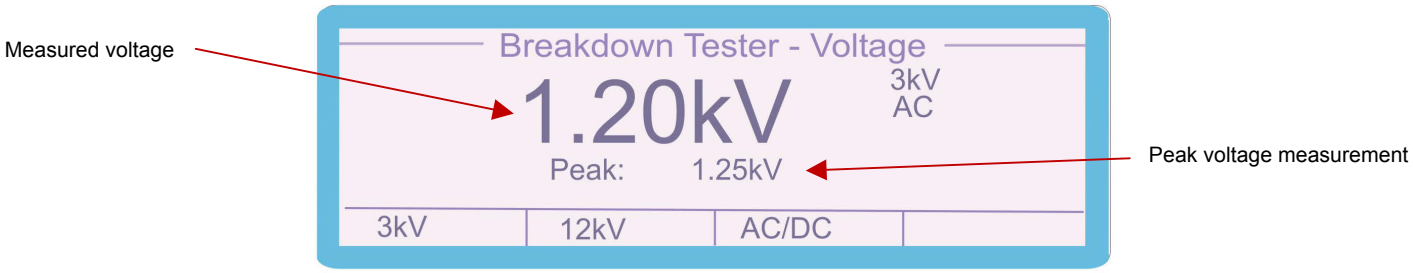


Step 4 Select the voltage range using the soft keys 3kV or 12kV and also either A.C. or D.C. with the AC/DC soft key



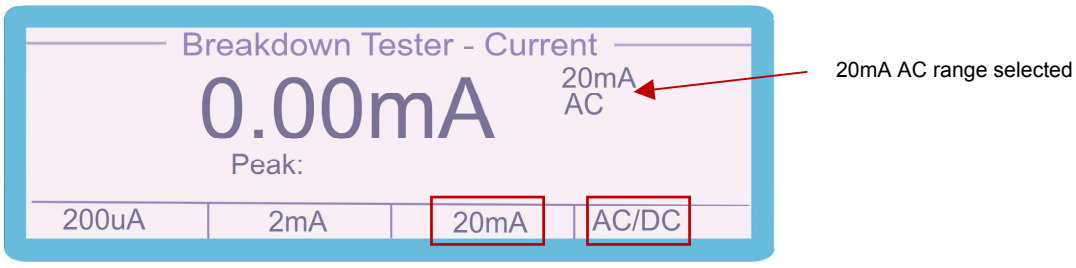
Step 5 Adjust the output of the breakdown / hipot tester to the required output voltage and read the voltage on the 3200A.

Note: the peak voltage is also recorded, as some testers only produce the set voltage for a limited time, this is reset by pressing the range button soft key again i.e. 3kV or 12kV



Step 6 Connect the Breakdown / Hipot tester to the 2102 current AC/DC 'Current Measurement' Inputs as required (20mA, 10mA or 5mA load @ 1kV) and the testers low output to the ground terminal on the 2102.

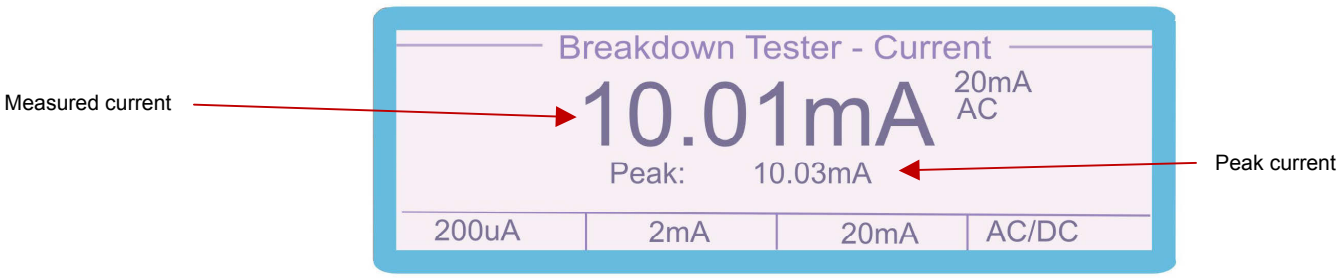
Step 7 Select the current range using the soft keys 200uA (100uA and 50uA), 2mA (1mA and 500uA) or 20mA (10mA and 5mA)



Step 7

Increase the output of the instrument under test to set the output current and measure the recorded current on the 3200A.

Note: the peak current is also recorded, this can be used to measure The trip current of the instrument under test.



Warning : High voltages are present during Breakdown / Hipot testing

Remote Programming

USB Interface

The calibrator can be fully controlled and calibrated via USB interface.
The interface is optically isolated from the calibrator circuitry. The calibrator can send information with reference to the output status, calibration factors and value of internal standards together with other information. The internal processor decodes the commands and returns control codes to verify the correct operation of that command.

The calibrator can be sent individual commands directly from a Windows HYPER TERMINAL program, any basic or high level program, the virtual front panel (VFP) program, or from the ProCal Calibration System.

Programming Commands

The 3200A is controlled by a set of high level commands.

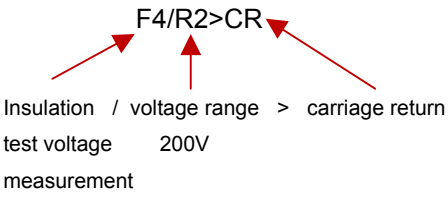
Continuity Test:

Function	Command	Description
CONTINUITY TESTING	**F1**	**Select the continuity function**
	Sxx.xx	**Set resistance value in Ω, ranges** 0.2Ω to 20Ω in 0.01Ω steps, fixed values 20mΩ, 100Ω & 1kΩ (1000Ω), e.g. command line: F1/S12.32>CR Continuity test function / resistance value 12.32Ω > carriage return (ASCII character 13)
	T	**Transmit measured value : Continuity current in uA, only when 1Ω (S1) is selected**

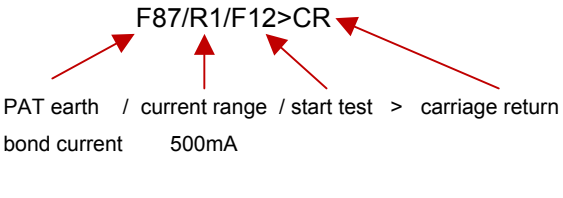
Insulation Tests:

Function	Command	Description
INSULATION TESTING	**F2**	**Select the insulation function**
	Sxxxx.xx	**Set resistance value in MΩ, ranges** 0Ω to 2GΩ (2000MΩ) – in 10kΩ steps 0Ω to 10GΩ (10000MΩ) – in 10kΩ steps with 10GΩ option, e.g. command line: F2/S1000>CR Insulation test function / resistance value 1000MΩ > carriage return (ASCII character 13)
INSULATION TEST VOLTAGE (D.C.)	**F3**	**Select the insulation test voltage function**
	R1	**Set 50V range**
	R2	**Set 100V range**
	R3	**Set 250V range**
	R4	**Set 500V range**
	R5	**Set 1000V range**
	L0	**Set 1mA range (16th Edition testing)**
	L1	**Set 500uA range (17th Edition testing)**
	T	**Transmit measured values : Voltage in 100mV units : Current in 1uA units**
		Set voltage range and current range e.g. command line: F3/R3/L1>CR Insulation test voltage function / voltage range 250V / current range 500uA (17th) > carriage return

A.C. Output:

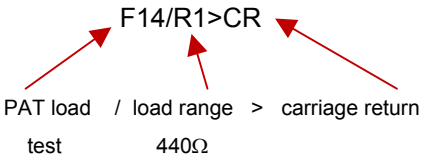
Function	Command	Description
INSULATION TESTER VOLTAGE MEASURE (A.C.)	**F4**	**Select the insulation tester voltage measurement function (A.C. output)**
	R1	**Set 100V range**
	R2	**Set 200V range**
	R3	**Set 240V range**
	R4	**Set 300V range**
	R5	**Set 400V range**
	T	**Transmit output value in 100mV units.**
		Set voltage range e.g. command line: 

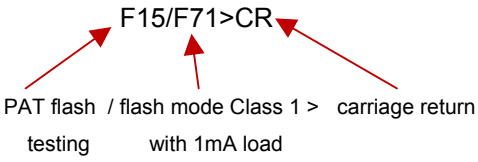
Portable Appliance Tests (PAT):

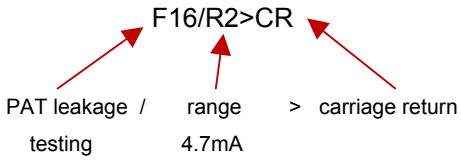
Function	Command	Description
PAT : EARTH BOND CURRENT	**F87**	**Select the PAT earth bond current menu**
	R1	**Set 500mA range**
	R2	**Set 10A range**
	R3	**Set 30A range**
	F12	**Start the PAT earth bond current test**
	T	**Transmit measured value in 1mA units.**
		Set current range and start test e.g. command line: 

Function	Command	Description
PAT : EARTH BOND RESISTANCE	**F11**	**Select the insulation tester voltage measurement function**
	R1	**Set 0Ω range**
	R2	**Set 0.05Ω range**
	R3	**Set 0.1Ω range**
	R4	**Set 0.22Ω range**
	R5	**Set 0.33Ω range**
	R6	**Set 0.5Ω range**
	R7	**Set 1Ω range**
	R8	**Set 5Ωrange**
	R9	**Set 10Ω range**
	R10	**Set 100Ω range**
	R11	**Set 1000Ω range**
	R12	**Set EXT 1 range**
	R13	**Set EXT 2 range**
	T	**Transmit output value in 1uΩ units.**
		Set resistance range e.g. command line: F11/R5>CR PAT earth bond resistance / resistance range 0.33Ω > carriage return

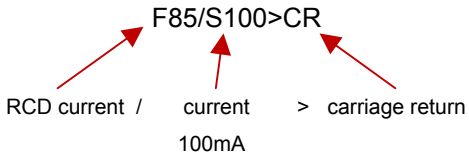
PAT : INSULATION TESTING	**F13**	**Select the PAT insulation testing function**
	Sxxxx.xx	**Set resistance value in MΩ, ranges** 0Ω to 2GΩ (2000MΩ) – in 10kΩ steps 0Ω to 10GΩ (10000MΩ) – in 10kΩ steps with 10GΩ option, e.g. command line: F13/S10.50>CR PAT Insulation testing / resistance value 10.50MΩ > carriage return

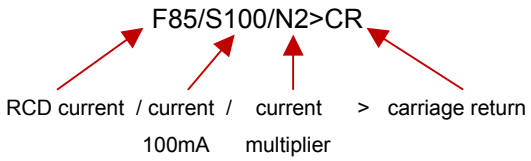
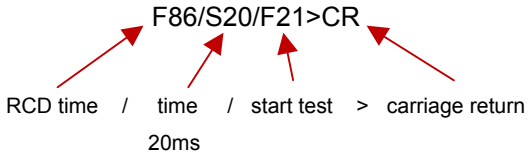
Function	Command	Description
PAT : LOAD TESTING	**F14**	**Select the PAT load test function**
	R1	**Select 440Ω load between live and neutral**
	R2	**Select short circuit**
	R3	**Select open circuit**
		Set load range e.g. command line: 

PAT : FLASH TESTING	**F15**	**Select the PAT Flash testing function**
	F58	**Select CLASS 1 (1.5kV) Flash test mode**
	F59	**Select CLASS 2 (3kV) Flash test mode**
	F71	**Select CLASS 1 Flash test mode with 1mA load**
	F72	**Select CLASS 2 Flash test mode with 1mA load**
	T	**Transmit measured values** **Flash Current in 1uΩ units (F71 & F72 only)** **Flash Voltage in 1V units (F58,F59,F71,F72)**
		Set Flash test mode e.g. command line: 

Function	Command	Description
PAT : LEAKAGE TESTING	**F16**	**Select the PAT leakage testing function**
	R1	**Set 2mA range**
	R2	**Set 4.7mA range**
	R3	**Set 7.7mA range**
	T	**Transmit measured value in 1uA units.**
		Set leakage current range e.g. command line: 

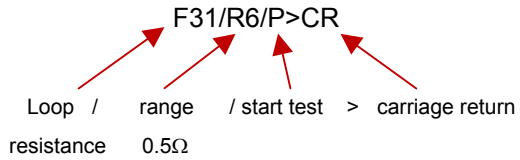
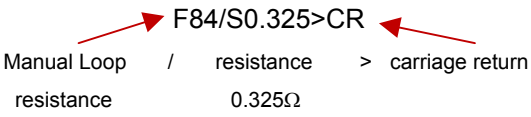
RCD Test:

Function	Command	Description
RCD	**F85**	**Select the RCD trip current menu**
	F86	**Select the RCD trip time menu**
	Sxxxx	**Set trip current in mA or trip time in ms depending on menu displayed.**
	F21	**Start RCD test**
	T	**Transmit measured current in 10uA units**
	A	**Abort RCD test**
	M	**Transmit mains voltage**
	N0	**½ I (current multiplier)**
	N1	**I (default current multiplier)**
	N2	**2I (current multiplier)**
	N3	**5I (current multiplier)**
		Set RCD trip current in mA e.g. command line: 

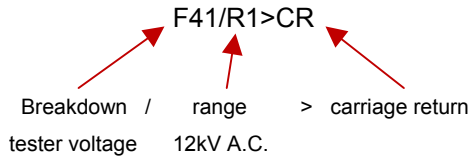
		Set RCD trip current in mA with multiplier e.g. command line: 
		Set RCD trip time in ms and start test e.g. command line: 

Loop Test:

Function	Command	Description
LOOP RESISTANCE	**F31**	**Select the loop resistance function**
	R1	**Set 0Ω range**
	R2	**Set 0.05Ω range**
	R3	**Set 0.1Ω range**
	R4	**Set 0.22Ω range**
	R5	**Set 0.33Ω range**
	R6	**Set 0.5Ω range**
	R7	**Set 1Ω range**
	R8	**Set 5Ωrange**
	R9	**Set 10Ω range**
	R10	**Set 100Ω range**
	R11	**Set 1000Ω range**
	R12	**Set EXT 1 range**
	R13	**Set EXT 2 range**
	P	**Switch on mains supply and start test (Incorporates pre-test for fault detection)**
	T	**Transmit output value (internal resistor value + auto / manual loop resistance) in 1uΩ units (12 Chars)** **Transmit Mains Voltage in mV (12 Chars)**

Function	Command	Description
	F53	**Command 3200A to measure its mains resistance (Auto loop option)**
	F84	**Select manual mains resistance menu**
	Sx.xxx	**Send manual mains resistance in ohms** **For use in conjunction with F84 command**
		Set loop resistance range e.g. command line: 
		Send manual loop resistance in Ω e.g. command line: 

Breakdown Tests:

Function	Command	Description
BREAKDOWN TESTER VOLTAGE	**F41**	**Select the breakdown tester voltage function**
	R0	**Set 3kV A.C. range**
	R1	**Set 12kV A.C. range**
	R4	**Set 3kV D.C. range**
	R5	**Set 12kV D.C. range**
	T	**Transmit output value** **Breakdown voltage in 1V units**
		Set voltage range e.g. command line: 

Function	Command	Description
BREAKDOWN TESTER CURRENT	**F42**	**Select the breakdown tester current function**
	R0	**Set 20mA A.C. range**
	R1	**Set 2mA A.C. range**
	R2	**Set 200uA A.C. range**
	R3	**Set 20mA D.C. range**
	R4	**Set 2mA D.C. range**
	R5	**Set 200uA D.C. range**
	T	**Transmit output value** **Breakdown current in 1uA units**
		Set voltage range e.g. command line: F42/R3>CR Breakdown tester current / range 20mA D.C. > carriage return

Miscellaneous Commands:

Function	Command	Description
MISCELLANEOUS COMMANDS	**U**	**Transmit all calibration factors** **A1 to A20 : Insulation Test Voltage** **B21 to B40 : ACV Output** **C41 to C60 : Earth Bond Resistance** **D61 to D80 : Earth Bond Current** **E81 to E100 : RCD** **F101 to F120 : LOOP Resistance**
	!	**Reverse display mode**
	&21xxxxxxxxxxxxxxx	**Store text string (16 chars max.)**
	#	**Display stored text string**
	F80	**Set 3200A back to main menu**

Technical Description

General

The 3200A calibrator uses the latest in reference, resistor and processor technology designed to minimise cost and size yet maximise performance. The micro processor controls and monitors all functions of the calibrator. Calibration constants are held in non volatile memory allowing the calibration to be performed without removing the covers. There are no internal adjustments required in normal service.

⚠ *Warning* risk of shock ⚠

The line power cord must be disconnected before removing the covers

The circuitry comprises of three printed circuit boards:

- Main PCB.
- Processor board
- Front Panel Display and keyboard control

Construction

The calibrator is constructed in a 3U 19” case.

The calibrator is constructed is modular to allow easy of servicing.

Internal Fuses.

Under normal operating conditions these fuses should not need to be replaced. Only under fault conditions will they require changing.

NOTE: To access these fuses it is necessary to dismantle the case which should only be carried out by qualified personnel. See removing top cover.

⚠ *Warning* risk of shock ⚠

The line power cord must be disconnected before removing the covers

Internal fuses include:

± 12V Supply A/S 2Amp 20mm

Continuity fuse

Opening The Case

⚠ *Warning* risk of shock ⚠

The line power cord must be disconnected before removing the covers

To gain access to the inside remove the six screws which hold the top cover in place. These are located on the underside edges of the 3200A calibrator. The two side screws on the plastic front panel must also be removed to allow the top cover to be slid back. Once these screws are removed, simply slide the top cover toward the rear of the instrument to remove.

Once the rear panel is removed the top or bottom cover can, if required, slide out allowing full access.

Access to Internal Fuses

After removing the top cover (see above) the fuses will be clearly visible.

PCB Removal (Not required to gain access to internal fuses).

The main PCB can only be removed from the front of the case by removing the front panel.

Processor Board

Plugs into the main PCB and controls all functions within the calibrator. The processor also manages all calibration constants held in memory. Calibration constants are stored twice to prevent errors - the processor runs a self test to detect malfunction and overloads.

Warning

Removal of the processor board may corrupt the calibration constants.

Calibration and Maintenance

WARNING

The information in this section is intended only for qualified personnel. The user must at all times be adequately protected from electric shock.

General

The 3200A calibrator maintenance requirements are listed below. Please note that the calibrator **does not** require any regular internal servicing or adjustment.

1: Electrical Safety Checks on Line power lead and case
2: Cleaning the external case
3: Calibration and operation verifications

Electrical Safety Tests

These can be carried out as frequently as required. Earth bond and insulation can be tested as a class 1 standard. Flash testing is not recommended due to the possibility of damage to internal components. .

Cleaning the external case

Use a damp cloth with a mild water based cleaner for the outside case and front panel. Do not use alcohol based cleaners or solvents and do not spill or allow liquid to enter the case.

Calibration Overview

The calibration of the 3200A calibrator can be performed covers on. Calibration factors for positive, negative and zero are store in non volatile memory for each range. Values for resistance will only need adjusting after repair.

Calibration can be carried out automatically via the USB interface if required. Adjustments to the calibration can only be made using the interface see remote commands section of this manual for details. A Calibration Control Panel (CCP) program is available from Transmille which allows full control and adjustment of the calibrator.

The recalibration of 3200A calibrator should be performed annually in a standards laboratory with the correct equipment. Adjustment should not be attempted without the required standards.

Before calibration it is important to have met the conditions listed below

1: The correct environmental condition.
2: The calibrator must have fully warmed up and been allowed to stabilise for the correct period of time.
3: Operated from the correct line voltage.
4: To use the correct calibration equipment.
5: To have available the Correct Test leads required
6: To understand the required test specifications.
7: To operate the calibrator at all times within its load and voltage capabilities

COMPREHENSIVE CALIBRATION INSTRUCTIONS ARE AVAILABLE IN THE 3200A SERVICE KIT (OPTION).

Guarantee and service

Transmille Ltd. guarantees this instrument to be free from defects under normal use and service for a period of 1 year from purchase. This guarantee applies only to the original purchaser and does not cover fuses, or any instrument which, in Transmille's opinion, has been modified, misused or subjected to abnormal handling or operating conditions.

Transmille's obligation under this guarantee is limited to replacement or repair of an instrument which is returned to Transmille within the warranty period. If Transmille determines that the fault has been caused by the purchaser, Transmille will contact the purchaser before proceeding with any repair.

To obtain repair under this guarantee the purchaser must send the instrument (carriage prepaid) and a description of the fault to Transmille at the address shown below. The instrument will be repaired at the factory and returned to the purchaser, carriage prepaid.

Note:
TRANSMILLE ASSUMES NO RESPONSIBILITY FOR DAMAGE IN TRANSIT

THIS GUARANTEE IS THE PURCHASER'S SOLE AND EXCLUSIVE GUARANTEE AND IS IN LEIU OF ANY OTHER GUARANTEE, EXPRESS OR IMPLIED. TRANSMILLE SHALL NOT BE LIABLE FOR ANY INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OR LOSS.

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3200A Fax Back Form

Your 3200A Electrical Test Equipment Calibrator is fitted with a *security system* which requires a *security code* to be entered to allow continued operation of the unit beyond the 65 Day evaluation period.

Please complete the following details:

Company Name: _____

Contact Name: _____

Address: _____

_____

_____

_____

Country: _____

Tel: _____

Fax: _____

Instrument Model: **3200A Electrical Test Equipment Calibrator**

Serial Number: _____

Please Fax This Form To : +44 (0) 1580 890711.

On receipt of this fax Transmille will, on receipt of payment for the calibrator, send details of the security code with details on how to enter this code.

Appendix A

Installing the USB Interface Driver (Windows XP)

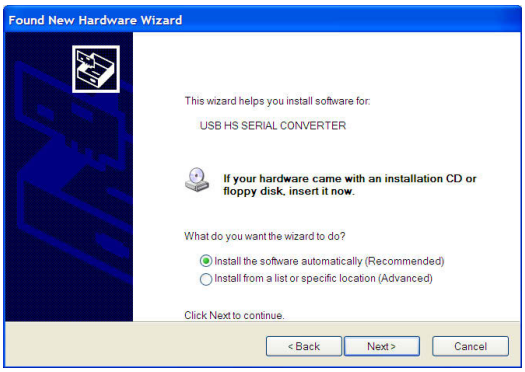
Insert the supplied USB lead driver CD into the computer CD drive

Click on menu to install driver –
follow on screen prompts.

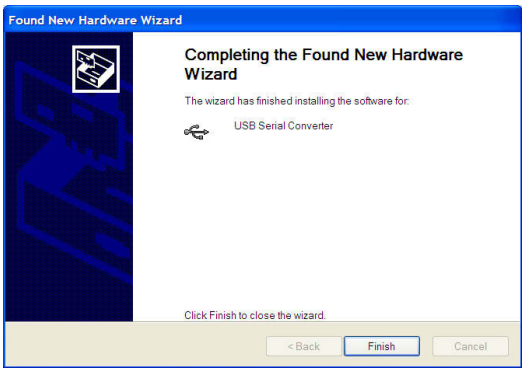
Connect the USB lead to the INSTRUMENT and connect to the computer

Windows will detect a new device is connected - Select **No, not this time** when asked if a Windows update search should be run

Select **Install the software automatically** to begin driver installation



Once located Windows will install the driver and complete the installation.



Installing the USB Interface Driver (Windows Vista / 7)

Insert the supplied USB lead driver CD into the computer CD drive

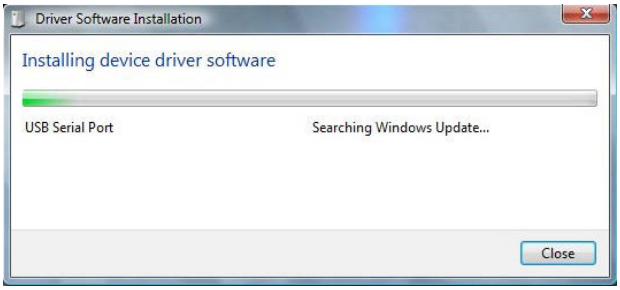
Click on menu to install driver –
follow on screen prompts.

Connect the USB lead to the INSTRUMENT and connect to the computer

Click **Locate and Install driver software**

Windows will begin installation

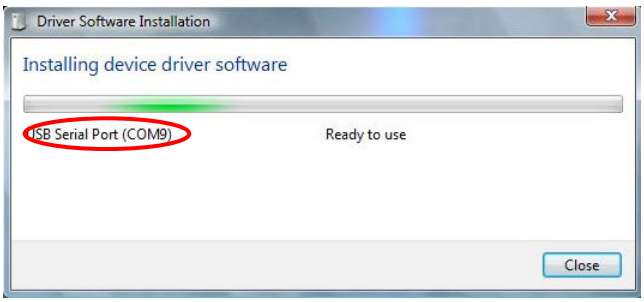
Windows will install device driver



Once installed, Windows will displayed the allocated COM Port in brackets as shown :

Note : The COM port number can be checked at any time by using Windows Control Panel.

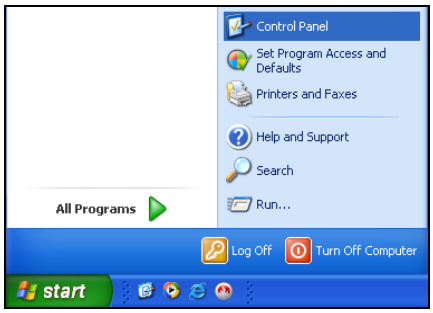
[see instructions on next page].



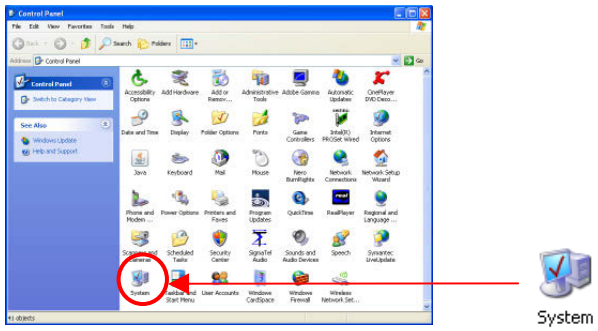
Checking the COM Port setting for the USB Interface

Once the USB interface driver is installed, it will have assigned a '*virtual*' COM port number which is needed for setting up the instrument for computer control (via optional ProCal Calibration software). To determine the COM port number, follow the steps below :

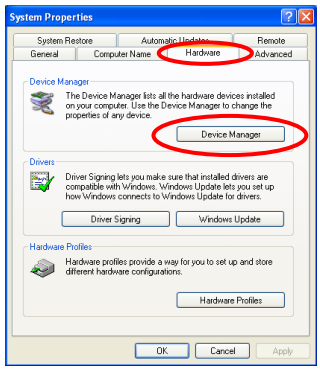
Open **Windows Control Panel**



Select the **SYSTEM** icon



Select the **Hardware** tab, then click the **Device Manager** button



Select **Ports (COM & LPT)** - the virtual COM Port number assigned is shown in brackets