1000 SERIES

OPERATION MANUAL

TRANSMILLE
SOLUTIONS IN CALIBRATION

■ 1000A ULTRA PORTABLE
■ 1000B COMPACT BENCH
MULTI FUNCTION CALIBRATORS

1000 Series
Precision Multi Product Calibrator

Operation Manual

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 ONLY AFTER PAYMENT HAS BEEN RECEIVED.

This code 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 unlock 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: Multi-product Calibrator
Model Number: 1000A / 1000B
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
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

01/07/2013

Managing Director

Revision No: 1.0
Date: 01/07/2013

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1000 Series Calibrator Introduction

The 1000 series of calibrators offer the smallest and by far the most portable multi product multi-function calibrator in the world.

Main Features

- **AC/DC Volts to 1025V**
- **AC/DC Current to 10 Amps**
- **AC/DC Current to 500 Amps with 50 Turn Clamp coil Adapter EA002**
- **Simulated 2 wire Resistance 0 ohms to 10 MOhms**
- **Passive 2 wire Resistance 10 ohms to 100 MOhms**
- **Capacitance 10nF to 1uF**
- **Frequency to 100kHz**
- **PT100 resistance Simulation**
- **Thermocouple Simulation (°C / °F)**
- **USB Interface**
- **Inbuilt Procedure storage functionality, allowing test routines to be saved in memory**
- **Expandable via the Adapter Interface for added functionality**
- **Insulation Resistance Simulation (OPTION)**
- **Continuity Resistance Generation (OPTION)**
- **Voltage, Current and Resistance Measurement (OPTION)**

Accuracy and Functionality

The 1000 Series calibrators are available in a rugged portable case or a bench case. A rack mounting option is also available.

True Multiproduct Calibration

Designed to provide an accurate cost effective portable instrument for the calibration of multimeters, clamp meters, frequency meters and temperature meters.

Designed for use in the laboratory or portable onsite calibration. The fast warm up time combined with the small case and low weight make the 1000 series calibrator also ideal for onsite calibration. The USB interface allows direct connection to a computer/laptop.

USB Interface

All functions and outputs of the series 1000 calibrator are fully programmable over the USB interface. The use of the USB interface saves the cost of fitting GPIB cards to the computer, and also allows easy connection to laptops, reducing the set up time for on-site calibration.

Output Connection Indication

The output terminal configuration is designed to match the majority of multimeter input connections, e.g. volts/ohms, low current and high current eliminating the need for lead changing during calibration. All outputs are isolated when not in use and an LED indicator shows the active output(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.

Before connecting to Line power, ensure that the input voltage of the calibrator matches your supply voltage. For further information on verifying the input voltage, please refer to Page 12

Lifting and Carrying the Calibrator

The calibrator weighs 9.5kg so can be carried by one person. (note: observe all normal practices for health and safety when carrying). 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.

The 1000A, in the ruggedized case should always be transported with the lid closed to protect the front panel of the instrument from accidental damage.

Warning: DO NOT DROP THE CALIBRATOR
This may cause internal damage which will not be covered under warranty
The 1000A should always be shipped in suitable packaging to avoid damage when shipped via courier or freight.

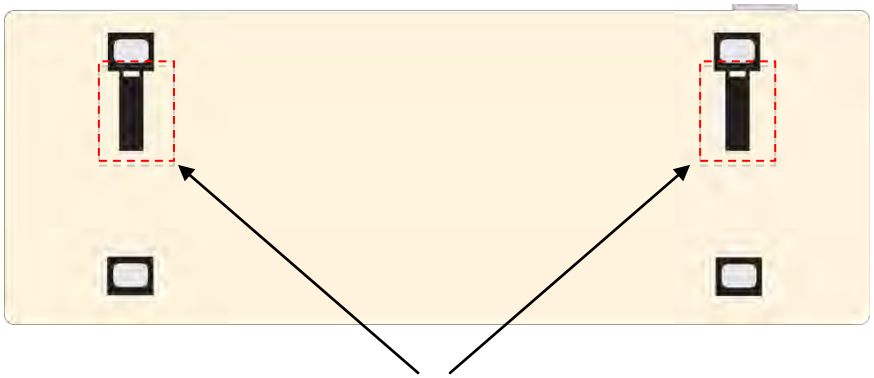
Positioning the Calibrator

The 1000 series calibrator is available in a variety of different casings for use on site, on a bench or in a rack.

Care should be taken when positioning the calibrator to ensure that items are not placed against the cooling vents. Placing items against the cooling vents will affect the performance of the calibrator and reduce the amount of time that the 10A output will operate for before reaching thermal cut-out conditions (see Page 73)

When considering placement of the 1000A (in ruggedized casing), ensure that the calibrator is placed on a flat, stable surface.

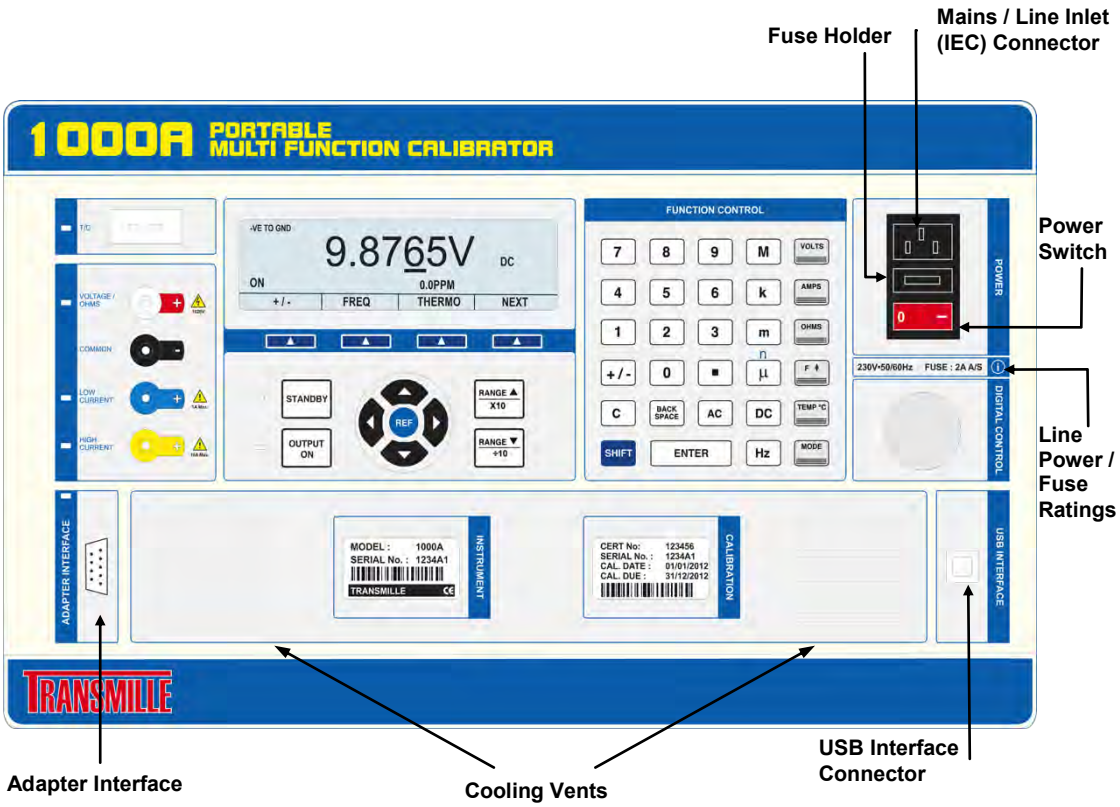
For bench-top use, the 1000B (bench top casing) is fitted with 4 non-slip feet. The front pair of feet are fitted with moveable ‘arms’ that can be positioned to raise the front of the calibrator to a more ergonomic position.



Moveable ‘arms’ attached to front pair of feet

Power and Interface Connections

Connections on the front panel are for Line Power via a 3 Pin IEC connector incorporating the Line fuse and on-off switch, and a Female Type B USB connector for interfacing with a computer.



The 1000 Series is provided with an IEC lead suitable for the country of shipping, if a different lead is required please inform Transmille prior to shipping.

Checking the Line Voltage

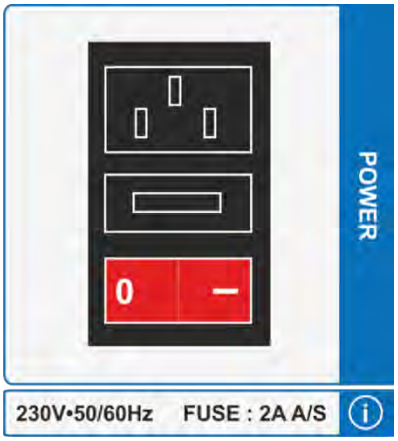
Warning: The line power cord must have an earth conductor to avoid risk of shock. This instrument must be correctly earthed.

The calibrator must be ordered with 100-120 Volt line supply or 220 - 240 Volt line supply option. Check that the line voltage matches the configured voltage before connecting the power to the instrument. The input voltage is indicated on the front panel underneath the power switch.

Warning: Connecting the calibrator to the wrong supply will cause internal damage to the instrument.

Power Line Inlet Fuse and rating

The power line inlet fuse is located directly below the power inlet within the voltage selector housing. The correct fuse rating is 2A anti-surge (slow blow) for 230V operation and 4A anti-surge (slow blow) for 110V operation.

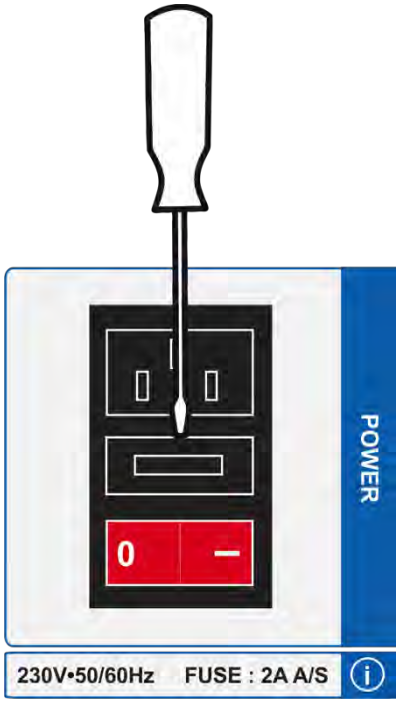


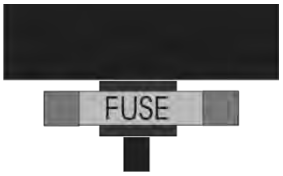
Replacing the Power Line Fuse

In the event of the Power Line fuse being damaged, the fuse will need to be replaced. This operation can be performed by the user.

Warning: Ensure Line Power has been disconnected from the instrument before performing this procedure

Using a Flat Head screwdriver, insert the end of the screw driver into the recess on the fuse holder. The screwdriver must be parallel to the front panel of the calibrator





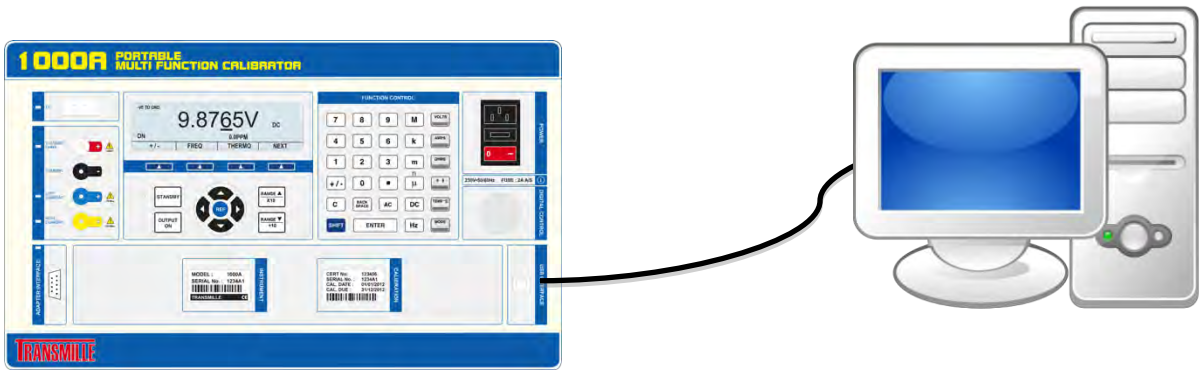
Once the screwdriver is in the recess of the fuse holder, gently hinge the fuse holder up (away from the front panel). Be careful not to damage the fuse holder by applying too much force. The fuse holder will lift out, revealing the fuse. Check the fuse using a continuity tester to ensure that the problem is the fuse. If the fuse is damaged, replace the fuse with an anti-surge fuse of the recommended rating for the supply voltage. Re-insert the fuse holder in the same orientation as it was removed.

Connecting to a computer

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

Connection Details

Connection from calibrator to a computer :



The USB connection on the 1000 series calibrator is a Female type B 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 above the mains inlet socket on the front panel.

The fan will start and the front panel display will illuminate indicating power. The display will show a firmware version number and after a short delay, during which time the processor performs a self-test of the instrument, the display will show an output of **0.0000mV DC**. The default start condition of the calibrator is as follows:

- Output Status : Standby
- Range : 100mV DC
- Negative to Ground Enabled

Allow the calibrator to warm up for 20 minutes to obtain full accuracy; the fast start feature of the calibrator will give approximately 90% of full specifications within 10 minutes. The calibrator has been designed to be powered up continuously and does not need to be turned off when not in use.

If required, a control program (i.e. ProCal) can now be started on the computer; the program will establish communication with the calibrator. If used with ProCal, the stored value of the passive standards will be downloaded to the computer, and the calibrator will indicate 'ProCal Control' on the screen when ProCal is started.

Output Connections

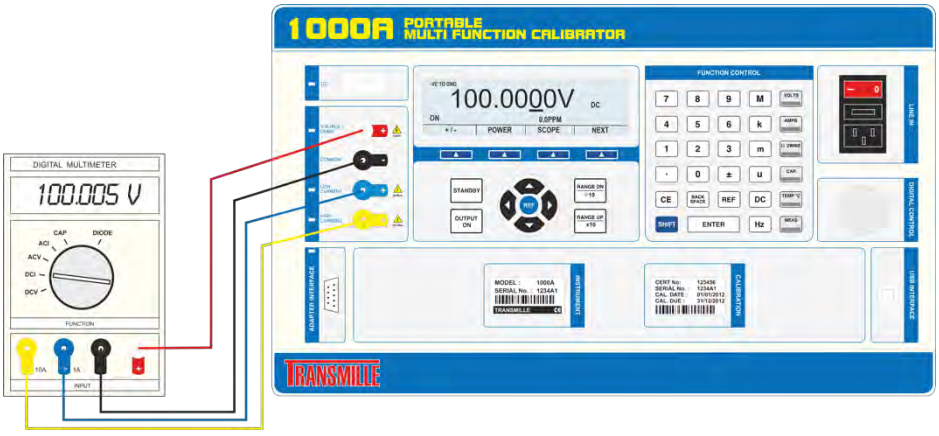
Warning*:* Risk of shock.
High voltages may be present on the output sockets.

Output sockets are 4mm safety type, the voltage pair contacts are low thermal gold plated for minimum thermal EMF.

The 1000 series calibrator's outputs have been designed to allow most multimeters to be calibrated without changing connections. There are 4 sets of outputs:

1) Voltage, Resistance, Capacitance, Frequency.
2) Current to 1A.
3) High 10A Current.
4) Thermocouple Output

The Voltage and Current terminals share a single common terminal. This allows the 1000 series to connect directly to all inputs on typical multimeters without the need for changing leads as below:



When an output terminal pair is not active they are completely open circuit and isolated from the other outputs.

Note: When outputting resistance, capacitance and frequency the calibrator will use the voltage output terminals.

It is recommended that the voltage and low current leads be high quality screened cable with gold plated 4mm plugs fitted. The cable must be able to withstand 1025 volts AC and have an insulation resistance greater than 1TΩ to avoid introducing any shunting effect on the high resistance ranges.

Poor quality test leads will introduce noise, thermal emf and leakage errors on low voltage & current ranges and also unstable readings on resistance and capacitance outputs (see measurement techniques). Special test leads are available from Transmille for ensuring accurate measurements, see accessories.

Warning: Under no circumstances should any voltage be connected to the calibrator outputs*. The 1000 Series calibrator outputs are protected with IGuard however we advise to be vigilant against accidental connections

*** Insulation testers up to 1000V may be connected when using the Insulation test functions**

Output Overloads

If the calibrator is unable to drive the load then the output will be turned off and the calibrator returned to standby mode. The message `Standby` will be displayed on the front panel. The output will be automatically reset on setting the output again.

Operation

Safety Warnings

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.

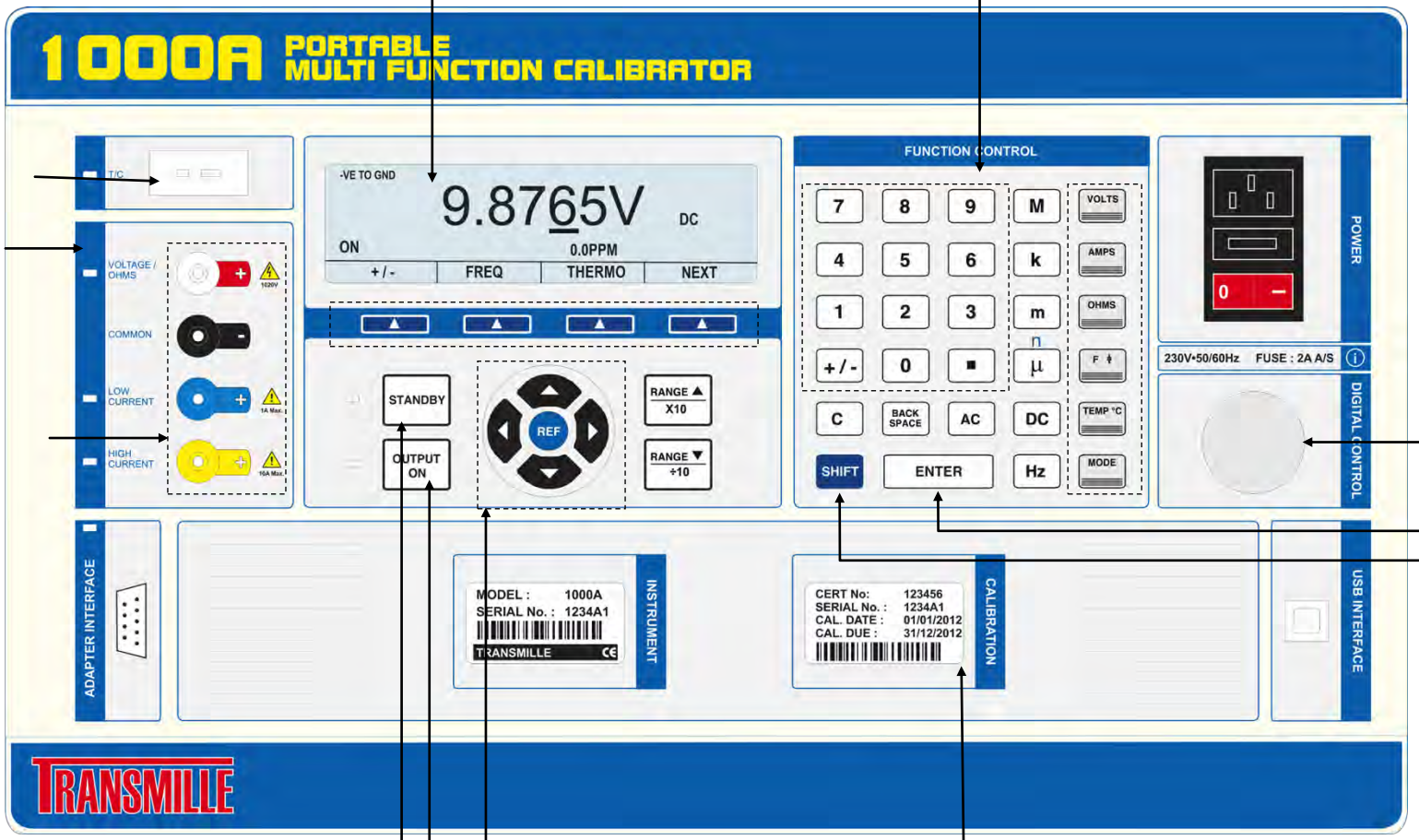
WARNING: This instrument is capable of generating both DC and AC high voltages.

Introduction to Operation

All functions of the 1000 Series Calibrator can be controlled from the front panel, or controlled remotely by a computer over the interface.

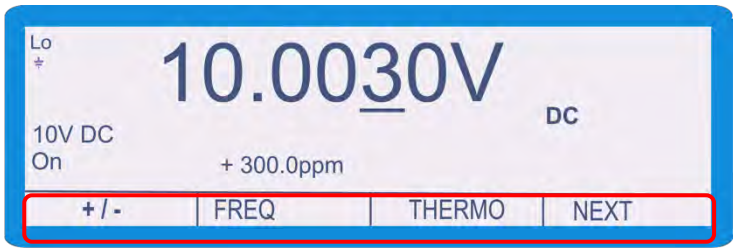
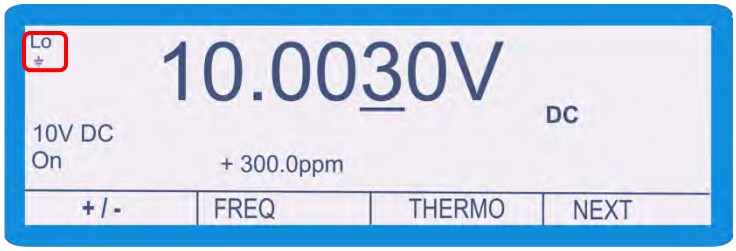
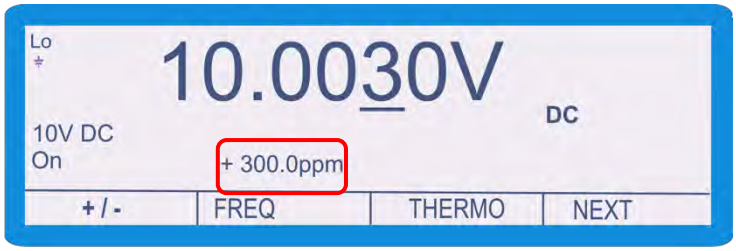
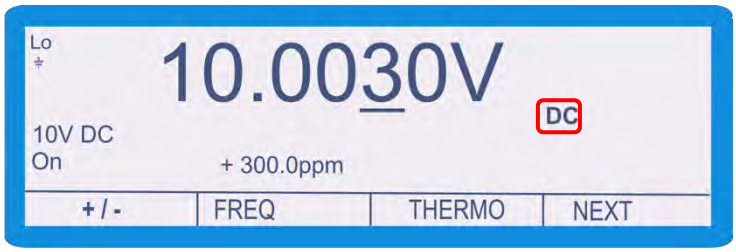
The front panel controls are ‘locked out’ when controlled by a computer, but local control may be resumed by selecting the ‘local’ soft key - it must be remembered that this action may disrupt the computer program.

Front Panel Controls and Indicators



Graphic LCD Display

The graphic backlit LCD display shows the present output, instrument status, % or ppm change from the entered value, and also the new value being entered. The bottom portion of the display is used to assign the function of the four ‘soft keys’.

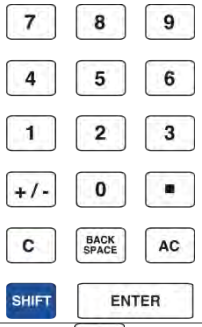
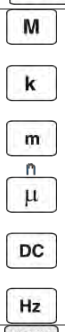
Output Value & Range	
Dynamic Soft key Menu	
Low to Ground Output On / Standby Indicators	
Deviation (ppm)	
Function Specific Configuration Display	

Front Panel Keyboard

The front panel of the 1000 Series 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.

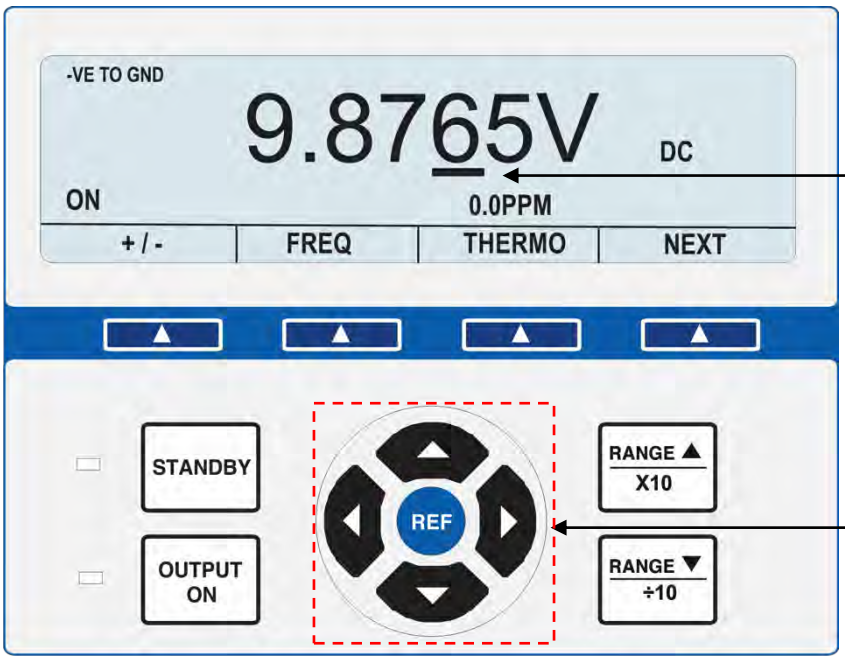
The Keyboard is divided into sections to allow easy operation.

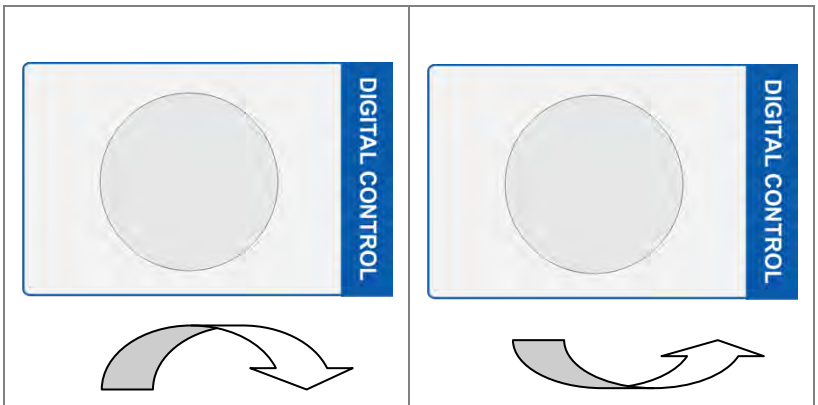
Numeric section Allows numeric values to be entered, also contains the + / - key for entering polarity for DC settings, the Back space and Clear key for information entry, the Shift key for selecting additional functions and the Enter key for confirming data entry	
Multiplier section *Mega (M), kilo (k), milli (m), micro(u) or nano (n)*	
Function section *Volts (V), Amps(A), Ohms,* *Farads(F), Celsius(C), & Frequency(Hz)*	
Range Up / Range Down Allow the output to be multiplied / divided by 10.	
Left / Right / Up / Down Cursor Keys To select the digit to be controlled by the rotary control.	
Output On / Standby keys Allow the calibrators output to be disconnected from the terminals. LED indicators are incorporated in these switches to clearly show the output status.	

Digital Control and Cursor Keys

A digital potentiometer allows the 'highlighted digit' on the display to be incremented (turning clockwise) or decrement (turning anti-clockwise). As an output is changed, the deviation from the original value entered on the keyboard is shown in either % or ppm depending upon the magnitude of the change.

To 'Reset' the deviation calculation, press the REF key in the middle of the cursor keys, this resets the reference value from which the deviation is calculated

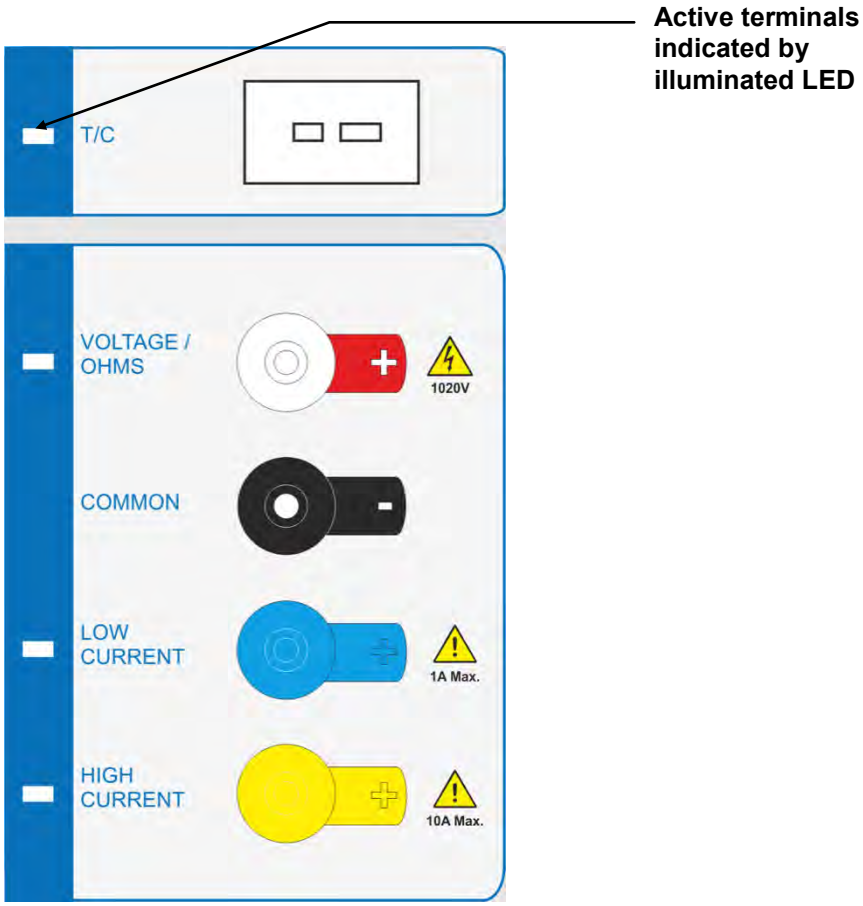




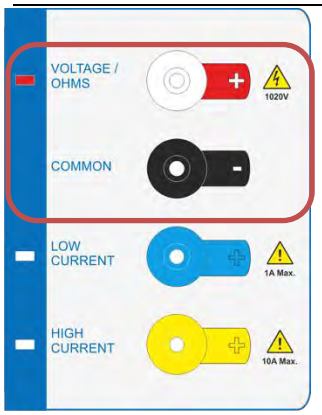
Terminal status LED's

LED's above the terminals indicate which pair is active. When terminals are not active they are electrically isolated from each other

All 4mm safety sockets share a single common terminal.



Voltage Output Terminal Pair (Black & White)



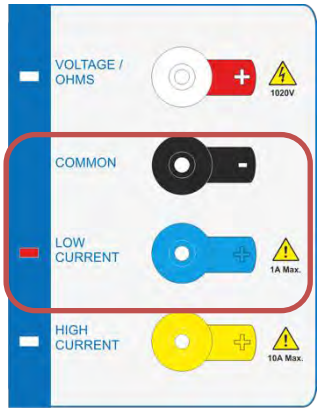
Low thermal 4mm safety terminals

Used for all voltage outputs up to 1025V, for resistance, capacitance and frequency.

Also used for Insulation resistance, test voltage measurement and continuity current measurement

WARNING:
Dangerous voltage may be present on these terminals.

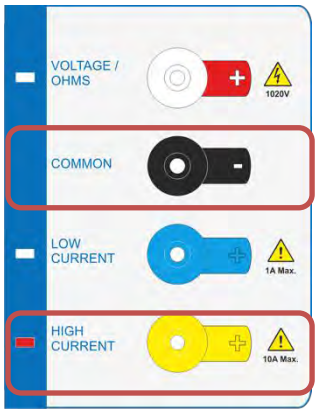
Low Current Output Terminal Pair (Black & Blue)



4mm safety terminals

Used for current outputs up to 1 Amp

High Curent Output Terminals (Black and Yellow)



4mm Safety terminals

Used for all currents above 1 Amp.

Thermocouple Output Terminals (White)

Mini thermocouple socket used for generation of thermocouple output. Ensure the correct thermocouple wiring is used to match the type (i.e. Type K, Type J)

9 Pin Adapter Interface Connector.

To expand the 1000 Series calibrators, an adapter interface is provided on the front panel. This allows for connection to external adapters used for extending calibration capability, e.g. Pressure measurement etc.

Incorporates a yellow LED to indicate when the adapter interface is active.

The pins connections are as follows:

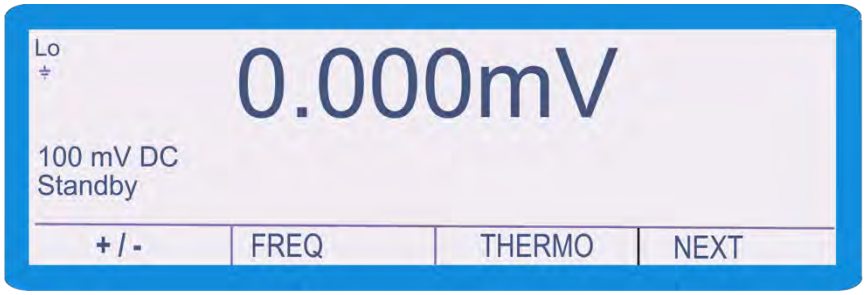
Pin 1 – +15V
Pin 2 – Digital ground
Pin 3 – Strobe
Pin 4 – Data
Pin 5 – Select
Pin 6 – -15V
Pin 7 – Analogue ground
Pin 8 – Output
Pin 9 – Input

Soft Key Menus

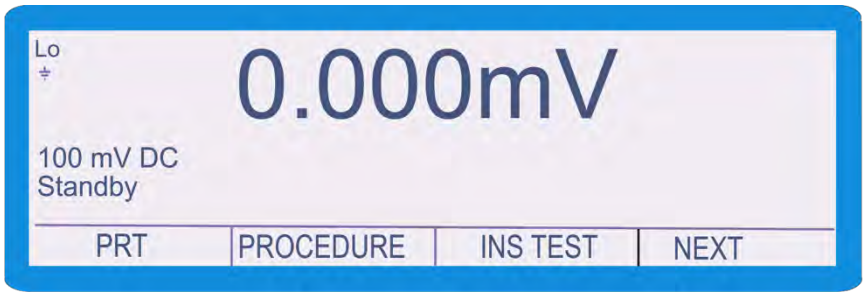
Menu Structure

To access advanced functions of the calibrator, the 4 soft keys below the screen can be used to select the menu functions that appear at the bottom of the screen.

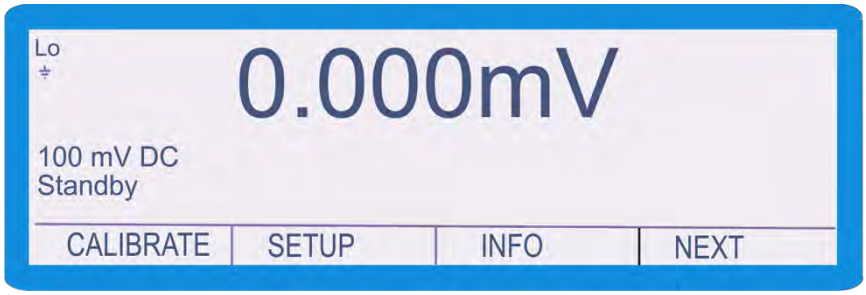
There are 3 pages of menus, each featuring 3 separate functions and a next key.



Key Name	Function
+ / -	In DC functions, pressing this key will invert the polarity, e.g. an existing setting of +1 V, pressing this key will change the output to -1V
FREQ	Pressing this key will enter the frequency output function, further described
THERMO	Pressing this key will enter the Thermocouple source function, operation described



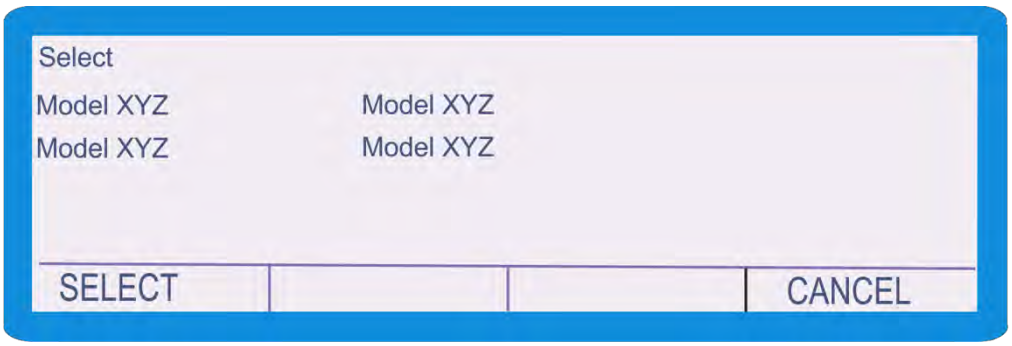
Key Name	Function
PRT	Pressing this key will enter the simulated PRT output function, operation described
PROCEDURE	Pressing this key will enter the procedure select screen, further described
INS TEST	Pressing this key will enter the Insulation resistance function, operation described



Key Name	Function
CALIBRATE	Pressing this key will enter the Calibration function, further described
SETUP	Pressing this key will enter the setup menu, further described
INFO	Pressing this key will display the info screen, further described

Procedure Menu

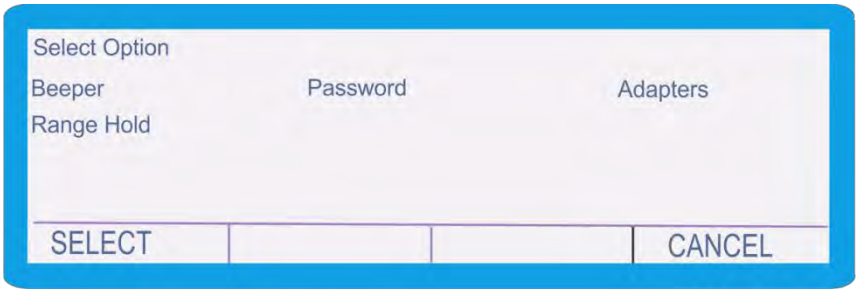
The 1000 series calibrators has the ability to store procedures in memory for on site use. After pressing the ‘PROCEDURE’ key the calibrator will display a list of procedures that have been loaded.



Using the arrows keys (as described on page 23), move the cursor to the desired model number and press the ‘SELECT’ soft key

Setup Menu

To configure the 1000 series calibrator, a setup menu is provided. This allows users to configure options, i.e. the Calibration Password.



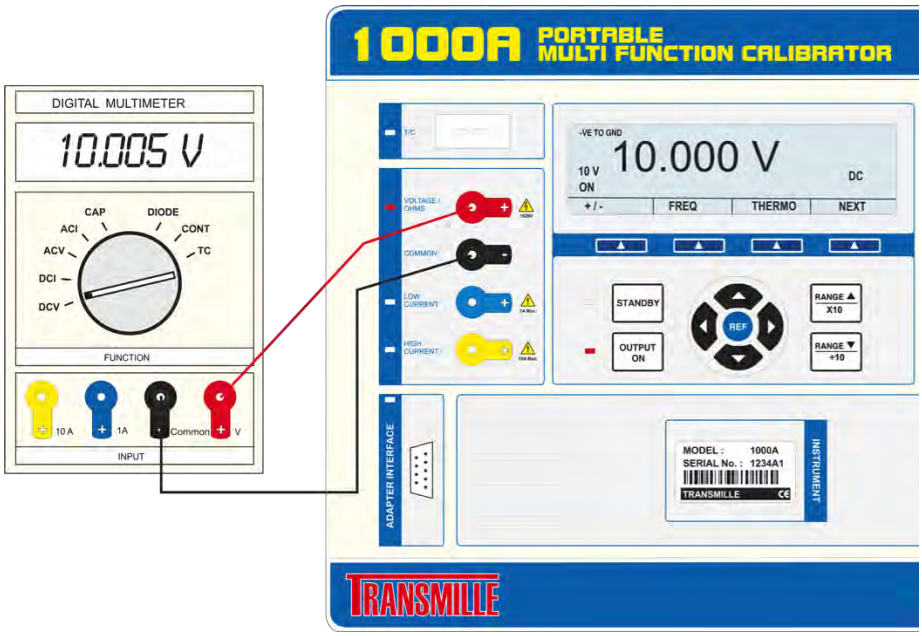
Using the arrows keys (as described on page 23), move the cursor to the desired function and press the ‘Select’ soft key or press the enter button.

Function Name	Description
Beeper	This menu item allows the beeper to be turned on or off. With the beeper off the unit will not emit any noises for key presses, however beeps will STILL be emitted for HV ramps and errors.
Password	This function prompts the user to enter the calibration password. After entering the correct password the calibrator will be in calibration mode. Another function of this key, once already in calibration mode, is to edit the system password to a new password.
Adapters	This menu item allows the user to edit the displayed unit for pressure adapters that have been stored in the calibrator
Range Hold	This function enables a ‘Range Hold’ function on the calibrator, enabling outputs that would not normally be available from the range to be output, i.e. 50mV from the 1V range

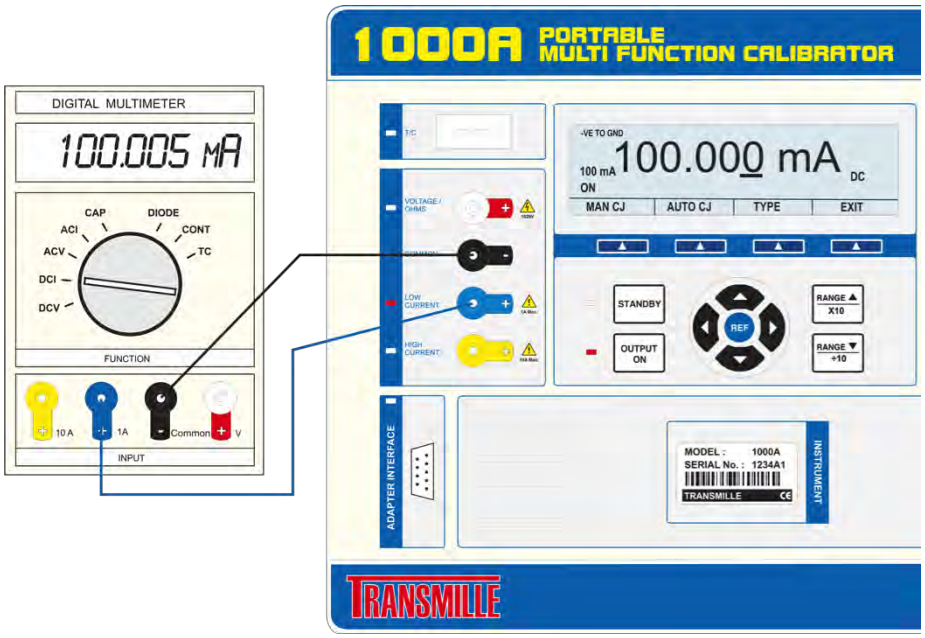
Connection Diagrams

Provided in this section are example connection diagrams for typical pieces of test equipment, indicating the terminals to use

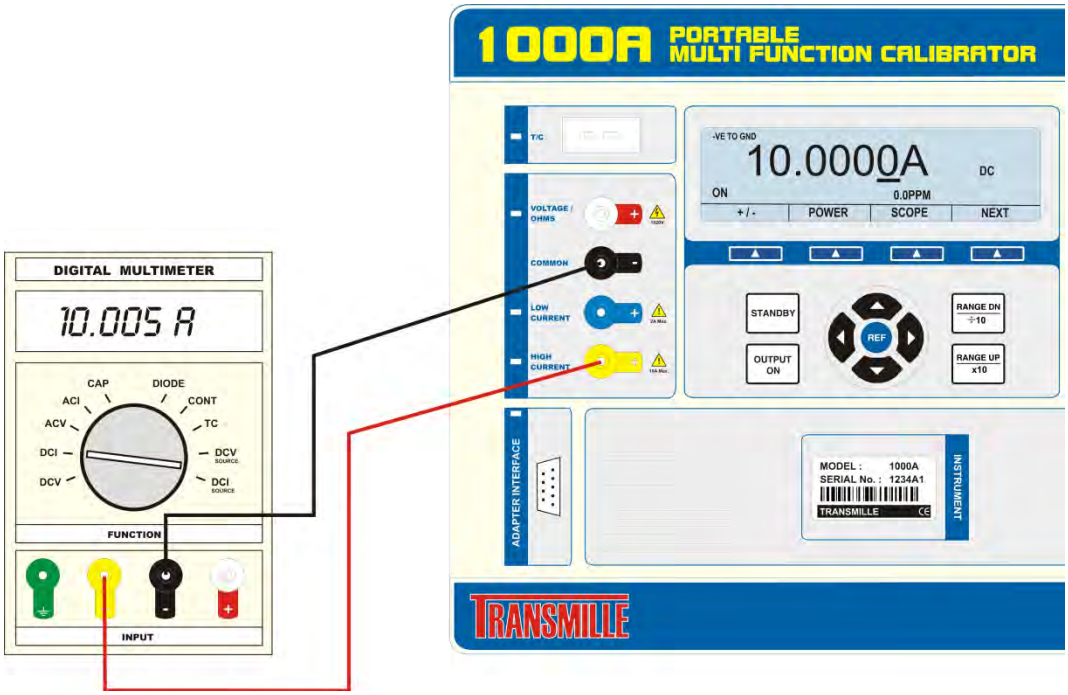
DC / AC Voltage



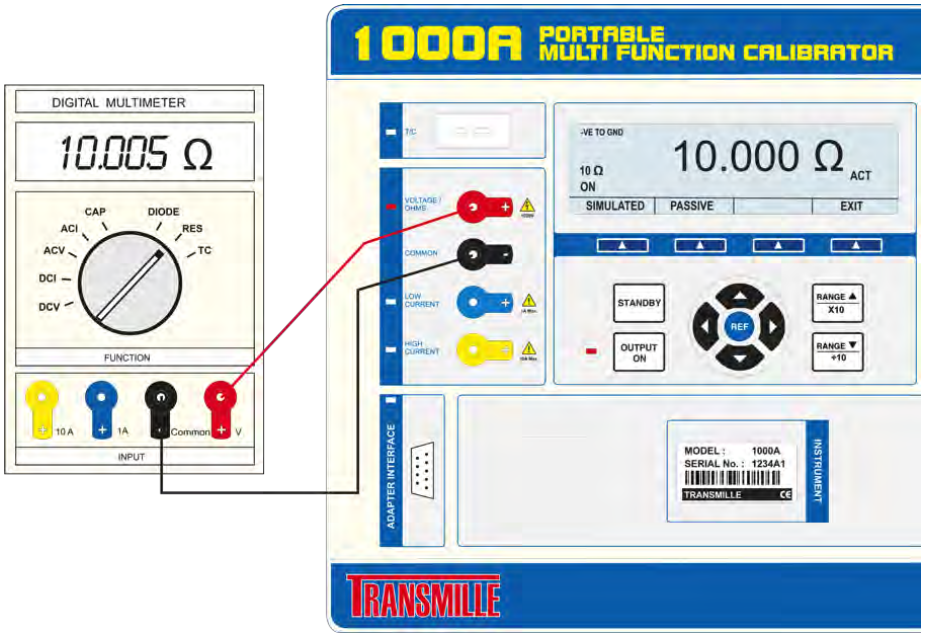
DC / AC Current – Outputs below 1A



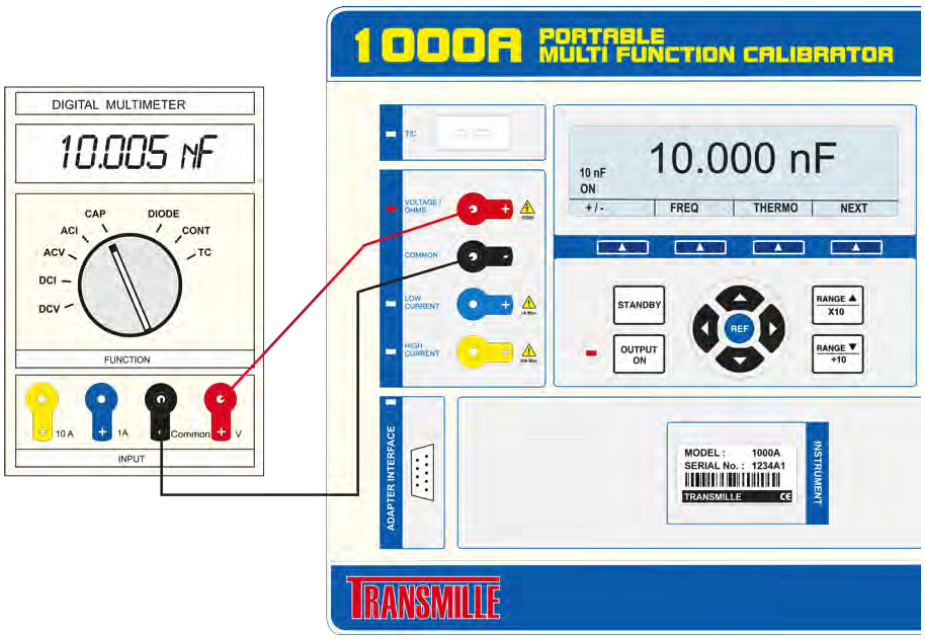
DC/AC Current – Outputs above 1A



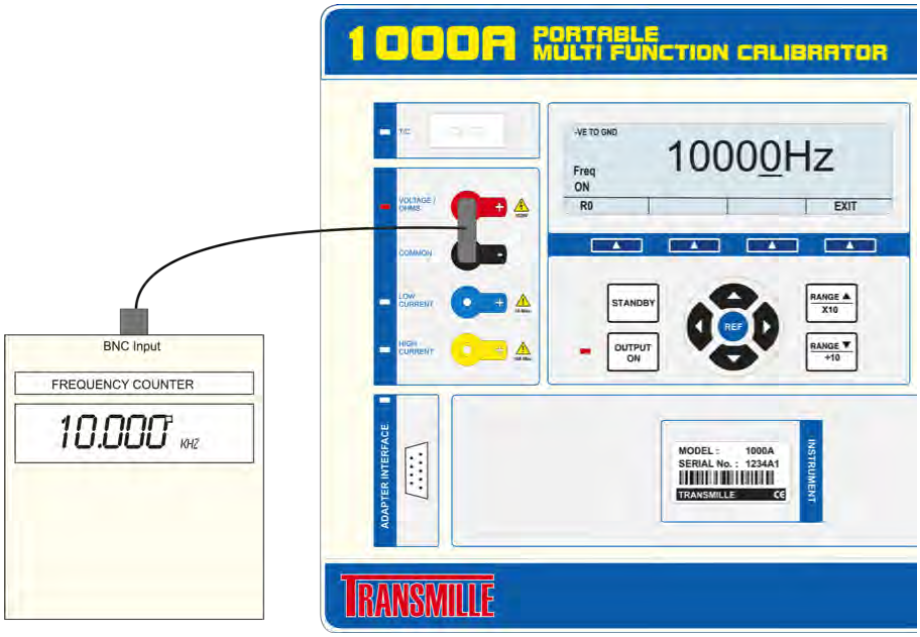
Resistance



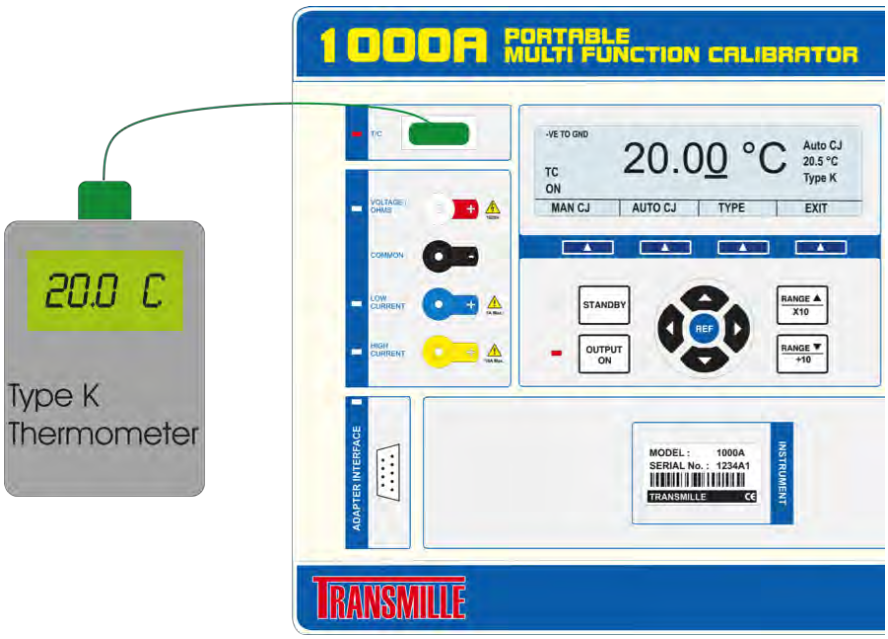
Capacitance



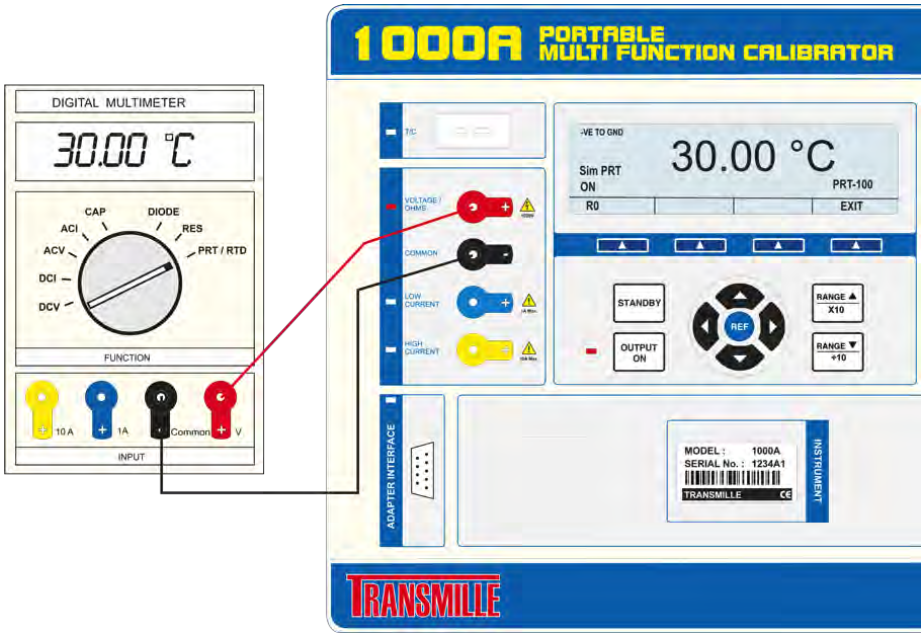
Frequency



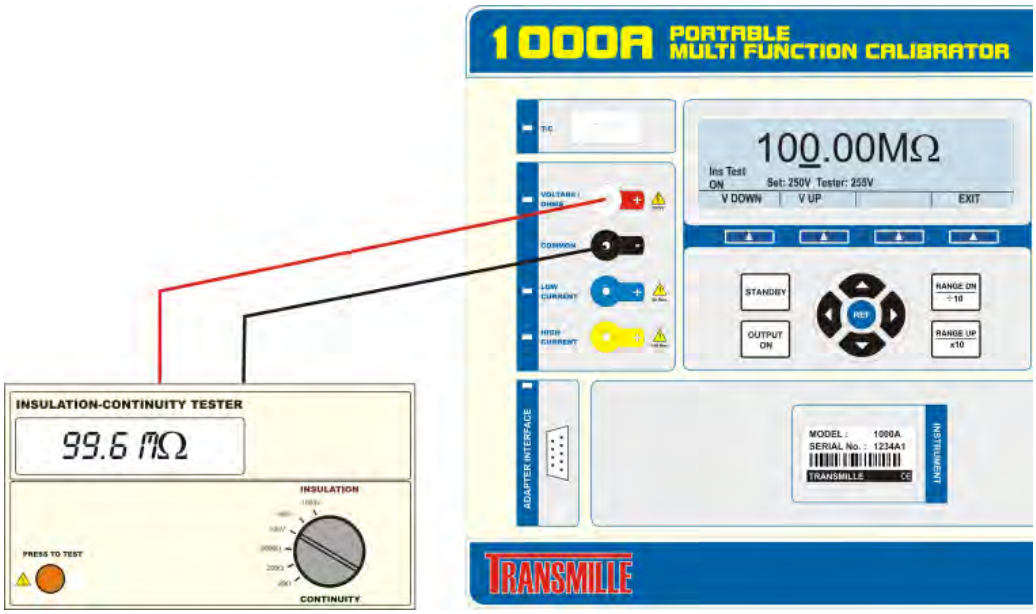
Thermocouple



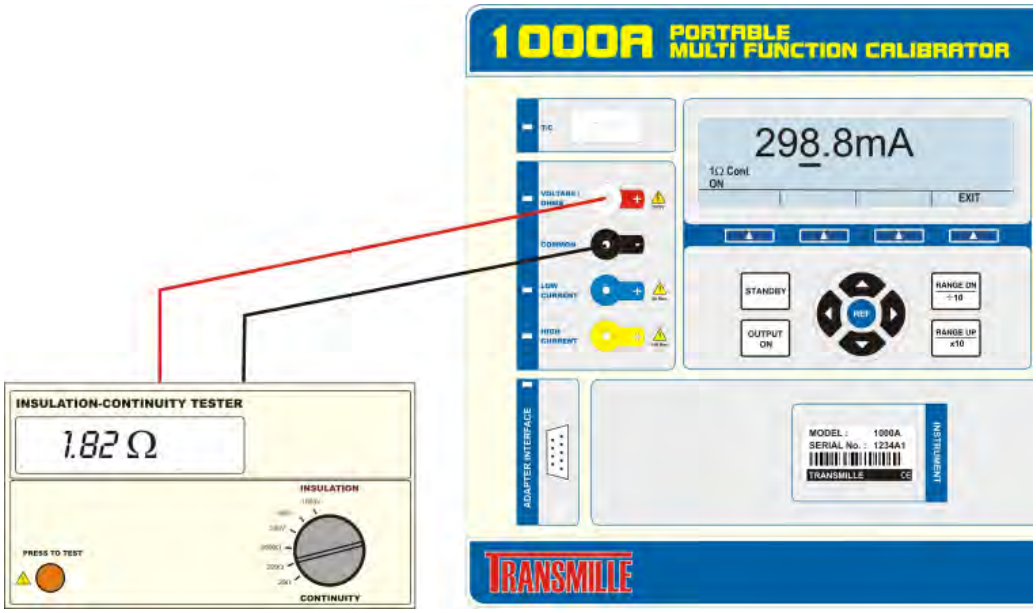
PRT / RTD


DIGITAL MULTIMETER
30.00 °C
CAP
DIODE
ACI
RES
ACV
PRT / RTD
DCI
DCV
FUNCTION
10 A
1A
Common
V
INPUT
1000A PORTABLE MULTI FUNCTION CALIBRATOR
30.00 °C
Sim PRT
ON
PRT-100
R0
EXIT
STANDBY
OUTPUT ON
REF
RANGE ▲ X10
RANGE ▼ ÷10
MODEL : 1000A
SERIAL No. : 1234A1
TRANSMILLE
INSTRUMENT
ADAPTER INTERFACE
TRANSMILLE

Insulation Resistance / Test Voltage Measurement



Continuity Resistance / Current Measurement



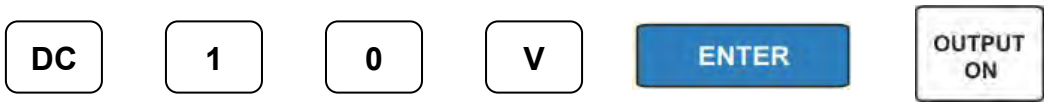
Setting An Output

Using the Keyboard

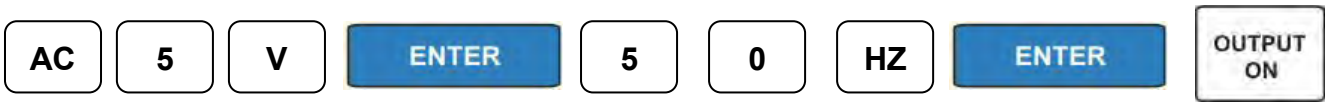
Setting the output of the calibrator is similar to entering values on a calculator. Simply press the keys to enter the value required, select a multiplier (i.e. m for milli), and then select the units, i.e. volts.

The new value will appear under the current set value on the calibrator display. Once you are happy with the new value, press ENTER

For example, to set 10 volts DC



To set 5V AC at 50Hz



To return to DC

The calibrator will retain the value of the last output when switching between DC and AC modes, i.e. switching from 5V at 50Hz, pressing the DC key will switch the calibrator output to 5V DC. The calibrator will switch into standby mode when switching between DC and AC outputs.

Worked examples are provided for the following outputs:

- DC Voltage
- DC Current
- AC Voltage
- AC Current
- Resistance (Simulated)
- Resistance (Passive)
- Capacitance
- Frequency
- Thermocouple Output
- PRT / RTD Output
- Using a Current Coil
- Insulation Resistance Measurement
- Insulation Test Voltage Measurement
- Continuity Current Measurement

Adjusting the output using the digital control

After the output has been set, any digit of the output display can be incremented or decremented using either the digital control or the up and down arrow keys.

This function makes calibration of analogue meters easy, where deviating the output of the calibrator rather than interpreting the indicated value from the UUT provides more accurate results.

For further information on adjusting the output using the digital control, please refer to Page 23

Display of % or ppm Error

When the output value is changed by the methods above, the display will show the change in ppm or % from the original reference value entered from the keyboard.

This feature is ideal for displaying the error in a meter under test by adjusting the output from the calibrator to make the meter read the nominal value.

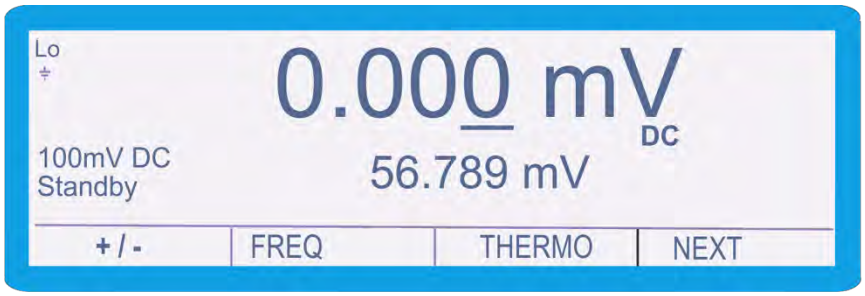
For further information on displaying the deviation from nominal, please refer to Page 23

Setting a DC Voltage Output

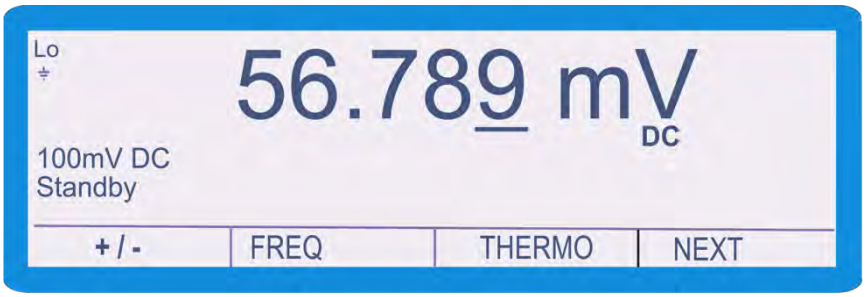
Complete the following procedure to set a dc voltage output. The BACK SPACE and C keys can be used to edit the entry in the event of an incorrect key press.

Warning
ENSURE THE OUTPUT DOES NOT EXCEED RATING FOR UUT INPUT

1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.
2) Connect the UUT to the calibrator as described for DC Voltage measurements (see connection diagram on Page 31)
3) Select the correct range on the UUT.
4) Press DC
5) Press the numeric and decimal point keys to enter the required value, e.g. 56.789.
6) Press +/- key, depending upon the polarity of the output required (default is positive)
7) Press the multiplier key (if required) e.g. m
8) Press VOLTS
9) The display will now indicate the value that has been entered below the currently set output.



10)Press ENTER. The new value will replace the existing output in the middle of the display.



11)Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light up, as well as the terminal indicator; indicating that the output is active.

The calibrator will now produce 56.789 mV DC at the voltage terminals. Once on a range, any new output within that range can be set without the calibrator returning to standby.

When a high voltage value is entered the calibrator will automatically go into standby mode. To output the voltage, press the Output On key. This safety feature stops the accidental output of high voltage.

For protection of UUT's, the 1000 Series calibrators high voltage outputs are ramped, so that voltage is increased gradually. Please refer to the 'High Voltage Output Ramp' section (Page 72) for further information on this function.

For safety reasons the 1000 Series calibrator is fitted with a High Voltage timeout. Please refer to the 'High Voltage Timeout' section (Page 72) for further information on this function.

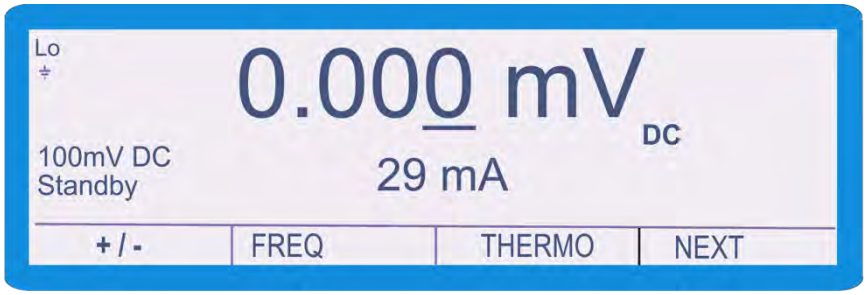
For safety reasons the 1000 Series calibrator is fitted with a High Voltage current limit. This ensures that incorrect connections, faulty UUT's or potentially dangerous situations are protected against. Please refer to the 'High Voltage Current Limit' section (Page 73) for further information on this function.

Setting a DC Current Output

Complete the following procedure to set a DC current output. The BACK SPACE and C keys can be used to edit the entry in the event of an incorrect key press.

Warning: ENSURE CONNECTIONS TO UUT ARE CORRECT
To avoid damaging UUT protection fuses, ensure the correct terminals on the UUT are used before sourcing currents

1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.
2) Connect the UUT to the calibrator as described for DC current measurements (see connection diagram on Page 32)
3) Select the correct range on the UUT.
4) Press DC
5) Press the numeric and decimal point keys to enter the required value, e.g. 29
6) Press +/- key, depending upon the polarity of the output required (default is positive)
7) Press the multiplier key (if required) e.g. m
8) Press AMPS
9) The display will now indicate the value that has been entered below the currently set output.



10) Press ENTER . The new value will replace the existing output in the middle of the display.

11) Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light up, as well as the terminal indicator; indicating that the output is active.

The calibrator will now source 29 mA DC at the low current terminals. Once on a range, any new output within that range can be set without the calibrator returning to standby.

Depending upon the output selected, the current will be sourced between different terminals. For currents of 1A and below, the current will be sourced between the Common Low Current (Blue Terminal) and Common (Black Terminal). Currents above 1A will be sourced between the High Current (Yellow Terminal) and Common (Black Terminal).

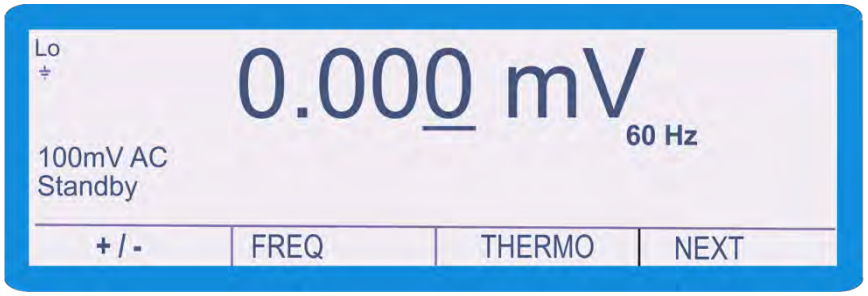
The 1000 Series calibrator is fitted with a temperature controlled high current output. This will automatically turn the high current output off once the internal temperature has reached a pre-determined limit. The 1000A will indicate ‘Over Temperature’ on the Screen for approximately 5 seconds, and then return to the normal screen, with ‘Temp !’ displayed in the status section. Further information regarding the temperature output cut-out is available on Page 73

Setting an AC Voltage Output.

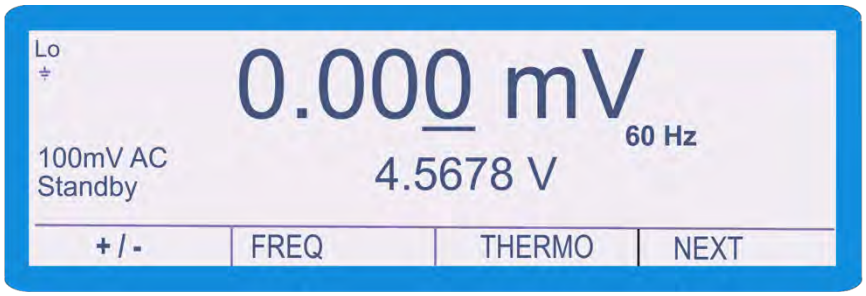
Complete the following procedure to set a AC voltage output. The BACK SPACE and C keys can be used to edit the entry in the event of an incorrect key press.

WARNING
ENSURE THE OUTPUT DOES NOT EXCEED RATING FOR UUT INPUT

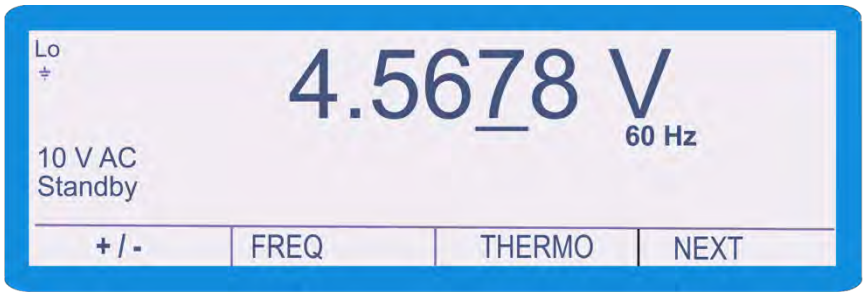
1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.
2) Connect the UUT to the calibrator as described for AC Voltage measurements (see connection diagram on Page 31)
3) Select the correct range on the UUT.
4) Press AC . The calibrator will switch to AC output.



5) Press the numeric and decimal point keys to enter the required voltage output, e.g. 4.5678
6) Press the multiplier key (if required) e.g. m
7) Press VOLTS
8) The display will now indicate the value that has been entered below the currently set output



9) Press ENTER. The new voltage will replace the existing output in the middle of the display



10) Press the numeric and decimal point keys to enter the required frequency, e.g. 1.234

11) Press the multiplier key (if required) e.g. k

12) Press Hz

13) The display will now indicate the value that has been entered below the currently set output

14) Press ENTER The new value will replace the currently set frequency

15) Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light up, as well as the terminal indicator; indicating that the output is active.

The display will show the frequency in the bottom right hand corner of the display. The frequency can be adjusted using the digital control or the directional keys when the cursor is placed over the frequency.

To move the cursor from voltage setting to frequency setting, press the Hz key, followed by ENTER

For protection of UUT's, the 1000 Series calibrators high voltage outputs are ramped, so that voltage is increased gradually. Please refer to the 'High Voltage Output Ramp' section (Page 72) for further information on this function.

For safety reasons the 1000 Series calibrator is fitted with a High Voltage timeout. Please refer to the 'High Voltage Timeout' section (Page 72) for further information on this function.

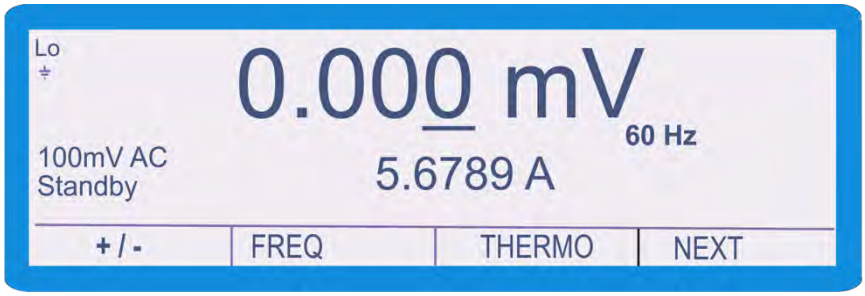
For safety reasons the 1000 Series calibrator is fitted with a High Voltage current limit. This ensures that incorrect connections, faulty UUT's or potentially dangerous situations are protected against. Please refer to the 'High Voltage Current Limit' section (Page 73) for further information on this function.

Setting an AC Current Output

Complete the following procedure to set an AC current output. The BACK SPACE and C keys can be used to edit the entry in the event of an incorrect key press.

Warning: ENSURE CONNECTIONS TO UUT ARE CORRECT
To avoid damaging UUT protection fuses, ensure the correct terminals on the UUT are used before sourcing currents

1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.
2) Connect the UUT to the calibrator as described for AC current measurements (see connection diagram on Page 32)
3) Select the correct range on the UUT
4) Press AC
5) Press the numeric and decimal point keys to enter the required value, e.g. 5.6789
6) Press the multiplier key (if required) e.g. m
7) Press AMPS
8) The display will now indicate the value that has been entered below the currently set output.



9) Press ENTER . The new value will replace the existing output in the middle of the display.

10) Press the numeric and decimal point keys to enter in the desired frequency, e.g. 80

11) Press the multiplier key (if required) e.g. k

12) Press Hz

13) The display will show the new entry below the previous set value.

14) Press ENTER The new value will replace the existing frequency on the right of the display.

15) Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light up, as well as the terminal indicator; indicating that the output is active.

The calibrator will now source 5.6789A at 60Hz at the high current terminals. Once on a range, any new output within that range can be set without the calibrator returning to standby.

Depending upon the output selected, the current will be sourced between different terminals. For currents of 1A and below, the current will be sourced between the Common Low Current (Blue Terminal) and Common (Black Terminal). Currents above 1A will be sourced between the High Current (Yellow Terminal) and Common (Black Terminal).

The 1000 Series calibrator is fitted with a temperature controlled high current output. This will automatically turn the high current output off once the internal temperature has reached a pre determined limit.

The 1000A will indicate ‘Over Temperature’ on the Screen for approximately 5 seconds, and then return to the normal screen, with ‘Temp !’ displayed in the status section. Further information regarding the temperature output cut-out is available on Page 73.

Setting the Simulated Resistance Output

The calibrator defaults to simulated resistance output. This provides a fully variable resistance output from 0 Ohms to 10M Ohms.

Complete the following example to set 10 Ohms output using the simulated resistance output.

1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.
2) Connect the UUT to the calibrator as described for resistance measurements (see page 32 for connection diagram)
3) Select the correct range on the UUT.
4) Press the numeric and decimal point keys to enter the required value, e.g. 1.234
5) Press the multiplier key (if required) e.g. M
6) Press OHMS
7) The display will now indicate the value that has been entered below the currently set output

8) Press ENTER . The new value will replace the existing output in the middle of the display

9) Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light up, as well as the terminal indicator; indicating that the output is active.

To adjust the value, either type in a new value using the keyboard, for example 110 Ohms, or deviate the output using the cursor keys or the digital control.

Nulling the UUT

The value displayed/set on the calibrator is the value at the terminals. Therefore the measuring instrument should be zeroed (Nulled) with the leads shorted before connection to the calibrator.

This will remove any errors due to the resistance of the leads, especially at low values where resistance of the test leads may be significant.

Setting Passive Resistance Output

Note: The calibrator uses standard resistors of fixed decade values. The nearest available resistance to the entered value will be automatically selected.

The 1000 series calibrator features passive resistance output as an alternative to simulated resistance. This method does not allow the output to be varied, as the values are fixed passive standards.

Complete the following example to set an output using the passive resistance output.

1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.
2) Connect the UUT to the calibrator as described for resistance measurements (see connection diagram on Page 32).
3) Select the correct range on the UUT.
4) Press OHMS
5) Press ENTER
6) Select the **PASSIVE** soft key.
7) The display will now show the 10 Ohm passive output (this is the lowest available output).

8) To change the value, using the numeric keys enter the appropriate decade value, e.g. 100
9) Press the multiplier key (if required) i.e. M
10) Press OHMS

11) The display will now indicate the value that has been entered below the currently set output

12)Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light up, as well as the terminal indicator; indicating that the output is active

The output can be changed by using the RANGE ▲ X10 and RANGE ▼ ÷10 Using these keys will switch to the next decade value.

Nulling the UUT

The value displayed/set on the calibrator is the value at the terminals. Therefore the measuring instrument should be zeroed (Nulled) with the leads shorted before connection to the calibrator.

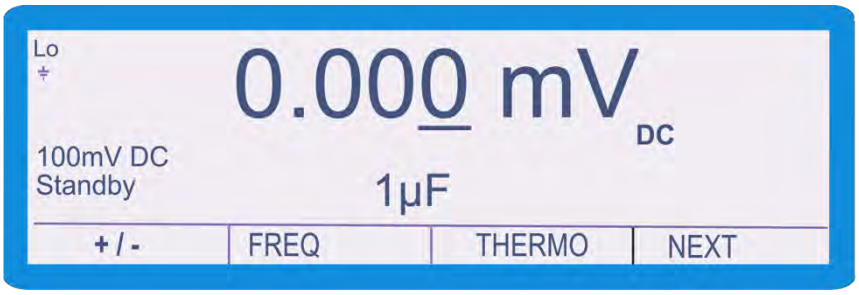
This will remove any errors due to the resistance of the leads, especially at low values where resistance of the test leads may be significant.

Setting Capacitance Output

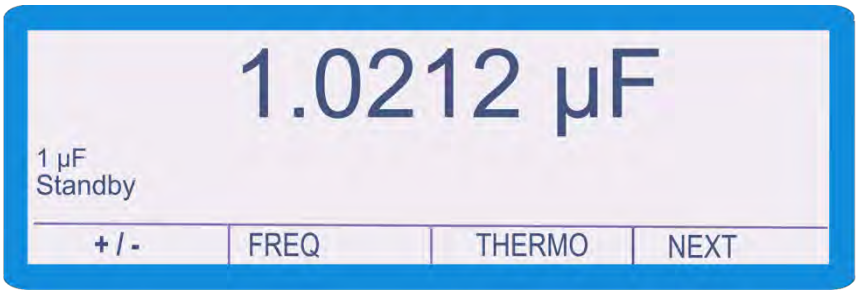
Note: The calibrator uses standard capacitors of fixed values. The nearest available capacitance to the entered value will be automatically selected. Complete the following procedure to select 100nF.

Complete the following example to set an output using the simulated resistance output.

1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.
2) Connect the UUT to the calibrator as described for capacitance measurements (see connection diagram on Page 33)
3) Select the correct range on the UUT
4) Press the **FREQ** soft key
5) Press the numeric and decimal point keys to enter the required value, e.g. 1.234
6) Press the multiplier key (if required) e.g. m
7) Press F
8) The display will now indicate the value that has been entered below the currently set output



9) Press ENTER . The new value will replace the existing output in the middle of the display



10) Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light up, as well as the terminal indicator; indicating that the output is active.

The output can now be changed by using the RANGE ▲ X10 and RANGE ▼ ÷10 . Using these keys will switch to the next decade value.

Capacitance is available at the voltage terminals as indicated by the terminal indicator LED. The capacitance displayed will be the calibrated value held in the non-volatile calibration memory for that standard. Note that this is the value measured at 1 kHz. When measuring capacitance, Cp (parallel) should be selected for values up to and including 1uF (where available)

It is important to ensure that the capacitance of the leads has been removed from the measurement indicated by the UUT as this may affect

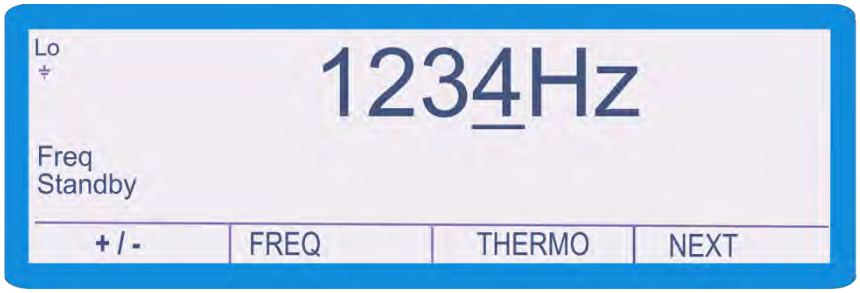
Setting Frequency Output.

Note: The calibrator uses a precision crystal oscillator for frequency output. Frequencies from 1Hz to 100kHz in 1Hz steps are available.

Complete the following example to set an output using the frequency output.

1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.
2) Connect the UUT to the calibrator as described for frequency measurements (see connection diagram on Page 33)
3) Select the correct range on the UUT
4) Press the numeric and decimal point keys to enter the required value, e.g. 1.234
5) Press the multiplier key (if required) e.g. [µ]
6) Press [Hz]
7) The display will now indicate the value that has been entered below the currently set output

8) Press [ENTER]. The new value will replace the existing output in the middle of the display



9) Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light up, as well as the terminal indicator; indicating that the output is active.

To adjust the value, either type in a new value using the keyboard, for example 10 Hz, or deviate the output using the cursor keys or the digital control as explained on page 38

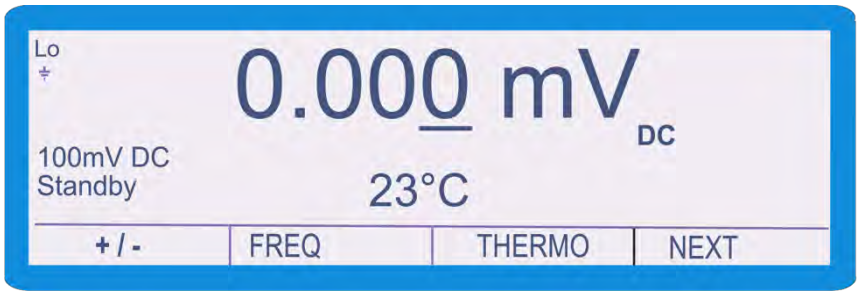
The output can also be changed by using the RANGE ▲ X10 and RANGE ▼ ÷10 Using these keys will either multiply or divide the currently set value by a factor of 10.

Thermocouple Simulation

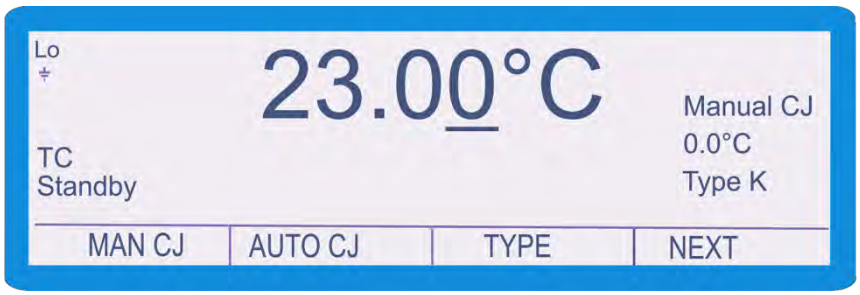
Thermocouple Adapter Connection

Connect the temperature meter under test to the thermocouple output of the 1000A/B using compensation cable that matches the thermocouple type.

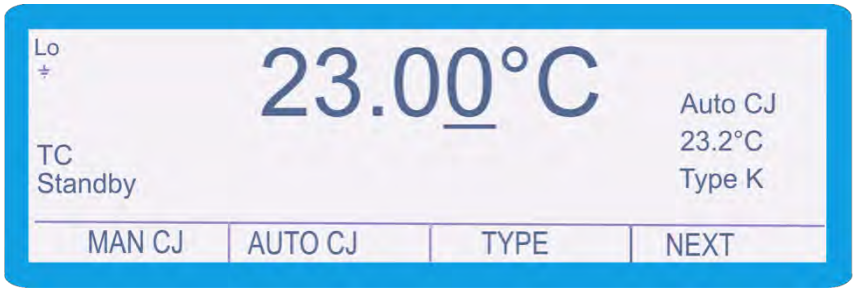
1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.
2) Connect the UUT to the calibrator as described for thermocouple measurements, taking care to ensure that the correct thermocouple cable is used (see connection diagram on Page 34)
3) Select the correct range on the UUT
4) Press the numeric and decimal point keys to enter the required value, e.g. 23
5) Press Temp °F TEMP °C . If 'F output is required, press SHIFT followed by Temp °F TEMP °C
6) The display will now indicate the value that has been entered below the currently set output



7) Press ENTER . The calibrator will switch into Thermocouple sourcing mode, with the entered value in the centre of the screen. The thermocouple will default to Type K, with the cold junction compensation set to Manual.

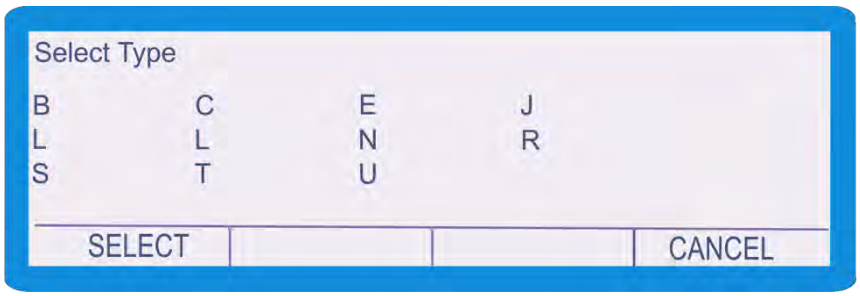


8) If required, press the **AUTO CJ** soft key to automatically take a measurement of the cold junction at the thermocouple socket. Once in Auto Cold Junction mode the temperature will continue to update automatically.



9) Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light up, as well as the terminal indicator; indicating that the output is active

To change thermocouple type, press the Type soft key, this will bring up the Thermocouple Type menu.



Select the required thermocouple type and press **SELECT** or ENTER. The calibrator will return to the Thermocouple output screen and display the now selected thermocouple type on the right hand of the screen. Ensure to use the appropriate thermocouple wiring when changing thermocouple type to avoid errors due to incorrect connections.

PRT Output

The calibrator can simulate PRT temperature values with R0's (the nominal resistance at 0ºC) of 25Ω,100Ω, 250Ω, 500Ω and 1000Ω in the range -200°C to 800°C

1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.
2) Connect the UUT to the calibrator as described for PRT measurements (see connection diagram on Page 34)
3) Select the correct range on the UUT
4) Press the **PRT** soft key. If the **PRT** key is not visible, press the **NEXT** key until the **PRT** key appears

5) Press **RO**, the Ro Selection screen will appear

6) Select the required R0 value (typically 100) and press **SELECT** or ENTER
7) Press the numeric and decimal point keys to enter the required value, e.g. 30
8) Press TEMP °C

9) The display will now indicate the value that has been entered below the currently set output

10) Press ENTER . The new value will replace the existing output in the middle of the display

11) Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light up, as well as the terminal indicator; indicating that the output is active

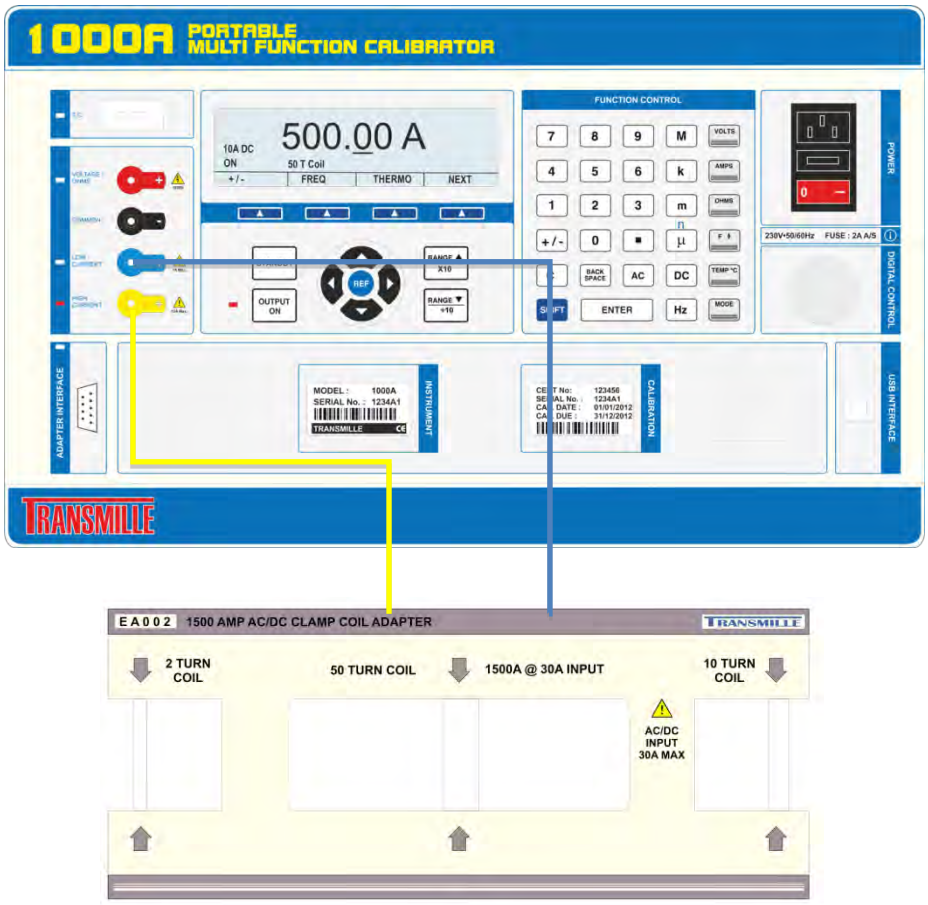
To adjust the value, either type in a new value using the keyboard, for example 100ºC, or deviate the output using the cursor keys or the digital control as explained on page 38

The output can also be changed by using the RANGE ▲ X10 and RANGE ▼ ÷10 . Using these keys will either multiply or divide the currently set value by a factor of 10.

EA002 – 2/10/50 Turn Coil Adapter (Option)

The 1000 Calibrators can be used with the optional current coil EA002 (2, 10 and 50 turn coils). This enables currents both DC and AC of up to 500A to be produced for the calibration of current clamp meters.

The current from the calibrator is connected to the appropriate coil connections. The current output from the calibrator is then multiplied by the number of turns in that coil, simulating a higher current for the clamp meter to measure.

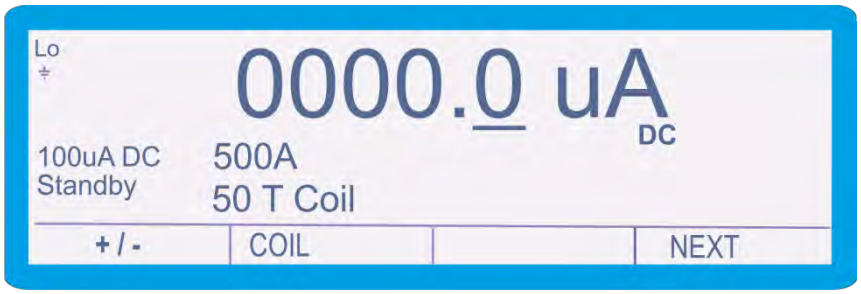


Complete the following procedure to select 500A DC using the 50 turn coil.

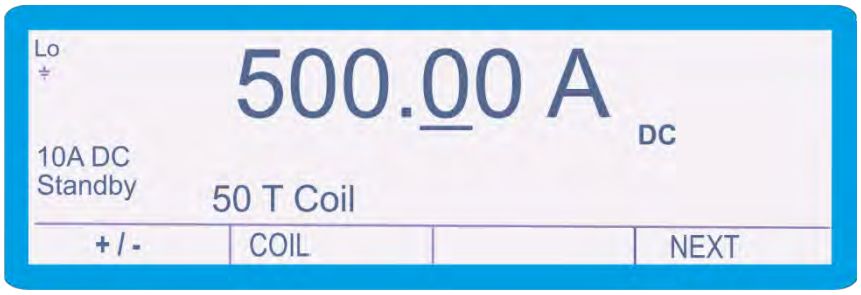
1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.
2) Connect the EA002 to the appropriate terminals
3) Ensure the coil platform is attached to the EA002 and that the clamp coil is correctly aligned.
4) Press DC
5) Press AMPS
6) Press ENTER
7) Press the COIL soft key
8) The following menu will appear

9) Select the number of turns (e.g. 50)
10) Press SELECT or ENTER
11) Using the numerical and decimal keys, enter the required output (i.e. 500)
12) Press the +/- key, depending upon the polarity of the output required (default is positive)
13) Press AMPS

14) The display will now indicate the value that has been entered below the currently set output



15) Press ENTER . The new value will replace the existing output in the middle of the display



16) Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light up, as well as the terminal indicator; indicating that the output is active.

Note : When setting AC Frequencies, at high frequencies (>300Hz) the coil will emit a high frequency tone. This is normal

For further information on operation of the EA002, please refer to the EA002 manual and extended specifications available from www.transmille.co.uk

Insulation Resistance Calibration (Option)

The insulation resistance simulation function provides resistance calibration for insulation testers.

1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.

2) Set the insulation tester to the required Insulation voltage range and connect it to the voltage terminals of the calibrator.

3) Press the **INS TEST** soft key. If the **INS TEST** key is not visible, press the **NEXT** key until the **INS TEST** key appears

4) Press **V DOWN** or **V UP** to select the required range as set on the UUT

5) To change the resistance value, using the numeric keys enter the required value, e.g. 99.8

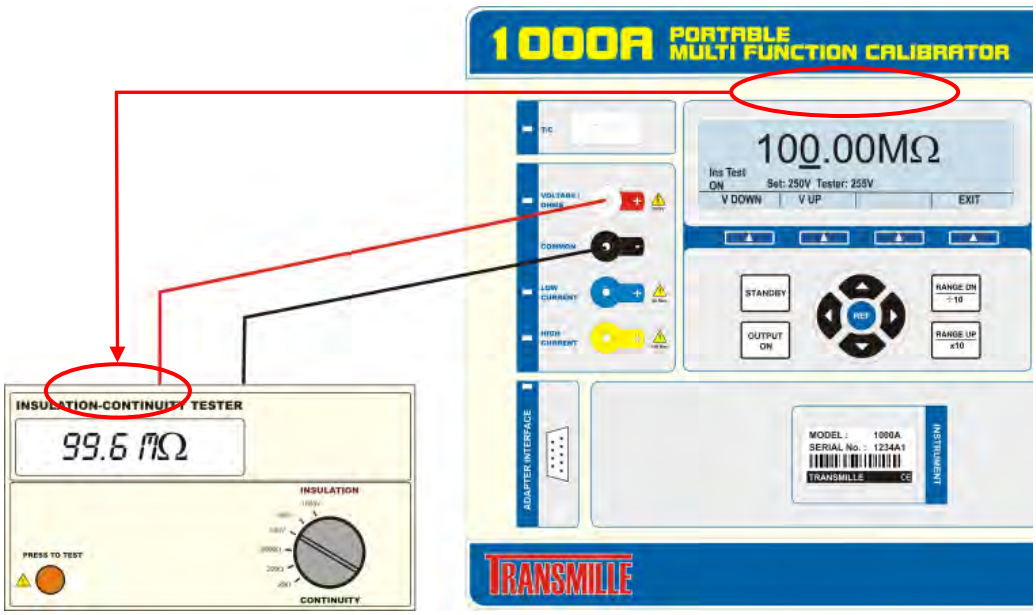
6) Press the multiplier key (if required) i.e. M

7) Press ENTER

8) The display will now indicate the value that has been entered below the currently set output

9) Press and hold the Insulation tester TEST button and ensure it is kept depressed for the duration of the test

10) Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light
up, as well as the terminal indicator; indicating that the output is active



11) The 1000 Series will show the insulation resistance value which can be read from the tester (UUT) display

> Note : If the polarity of the input from the insulation tester is reversed, the 1000 series will display **INCORRECT INPUT.** In this case, simply reverse the input from the insulation tester to resolve this.

Insulation Test Voltage Measurement (Option)

The calibrator can measure insulation test voltage measurement from an insulation/continuity or installation tester up to 1000V

1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.

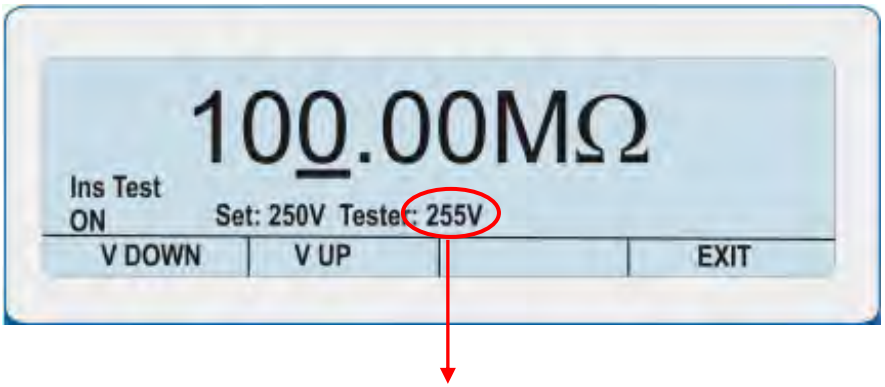
2) Set the insulation tester to the required insulation voltage range and connect it to the voltage terminals of the calibrator.
   Note : For this function it is permitted to connect a voltage output device to the calibrator terminals.

3) Press the **INS TEST** soft key. If the **INS TEST** key is not visible, press the **NEXT** key until the **INS TEST** key appears

4) Press **V DOWN** or **V UP** to select the required voltage range as set on the UUT

5) Press and hold the Insulation tester TEST button and ensure it is kept depressed for the duration of the test

6) Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light up, as well as the terminal indicator; indicating that the output is active



7) The 1000 Series will display the test voltage measured from the tester (UUT)

Note : If the polarity of the input from the insulation tester is reversed, the 1000 series will display **INCORRECT INPUT.** In this case, simply reverse the input from the insulation tester to resolve this.

Continuity Resistance Calibration (Option)

The 1000 Series provides a continuity resistance function for calibrating the continuity ranges of insulation testers.

1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.

2) Set the tester to the required continuity range and connect it to the voltage terminals of the calibrator.

3) Press the **CONT.** soft key. If the **CONT.** key is not visible, press the **NEXT** key until the **CONT.** key appears

4) Continuity mode has two functions – the default function is resistance with a current measurement function also available. To select between these two functions press either the **RESIST.** soft key or the **CURRENT** softkey

5) To change the resistance value, using the numeric keys enter the required value, e.g. 99.8

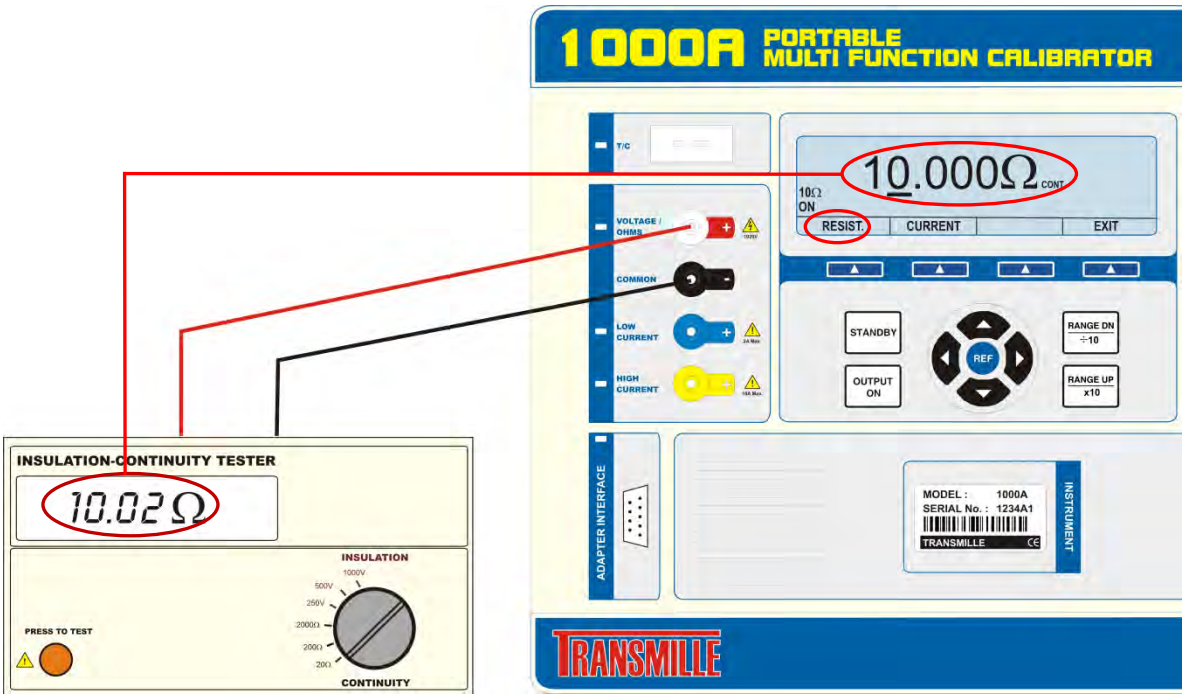
6) Press the multiplier key (if required) eg. k

7) Press ENTER

8) Depending on the model of tester you may need to press the TEST button on the tester to start measuring (this does not apply to all testers).

9) Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light up, as well as the terminal indicator; indicating that the output is active

10)The 1000 Series will show the resistance value which can be read from the tester (UUT) display



Continuity Current Measurement [1 Ohm] (Option)

The calibrator can measure continuity current from a tester using a 1 Ohm load.

1) Ensure the calibrator's output has been set to Standby. This can be verified by ensuring that standby is indicated on the display, and the output standby status LED is lit.

2) Set the insulation tester to the required continuity range and connect it to the voltage terminals of the calibrator.

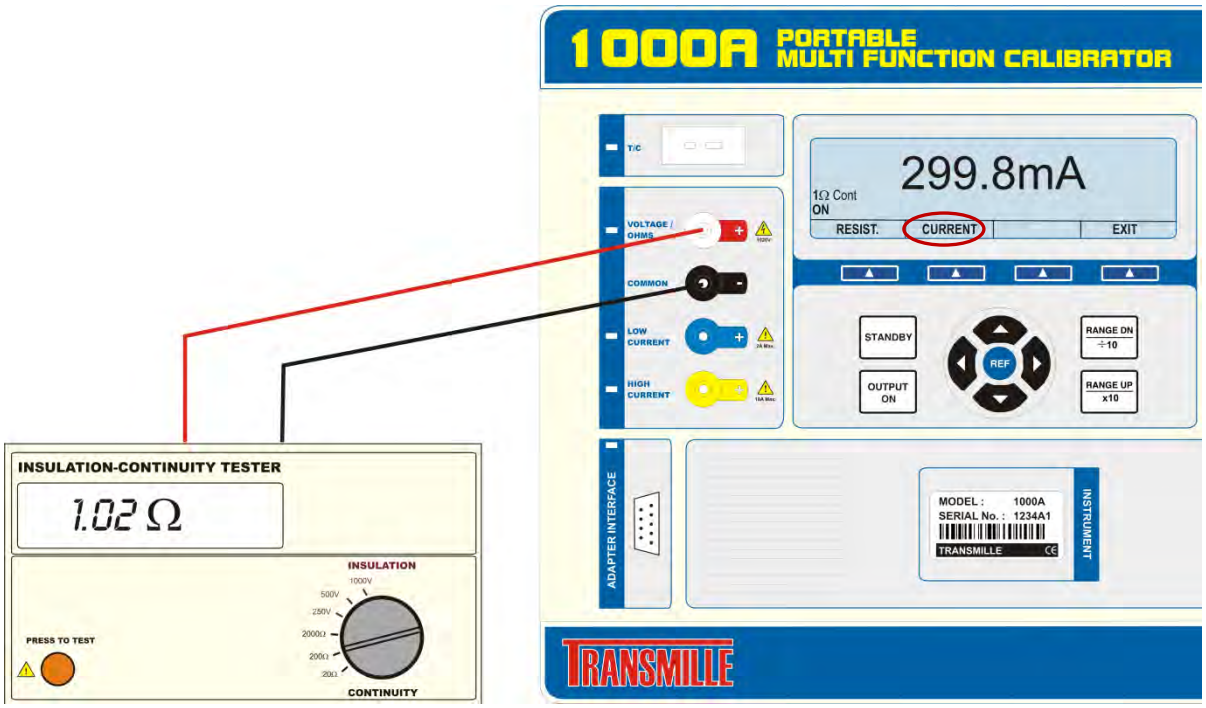
3) Press the **CONT.** soft key. If the **CONT.** key is not visible, press the **NEXT** key until the **CONT.** key appears

4) Continuity mode has two functions – the default function is resistance with a Current measurement function also available. To select between these two functions press either the **RESIST.** soft key or the **CURRENT** softkey

5) Depending on the model of tester you may need to press the TEST button on the tester to start measuring (this does not apply to all testers).

6) Press OUTPUT ON to activate the calibrator output. The LED next to the OUTPUT ON key will light up, as well as the terminal indicator; indicating that the output is active

7) The 1000 Series will display the continuity current measured from the tester (UUT)



Output Protection and Safety Features

Warning and Output Overload Indications

The self-test function of the 1000 series calibrator continuously monitors the output of the calibrator for overload or fault conditions.

In the event of the calibrator not being able to drive the load, it will automatically trip into standby and the display will show **Standby**. The 'standby' condition is caused by the required drive current being too high on a voltage range or the required compliance voltage being too high on a current range. The output can be restored by pressing the **Output On** key after the load has been corrected.

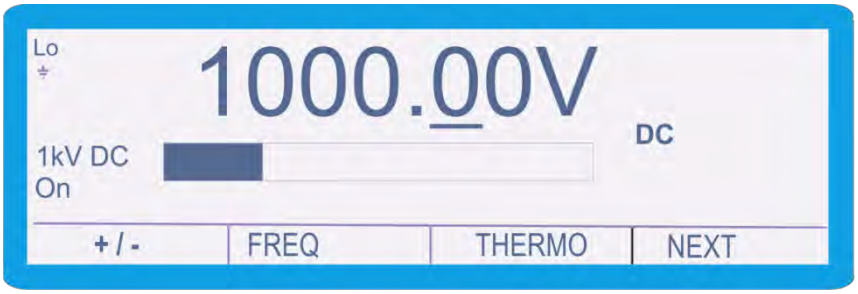
High Voltage Timeout.

As an additional safety feature, the calibrator will automatically return to standby if left on the 100V or 1kV ranges after a set time period. This is factory set as 20 minutes.

If required this timeout can be disabled through a software application, or the period changed.

High Voltage Output Ramp

The 1000 Series calibrator is fitted with a high voltage ramp, this means that the high voltage output is increased slowly to prevent damage to faulty UUT's. A bar will appear on the screen of the 1000 calibrator, as well as a periodic beep while the output is ramping.



High Voltage Current Limit

The 1000 Series is fitted with the same high voltage current limiting circuitry as the 3000A Series Calibrator. This circuit consists of completely independent circuit that monitors the current flowing in the high voltage section of the instrument. A fast acting Triac is used so that in the event of too much current being drawn from the high voltage output, the output is cut off immediately. This part of the circuitry is NOT processor controlled, meaning in the event of a processor crash due to a high voltage spark the trip circuitry will not be affected

10 Amp Temperature Cut-out

The 1000 Series calibrators are capable of supplying high currents for a limited period. The calibrator will then enter standby and turn off the output. The output amplifier operating temperature is monitored by the micro controller which will shut down the output if required. The time before shut down occurs will vary depending on the set output current and the load but is typically 60 to 90 seconds at 10A, depending upon the load that is being driven. During this shutdown period, the calibrator will be set to standby with a warning message shown on the display. It is safe to reselect the output at any time as the microprocessor will automatically protect the output amplifier from damage.

Remote Programming

WARNING

The 1000 series calibrators can produce high voltages up to 1025V and must be programmed with due caution to prevent dangerous voltages from being present at the output terminals without warning to the operator.

Any programs should be extensively tested to maintain safe operation and include safeguard's such as error catchments and handling to ensure that any commands sent to the calibrator perform as expected and any that do not are safely handled to ensure user safety.

Within the 1000 series command language, response codes are included to determine the operational state of the calibrator. These response codes can also be used to determine whether a command was received correctly and thus ensuring safe operation of the calibrator.

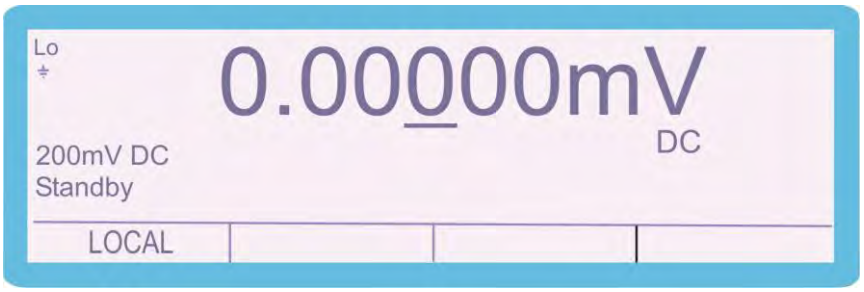
USB Interface

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 or from the ProCal Calibration System.

Returning to Local Control

When the calibrator has been controlled from the interface, the front panel controls are disabled. To regain front panel control use the **LOCAL** soft key



Programming Commands Overview

The 1000 Series calibrators are controlled by a set of simple high level commands which can be used either individually or as part of a command sequence.

The commands can be joined together using the / (forward slash) character.
The required terminator for the commands to be detected by the calibrator is a carriage return (ASCII character 13) and should be the last character sent on a command line.

For Example:

Command1/Command2 <CR>

Where each command is represented as Commandx
(x being the command number)
and the carriage return (ASCII character 13) is represented by <CR>

Response Codes

The 1000 Series calibrators will respond to any command with a fixed code beginning with a star (*) - the codes are listed below

Response Code	Description
***0**	**COMMAND RECEIVED OK**
***1**	**ERROR IN COMMAND LINE**
***2**	**ERROR IN RANGE COMMAND**
***3**	**ERROR IN FREQUENCY COMMAND**
***4**	**ERROR IN O/P COMMAND**
***5**	**ERROR IN CAL FACTOR SENT**
***6**	**ERROR IN CAL FACTOR COMPARE**
***7**	**COMMAND OUT OF RANGE (A1,A2 ETC) OR PASSWORD NOT SET**
***8**	**10A/HV TIMEOUT or OVER TEMPERATURE**
***9**	**OUTPUT ERROR**

DC Voltage Commands

Function	Range	Command
DC Voltage	100mV	R1
	1V	R2
	10V	R3
	100V	R4
	1000V	R5

Standby Mode	
Standby ON	S1
Standby OFF	S0

Output	
Set Output	O (not zero)

The DC voltage section consists of a set of range commands which are used in conjunction with the standby and output command. To enable a DC Voltage to be set and an output assigned, the following command sequence should be used:

<RANGE>/<OUTPUT>/<STANDBY CONDITION><CR>

For example, to assign 1V D.C. with the output switched on, the command is:

R2/O1/S0<CR>

R2 = 1V Range (as detailed in the table above)

O1 = Set an OUTPUT of 1V

S0 = Standby OFF (i.e. output switched ON)

<CR> = Carriage Return (ASCII character 13)

Additional examples

90mV DC R1/O90/S0<CR> (sets 150mV output on the 100mV range)
22V DC R3/O22/S0<CR> (sets 22V output on the 100V range)

If a command includes a value which cannot be set due to, for example, the value being higher than the range maximum, the calibrator will reject the command and stay set as it is (the calibrator will also beep to signify a rejected command)

The calibrator will respond to the commands sent with the response codes as detailed at the beginning of this section. These codes can be used to ensure that hazardous output conditions are clearly indicated to the operator and to maintain control of these outputs. This allows the calibrator to be returned to a safe state once the testing required has been completed (e.g. setting the calibrator back to standby once a test is complete and ensuring this has been successfully achieved and no hazardous outputs remain on the terminals).

This functionality is employed within the ProCal calibration software from Transmille to allow safe operation of the calibrator and to ensure the calibrator is returned to a safe state in between test points and at the completion of a test sequence.

AC Voltage Commands

Function	Range	Command
AC Voltage	100mV	R12
	1V	R13
	10V	R14
	100V	R15
	1000V	R16

Standby Mode	
Standby ON	S1
Standby OFF	S0

Output	
Set Output	O (not zero)

AC Frequency	
Fxxxxx	E.G. 10kHz = F10000

The AC voltage section consists of a set of range commands which are used in conjunction with the standby and output command. To enable an AC Voltage to be set and an output assigned, the following command sequence should be used :

<RANGE>/<OUTPUT>/<FREQUENCY>/<STANDBY CONDITION><CR>

For example, to get 1V @ 200Hz AC with the output switched on, the command is:

R13/O1/F200/S0<CR>

R13 = 1V Range (as detailed in the table above)

O1 = 1V Output

F200 = 200Hz Frequency

S0 = Standby OFF (i.e. output switched ON)

<CR> = Carriage Return (ASCII character 13)

Additional examples

35mV @ 1kHz AC R12/O35/F1000/S0<CR>
(sets 35mV @ 1kHz output on the 100mV range)

255V @ 200Hz AC R16/O255/F200/S0<CR>
(sets 255V @ 200Hz output on the 1000V range)

If a command includes a value which cannot be set due to, for example, the value being higher than the range maximum, the calibrator will reject the command and stay set as it is (the calibrator will also beep to signify a rejected command)

The calibrator will respond to the commands sent with the response codes as detailed at the beginning of this section. These codes can be used to ensure that hazardous output conditions are clearly indicated to the operator and to maintain control of these outputs. This allows the calibrator to be returned to a safe state once the testing required has been completed (e.g. Setting the calibrator back to standby once a test is complete and ensuring this has been successfully achieved and no hazardous outputs remain on the terminals).

This functionality is employed within the ProCal calibration software from Transmille to allow safe operation of the calibrator and to ensure the calibrator is returned to a safe state in between test points and at the completion of a test sequence.

DC Current Commands

Function	Range	Command
DC Current	100uA	R6
	1mA	R7
	10mA	R8
	100mA	R9
	1A	R10
	10A	R11

Standby Mode	
Standby ON	S1
Standby OFF	S0

Output	
Set Output	O (not zero)

The DC current section consists of a set of range commands which are used in conjunction with the standby and output command. To enable a DC current to be set and an output assigned, the following command sequence should be used :

<RANGE>/<OUTPUT>/<STANDBY CONDITION><CR>

For example, to get 10mA DC with the output switched on, the command is :

R8/O10/S0<CR>

R8 = 10mA Range (as detailed in the table above)

O10 = 10mA Output

S0 = Standby OFF (i.e. output switched ON)

<CR> = Carriage Return (ASCII character 13)

Additional examples

25mA DC R9/O25/S0<CR> (sets 25mA output on the 100mA range)
5A DC R11/O5/S0<CR> (sets 5A output on the 10A range)

If a command includes a value which cannot be set due to, for example, the value being higher than the range maximum, the calibrator will reject the command and stay set as it is (the calibrator will also beep to signify a rejected command)

The calibrator will respond to the commands sent with the response codes as detailed at the beginning of this section. These codes can be used to ensure that hazardous output conditions are clearly indicated to the operator and to maintain control of these outputs. This allows the calibrator to be returned to a safe state once the testing required has been completed (e.g. Setting the calibrator back to standby once a test is complete and ensuring this has been successfully achieved and no hazardous outputs remain on the terminals).

This functionality is employed within the ProCal calibration software from Transmille to allow safe operation of the calibrator and to ensure the calibrator is returned to a safe state in between test points and at the completion of a test sequence.

AC Current Commands

Function	Range	Command
AC Current	100uA	R17
	1mA	R18
	10mA	R19
	100mA	R20
	1A	R21
	10A	R22

Standby Mode	
Standby ON	S1
Standby OFF	S0

Output	
Set Output	O (not zero)

AC Frequency	
Fxxxxx	E.G. 10kHz = F10000

The AC current section consists of a set of range commands which are used in conjunction with the standby and output command. To enable a AC current to be set and an output assigned, the following command sequence should be used:

<RANGE>/<OUTPUT>/<FREQUENCY>/<STANDBY CONDITION><CR>

For example, to get 10mA @ 1 kHz AC with the output switched on, the command is:

R19/O10/F1000/S0<CR>

R19 = 10mA Range (as detailed in the table above)

O10 = 10mA Output

F1000 = 1 kHz Frequency

S0 = Standby OFF (i.e. output switched ON)

<CR> = Carriage Return (ASCII character 13)

Additional examples

25mA @ 500Hz AC R20/O25/F500/S0<CR>
(sets 25mA @ 500Hz output on the 100mA range)

7A AC @ 300 Hz R22/O7/F300/S0<CR>
(Sets 7A @ 300Hz output on the 10A range)

If a command includes a value which cannot be set due to, for example, the value being higher than the range maximum, the calibrator will reject the command and stay set as it is (the calibrator will also beep to signify a rejected command)

The calibrator will respond to the commands sent with the response codes as detailed at the beginning of this section. These codes can be used to ensure that hazardous output conditions are clearly indicated to the operator and to maintain control of these outputs. This allows the calibrator to be returned to a safe state once the testing required has been completed (e.g. Setting the calibrator back to standby once a test is complete and ensuring this has been successfully achieved and no hazardous outputs remain on the terminals).

This functionality is employed within the ProCal calibration software from Transmille to allow safe operation of the calibrator and to ensure the calibrator is returned to a safe state in between test points and at the completion of a test sequence.

Passive Resistance Commands

Function	Range	Command
Passive Resistance	10 Ohms	R26
	100 Ohms	R27
	1 kOhm	R28
	10 kOhms	R29
	100 kOhms	R30
	1 MOhms	R31
	10 MOhms	R32
	100 MOhms	R33

Standby Mode	
Standby ON	S1
Standby OFF	S0

Resistance	
Passive output	I0
Simulated output	I2

The resistance section consists of a set of range commands which are used in conjunction with the passive/simulated mode and standby commands. To enable a resistance to be set, the following command sequence should be used :

<RANGE>/< MODE>/<STANDBY CONDITION><CR>

The use of the output (O) command is not necessary as the resistance ranges are fixed ranges at decade points.

For example, to set the 1kOhm range passive resistance output with the output switched on, the command is:

R28/I0/S0<CR>

R28 = 1KOhm Range (as detailed in the table above)
I0 = 2 Wire passive mode
S0 = Standby OFF (i.e. output switched ON)
<CR> = Carriage Return (ASCII character 13)

Additional examples

10 MOhm Passive R32/I0/S0<CR>

The calibrator will respond to the commands sent with the response codes as detailed at the beginning of this section. These codes can be used to ensure that hazardous output conditions are clearly indicated to the operator and to maintain control of these outputs. This allows the calibrator to be returned to a safe state once the testing required has been completed (e.g. setting the calibrator back to standby once a test is complete and ensuring this has been successfully achieved and no hazardous outputs remain on the terminals).

This functionality is employed within the ProCal calibration software from Transmille to allow safe operation of the calibrator and to ensure the calibrator is returned to a safe state in between test points and at the completion of a test sequence.

Capacitance Commands

Function	Range	Command
Capacitance		
	10nF	R35
	100nF	R38
	1uF	R39

Standby Mode	
Standby ON	S1
Standby OFF	S0

The capacitance section consists of a set of range commands which are used in conjunction with the standby command. To enable a capacitance to be set, the following command sequence should be used:

<RANGE>/<STANDBY CONDITION><CR>

The use of the output (O) command is not necessary as the capacitance ranges are fixed ranges at decade points.

For example, to set the 10nF output with the output switched on, the command is :

R35/S0<CR>

R35 = 10nF Range (as detailed in the table above)
S0 = Standby OFF (i.e. output switched ON)
<CR> = Carriage Return (ASCII character 13)

Simulated Resistance Commands

Function	Mode Activation Command		
Simulated Resistance	I2		
	Range	Command	Output
	0 Ohms – 10.0 Ohms	R26	Ohms
	10 Ohms – 100 Ohms	R27	Ohms
	100 Ohms – 1k Ohms	R28	kOhms
	1kOhms – 9.99kOhms	R29	kOhms
	10kOhms – 99.9kOhms	R30	kOhms
	100kOhms – 999kOhms	R31	MOhms
	1MOhms – 9.99MOhms	R32	MOhms

Standby Mode	
Standby ON	S1
Standby OFF	S0

Output	
Set Output	x.xxxx

The resistance section consists of a set of range commands which are used in conjunction with the standby command. To enable a resistance to be set, the following command sequence should be used :

<FUNCTION>/<RANGE>/<OUTPUT>/<STANDBY CONDITION><CR>

Examples :

8 kOhms	5 MOhms	60 Ohms
I2/R29/O8/S0<CR>	I2/R33/O5/S0<CR>	I2/R53/O60/S0<CR>
I2 = Simulated Resistance Function R29 = 1kOhms – 9.99kOhms Range O8 = 8 kohms Output S0 = Standby OFF (i.e. output ON) <CR> = Carriage Return (ASCII 13)	I2 = Simulated Resistance Function R32 = 1MOhms – 9.99 MOhms Range O5 = 5 MOhms Output S0 = Standby OFF (i.e. output ON) <CR> = Carriage Return (ASCII 13)	I2 = Simulated Resistance Function R53 = 50 Ohms – 99.9 Ohms Range O60 = 60 Ohms Output S0 = Standby OFF (i.e. output ON) <CR> = Carriage Return (ASCII 13)

Frequency Commands

Function	Mode Activation Command	
Frequency	r96	
	1Hz	H0
	10Hz	H1
	100Hz	H2
	1kHz	H3
	10kHz	H4
	20kHz	H5
	50kHz	H6
	100kHz	H7

Standby Mode	
Standby ON	S1
Standby OFF	S0

The frequency section consists of a mode activation command followed by a set of range commands which are used in conjunction with the standby command. To enable a frequency to be set, the following command sequence should be used:

<MODE>/<PRESET OR (O) FREQUENCY>/<STANDBY CONDITION><CR>

The use of the output (O) command enables the frequency to be set from 1Hz to 100kHz in 1Hz steps.

For example, to set the 10 kHz output with the output switched on, the command would be:

R58/H4/S0<CR>

R58 = Frequency Mode Activation (as detailed in the table above)
H4 = 10 kHz output (as detailed in the table above)
S0 = Standby OFF (i.e. output switched ON)
<CR> = Carriage Return (ASCII character 13)

To set a frequency other than a preset the following command line would be used, for example 15 kHz output with the output switched on:

R58/O15000/SO<CR>

R58 = Frequency Mode Activation (as detailed in the table above)
O15000 = 15 kHz output
S0 = Standby OFF (i.e. output switched ON)
<CR> = Carriage Return (ASCII character 13)

Additional examples

1 Hz R58/H0/S0<CR>
100 kHz R58/H7/S0<CR>

The calibrator will respond to the commands sent with the response codes as detailed at the beginning of this section. These codes can be used to ensure that hazardous output conditions are clearly indicated to the operator and to maintain control of these outputs. This allows the calibrator to be returned to a safe state once the testing required has been completed (e.g. Setting the calibrator back to standby once a test is complete and ensuring this has been successfully achieved and no hazardous outputs remain on the terminals).

Thermocouple Simulation Commands

This function requires the use of the optional Thermocouple simulation adapter. This is used in conjunction with the adapter interface on the 1000 Series to provide the thermocouple simulation.

Function	Mode Activation Command
Thermocouple Simulation	R60

Range	Command
Type K	L1(K)
Type J	L2(J)
Type T	L3(T)
Type R	L4(R)
Type S	L5(S)
Type E	L6(E)
Type N	L7(N)
Type B	L8(B)
Type U	L9(U)
Type C	L10(C)

Cold Junction	
Manual Cold Junction (0°C)	K0
Auto Cold Junction	K1
Manual Cold Junction settable	KT

Output	
Set Output	O (not zero)

Standby Mode	
Standby ON	S1
Standby OFF	S0

The thermocouple simulation function consists of the following commands:

1) **Thermocouple simulation mode activation**
2) **Thermocouple cold junction type**
3) **Thermocouple type command**
4) **Thermocouple output value**
5) **Standby mode command**

To enable thermocouple simulation to be set up, the following command sequence should be used:

<MODE>/<CJC TYPE>/<THERMO TYPE>/<TEMP VALUE>/
<STANDBY CONDITION><CR>

For example, to set the following configuration:

6) **AUTOMATIC COLD JUNCTION COMPENSATION**
7) **TYPE R**
8) **250°C**
9) **Output ON**

Send the following command sequence:

R60/K1/L4/O250/S0<CR>

R60 = Thermocouple simulation mode activation
K1 = Automatic cold junction compensation (as detailed in the table above)
L4 = Type R thermocouple
O250 = 250°C output
S0 = Standby OFF (i.e. output switched ON)
<CR> = Carriage Return (ASCII character 13)

Additional examples

Type K: Auto CJC: 500°C = R60/K1/L1/O500/S0<CR>
Type K: Auto CJC: 1500°C = R60/K1/L1/O1500/S0<CR>
Type E: Manual CJC (0°C): 400°C = R60/K0/L6/O400/S0<CR>
Type N: Auto CJC: -100°C = R60/K1/L7/O-100/S0<CR>
Type K: Manual CJC (24.5°C): 200°C = R60/KT24.5/L1/O200/S0<CR>

If a command includes a value which cannot be set due to, for example, the value being higher than the range maximum, the calibrator will reject the command and stay set as it is (the calibrator will also beep to signify a rejected command)

The calibrator will respond to the commands sent with the response codes as detailed at the beginning of this section. These codes can be used to ensure that hazardous output conditions are clearly indicated to the operator and to maintain control of these outputs. This allows the calibrator to be returned to a safe state once the testing required has been completed (e.g. setting the calibrator back to standby once a test is complete and ensuring this has been successfully achieved and no hazardous outputs remain on the terminals).

This functionality is employed within the ProCal calibration software from Transmille to allow safe operation of the calibrator and to ensure the calibrator is returned to a safe state in between test points and at the completion of a test sequence.

Insulation Resistance Commands (OPTION)

If fitted with the option INS, the 1000 series has the ability to simulate insulation resistance at set voltages up to 1000V, with a maximum simulated output of

Function	Mode Activation Command
Insulation Resistance	r100

Voltage Setting	Command
Set Test Voltage	t<value in V>

Output	
Set Output	O (not zero)

Standby Mode	
Standby ON	S1
Standby OFF	S0

The insulation resistance simulation function consists of the following commands:

1) **Selection of Insulation Resistance range**
2) **Selection of test voltage**
3) **Simulated resistance setting**
4) **Standby mode command**

The activate the insulation resistance mode, the following command should be sent :

<r100>/<Voltage Setting>/<Output Setting>/<Standby Mode>/<CR>

For example, to set the following configuration:

1) **Output Voltage 250V**
2) **10 MOhms**
3) **Output ON**

Send the following command sequence:

r100/t250/O10/S0<CR>

Where :

r100 = Insulation Test Function
t250 = Insulation voltage setting of 250V
O10 = Resistance simulation of 10 MOhms
S0 = Standby OFF (i.e. output switched ON)
<CR> = Carriage Return (ASCII character 13)

Additional examples :

Set voltage 1000V, Output setting of 100MOhms :

r100/t1000/O100/S0<CR>

Set voltage 500V, output setting of 450MOhms :

r100/t500/O450/S0<CR>

If a command includes a value which cannot be set due to, for example, the value being higher than the range maximum, the calibrator will reject the command and stay set as it is (the calibrator will also beep to signify a rejected command)

The calibrator will respond to the commands sent with the response codes as detailed at the beginning of this section. These codes can be used to ensure that hazardous output conditions are clearly indicated to the operator and to maintain control of these outputs. This allows the calibrator to be returned to a safe state once the testing required has been completed (e.g. setting the calibrator back to standby once a test is complete and ensuring this has been successfully achieved and no hazardous outputs remain on the terminals).

Continuity Resistance Commands (OPTION)

If option INS has been specified, the 1000 series calibrator is fitted with the ability to generate continuity resistance, supporting a higher measurement current than the normal resistance mode. It also adds the ability to measure the test current being supplied by the meter

Function	Mode Activation Command		
Continuity Resistance			
	Range	Command	Output
	0 Ohms - 10 Ohms	I2/R26	Ohms
	10 Ohms - 50 Ohms	r53	Ohms
	50 Ohms - 499.99 Ohms	r54	Ohms
	500 Ohms - 5kOhms	r55	Ohms
	5kOhms - 50kOhms	r56	kOhms

Standby Mode	
Standby ON	S1
Standby OFF	S0

Output	
Set Output	Ox.xxxx

The continuity resistance section consists of a set of range commands which are used in conjunction with the standby command. To enable a contuinity resistance to be set, the following command sequence should be used :

<FUNCTION>/<RANGE>/<OUTPUT>/<STANDBY CONDITION><CR>

Examples :

5 Ohms	25 Ohms	100 Ohms
I2/R26/O5/S0<CR>	r53/O25/S0<CR>	r54/O100/S0<CR>
I2 = Simulated Resistance Function R26 = 0 Ohms through 10 Ohms range O5 = 5 Ohms Output S0 = Standby OFF (i.e. output ON) <CR> = Carriage Return (ASCII 13)	r53 = 10 Ohms - 50 Ohms range O25 = 25 Ohms output S0 = Standby OFF (i.e. output ON) <CR> = Carriage Return (ASCII 13)	r54 = 50 Ohms - 500 ohms range O100 = 100 Ohms output S0 = Standby OFF (i.e. output ON) <CR> = Carriage Return (ASCII 13)

Continuity Current Measurement (OPTION)

If option INS has been specified, the 1000 series calibrator is fitted with the ability to measure the continuity measurement current supplied by a tester into 1 Ohm.

Function	Mode Activation Command		
Continuity Current Measurement			
	Range	**Command**	**Output**
	1 Ohm	**r42**	**Ohms**

Standby Mode	
Standby ON	**S1**
Standby OFF	**S0**

To activate continuity current measurement mode, the following command should be sent :

r42/S0<CR>

This will activate the continuity resistance measurement mode.

to read back the displayed current from the unit, the following command should be sent :

X<CR>

This will respond with two lines, followed by a *0 to indicate the command was received correctly.

The reply structure is as follows :

<indicated measurement on display including units><CR>
<secondary information to measurement><CR>
***0**

For example, an indicated current of 207.4mA on the screen of the 1000 series will respond with :

207.4mA

0

***0**

Technical Description

General

The 1000 Series calibrators use the latest in reference, resistor and processor technology designed to minimise cost and size yet maximise performance. The microprocessor controls and monitors all functions of the calibrator. Calibration constants are held in a 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 of the instrument

The circuitry comprises of five printed circuit boards:

1. Power supply and high current amplifier
2. Main analogue amplifier and feedback board
3. Front Panel Display, resistance range and processor control
4. 10A rectifier PCB
5. Keyboard PCB

Internal Fuses

In normal operation these fuses should never need to be replaced. Only under fault conditions will they require changing.

NOTE: To access these fuses it is necessary to dismantle the case, this should only be carried out by a qualified person.

***Warning* risk of shock.**

The line power cord must be disconnected before removing the covers of the instrument

Internal fuses include:

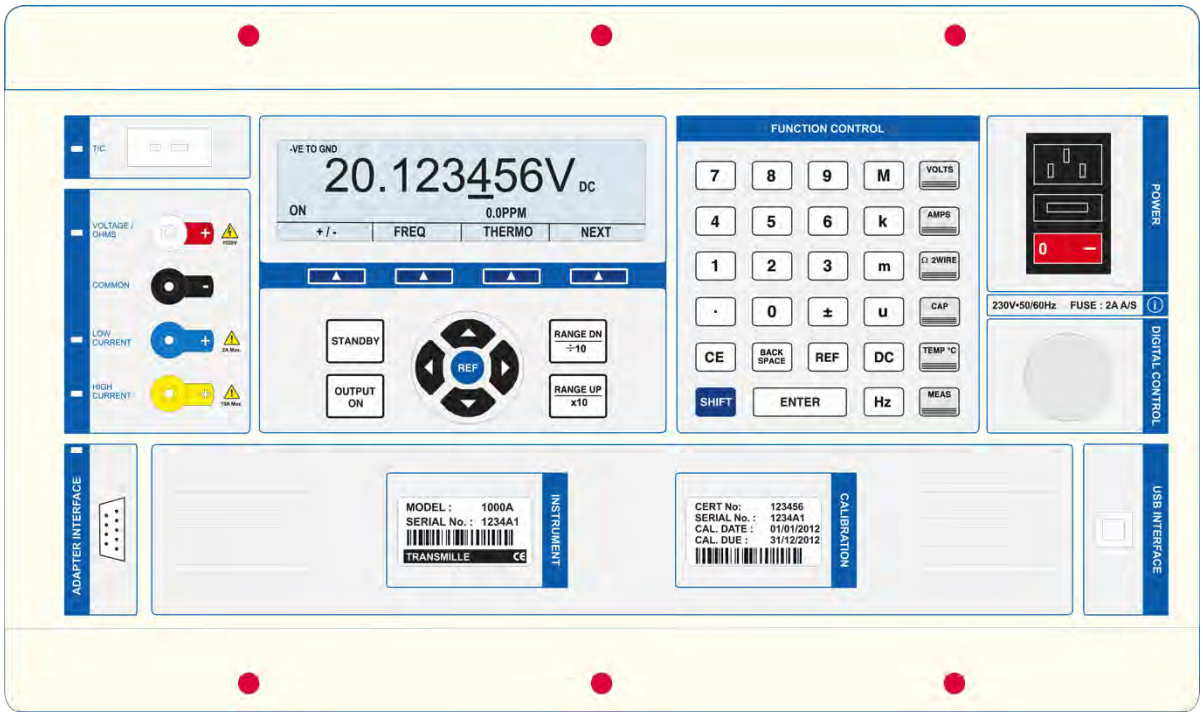
F3: ± 6V 10ASupply	**Anti Surge (slow blow) 10Amp 20mm**
F4: ± 6V 10ASupply	**Anti Surge (slow blow) 10Amp 20mm**
F3: Output	**Ultra-rapid 1A 20mm**

Opening The Case

***Warning* risk of shock.**

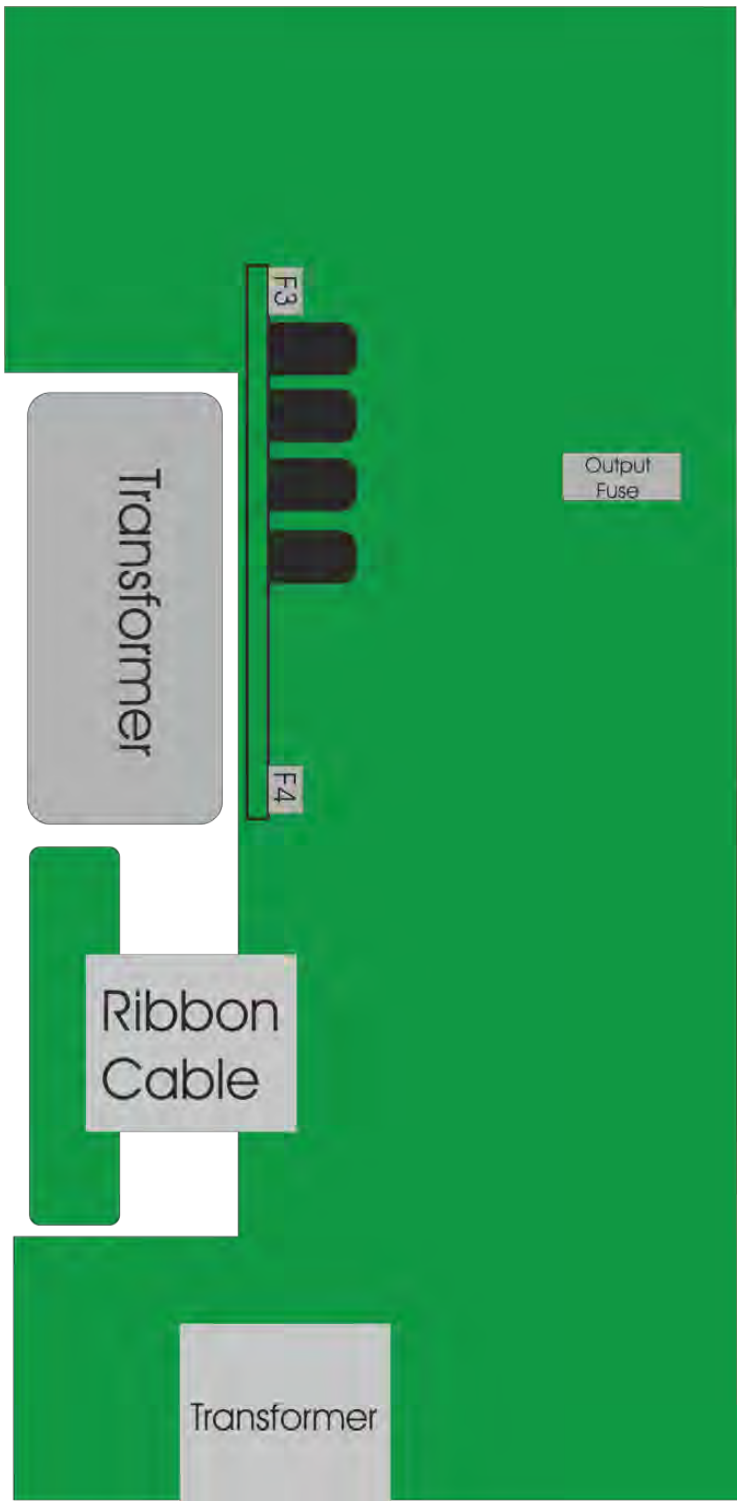
The line power cord must be disconnected before removing the instrument from it chassis

6 screws are used to attach the 1000 series to the chassis. The locations of these screws are highlighted in **Red** on the image below



Access to Internal Fuses

After removing the instrument from the case, the fuses as accessible as shown in the diagram below.



Getting the best out of the calibrator.

The 1000 series are very accurate calibrators producing a very wide range of output signals. To make the best possible use of the range of outputs and to eliminate errors this section details some common sources of errors and offers some techniques to reduce them.

Thermally generated EMF voltage errors.

At every connection in a measuring system different metals come into contact with each other, each junction forms a thermocouple. The voltages generated at these junctions are called thermoelectric voltages and are dependent on the type of metals in contact and the difference in temperature.

This effect, of course, is used to measure temperature with thermocouples, however this effect will cause large errors in low voltage measurements, as thermocouple voltages for some metals can be in the millivolt region. Copper is best but many standard test plugs are made from nickel plated brass and should not be used.

Gold plated copper plugs are available for low level work. If the test lead has been in use on a high current range this will have made the plug warm, which will also increase the error.

Power line and low frequency Pick up and noise

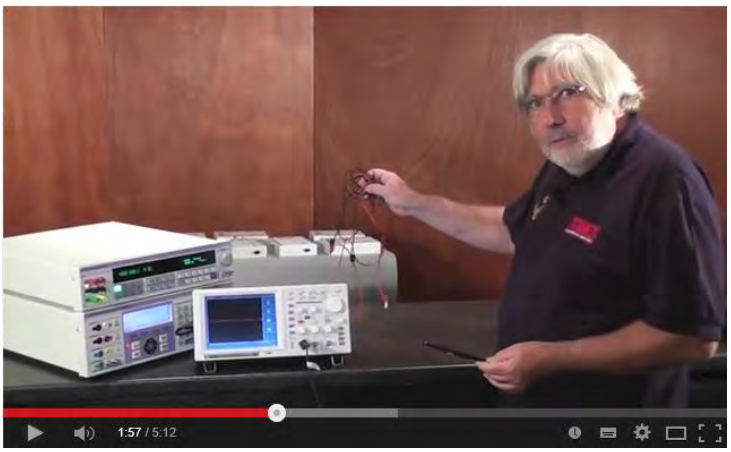
These effects are most noticeable when using high resistance (100kohms and above) and low current. All constant current sources have a very high output impedance which will pick up noise just like the high value resistance. To reduce pickup, use screened leads and try earthing the low side of the calibrator output.

For high value resistance it is essential that the cables insulation resistance will not affect the accuracy. Most PVC cables will only have insulation resistance of around 10GΩ; this will give an error of 1% on the 100mohm output.

Low AC Current is particularly difficult, as the capacitance of screened leads will shunt some of the current away.

Making good Measurements

As part of Transmille's commitment to educating technicians in correct measurement procedures, and in understanding errors, a series of education videos have been filmed that demonstrate common measurement practices and demonstrate the effects of common errors.



These videos can be viewed free of charge at our website, www.transmille.com/training as well as on our YouTube page, www.youtube.com/Transmille.

We welcome any comments on these videos, as well as suggestions for future videos demonstrating metrology practices.

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 1000 Series calibrators' 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 of the Fan**
3) **Cleaning the external case**
4) **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 appliance. Flash testing is not recommended due to the possibility of damage to internal components.

Cleaning of the Fan Vents

WARNING : Risk of Shock

Ensure calibrator is disconnected from line power before proceeding.

Fan ducts may be cleaned with brush and vacuum cleaner

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

To adjust the 1000 Series calibrator the calibrator can either be connected to a computer via the USB interface and adjusted using ProCal software or adjusted directly from the front panel. Adjustment can be completed without disassembly of the calibrator.

REFER TO THE SERVICE MANUAL FOR CALIBRATION PROCEDURE.

THE CALIBRATION OF THE INSTRUMENT SHOULD ONLY BE CARRIED OUT BY QUALIFIED PERSONNAL

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 return the instrument in its original packaging (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, EXPRESSED OR IMPLIED. TRANSMILLE SHALL NOT BE LIABLE FOR ANY INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OR LOSS.

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1000 Series Fax Back Form

Your 1000 Series Multi-Product Calibrator is fitted with a *security system* which requires a *security code* to be entered to allow continued operation of the unit beyond the 60 Day evaluation period.

Please complete the following details:

Company Name: _____

Contact Name: _____

Address: _____

_____

_____

_____

Country: _____

Tel: _____

Fax: _____

Instrument Model: ***1000 Series Multi-Product 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)

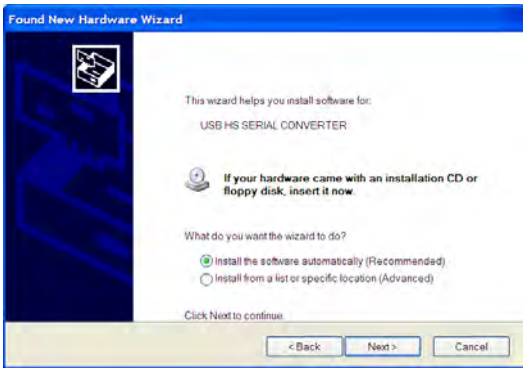
Insert the supplied USB lead driver CD into the computer CD drive

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 / 8)

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

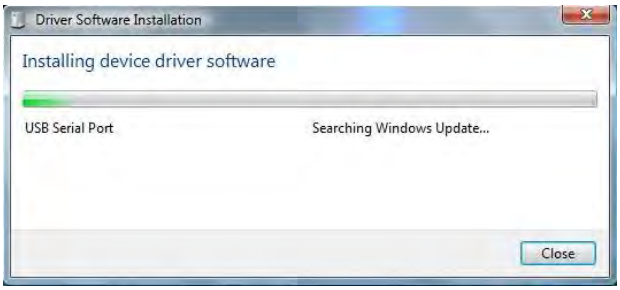
Click on menu to install driver –
follow on screen prompts.

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

Click **Locate and Install driver software**

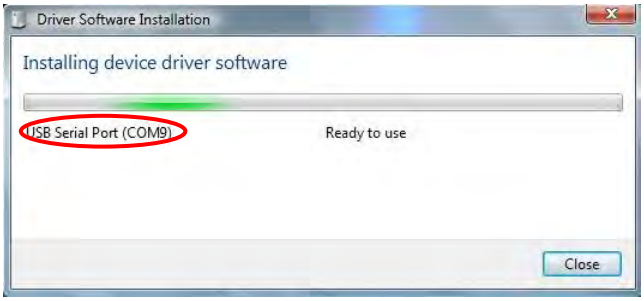
Windows will begin installation

Windows will install device driver



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

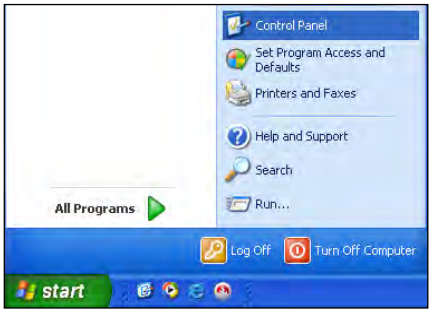
Note : The COM port number can be checked at any time by using Windows Control Panel.
[see instructions on next page].



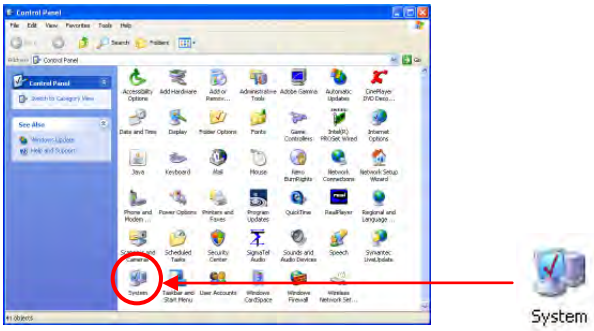
Checking the COM Port setting for the USB Interface

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 :

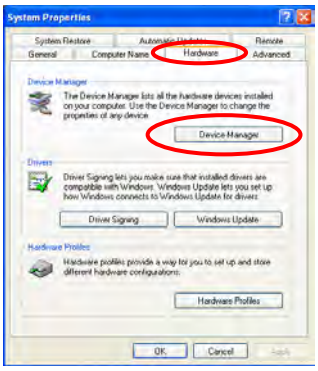
Open **Windows Control Panel**



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