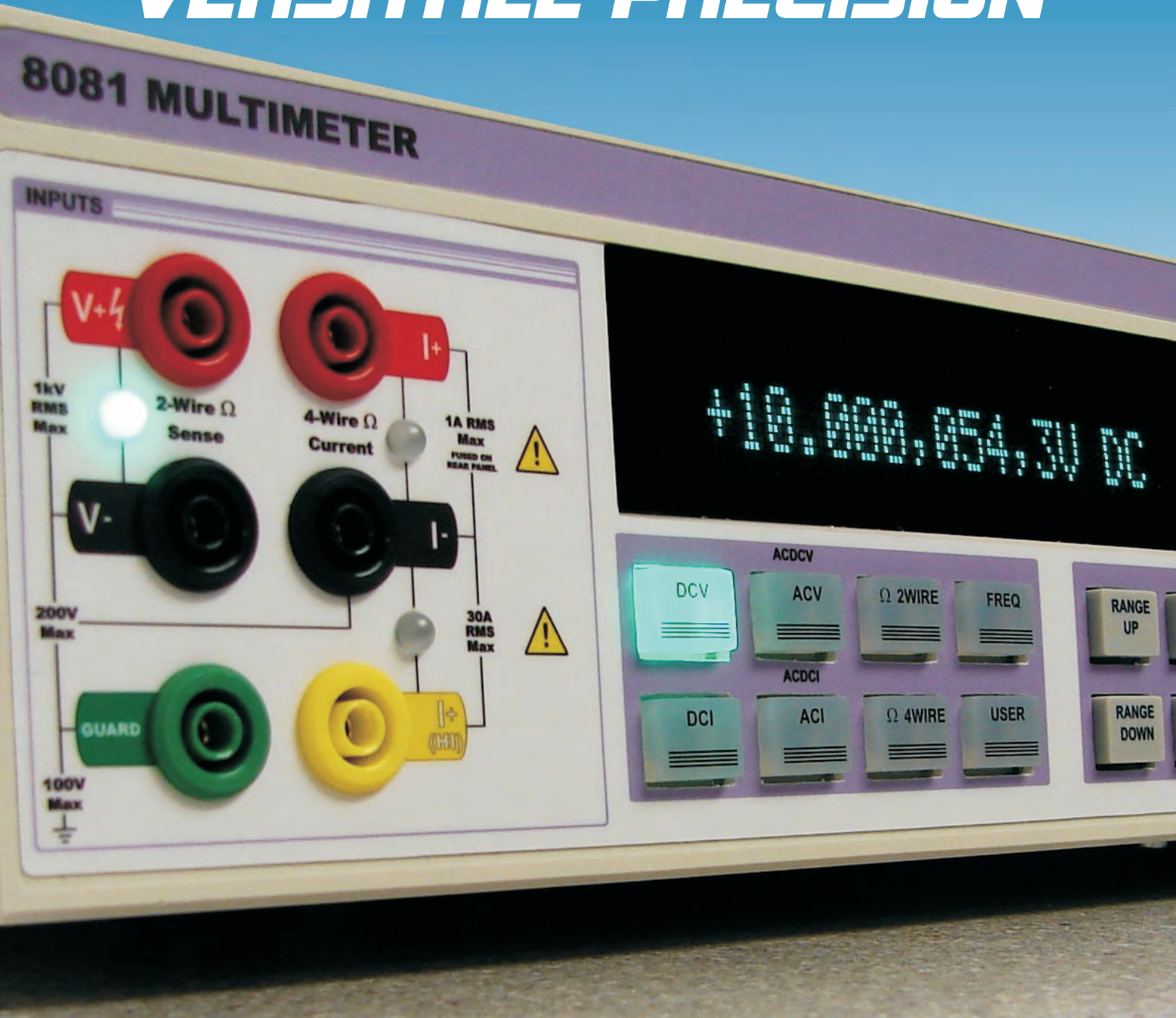
VERSATILE PRECISION



8000 SERIES

OPERATION MANUAL

TRANSMILLE

SOLUTIONS IN CALIBRATION

8000 Series

Precision Multimeter

Operation Manual

Version 2.10 : Nov 2009

IMPORTANT NOTICE

THIS PRODUCT 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 PRODUCT 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 is only entered once in the life of the instrument.)

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

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

DECLARATION OF CONFORMITY CE

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

Declares, that the product

Product Name: **Multimeter**
Model Number: **8071 / 8081**
Product Options: **This declaration covers all options of the above product(s)**

Conforms with the following European Directives:

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

Conforms with the following product standards:

EMC

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

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

Date : 27/02/2009

Revision No: 1.00

Managing Director

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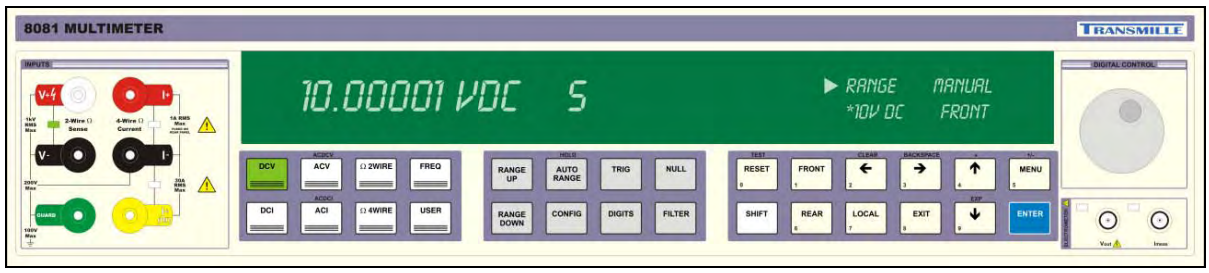
8000 Series Multimeter Introduction



The 8000 series range of multimeters offer maximised capabilities from a highly accurate 4ppm / 9ppm advanced design. Utilising the precision electronics to their fullest extent, the 8000 Series provides high performance core functionality combined with advanced operation modes in a single instrument.

Main Features

- **AC/DC Volts to 1025V**
- **AC/DC Current to 30 Amps**
- **AC/DC Low Current Measurement to 0.1pA (8081)**
- **2 and 4 Wire Resistance to 1 GOhm (8081)**
- **High Resistance Measurement to 1 TOhm (8081)**
- **Frequency**
- **Temperature Measurement (PRT / ITS90 / SPRT Co-efficient storage modes) (8081)**
- **Pressure Module Support : Measurement to 100Bar (8081)**

- **RS232 Serial Interface**
- **USB Interface**
- **GPIB (IEEE488) Interface**
- **Ethernet (LAN) Interface**

Accuracy And Functionality

The 8000 Series multimeters are available in 2 accuracy grades - the 8081 4ppm model and the 8071 of 9ppm model. The appearance of these units is the same, however the model is indicated on the front & rear panel and shown on the display on power up.

Multi Product Multimeter

Designed to provide an accurate cost effective portable instrument for the calibration of a wide range of signal sources including pressure, temperature and more. The 8000 series multimeter is equally suitable for use in the standards laboratory or for on site calibration work with a fast warm up time combined with low weight and optional soft / hard carry cases. The multi –interface design allows direct connection to desktop or laptop PCs via RS232, USB, GPIB or Ethernet.

Expandable Range of Pressure Modules

A range of pressure modules are available for support of pressure measurement up to 100 Bar (optional pressure hand pump also available).

Multi Interface Support : Available As Standard.

All functions and ranges of the series 8000 multimeter are fully programmable over the multi interfaces fitted as standard. The support of RS232, USB and Ethernet saves the cost of fitting GPIB cards to the PC, and also allows easy connection to portable PC's, reducing the set up time for on site calibration. GPIB is also available where use of this type of interface is already implemented.

Output Connection

The input terminal configuration is designed to most 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, an LED indicator showing the active output pair.

Preparing the Multimeter For Use.

Initial Inspection.

After shipment the multimeter 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 keep the original box which can be used when returning the multimeter for service and recalibration.

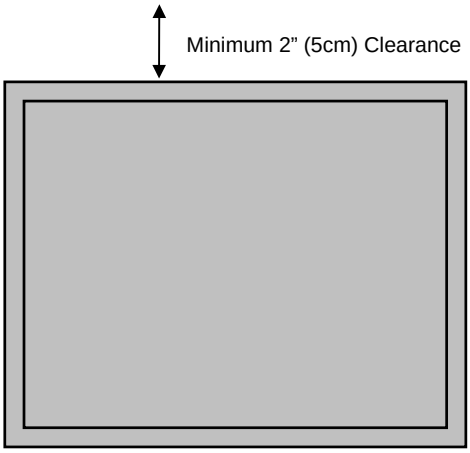
Lifting and carrying the Multimeter

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

WARNING
DO NOT DROP THE MULTIMETER AS THIS MAY CAUSE INTERNAL DAMAGE.

Positioning the Multimeter.

The multimeter can be used free standing on a bench or mounted in a standard 19” rack enclosure.
The multimeter can be operated at any angle, the two front feet have tilt legs for bench operation.
A 2” (5cm) space behind the instrument is also required for line and interface connections.

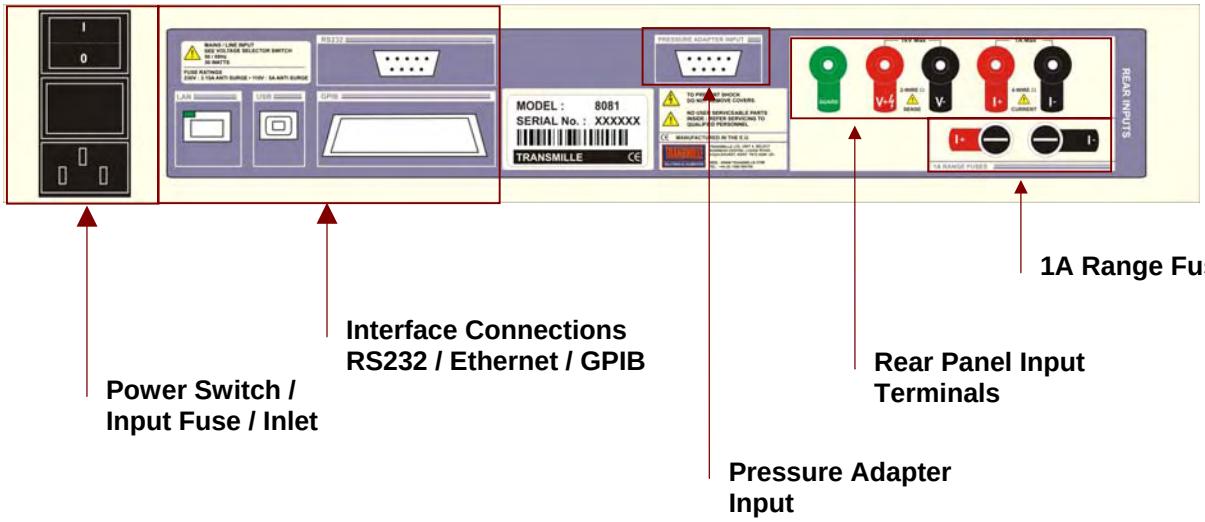


Rear Panel Connections and controls

Connections on the rear panel are for Line Power via a 3 Pin IEC connector incorporating the Line fuse and on-off switch -note the mains inlet is filtered.

The multiple interface connections are available including RS232, USB, GPIB and Ethernet (LAN) These interfaces are optically isolated from the multimeter output.

A set of rear panel terminals are fitted as standard, including voltage, current (to 1A) and a guard terminal. The 1 A range + and – fuses are located below the current terminals (1A Q.B.)



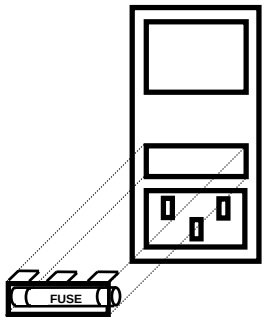
Setting and checking the Line Voltage.

WARNING
THE LINE POWER CORD MUST HAVE AN EARTH CONDUCTOR TO AVOID RISK OF SHOCK. THIS INSTRUMENT MUST BE CORRECTLY EARTHED.

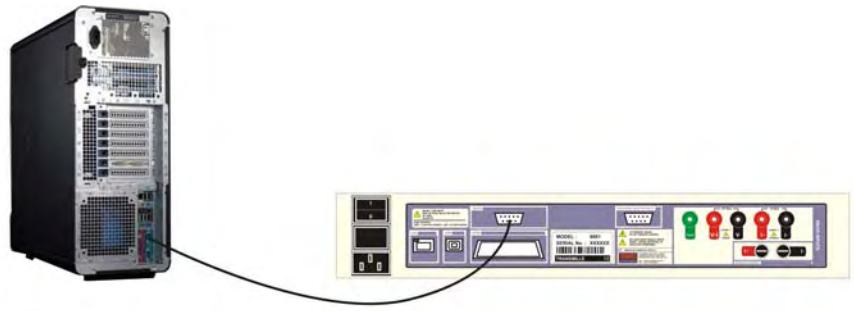
The multimeter has been designed to work from either 100-120 Volt line supply or 200 - 240 Volt line supply. Check Supply voltage as marked on the rear panel before connecting to power line. Connecting the multimeter to the wrong supply will cause internal damage to the instrument. To change the line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

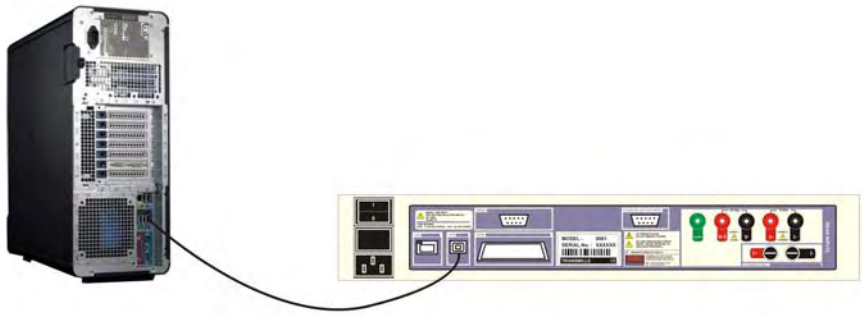
Power Line Inlet Fuse and rating

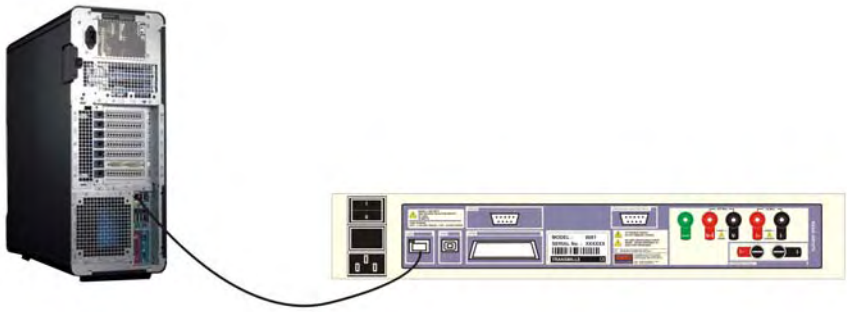
The Power line inlet fuse is located directly above the power inlet. The correct fuse for is 3.15A Anti-surge for 230V operation and 5A Anti surge for 110V Operation

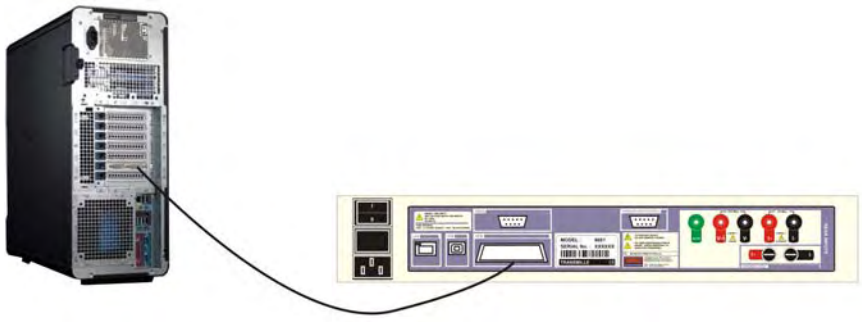


Connecting to a computer

RS232 Interface	
Connection	 8000 Series to PC RS232 Connection
Configuration	BAUD RATE : 9600 PARITY : NONE DATA BITS : 8 STOP BITS : 1
Cable Type	Male to Female Serial Cable Straight Though Pin Connection (Not Null MODEM)
Software Driver	N/A

USB Interface	
Connection	 8000 Series to PC USB Connection
Configuration	N/A
Cable Type	USB ‘A’ Type connector to USB ‘B’ Connector
Software Driver	FTDI USB Driver (Supplied)

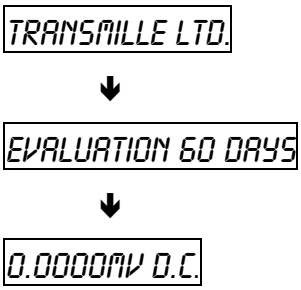
Ethernet (LAN) Interface	
Connection	 8000 Series to PC Ethernet (Lan) Connection
Configuration	8000 Series Menu Setup : Press MENU Press ➔ until ETHERNET is displayed Press ⬇ *For automatic IP Address (DHCP Host required*) Select ENABLE DHCP *To set a manual IP Address Select SET IP and enter IP Address in xxx.xxx.xxx.xxx format. * For further information consult your network administrator.
Cable Type	100BaseT Ethernet Cable (Standard Network Cable)
Software Driver	N/A

GPIB Interface	
Connection	 8000 Series to PC GPIB Connection (Internal PC GPIB Card / PC USB-> GPIB Converter Lead required)
Configuration	N/A
Cable Type	GPIB Interface Cable
Software Driver	National Instruments GPIB Device Driver or Similar (Card Specific)

Powering up the multimeter

After connecting line power, the multimeter can be switched on with the line power switch above the mains inlet socket on the rear panel.

The front panel displays will illuminate and indicate if the instrument is in evaluation mode for a period of 5 seconds, giving the user a chance to unlock the instrument. The start-up sequence will operate internal circuits indicating initial power up during which time the processor performs a self test of the instrument - the display will then switch to measurement display mode.



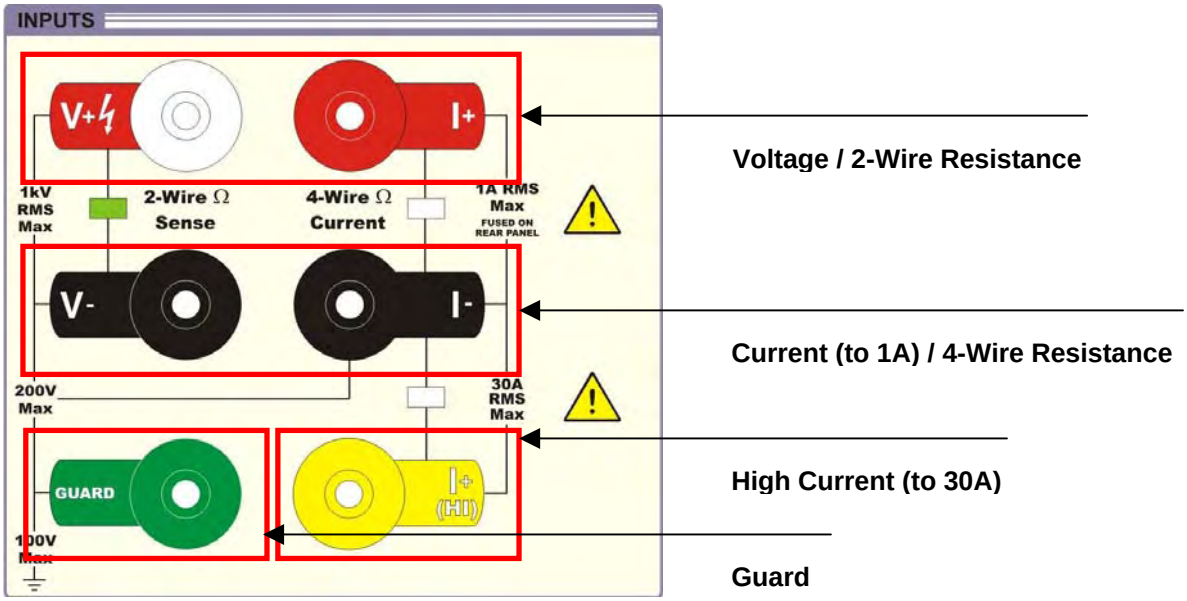
Allow the multimeter to warm up for 3 hours to obtain 90% of full specifications.

Output Connections

WARNING
THE LINE POWER CORD MUST HAVE AN EARTH CONDUCTOR TO AVOID RISK OF SHOCK. THIS INSTRUMENT MUST BE CORRECTLY EARTHED.

Input sockets are all 4mm safety type, the voltage pairs contacts are low thermal gold plated for minimum thermal EMF.

The 8000 series multimeter inputs have been designed to allow instruments to be calibrated minimising connection changes. There are 2 pairs of inputs, a high current input and a single guard input terminal :



When an output terminal pair is not active they are completely open circuit and isolated from the other outputs (note : a 30A shunt is permanently connected between the current negative and 30A terminals). As only one pair is active at a time on (except on 4 wire ohms) they may be combined together if required to match the input arrangement.

One example common configuration of a instrument's inputs is a single common low with a voltage, current and high current input. To match this to the multimeter, simply connect the 3 low outputs of the multimeter together and connect the voltage, current & high current outputs to the appropriate meters input . Note that when measuring ohms, the multimeter will use the voltage input terminals in 2 Wire mode.

A second example where the UUT instrument has separate voltage and current inputs, often using 4 wire ohms on both pairs. In this case simply connect the voltage and current outputs to the meter's inputs, the multimeter will use both the voltage and current pair on 4 wire ohms.

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 1 TOhm 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, see accessories.

WARNING
OBSERVE ALL MAXIMUM INPUT RATINGS WHEN PERFORMING MEASUREMENTS

The low output can be connected to line earth or allowed to float as selected.
It is recommended that the low is earthed which will help to reduce noise on high ohms and low current. If allowed to float with respect to line earth the low must remain within 50 volts of line earth.
Outputs are opto-isolated from the interfaces

Input Overloads

If the multimeter is unable to measure the input due to over range, the display will indicate OVER-RANGE.

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.

A SOFT CARRY-CASE AND A HARD TRANSIT CASE ARE AVAILABLE FOR REGULAR TRANSPORTATION OF THE MULTIMETER.

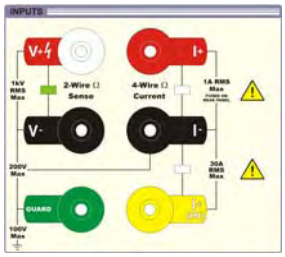
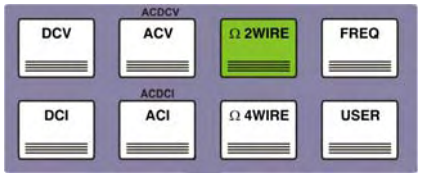
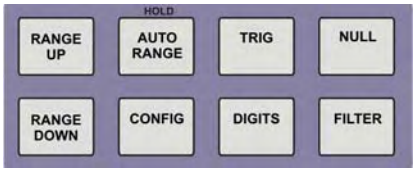
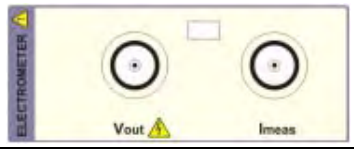
Introduction to Operation

All functions of the 8000 Series Multimeter can be controlled from the front panel. or controlled remotely by a computer over the interface. The front panel controls are ‘locked out’, but local control may be resumed by selecting the **LOCAL** key - it must be remembered that this action may disrupt any computer program controlling the multimeter.

Controls & Functions

To familiarise yourself with the 8000 Series multimeters, it is advised to learn a selection of the basic operations of the front panel controls before use.

The front panel consists of the following sections :

Dual Display	
Input terminals and Indicator LEDs	
Digital Control Dial	
Function Keys	
Range & Readback Controls	
Input & Menu Controls	
Electrometer I/O Terminals	

The front panel keys are grouped into related sections, with certain keys providing ‘shift’ functions as printed above the relevant key. To perform a shifted function, simply click the **SHIFT** key which will illuminate in blue. Press one of the keys with the required function labelled above it and this function will be selected. For example to select the ACDCV function press **SHIFT** **ACV**.

If the **SHIFT** button is pressed by mistake, simple press it again to de select it.

Preparing the Multimeter For Use

Follow the steps below to verify the multimeter is ready to use :

1. Check the following items have been received

- 1x Set of low thermal test leads
- 1x mains / line lead
- 1x Operation Guide
- 1x Certificate of Calibration (if ordered)

2. Connect the mains/line lead and power up the multimeter

The multimeter front panel displays and function buttons will illuminate, with the function selected remaining lit once the start up sequence is complete.

The default power up state is **DC VOLTAGE** with **AUTO RANGING ENABLED**.

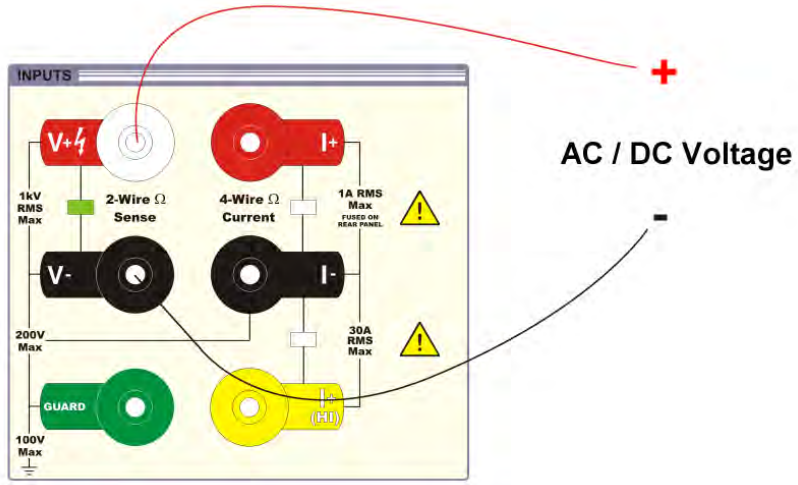
If the multimeter does not power up as expected check the following :

- **Check AC power is connected to the multimeter**
  Ensure AC power is supplied via the mains lead and the Off/ On switch is switch to the I (on) position

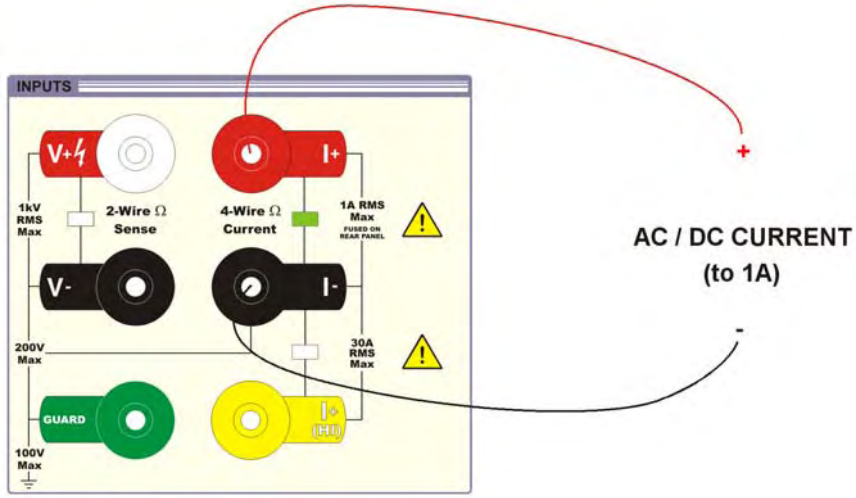
- **Verify the line voltage selection on the rear power inlet is correct**
  Check voltage selector as shown below :

- **Check the line input fuse is OK and does not require replacement.**
  This can be performed using the continuity function on a basic hand held multimeter.

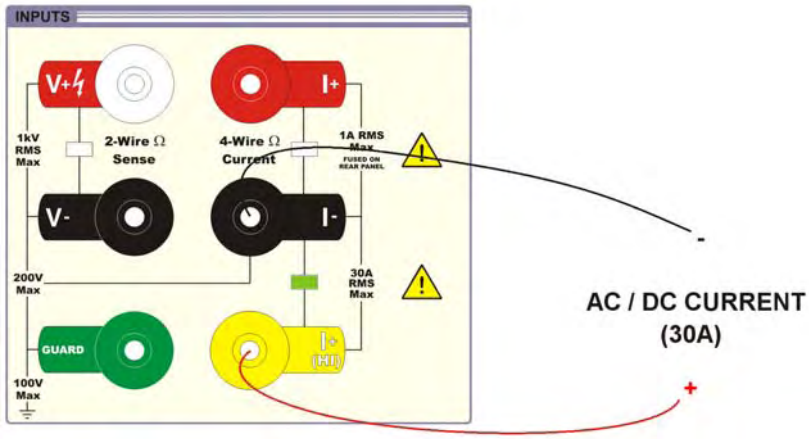
Connections for Voltage Measurement to 1kV



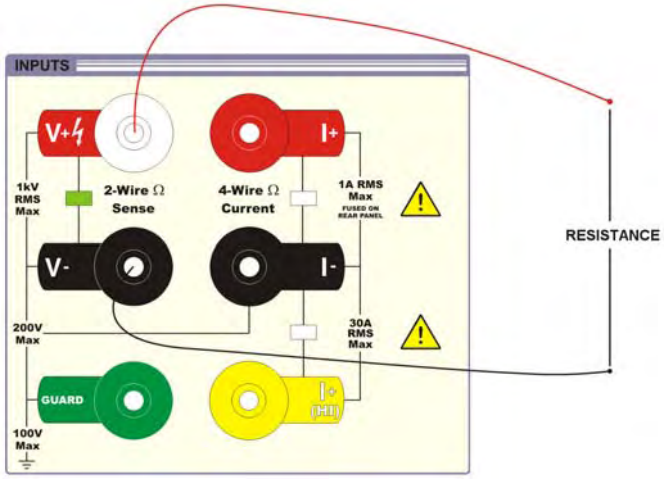
Connections for Low Current Measurement to 1A



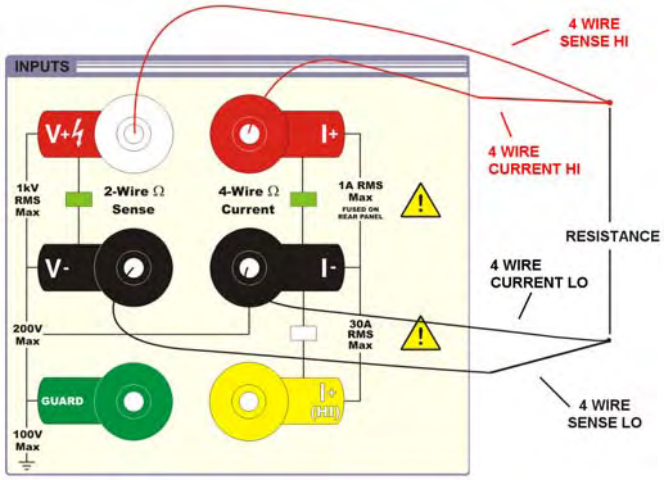
Connections for Low Current Measurement to 30A



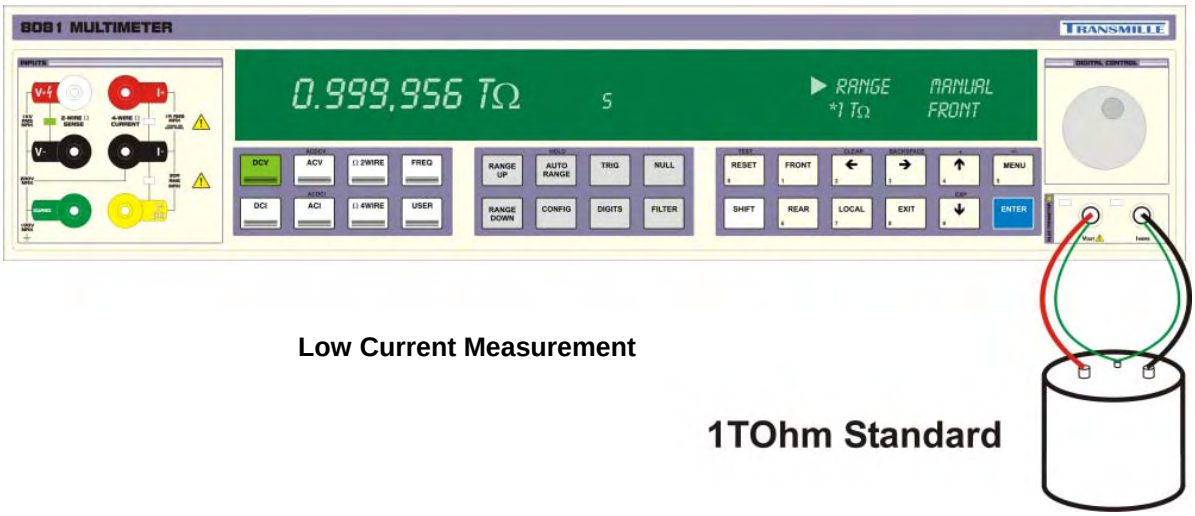
Connections for 2 Wire Resistance Measurement



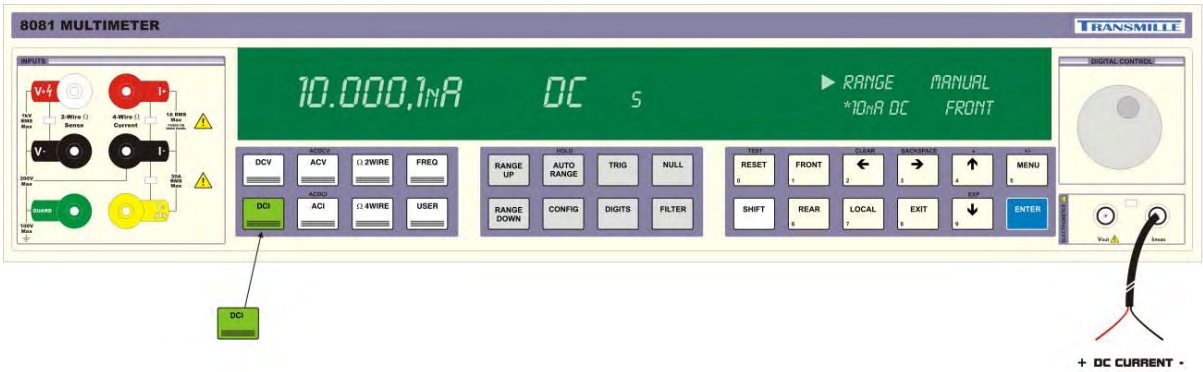
Connections for 4 Wire Resistance Measurement



Electrometer Input : High Resistance Measurement

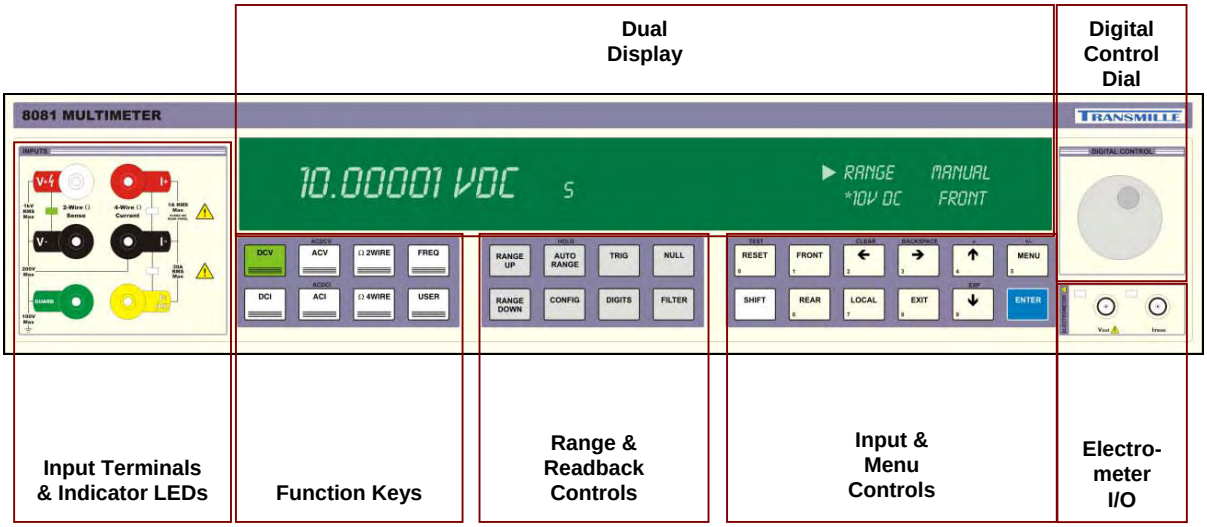


Electrometer Input : Low Current Measurement

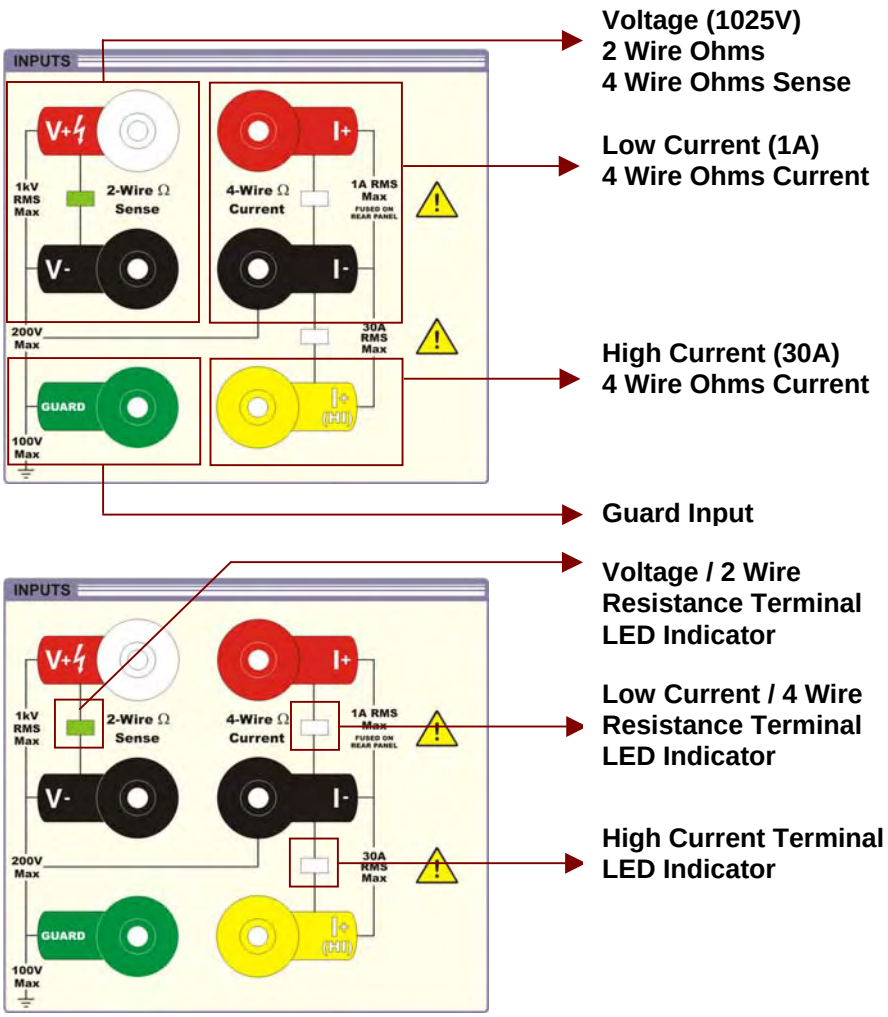


Front Panel Controls and Indicators

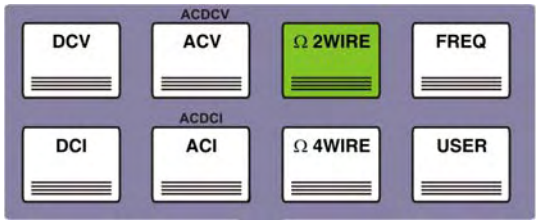
Front Panel Sections



Input Terminals & Indicator LEDs

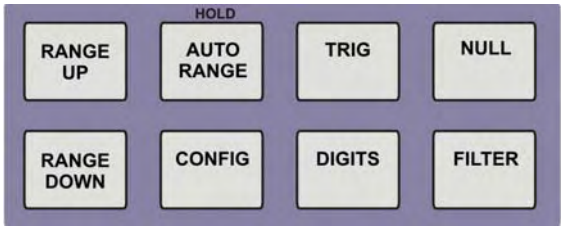


Function Keys



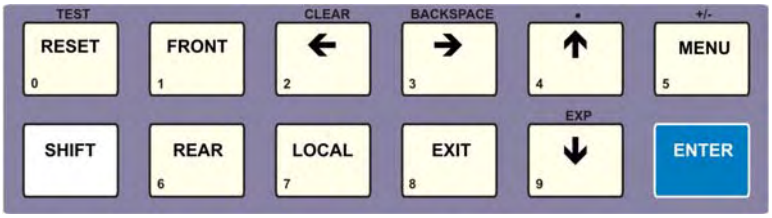
DCV	DC Voltage
ACV ACDCV	AC Voltage ACDC Voltage (Coupled)
Ω 2WIRE	2 Wire Resistance
FREQ	Frequency
DCI	DC Current
ACI ACDCI	AC Current ACDC Current (Coupled)
Ω 4WIRE	4 Wire Resistance
USER	User Defined Function

Range & Readback Controls



RANGE UP	Select Next Range Up
RANGE DOWN	Select Next Range Down
AUTO RANGE	Set Auto Range Mode
CONFIG	Enter Configuration Menu
TRIG	Select Trigger Setting
DIGITS	Select Number of Digits
NULL	Set Null Point
FILTER	Select Filter Setting

Input & Menu Controls

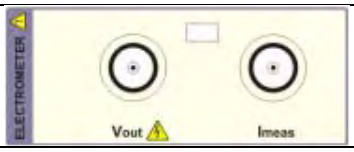


RESET 0	Reset Multimeter / Numeric Entry 0
SHIFT	Select Button Shift Function
FRONT 1	Activate Front Inputs Numeric Entry 1
REAR 6	Activate Rear Inputs Numeric Entry 6
← 2	Menu Left Select Numeric Entry 2
LOCAL 7	Set to Local Control Numeric Entry 7
→ 3	Menu Right Select Numeric Entry 3
EXIT 8	Exit Menu Numeric Entry 8
↑ 4	Menu Up Select Numeric Entry 4
↓ 9	Menu Down Select Numeric Entry 9
MENU 5	Enter Menu Numeric Entry 5
ENTER	Confirm Menu Select

Menu Dial

	**Multi Purpose Use – Context Specific :** **Range Up / Down** **Menu Navigation** **Menu Item Selection** **Numeric Increment / Decrement**

Electrometer I/O Terminals

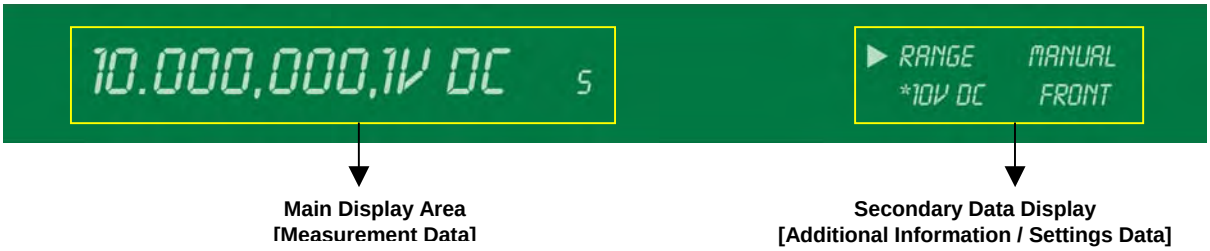
	**Vout**	**Voltage *output* for Electrometer high resistance measurement function**
	IMeas	**Current measurement *input* for Electrometer function**

Front panel Keyboard

The front panel of the 8000 Series Multimeter utilises a high quality custom rubber keyboard with tactile feel buttons and integral dual display window. The front panel is therefore sealed against the ingress of moisture and dirt enabling the multimeter to be used in working environments without risk of dirt causing early failure of the operating buttons. The front panel can easily be wiped clean with a soft cloth. Care should be taken not to scratch the display window. All graphics are 'under printed' so that they will not wear off with use.

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 ON TOP OF THE PANEL WHICH MAY GET PUSHED INTO THE DISPLAY AREA OR KEYS WHICH CAN ALSO CAUSE DAMAGE.

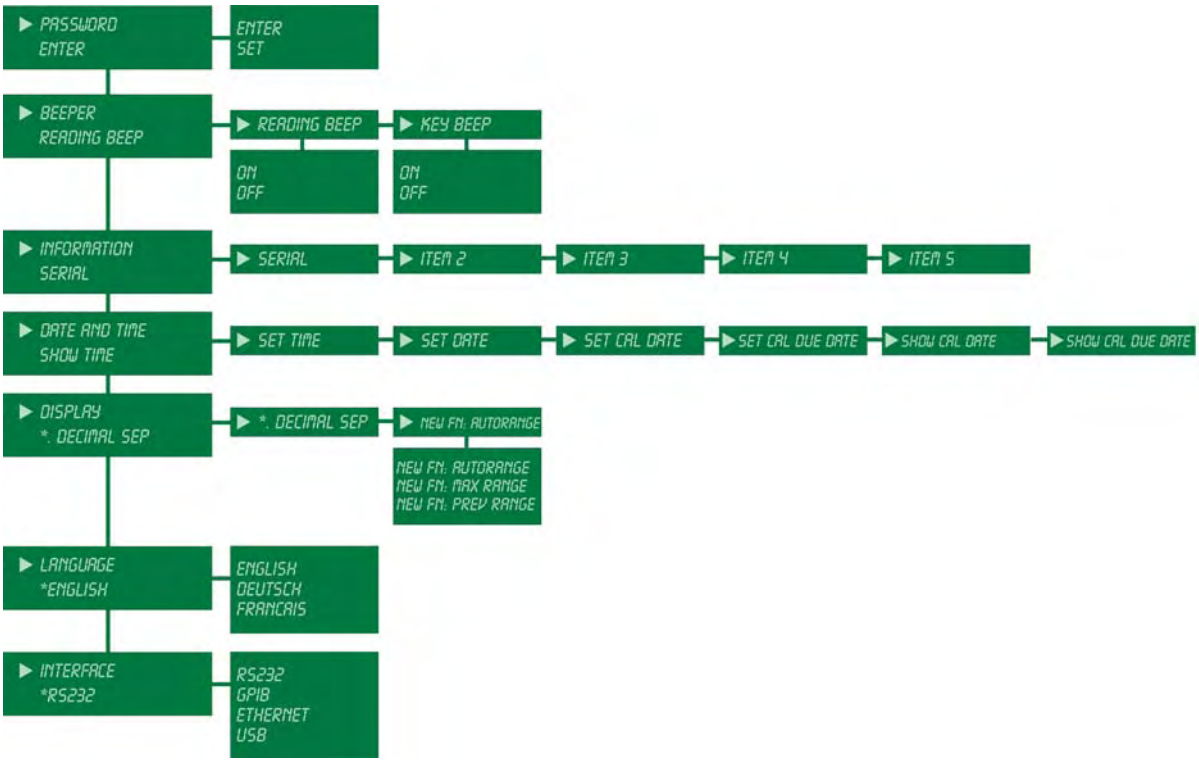
Dual Display



The 8000 Series multimeters incorporate clear, bright dual vacuum fluorescent displays to present the user with a large amount of information in an easy to read configuration.

The main display shows the reading, function selected and various indicators depending on the mode of operation (for example, an ‘s’ to indicate a sample being taken).

The secondary two line display shows additional settings related to the modes selected, including FILTER, RANGE, TERMINAL SELECTION. In addition the secondary display is also available to display menu options and settings.

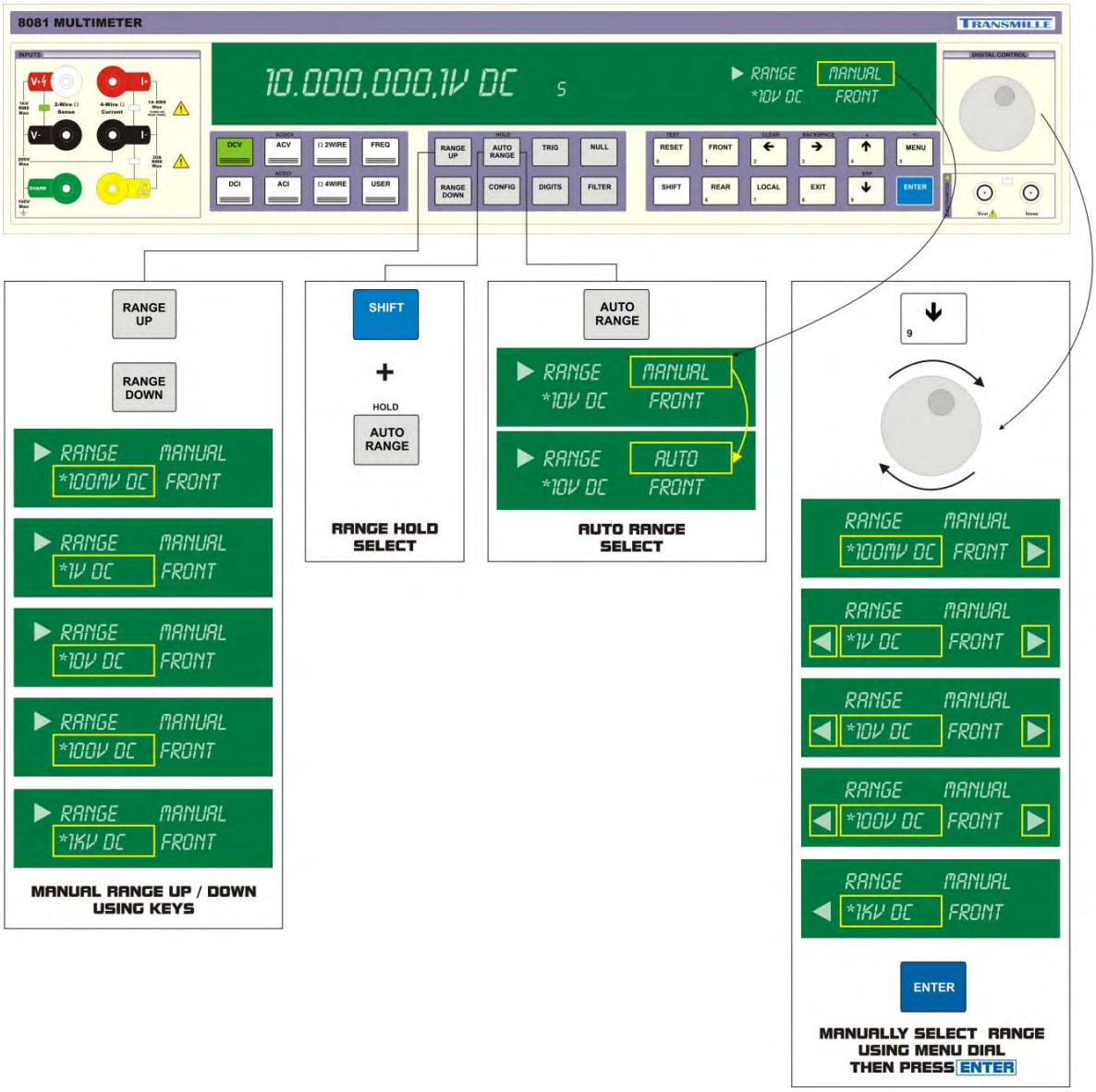


Example Status Display : User Menu

Operating the multimeter

Selecting a Range

Range selection can be set to automatic **AUTORANGE** mode or a manual range can be set using **MANUAL RANGING**.



- Autoranging is selected on power up and after a remote interface reset
- If the input signal is greater than the range full scale the multimeter will indicate overrange
- For frequency measurements, the ranging applies to the input signal *voltage*, not the frequency.

FUNCTION SPECIFIC RANGE MEMORY
Range settings are automatically stored for each function - these can be set as follows :

- **Autorange**
- **Set to maximum range**
- **Set to previously selected range**

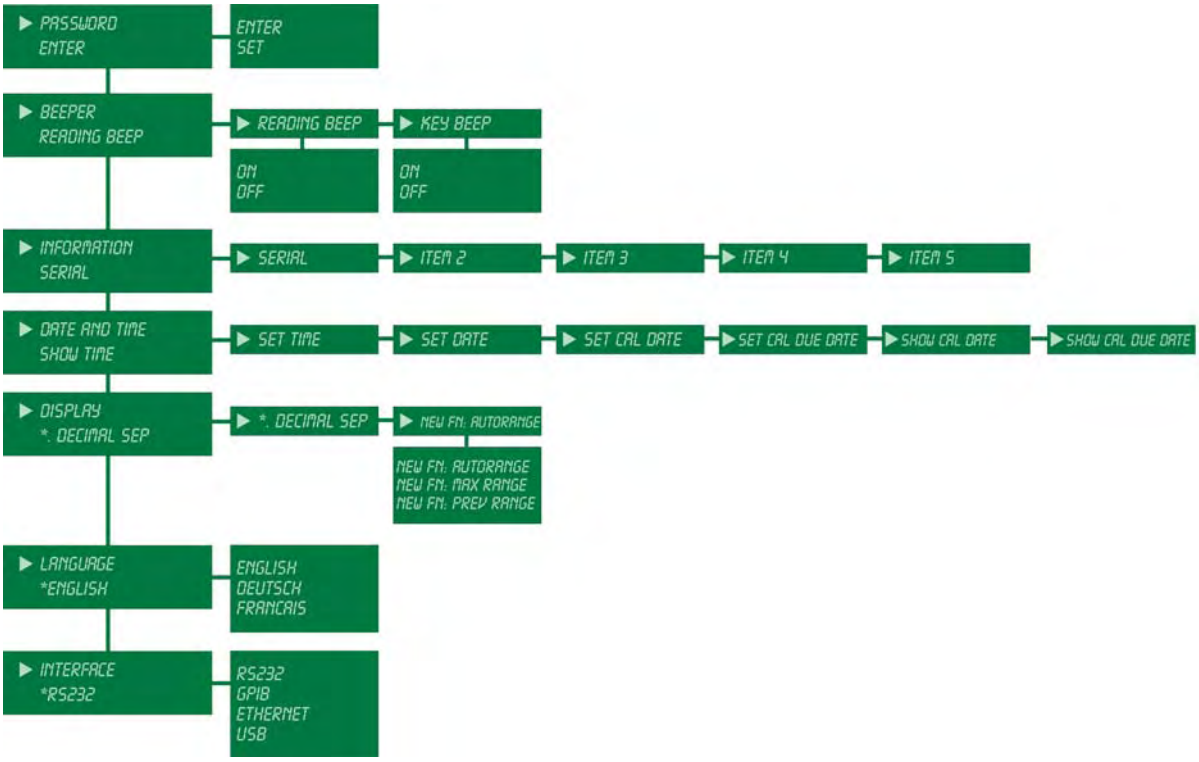
Front Panel Menu

The 8000 Series multimeters incorporate an intuitive control dial interface for menu navigation and configuration.

The following menus are available from direct access keys :

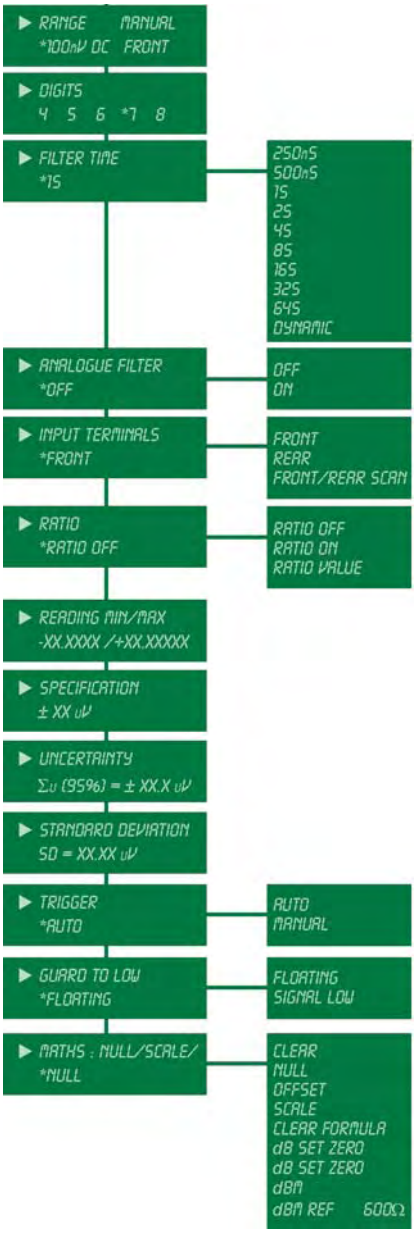
CONFIG	:	Configuration Menu This menu displays the currently configured status of the DMM including additional information display
USER	:	User Function Menu
SETTINGS	:	Setting Menu

Settings Menu



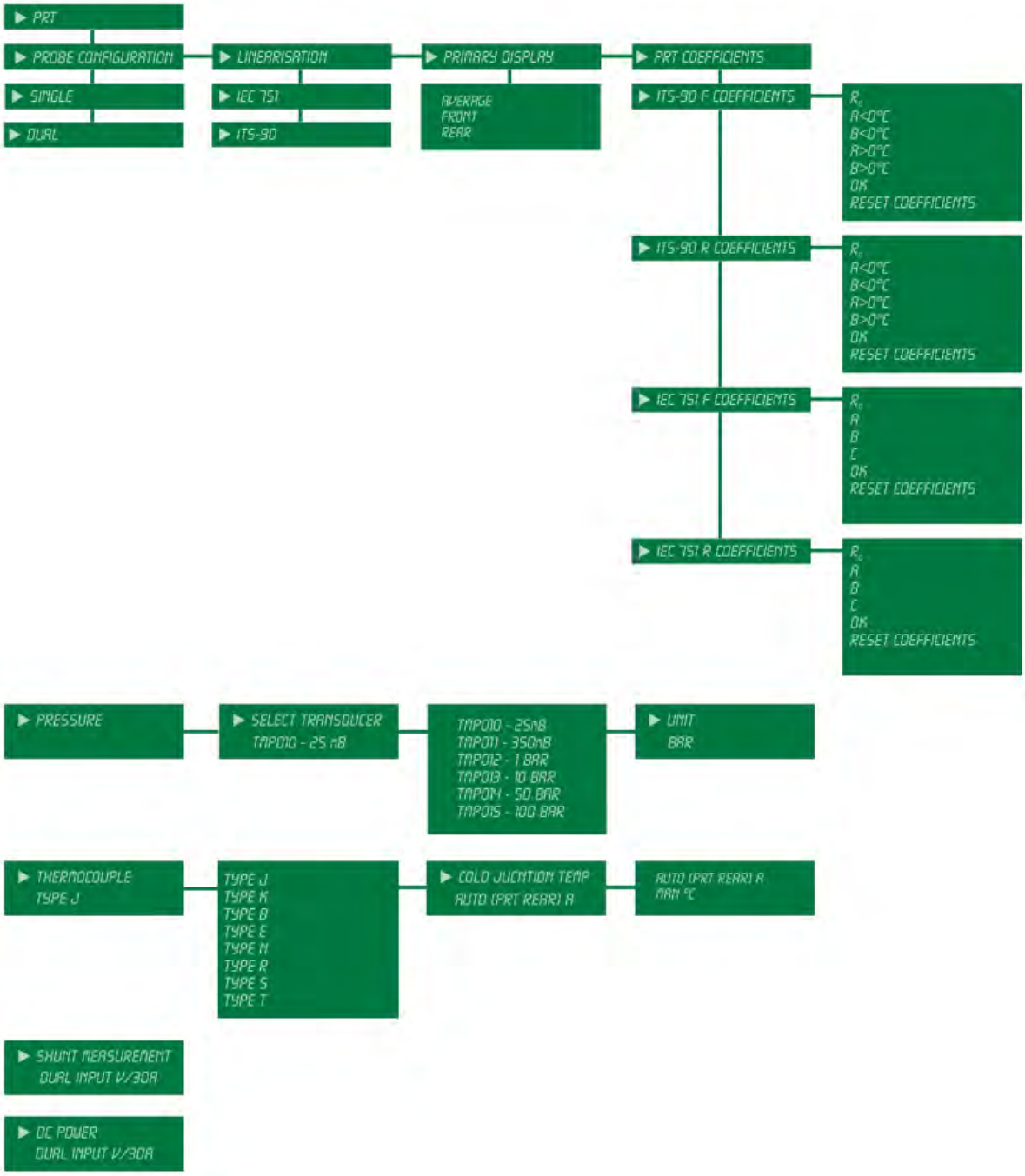
Menu Item	Description of Use
▶ PASSWORD ENTER ENTER SET	Enter password to access calibration menus or set new password
▶ BEEPER READING BEEP ▶ READING BEEP ▶ KEY BEEP ON OFF ON OFF	Set reading and key beep modes on or off
▶ INFORMATION SERIAL ▶ SERIAL ▶ ITEM 2 ▶ ITEM 3 ▶ ITEM 4 ▶ ITEM 5	View / set multimeter information
▶ DATE AND TIME SHOW TIME ▶ SET TIME ▶ SET DATE ▶ SET CAL DATE ▶ SET CAL DUE DATE ▶ SHOW CAL DATE ▶ SHOW CAL DUE DATE	View / Set current date/time and calibration due date/time
▶ DISPLAY *. DECIMAL SEP ▶ *. DECIMAL SEP ▶ NEW FN: AUTORANGE NEW FN: AUTORANGE NEW FN: MAX RANGE NEW FN: PREV RANGE	Set decimal separator type (. or,) and function default Ranging behaviour
▶ LANGUAGE *ENGLISH ENGLISH DEUTSCH FRANCAIS	Set regional language
▶ INTERFACE *RS232 RS232 GPIB ETHERNET USB	Select interface type

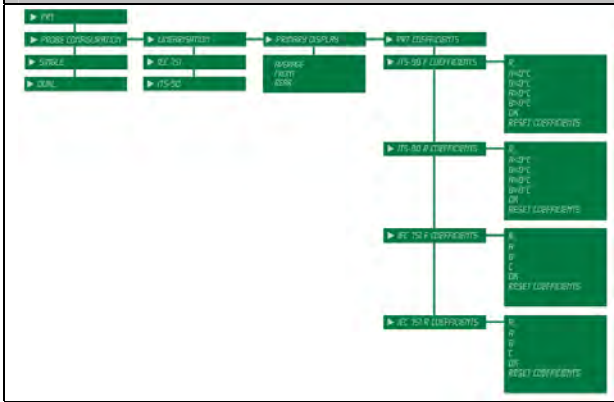
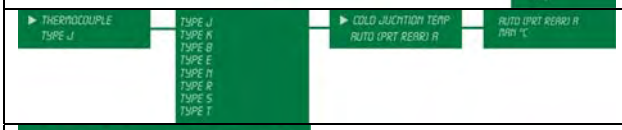
Configuration Menu



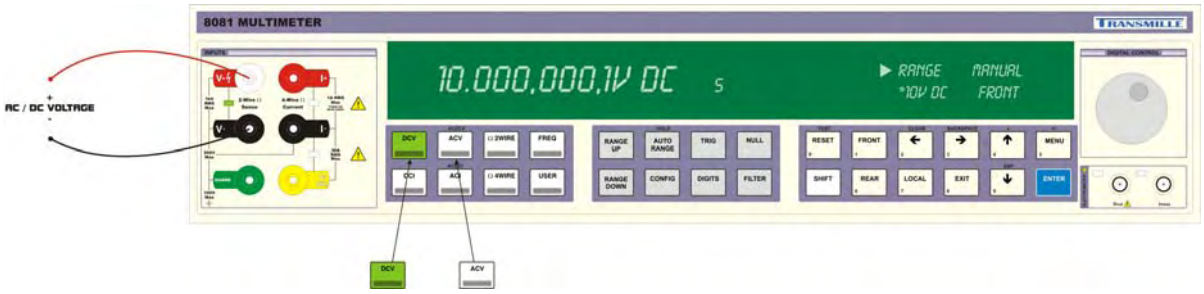
Menu Item	Description of Use
▶ RANGE MANUAL *100mV DC FRONT	Displays function, range and terminal settings.
▶ DIGITS 4 5 6 *7 8	View / set number of digits
▶ FILTER TIME *1S 250mS 500mS 1S 2S 4S 8S 16S 32S 64S DYNAMIC	View / set filter time or select Dynamic for intelligent filter selection
▶ ANALOGUE FILTER *OFF OFF ON	View / set analogue filter
▶ INPUT TERMINALS *FRONT FRONT REAR FRONT/REAR SCAN	View / set input terminal settings
▶ RATIO *RATIO OFF RATIO OFF RATIO ON RATIO VALUE	View / set Ratio settings
▶ READING MIN/MAX -XX.XXXX /+XX.XXXXX	View Minimum / maximum readings
▶ SPECIFICATION ± XX uV	View automatically calculated accuracy for the selected function / range / reading
▶ UNCERTAINTY Σu (95%) = ± XX.X uV	View automatically calculated uncertainty for the selected function / range / reading
▶ STANDARD DEVIATION SD = XX.XX uV	View automatically calculated standard deviation
▶ TRIGGER *AUTO AUTO MANUAL	View / set the trigger mode
▶ GUARD TO LOW *FLOATING FLOATING SIGNAL LOW	View / set the guard to low setting
▶ MATHS : NULL/SCALE/ *NULL CLEAR NULL OFFSET SCALE CLEAR FORMULA dB SET ZERO dB SET ZERO dBM dBM REF 600Ω	Set maths functions

User Menu


PRT
PROBE CONFIGURATION
SINGLE
DUAL
LINEARISATION
IEC 751
ITS-90
PRIMARY DISPLAY
AVERAGE
FRONT
REAR
PRT COEFFICIENTS
ITS-90 F COEFFICIENTS
R0
A<0°C
B<0°C
A>0°C
B>0°C
OK
RESET COEFFICIENTS
ITS-90 R COEFFICIENTS
R0
A<0°C
B<0°C
A>0°C
B>0°C
OK
RESET COEFFICIENTS
IEC 751 F COEFFICIENTS
R0
A
B
C
OK
RESET COEFFICIENTS
IEC 751 R COEFFICIENTS
R0
A
B
C
OK
RESET COEFFICIENTS
PRESSURE
SELECT TRANSDUCER
TMP010 - 25 mB
TMP010 - 25mB
TMP011 - 350mB
TMP012 - 1 BAR
TMP013 - 10 BAR
TMP014 - 50 BAR
TMP015 - 100 BAR
UNIT
BAR
THERMOCOUPLE
TYPE J
TYPE J
TYPE K
TYPE B
TYPE E
TYPE N
TYPE R
TYPE S
TYPE T
COLD JUNCTION TEMP
AUTO (PRT REAR) A
AUTO (PRT REAR) A
MAN °C
SHUNT MEASUREMENT
DUAL INPUT V/30A
DC POWER
DUAL INPUT V/30A

Menu Item	Description of Use
	Configure probe inputs for PRT measurement
	Configure pressure modules for pressure measurement
	Configure thermocouple type and cold junction compensation for thermocouple measurement
	Configure dual input voltage and current input mode for shunt measurement
	Configure dual input voltage and current input mode for DC power measurement

DC Voltage

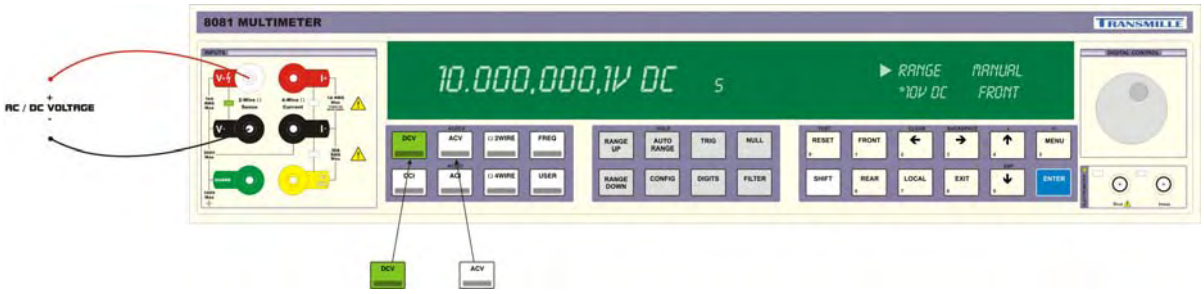


Press **DCV** to enter the DCV measurement mode – the status display will indicate the settings and range information.

Status Display Section	Description
▶ RANGE eg. *10V DC	Display / Selection of DC Voltage range – Use menu dial or RANGE UP RANGE DOWN buttons to change range. Selected range indicated by a *
MANUAL	Ranging mode : AUTO or MANUAL
FRONT	FRONT or REAR terminals in use

Additional Settings	Description
DIGITS	Set measurement resolution
FILTER TIME	Set FILTER TIME : 250ms to 64s Dynamic Mode for Automatic filter setting based on measurement stability
ANALOGUE FILTER	Set ANALOGUE FILTER mode : ON / OFF
INPUT TERMINALS	Set INPUT TERMINALS to use : FRONT / REAR
RATIO	Set RATIO mode : ON / VALUE / OFF
READING MIN / MAX	Display READING MIN / MAX measurement data for the selected function / range
TRIGGER	TRIGGER mode : AUTO / MANUAL
GUARD TO LOW	Set GUARD TO LOW mode : FLOATING / SIGNAL LOW
MATHS, NULL, dB	Set NULL : Store zero offset value Clear NULL : Clear zero offset value Set OFFSET : Add a user entered value to the measurement Set SCALE : Multiply measurement by a user entered value Clear FORMULA : Clear the formula entered (SCALE & OFFSET) See dB function for use of Set dB, dB SET ZERO & dBm REF 600 Ohms
INTERNAL TEMPERATURE	Displays the internal temperature

AC Voltage



Press **ACV** to enter the ACV measurement mode – the status display will indicate the settings and range information.

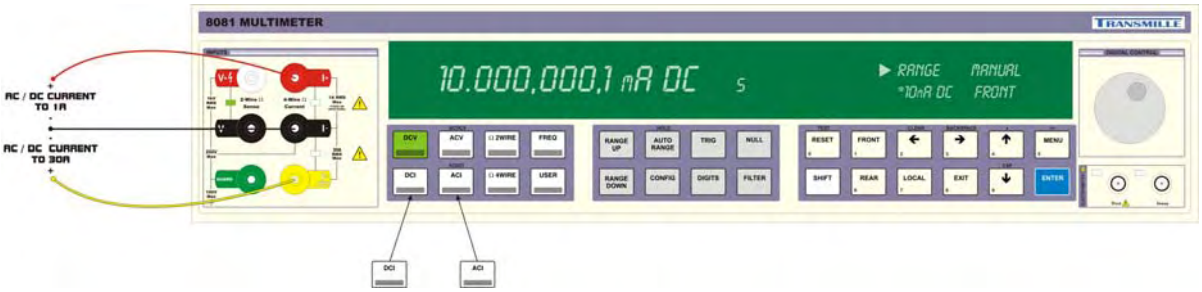
Press **FREQ** to enter the FREQUENCY measurement mode (1Hz resolution) : **ACV** and **FREQ** will both illuminate.

Press **FREQ** to switch back to **ACV** display

Status Display Section	Description
▶ RANGE eg. *10V AC	Display / Selection of AC Voltage range – Use menu dial or RANGE UP RANGE DOWN buttons to change range. Selected range indicated by a *
MANUAL	Ranging mode : AUTO or MANUAL
FRONT	FRONT or REAR terminals in use

Additional Settings	Description
DIGITS	Set measurement resolution
FILTER TIME	Set FILTER TIME : 250ms to 64s Dynamic Mode for Automatic filter setting based on measurement stability
ANALOGUE FILTER	Set ANALOGUE FILTER mode : ON / OFF
INPUT TERMINALS	Set INPUT TERMINALS to use : FRONT / REAR
RATIO	Set RATIO mode : ON / VALUE / OFF
READING MIN / MAX	Display READING MIN / MAX measurement data for the selected function / range
TRIGGER	TRIGGER mode : AUTO / MANUAL
GUARD TO LOW	Set GUARD TO LOW mode : FLOATING / SIGNAL LOW
MATHS, NULL, dB	Set NULL : Store zero offset value Clear NULL : Clear zero offset value Set OFFSET : Add a user entered value to the measurement Set SCALE : Multiply measurement by a user entered value Clear FORMULA : Clear the formula entered (SCALE & OFFSET) See dB function for use of Set dB, dB SET ZERO & dBm REF 600 Ohms
FREQUENCY	Displays the measurement frequency value
INTERNAL TEMPERATURE	Displays the internal temperature

DC Current

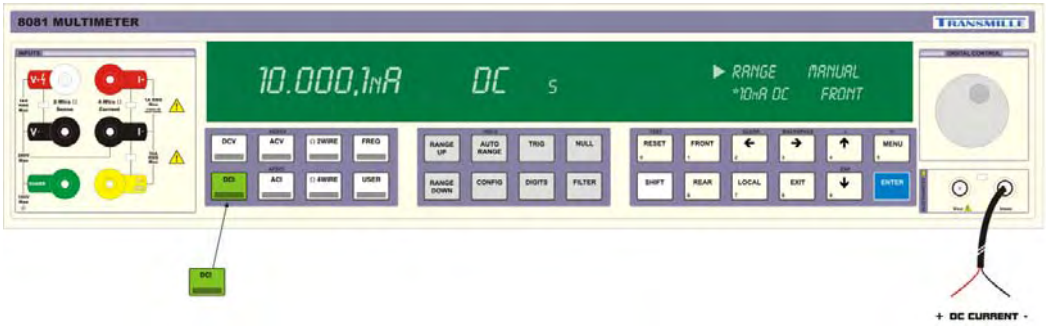


Press **DCI** to enter the DCI measurement mode – the status display will indicate the settings and range information.

Status Display Section	Description
▶ RANGE eg. *10mA DC	Display / Selection of DC Current range – Use menu dial or RANGE UP RANGE DOWN buttons to change range. Selected range indicated by a *
MANUAL	Ranging mode : AUTO or MANUAL
FRONT	FRONT or REAR terminals in use (Rear to 1A Max.)

Additional Settings	Description
DIGITS	Set measurement resolution
FILTER TIME	Set FILTER TIME : 250ms to 64s Dynamic Mode for Automatic filter setting based on measurement stability
ANALOGUE FILTER	Set ANALOGUE FILTER mode : ON / OFF
INPUT TERMINALS	Set INPUT TERMINALS to use : FRONT / REAR
RATIO	Set RATIO mode : ON / VALUE / OFF
READING MIN / MAX	Display READING MIN / MAX measurement data for the selected function / range
TRIGGER	TRIGGER mode : AUTO / MANUAL
GUARD TO LOW	Set GUARD TO LOW mode : FLOATING / SIGNAL LOW
MATHS, NULL, dB	Set NULL : Store zero offset value Clear NULL : Clear zero offset value Set OFFSET : Add a user entered value to the measurement Set SCALE : Multiply measurement by a user entered value Clear FORMULA : Clear the formula entered (SCALE & OFFSET) See dB function for use of Set dB, dB SET ZERO & dBm REF 600 Ohms
INTERNAL TEMPERATURE	Displays the internal temperature

DC Current (Electrometer Mode) (8081)



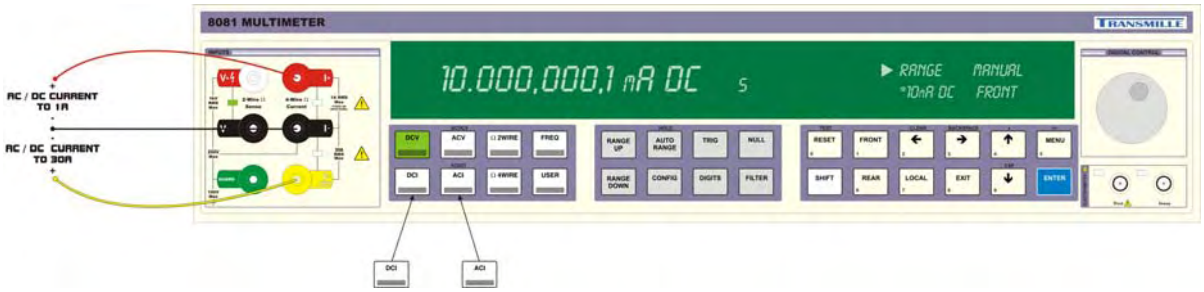
Press **DCI** to enter the DCI measurement mode – the status display will indicate the settings and range information.

Selecting ranges 10nA , 100nA, 1uA, 10uA will activate the electrometer mode. Inputs are measured from the IMeas BNC terminal on the right hand side of the multimeter. An LED indicates the BNC terminal set is active.

Status Display Section	Description
▶ RANGE eg. *10mA DC	Display / Selection of DC Current range – Use menu dial or RANGE UP RANGE DOWN buttons to change range. Selected range indicated by a *
MANUAL	Ranging mode : AUTO or MANUAL
FRONT	FRONT or REAR terminals in use (Rear to 1A Max.)

Additional Settings	Description
DIGITS	Set measurement resolution
FILTER TIME	Set FILTER TIME : 250ms to 64s Dynamic Mode for Automatic filter setting based on measurement stability
ANALOGUE FILTER	Set ANALOGUE FILTER mode : ON / OFF
READING MIN / MAX	Display READING MIN / MAX measurement data for the selected function / range
TRIGGER	TRIGGER mode : AUTO / MANUAL
GUARD TO LOW	Set GUARD TO LOW mode : FLOATING / SIGNAL LOW
MATHS, NULL, dB	Set NULL : Store zero offset value Clear NULL : Clear zero offset value Set OFFSET : Add a user entered value to the measurement Set SCALE : Multiply measurement by a user entered value Clear FORMULA : Clear the formula entered (SCALE & OFFSET) See dB function for use of Set dB, dB SET ZERO & dBm REF 600 Ohms
INTERNAL TEMPERATURE	Displays the internal temperature

AC Current



Press **ACI** to enter the ACI measurement mode – the status display will indicate the settings and range information.

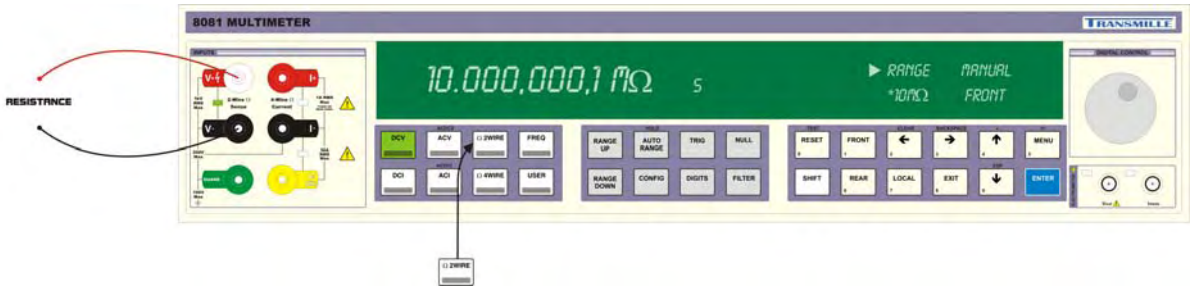
Press **FREQ** to enter the FREQUENCY measurement mode (1Hz resolution) : **ACV** and **FREQ** will both illuminate.

Press **FREQ** to switch back to **ACV** display

Status Display Section	Description
▶ RANGE eg. *10mA AC	Display / Selection of AC Current range – Use menu dial or RANGE UP RANGE DOWN buttons to change range. Selected range indicated by a *
MANUAL	Ranging mode : AUTO or MANUAL
FRONT	FRONT or REAR terminals in use (Rear to 1A Max.)

Additional Settings	Description
DIGITS	Set measurement resolution
FILTER TIME	Set FILTER TIME : 250ms to 64s Dynamic Mode for Automatic filter setting based on measurement stability
ANALOGUE FILTER	Set ANALOGUE FILTER mode : ON / OFF
INPUT TERMINALS	Set INPUT TERMINALS to use : FRONT / REAR
RATIO	Set RATIO mode : ON / VALUE / OFF
READING MIN / MAX	Display READING MIN / MAX measurement data for the selected function / range
TRIGGER	TRIGGER mode : AUTO / MANUAL
GUARD TO LOW	Set GUARD TO LOW mode : FLOATING / SIGNAL LOW
MATHS, NULL, dB	Set NULL : Store zero offset value Clear NULL : Clear zero offset value Set OFFSET : Add a user entered value to the measurement Set SCALE : Multiply measurement by a user entered value Clear FORMULA : Clear the formula entered (SCALE & OFFSET) See dB function for use of Set dB, dB SET ZERO & dBm REF 600 Ohms
FREQUENCY	Displays the measurement frequency value
INTERNAL TEMPERATURE	Displays the internal temperature

2-Wire Resistance

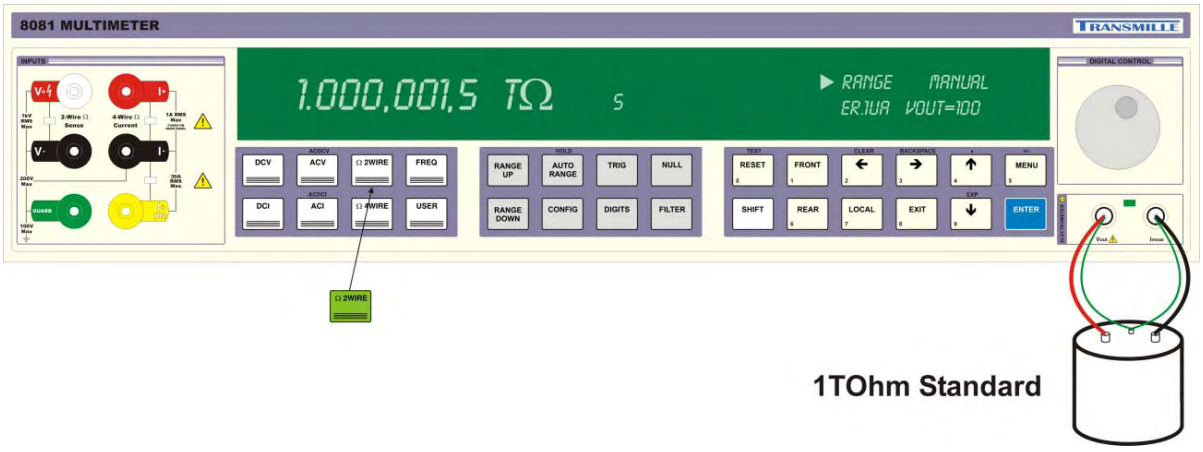


Press **Ω 2WIRE** to enter the Ω 2WIRE measurement mode – the status display will indicate the settings and range information.

Status Display Section	Description
▶ RANGE eg. *10m Ω DC	Display / Selection of 2-Wire Resistance range – Use menu dial or RANGE UP RANGE DOWN buttons to change range. Selected range indicated by a *
MANUAL	Ranging mode : AUTO or MANUAL
FRONT	FRONT or REAR terminals in use

Additional Settings	Description
DIGITS	Set measurement resolution
FILTER TIME	Set FILTER TIME : 250ms to 64s Dynamic Mode for Automatic filter setting based on measurement stability
ANALOGUE FILTER	Set ANALOGUE FILTER mode : ON / OFF
INPUT TERMINALS	Set INPUT TERMINALS to use : FRONT / REAR
RATIO	Set RATIO mode : ON / VALUE / OFF
READING MIN / MAX	Display READING MIN / MAX measurement data for the selected function / range
TRIGGER	AUTO / MANUAL
GUARD TO LOW	Set GUARD TO LOW mode : FLOATING / SIGNAL LOW
MATHS, NULL, dB	Set NULL : Store zero offset value Clear NULL : Clear zero offset value Set OFFSET : Add a user entered value to the measurement Set SCALE : Multiply measurement by a user entered value Clear FORMULA : Clear the formula entered (SCALE & OFFSET) See dB function for use of Set dB, dB SET ZERO & dBm REF 600 Ohms
OHMS LOW CURRENT	Reduced measurement current to reduce power dissipation / self heating during measurement OFF / ON
OHMS COMPENSATION	Compensates for thermal voltages which may be present at the measurement terminal connection OFF / ON
POWER / CURRENT	Displays the power dissipation / current flowing for the specific range & measurement
INTERNAL TEMPERATURE	Displays the internal temperature

2-Wire Resistance (Electrometer Mode) (8081)



Press **Ω 2WIRE** to enter the Ω 2WIRE measurement mode – the status display will indicate the settings and range information.

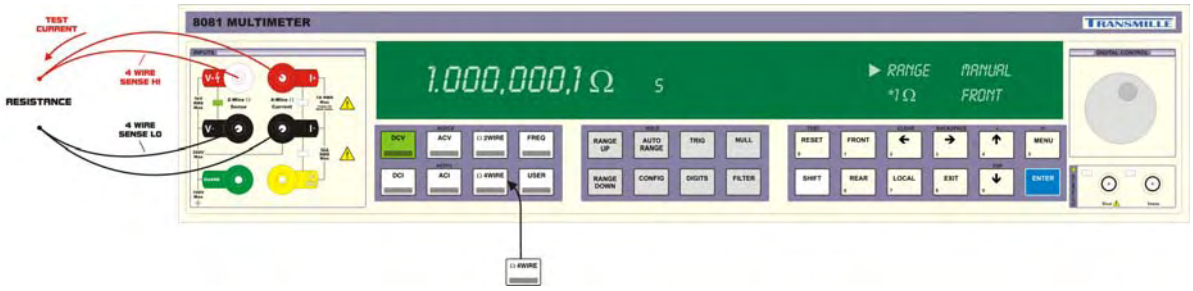
Selecting ranges above 10 MOhms will activate electrometer mode - this is displayed in terms of current (100uA, 10uA, 1uA, 100nA, 10nA). Inputs are measured from the IMeas BNC terminal on the right hand side of the multimeter. An LED indicates the BNC terminal set is active.

Voltage output on electrometer terminals is configurable from status menu (using menu dial) from 50V to 300V in 50V steps.

Status Display Section	Description
▶ RANGE eg. *10m Ω DC	Display / Selection of 2-Wire Resistance range – Use menu dial or RANGE UP RANGE DOWN buttons to change range. Selected range indicated by a *
MANUAL	Ranging mode : AUTO or MANUAL
FRONT	FRONT or REAR terminals in use

Additional Settings	Description
DIGITS	Set measurement resolution
FILTER TIME	Set FILTER TIME : 250ms to 64s Dynamic Mode for filter setting based on measurement stability
ANALOGUE FILTER	Set ANALOGUE FILTER mode : ON / OFF
READING MIN / MAX	Display READING MIN / MAX measurement
TRIGGER	AUTO / MANUAL
GUARD TO LOW	Set GUARD TO LOW mode : FLOATING / SIGNAL LOW
MATHS, NULL, dB	Set NULL : Store zero offset value Clear NULL : Clear zero offset value Set OFFSET : Add a user entered value to the measurement Set SCALE : Multiply measurement by a user entered value Clear FORMULA : Clear the formula entered (SCALE & OFFSET) See dB function for use of Set dB, dB SET ZERO & dBm REF 600 Ohms
POWER / CURRENT	Displays the power dissipation / current flowing for the specific range & measurement
TEST VOLTAGE	Select Test Voltage 50V • 100V • 150V • 200V • 250V • 300V for the specific range & measurement
INTERNAL TEMPERATURE	Displays the internal temperature

4-Wire Resistance

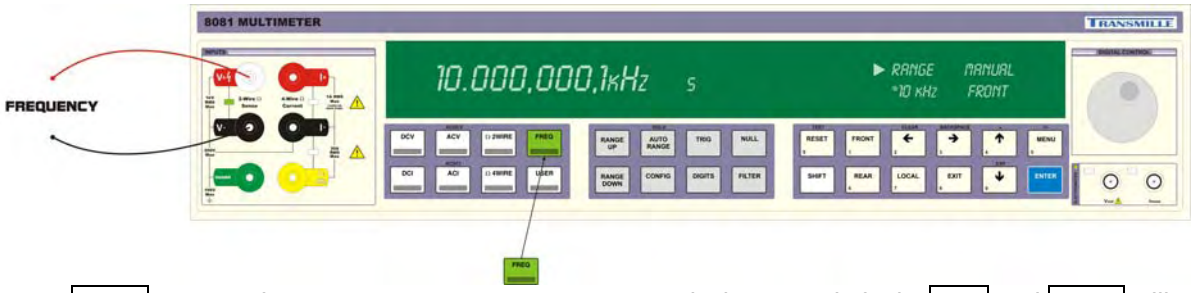


Press **Ω 4WIRE** to enter the Ω 4WIRE measurement mode – the status display will indicate the settings and range information.

Status Display Section	Description
▶ RANGE eg. *1Ω DC	Display / Selection of 4-Wire Resistance range – Use menu dial or RANGE UP RANGE DOWN buttons to change range. Selected range indicated by a *
MANUAL	Ranging mode : AUTO or MANUAL
FRONT	FRONT or REAR terminals in use

Additional Settings	Description
DIGITS	Set measurement resolution
FILTER TIME	Set FILTER TIME : 250ms to 64s Dynamic Mode for Automatic filter setting based on measurement stability
ANALOGUE FILTER	Set ANALOGUE FILTER mode : ON / OFF
INPUT TERMINALS	Set INPUT TERMINALS to use : FRONT / REAR
RATIO	Set RATIO mode : ON / VALUE / OFF
READING MIN / MAX	Display READING MIN / MAX measurement data for the selected function / range
TRIGGER	AUTO / MANUAL
GUARD TO LOW	Set GUARD TO LOW mode : FLOATING / SIGNAL LOW
MATHS, NULL, dB	Set NULL : Store zero offset value Clear NULL : Clear zero offset value Set OFFSET : Add a user entered value to the measurement Set SCALE : Multiply measurement by a user entered value Clear FORMULA : Clear the formula entered (SCALE & OFFSET) See dB function for use of Set dB, dB SET ZERO & dBm REF 600 Ohms
OHMS LOW CURRENT	Reduced measurement current to reduce power dissipation / self heating during measurement OFF / ON
OHMS COMPENSATION	Compensates for thermal voltages which may be present at the measurement terminal connection OFF / ON
POWER / CURRENT	Displays the power dissipation / current flowing for the specific range & measurement
INTERNAL TEMPERATURE	Displays the internal temperature

Frequency

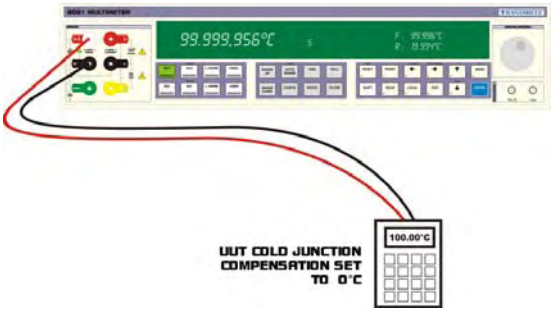


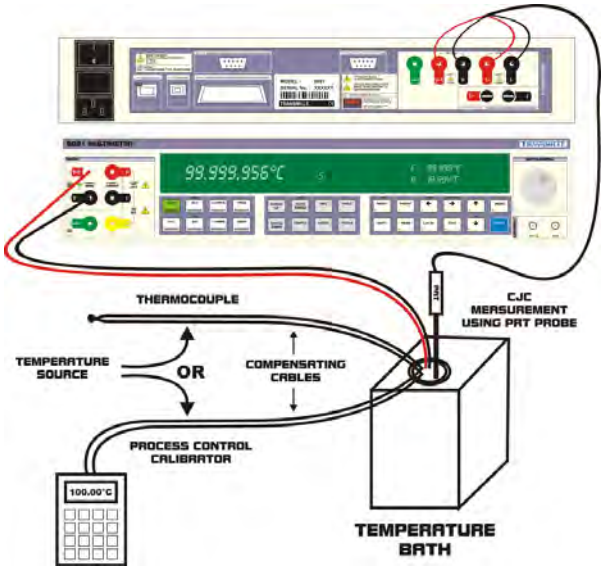
Press **FREQ** to enter the FREQUENCY measurement mode (1Hz resolution) : **ACV** and **FREQ** will both illuminate.

Status Display Section	Description
▶ RANGE eg. *1V	Display / Selection of AC Voltage range – Use menu dial or RANGE UP RANGE DOWN buttons to change range. Selected range indicated by a *
MANUAL	Ranging mode : AUTO or MANUAL
FRONT	FRONT or REAR terminals in use

Additional Settings	Description
DIGITS	Set measurement resolution
FILTER TIME	Set FILTER TIME : 250ms to 64s Dynamic Mode for Automatic filter setting based on measurement stability
ANALOGUE FILTER	Set ANALOGUE FILTER mode : ON / OFF
INPUT TERMINALS	Set INPUT TERMINALS to use : FRONT / REAR
RATIO	Set RATIO mode : ON / VALUE / OFF
READING MIN / MAX	Display READING MIN / MAX measurement data for the selected function / range
TRIGGER	AUTO / MANUAL
GUARD TO LOW	Set GUARD TO LOW mode : FLOATING / SIGNAL LOW
MATHS, NULL, dB	Set NULL : Store zero offset value Clear NULL : Clear zero offset value Set OFFSET : Add a user entered value to the measurement Set SCALE : Multiply measurement by a user entered value Clear FORMULA : Clear the formula entered (SCALE & OFFSET) See dB function for use of Set dB, dB SET ZERO & dBm REF 600 Ohms
OHMS LOW CURRENT	Reduced measurement current to reduce power dissipation / self heating during measurement OFF / ON
OHMS COMPENSATION	Compensates for thermal voltages which may be present at the measurement terminal connection OFF / ON
POWER / CURRENT	Displays the power dissipation / current flowing for the specific range & measurement
INTERNAL TEMPERATURE	Displays the internal temperature

Thermocouple Measurement (8081)





Configuration A :
Process Control Calibrator Connection

Configuration B :
Process Control Calibrator / Thermocouple Connection with Cold Junction Compensation using external PRT probe in temperature bath.

Press **SHIFT** then **DCV** to select thermocouple measurement.

Select the thermocouple **Type J** **Type K** **Type B** **Type E** **Type N** **Type R** **Type S** **Type T** using ← → buttons or menu dial

Select cold junction compensation mode using ← → buttons or menu dial

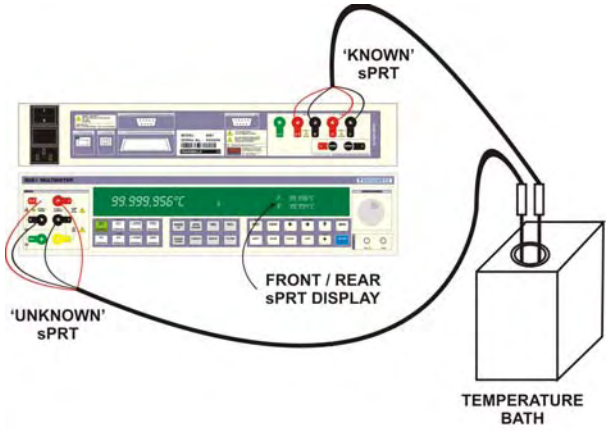
Auto (PRT Rear) A : Uses the PRT Rear Probe A coefficients - connect to rear panel terminals

Man °C : User measured and entered cold junction temperature value

Additional Settings	Description
DIGITS	Set measurement resolution
FILTER TIME	Set FILTER TIME : 250ms to 64s Dynamic Mode for Automatic filter setting based on measurement stability
ANALOGUE FILTER	Set ANALOGUE FILTER mode : ON / OFF
INPUT TERMINALS	Set INPUT TERMINALS to use : FRONT / REAR
RATIO	Set RATIO mode : ON / VALUE / OFF
READING MIN / MAX	Display READING MIN / MAX measurement data for the selected function / range
TRIGGER	AUTO / MANUAL
GUARD TO LOW	Set GUARD TO LOW mode : FLOATING / SIGNAL LOW
INTERNAL TEMPERATURE	Displays the internal temperature

PRT Measurement (8081)

Configuration A :
Single probe measurement



Configuration B :
Dual probe configuration with ratio comparison of known and unknown probes

Press **SHIFT** then **Ω 4WIRE** to select PRT measurement.

Select **PROBE CONFIGURATION** **SINGLE** **DUAL**

Select **LINEARISATION** **IEC 751** **ITS-90**

Select **PRIMARY DISPLAY** **AVERAGE** **FRONT** **REAR**

Select **PRT Coefficients** **ITS-90 Front** **ITS-90 Rear** **IEC 751 Front** **IEC 751 Rear**

ITS-90 Front Coefficients	
R_0	100
a<0°C	0
b<0°C	0
a>0°C	0
b>0°C	0
OK	
Reset coefficients	

ITS-90 Rear Coefficients	
R_0	100
a<0°C	0
b<0°C	0
a>0°C	0
b>0°C	0
OK	
Reset coefficients	

IEC 751 Front Coefficients	
R_0	100
A	3.908299e-3
B	-5.774999e-7
C	-4.183e-12
OK	
Reset coefficients	

IEC 751 Rear Coefficients	
R_0	100
A	3.908299e-3
B	-5.774999e-7
C	-4.183e-12
OK	
Reset coefficients	

OK	Saves coefficients as entered
Reset Coefficients	Reset coefficient data back to defaults

Additional Settings	Description
DIGITS	**Set measurement resolution**
FILTER TIME	**Set FILTER TIME : 250ms to 64s Dynamic Mode for Automatic filter (reading stability based)**
ANALOGUE FILTER	**Set ANALOGUE FILTER mode : ON / OFF**
INPUT TERMINALS	**Set INPUT TERMINALS to use : FRONT / REAR**
RATIO	**Set RATIO mode : ON / VALUE / OFF**
READING MIN / MAX	**Display READING MIN / MAX measurement data**
TRIGGER	**AUTO / MANUAL**
GUARD TO LOW	**Set GUARD TO LOW mode : FLOATING / SIGNAL LOW**
INTERNAL TEMPERATURE	**Displays the internal temperature**

Guide to setting up a PRT probe

1. Use digital control dial to choose

Probe Configuration ➔ **PRT Coefficients** ➔ **Primary Display** ➔ **PRT Coefficients**

2. Select Linearisation / Coefficient location **ITS-90 Front** **ITS-90 Rear** **IEC 751 Front** **IEC 751 Rear**

3. Enter Coefficient data (examples shown below) :

ITS-90 Front Coefficients	
R_0	100
a<0°C	0
b<0°C	0
a>0°C	0
b>0°C	0
OK	
Reset	

ITS-90 Rear Coefficients	
R_0	100
a<0°C	0
b<0°C	0
a>0°C	0
b>0°C	0
OK	
Reset	

IEC 751 Front Coefficients	
R_0	100
A	3.908299e-3
B	-5.774999e-7
C	-4.183e-12
OK	
Reset	

IEC 751 Rear Coefficients	
R_0	100
A	3.908299e-3
B	-5.774999e-7
C	-4.183e-12
OK	
Reset	

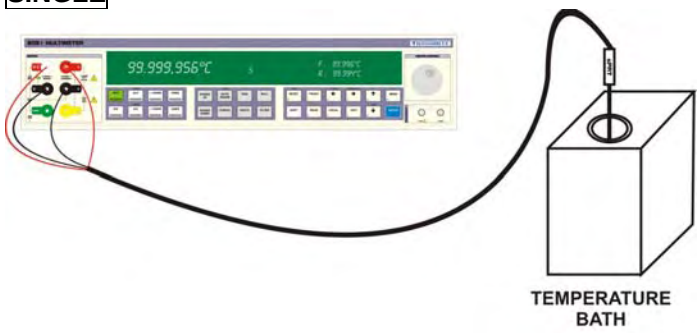
Coefficient data entry example : **3.908299e-3**

3 **SHIFT** **↑** **9** **0** **8** **2** **9** **9** **SHIFT** **↓** **SHIFT** **MENU** **SHIFT** **MENU** **3**

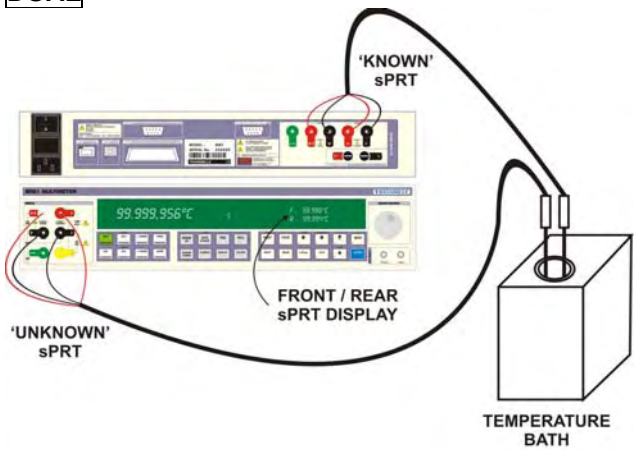
DECIMAL POINT — EXP — MINUS SYMBOL

4. Select **PROBE CONFIGURATION**

SINGLE



DUAL



5. Select **PRIMARY DISPLAY** **AVERAGE** **FRONT** **REAR** as required

Pressure Measurement (8081)

Pressure module connection

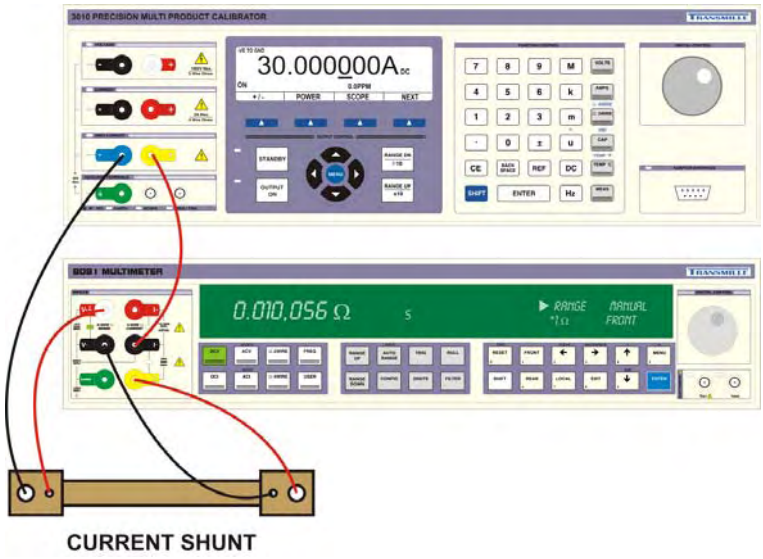
Press **SHIFT** then **USER** to select PRESSURE measurement.

Select **SELECT TRANSDUCER** **TPMxx**

Select **UNIT** **BAR** **PSI** **Pa** **mmHg** **cmH20** **Atm** **kg/sq.cm** **oz/sq.in** **inHg**

Additional Settings	Description
DIGITS	Set measurement resolution
FILTER TIME	Set FILTER TIME : 250ms to 64s Dynamic Mode for Automatic filter setting based on measurement stability
ANALOGUE FILTER	Set ANALOGUE FILTER mode : ON / OFF
INPUT TERMINALS	Set INPUT TERMINALS to use : FRONT / REAR
RATIO	Set RATIO mode : ON / VALUE / OFF
READING MIN / MAX	Display READING MIN / MAX measurement data for the selected function / range
TRIGGER	AUTO / MANUAL
GUARD TO LOW	Set GUARD TO LOW mode : FLOATING / SIGNAL LOW
MATHS, NULL, dB	Set NULL : Store zero offset value Clear NULL : Clear zero offset value Set OFFSET : Add a user entered value to the measurement Set SCALE : Multiply measurement by a user entered value Clear FORMULA : Clear the formula entered (SCALE & OFFSET) See dB function for use of Set dB, dB SET ZERO & dBm REF 600 Ohms
INTERNAL TEMPERATURE	Displays the internal temperature

Shunt Measurement (8081)



Shunt Measurement Configuration

The precision shunt measurement function allows accurate measurement of current shunts by monitoring the current supplied to the shunt and voltage measured across the shunt. By monitoring both the current and voltage the 8000 Series can provide an accurate measurement of the current shunt connected.

The diagram above shows the connection configuration required, using a 3000 Series to provide the 30A current source and both the current and voltage measured by the 8000 Series. When SHUNT MEASUREMENT mode is selected, the 8000 Series will automatically switch between voltage and current measurement terminals in a continuous cycle until shunt mode is exited.

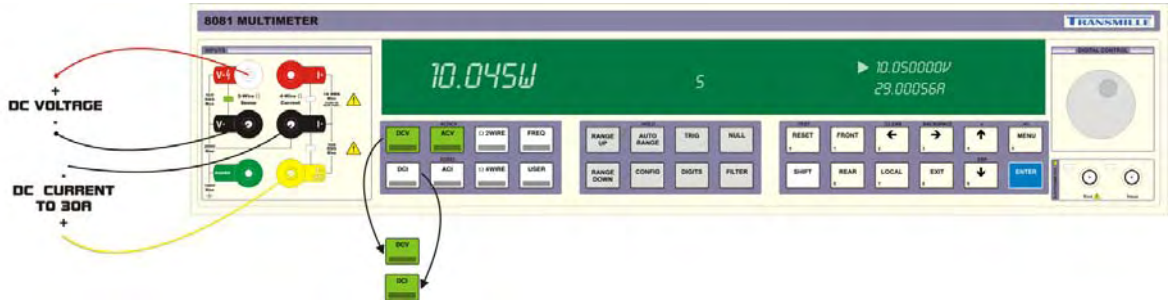
Press **USER** then press ➔ until **SHUNT MEASUREMENT** is displayed

Press **ENTER** to select **SHUNT MEASUREMENT**

The secondary display can be used to display the separate Voltage and Current readings by using the menu dial to scroll to this display.

Additional Settings	Description
DIGITS	Set measurement resolution
FILTER TIME	Set FILTER TIME : 250ms to 64s Dynamic Mode for Automatic filter setting based on measurement stability
ANALOGUE FILTER	Set ANALOGUE FILTER mode : ON / OFF
INPUT TERMINALS	Set INPUT TERMINALS to use : FRONT / REAR
READING MIN / MAX	Display READING MIN / MAX measurement data for the selected function / range
TRIGGER	AUTO / MANUAL
VOLTAGE / CURRENT DISPLAY	Displays the measured VOLTAGE and CURRENT separately as well as the calculated WATTS on the main display
GUARD TO LOW	Set GUARD TO LOW mode : FLOATING / SIGNAL LOW
INTERNAL TEMPERATURE	Displays the internal temperature

DC Power / Dual Input V/30A (8081)



The DC Power / Dual Input V/30A function allows the 8000 Series to automatically switch between the voltage and current inputs and display a calculated value in Watts.

Press **USER** then press ➔ until **DC POWER DUAL INPUT V/30A** is displayed

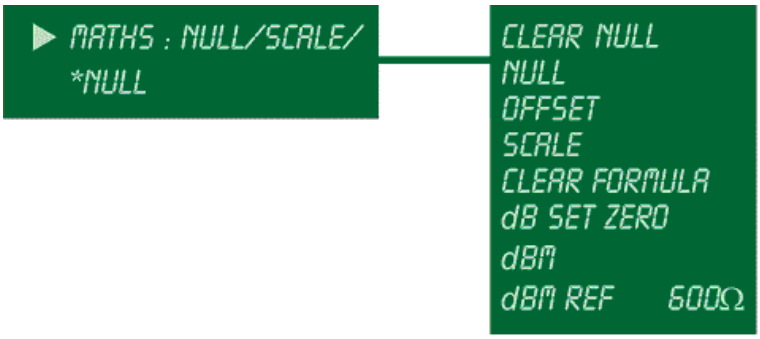
Press **ENTER** to select **DC POWER DUAL INPUT V/30A**

The 8000 Series will automatically switch between the Voltage and High Current Terminals, separately measuring both inputs and displaying a calculated value in Watts on the main display.

The secondary display can be used to display the separate Voltage and Current readings by using the menu dial to scroll to this display.

Additional Settings	Description
DIGITS	Set measurement resolution
FILTER TIME	Set FILTER TIME : 250ms to 64s Dynamic Mode for Automatic filter setting based on measurement stability
ANALOGUE FILTER	Set ANALOGUE FILTER mode : ON / OFF
INPUT TERMINALS	Set INPUT TERMINALS to use : FRONT / REAR
READING MIN / MAX	Display READING MIN / MAX measurement data for the selected function / range
TRIGGER	AUTO / MANUAL
GUARD TO LOW	Set GUARD TO LOW mode : FLOATING / SIGNAL LOW
VOLTAGE / CURRENT DISPLAY	Displays the measured Voltage and Current separately as well as the calculated Watts on the main display
INTERNAL TEMPERATURE	Displays the internal temperature

Using the Math Functions



Status Display Section	Description
CLEAR NULL	Clear stored null (zero reference point)
NULL	Store latest input value as zero reference point
OFFSET	Offset measured input using entered offset value ***MX+C*** Offset is the addition value (C) in the *MX+C* formula eg. If C=0.1, then a 10V input reads 10.1V eg. If C=5, then a 10V input reads 15V Note : M on right hand of display indicates formula active 
SCALE	Scale measured input using entered scale value ***MX+C*** Scale is the multiplier (x) in the *MX+C* formula eg. If X=0.5, then a 10V input reads 5V eg. If X=5, then a 10V input reads 50V Note : M on right hand of display indicates formula active 
CLEAR FORMULA	Clear any OFFSET or SCALE settings
dB	Turns on dB measurement mode
dB SET ZERO	Store latest input value as zero dB reference point
dBm	Turns on dBm measurement mode
dBm REF	Set dBm reference point (default = 600Ω)

Remote Programming

WARNING

THE 8000 SERIES MULTIMETERS CAN MEASURE HIGH VOLTAGES UP TO 1025V AND CURRENT UP TO 30A AND MUST BE PROGRAMMED WITH DUE CAUTION.

ANY PROGRAMS SHOULD BE EXTENSIVELY TESTED TO MAINTAIN SAFE OPERATION AND INCLUDE SAFEGUARD'S SUCH AS ERROR CATCHMENT AND HANDLING TO ENSURE THAT ANY COMMANDS SENT TO THE MULTIMETER PERFORM AS EXPECTED AND ANY THAT DO NOT ARE SAFELY HANDLED TO ENSURE USER SAFETY.

WITHIN THE 8000 SERIES COMMAND LANGUAGE, RESPONSE CODES ARE INCLUDED TO DETERMINE THE OPERATIONAL STATE OF THE MULTIMETER. THESE RESPONSE CODES CAN ALSO BE USED TO DETERMINE WHETHER A COMMAND WAS RECEIVED CORRECTLY AND IN ENSURING SAFE OPERATION OF THE MULTIMETER.

Programming Commands Overview

The 8000 series is controlled by a set of simple high level commands which can be used either individually or as part of a command sequence to setup the 8000 Series multimeter to required state.

The commands can be joined together using the / (forward slash) character.
The required terminator for the commands to be detected by the multimeter 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 8000 Series multimeters will respond to any command with a fixed code beginning with an star (*) - the codes are listed below

Response Code	Description
*0	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	INVALID COMMAND

8000 Series DMM Remote Commands

All commands followed by Carriage Return (ASCII 13)

SCPI

Command	Format	Parameters
Transmit Reading	READ?	
	*TRG	
Select AC Voltage Range	RANGE:AC:VOLTAGE <value> RANGE:AC:VOLT <value>	value = 0.01 to 1000
Select DC Voltage Range	RANGE:DC:VOLTAGE <value> RANGE:DC:VOLT <value>	value = 0.1 to 1000
Select AC Current Range	RANGE:AC:CURRENT <value> RANGE:AC:CURR <value>	value = 10^{-4} to 30
Select DC Current Range	RANGE:DC:CURRENT <value> RANGE:DC:CURR <value>	value = 10^{-8} to 30
Select 4-Wire Resistance	RANGE:FRES <value> RANGE:FRESISTANCE <value>	value=1 to 10^{7}
Select 2-Wire Resistance	RANGE:RES <value> RANGE:RESISTANCE <value>	value=1 to 10^{12}
		(value may be modified by SI Prefixes: n, u, m, k, M, G, T)

General

Command	Format	Parameters
Use Rear Terminals	r	
Use Front Terminals	f	
Set Filter Range	F<Filter Range>	Filter Range = 1 to 9 for filter times 250ms – 64s
Set Digits	D<Digits>	Digits = 4 to 8
Show Status	s	
Set Null	n	
Clear Null	N	
Display Date	a	
Version Information	v	
Internal Temperature	TEMP?	

Example Commands (where <CR> denotes Carriage Return (ASCII 13) :

Required Output	Range Command	Output Value	Command Separator	Filter Command	Terminator (Carriage Return)
1V DC @ 2s Filter	RANGE:DC:VOLT	1	/	F4	<CR>
10V AC @ 4s Filter	RANGE:AC:VOLT	10	/	F5	<CR>
100mA DC @ 500ms Filter	RANGE:DC:CUR R	0.1	/	F2	<CR>

Calibration

Command	Format	Parameters
Enter Password	**k<Password>**	**Password = 1 to 10 digits**
Set Password	**K<Password>**	**Requires calibration mode to be active**

If a command includes a value which cannot be set due to, for example, the value being higher than the range maximum, the multimeter will reject the command and stay set as it is (the multimeter will return a *9 code).

The multimeter 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 potentially hazardous conditions are clearly indicated to the operator and to maintain control of these outputs. This allows the multimeter to be returned to a safe state once the testing required has been completed.

This functionality is employed within the ProCal calibration software from Transmille to allow safe operation of the multimeter.

Getting the best out of the multimeter.

The 8000 series are accurate multimeters measuring a very wide range of input 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 multimeter output.

For high value resistance it is essential that the cables insulation resistance will not effect 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.

Calibration

Calibration Overview

To adjust the 8000 Series multimeter the multimeter can either be connected to a computer via the available interfaces. Calibration constants stored within the multimeter can then be adjusted using the built-in menus via the 8000 Series front panel. To prevent unauthorised access to calibration menus, a password is required before access is granted. Adjustment can be completed without disassembly of the multimeter.

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

Each function e.g. DC voltage, AC Current, Resistance etc. has several ranges. Each range has one or more calibration constants. See table below.

The 8000 Series allows any calibration constant to be adjusted independently of any other, therefore it is possible to adjust a single range without needing to adjust any other points. Altering the calibration constants directly changes the multimeter measurement. Adjusting the multimeter simply involves changing the constant until the output reads correctly.

Entering Calibration Mode

Press **MENU**

Press ↓

Enter password (default = Model Number, ie. 8081 or 8071)

Press **ENTER**

Multimeter will display **CAL PASSWORD OK** if successful

The calibration menus will change depending on the selected function :

Function	Menus Available	Notes
DC Voltage DC Current	Calibration Zero Calibration +ve Full Scale Calibration -ve Full Scale Value <range units> Reset	Set zero calibration point Set +FS calibration point Set -FS calibration point Calibrate FS to set value Reset range to default points
AC Voltage AC Current	Calibration 20% FS Calibration +ve Full Scale Value <range units> Reset	Set 20% FS calibration point Set +FS calibration point Calibrate FS to set value Reset range to default points
		Frequency Response points* : 1kHz (Reference Frequency)** 10Hz 23Hz 40Hz 56Hz 106Hz 206Hz 2kHz 1kHz** 10kHz 20kHz 35kHz 50kHz 75kHz 100kHz 200kHz 400kHz 700kHz 1MHz * Max. Frequency dependant on range ** 1kHz reference frequency point MUST be set up first
Resistance 2 Wire Resistance 4 Wire	Calibration Zero Calibration +ve Full Scale Value <range units> Reset	Set zero calibration point Set +FS calibration point Calibrate FS to set value Reset range to default points

Example 1 : DC Voltage 10V Range

Calibration Point	Actions
DC Voltage ZERO	Apply low thermal shorting link Select Calibration Zero Press ENTER
DC Voltage +ve Full Scale	Apply +10V signal Select +ve Full Scale Press ENTER
DC Voltage -ve Full Scale	Apply -10V signal Select -ve Full Scale Press ENTER

Example 2 : AC Voltage 10V Range

Calibration Point	Actions	Frequency Points
AC Voltage 20% FS	Apply 20% FS signal (2V) Select 20% Full Scale Press ENTER	
AC Voltage +ve Full Scale	Apply +10V signal Select +ve Full Scale Press ENTER	Frequency Response points* : 1kHz (Reference Frequency)** 10Hz 23Hz 40Hz 56Hz 106Hz 206Hz 2kHz 1kHz** 10kHz 20kHz 35kHz 50kHz 75kHz 100kHz 200kHz 400kHz 700kHz 1MHz * Max. Frequency dependant on range ** 1kHz reference frequency point MUST be set up first

Linearity is inherent within the design of the D to A in the multimeter and does not require adjustment.

General 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.

The 8000 series multimeters maintenance requirements are listed below. Please note that the multimeter does not require any regular internal servicing or adjustment.

1) **Electrical Safety Checks on Line power lead and case**
2) **Cleaning the external case**

Electrical Safety Tests

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

Cleaning the external case

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

Guarantee and service

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

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

To obtain repair under this guarantee the purchaser must send the instrument 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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Web : www.transmille.com

8000 Series Fax Back Form

Your 8000 Series Precision Multimeter is fitted with a *security system* which requires a *security code* to be entered to allow continued operation of the unit beyond the 65 Day evaluation period.

Please complete the following details :

Company Name : _____

Contact Name : _____

Address : _____

_____

_____

_____

Country : _____

Tel. : _____

Fax : _____

Instrument Model : 8000 Series Multimeter

Serial Number : _____

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

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