TRANSMILLE

ADVANCED METROLOGY SOLUTIONS

MODEL 3000HR



HIGH RESISTANCE STANDARD

OPERATION MANUAL

3000HR Series

High Resistance Standard

Operation Manual

Version 1.50
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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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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.

This instrument has been designed to work from either 100-120 Volt line supply or 200 - 240 Volt line supply.

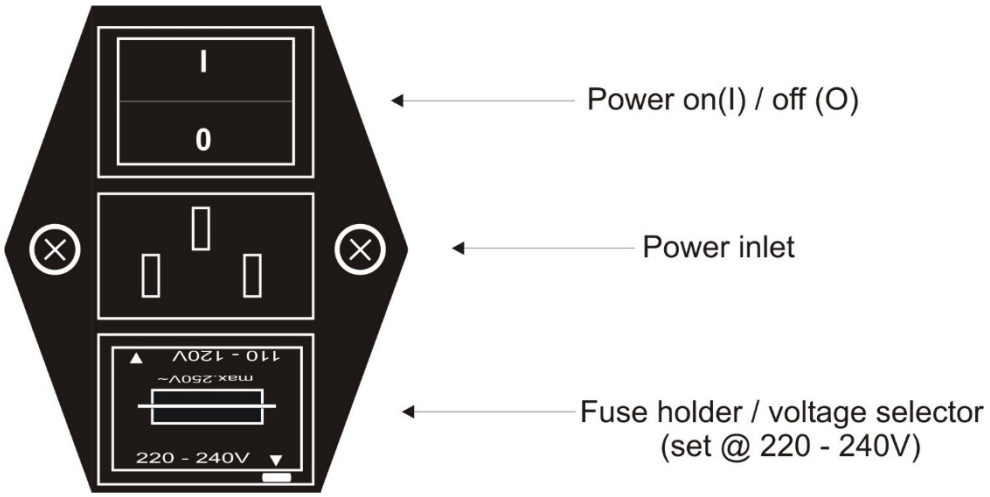
Check that the voltage selector is set at the correct voltage before connecting the power to the instrument.

Connecting the instrument to the wrong supply will cause internal. To change the line voltage, remove the fuse / voltage selector housing, rotate through 180°and replace with the required voltage setting at the bottom of the housing indicated by the arrow, ensure that the correct fuse is fitted.

The instrument is set for 110V operation in the USA,
230V operation in the UK and Europe.

Power Line Inlet Fuse

The power line inlet fuse is located directly below the power inlet within the voltage selector housing.



3000HR High Resistance Standard



The 3000HR is a designed as a dedicated high resistance standard, transfer standard as well as for calibration support for Transmille products

The stability and temperature co-efficients of the 3000HR are designed for a working environment of 18-23°C and the standard is supplied complete with a calibration certificate.

Main Features

OUTPUT RANGES / SPECIFICATION OVERVIEW			
VALUE	**STABILITY / YEAR**	**VOLTAGE RATING**	**TEMPERATURE COEFFICIENT**
10 MOhm	**0.01%**	**50V**	**5 ppm / °C**
100 MOhm	**1%**	**1kV**	**50 ppm / °C**
1 GOhm	**1%**	**1kV**	**100 ppm / °C**
10 GOhm **using 10 x 1 GOhm resistors from 1 to 10 GOhm resistor bank**	**1%**	**1kV**	**100 ppm / °C**
100 GOhm **using 10 x 10 GOhm resistors from 10 to 100 GOhm resistor bank**	**1%**	**1kV**	**25 ppm / °C**

Design Notes



The 3000HR is built using precision resistors – no adjustable resistors are used within the design of this reference.

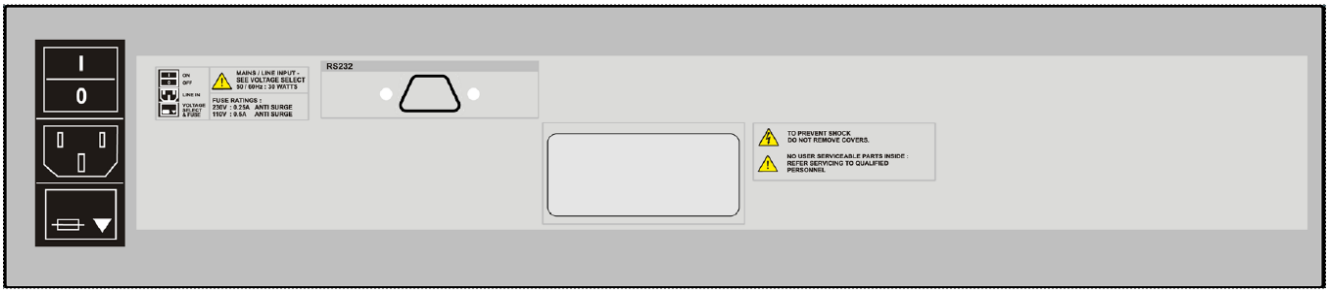
Preset decade values can be selected using a RANGE button to step through in sequence with the selected decade displayed via LED indicator.

Front Panel Connections & Controls

Functions of the terminal connections :

3000HR Terminal	Function
IOUTPUT	Preset Decade Value Connection (IOUTPUT)
VINPUT	Preset Decade Value Connection (VINPUT)
COM (10GΩ Bank)	10GΩ Common
1, 2, 3, 4, 5, 6, 7, 8, 9, 10	10GΩ bank values
COM (100GΩ Bank)	100GΩ Common
10, 20, 30, 40, 50, 60, 70, 80, 90, 100	100GΩ bank values
EARTH	Connected to the case
RANGE Push Button	Cycles through preset ranges
Range LED Indicators	One LED per preset range value

Rear Panel Connections



Connection	
IEC Inlet	Line Input
9 Way ‘D’ connector	RS232 interface Connect to computer via USB to RS232 converter for computers with a USB port

Label Reference	Information
Model Number	Model number reference for product
Serial Number	Unique serial number for product

Operational Parameters

CAUTION

Do not apply voltages above the maximum ratings detailed below. Excessive voltage can cause permanent damage and affect the nominal resistance values of the reference.

Preset Decade Outputs

VALUE	STABILITY / YEAR	VOLTAGE RATING	TEMPERATURE COEFFICIENT
10 MOhm	0.01%	50V	5 ppm / °C
100 MOhm	1%	1kV	50 ppm / °C
1 GOhm	1%	1kV	100 ppm / °C
10 GOhm using 10 x 1 GOhm resistors from 1 to 10 GOhm resistor bank	1%	1kV	100 ppm / °C
100 GOhm using 10 x 10 GOhm resistors from 10 to 100 GOhm resistor bank	1%	1kV	25 ppm / °C

Range : 1 to 10 GOhm Resistor Bank

VALUE	STABILITY / YEAR	VOLTAGE RATING	TEMPERATURE COEFFICIENT
1 GOhm	1%	1kV	100 ppm / °C
2 GOhm			
3 GOhm			
4 GOhm			
5 GOhm			
6 GOhm			
7 GOhm			
8 GOhm			
9 GOhm			
10 GOhm			

Range : 10 to 100 GOhm Resistor Bank

VALUE	STABILITY / YEAR	VOLTAGE RATING	TEMPERATURE COEFFICIENT
10 GOhm	1%	1kV	25 ppm / °C
20 GOhm			
30 GOhm			
40 GOhm			
50 GOhm			
60 GOhm			
70 GOhm			
80 GOhm			
90 GOhm			
100 GOhm			

Operation Overview



Principle of Operation

High value resistance measurements above 100MΩ traditionally require careful consideration with regards to noise / interference.

The principle of the high resistance standard is to allow measurements to be taken at lower resistance values where a measurement can be achieved with lower noise / interference levels.

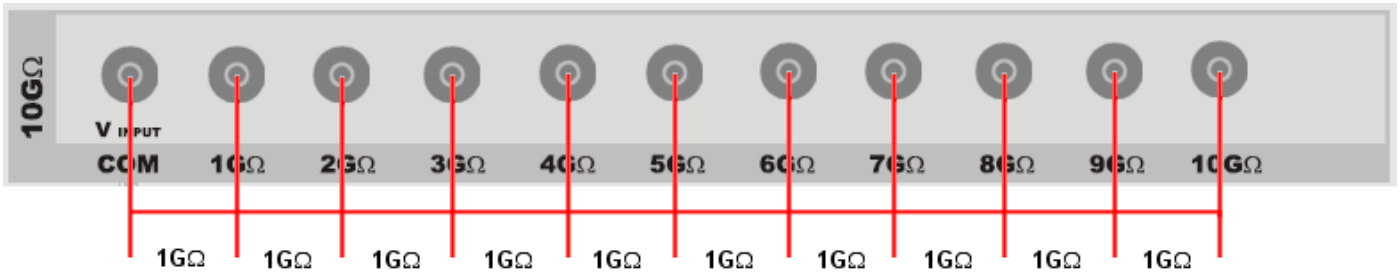
The purpose of the resistor banks to is allow each individual bank value to be measured in order to determine a calculated value for higher resistances.

Measuring each 1GΩ for the 10GΩ bank and each 10GΩ for the 100GΩ bank individually allows more accurate determination of higher value readings using the sum of these values.

This technique allows the noise / interference effects to be minimised when determining the high value resistance readings using a bank of lower value resistors.

Individual Resistor Measurement : 10GΩ Bank

Connect between each bank position to measure each individual 1GΩ resistor

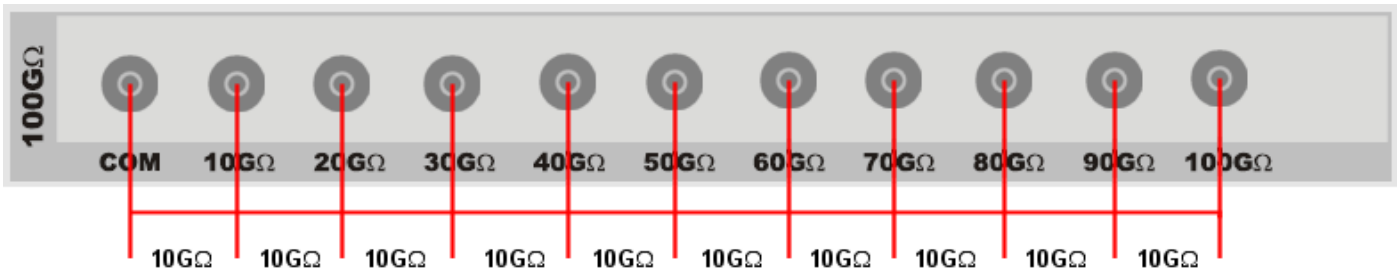


To determine the 10GΩ value, calculate the sum of 1GΩ resistor values

$10G\Omega = R_1 + R_2 + R_3 + R_4 + R_5 + R_6 + R_7 + R_8 + R_9 + R_{10}$

Individual Resistor Measurement : 100GΩ Bank

Connect between each bank position to measure each individual 10GΩ resistor



To determine the 100GΩ value, calculate the sum of 10GΩ resistor values

$100G\Omega = R_1 + R_2 + R_3 + R_4 + R_5 + R_6 + R_7 + R_8 + R_9 + R_{10}$

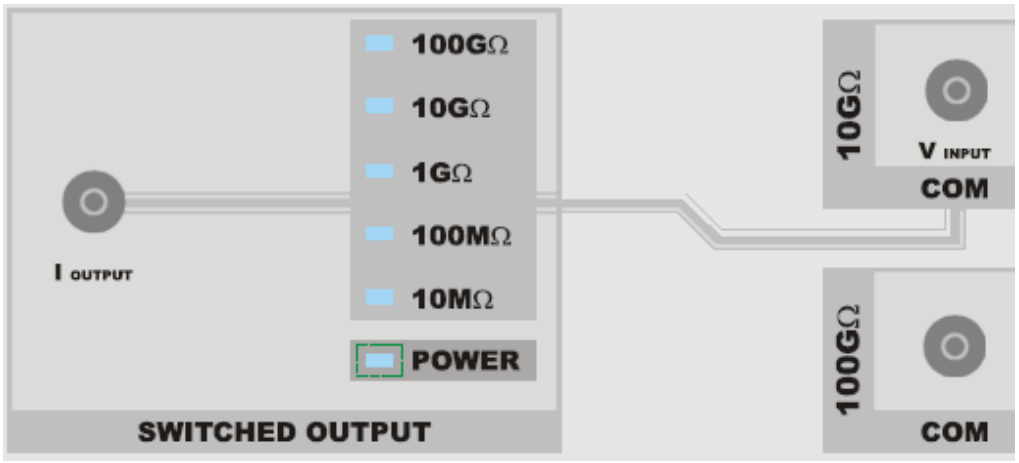
Preset Decade Values

To select preset decade values, simply connect to the I Output and V Input and use the **RANGE** button to cycle through 10MΩ to 100GΩ.

Note : The RANGE button will automatically set the output to the 10MΩ value again after the selected range reaches the 100GΩ position, eg.

10MΩ > 100MΩ > 1GΩ > 10GΩ > 100GΩ

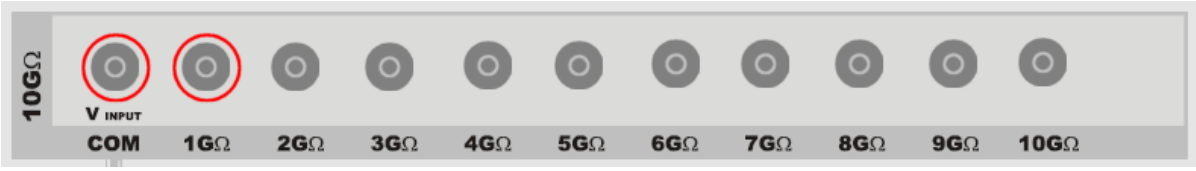
An LED will indicate the currently selected decade value



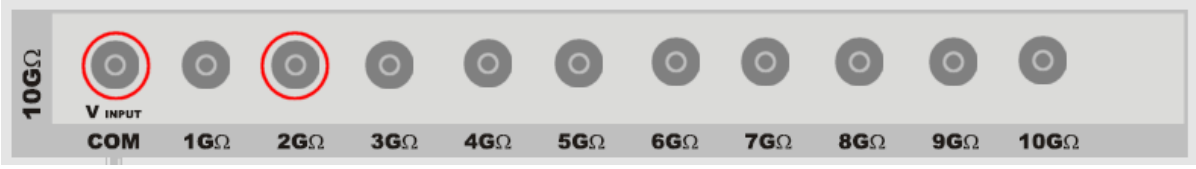
User Selected Values

To select a value from the 10GΩ bank or 100GΩ bank, simply connect the first test lead to the relevant COMMON terminal, and connect the second lead to the terminal with the desired value, for example :

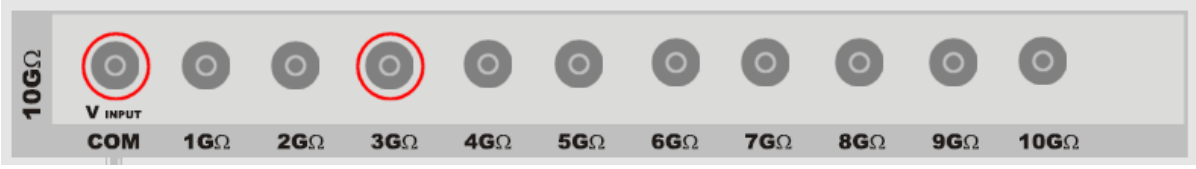
10GΩ Bank : 1GΩ Connection



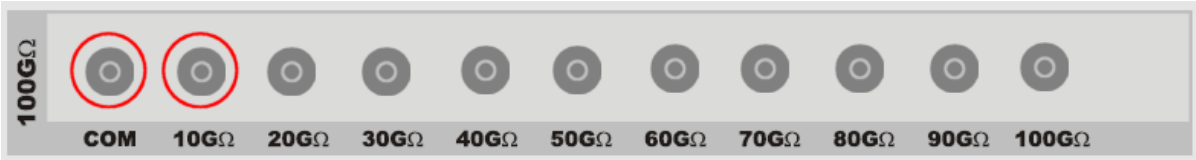
10GΩ Bank : 2GΩ Connection



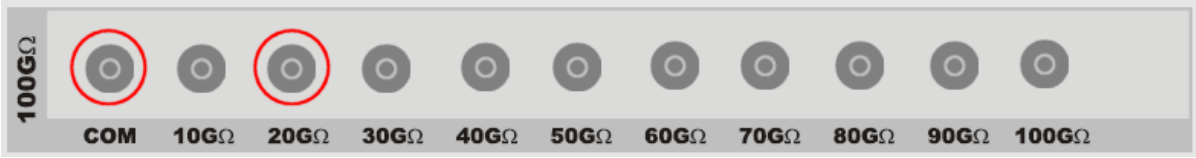
10GΩ Bank : 3GΩ Connection



100GΩ Bank : 10GΩ Connection



100GΩ Bank : 20GΩ Connection



100GΩ Bank : 30GΩ Connection



Remote Commands

The preset decade values can be selected via the RS232 interface. The interface uses a standard 9 pin PC connector and a standard serial lead. The standard can be sent individual commands directly from the Windows HYPER TERMINAL program, any basic or high level program or from the ProCal Calibration System

To allow communication from PC based programs, these programs must be configured to the following settings :

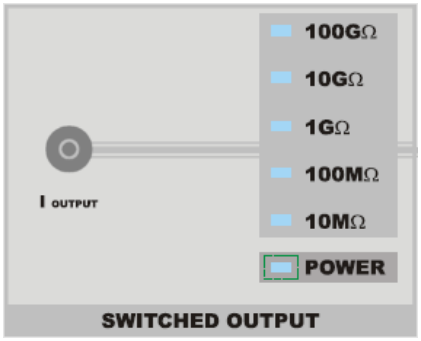
BAUD RATE : 9600
PARITY : NONE
DATA BITS : 8
STOP BITS : 1

COMMAND	DESCRIPTION
*IDN?<CR>	PRODUCT INFORMATION TRANSMILLE,3000HR,<SERIAL NUMBER>,<VERSION>

Once connected, using the PC the preset number can be sent to the standard to set the output. The command MUST be terminated with a carriage return
(ASCII character 13), for example :

COMMAND	DESCRIPTION
1<CR>	Set 10MΩ
2<CR>	Set 100MΩ
3<CR>	Set 1GΩ
4<CR>	Set 10GΩ
5<CR>	Set 100GΩ

Where <CR> is a carriage return (ASCII 13)
Standard will respond ***OK*** for a valid command



Specifications

GENERAL SPECIFICATIONS	
DESCRIPTION	High Resistance Reference / Transfer Standard
INTERFACE	RS232 via 9 pin 'D' type connector fitted to rear panel
INDICATORS	5 x LED Indicators for 5 preset output ranges
OUTPUTS	10 MOhm 100 MOhm 1 GOhm 10 GOhm [Comprised of 10 x 1 GOhm resistors in series] 100 GOhm [Comprised of 10 x 10 GOhm resistors in series] 1 to 10 GOhms Resistor Bank Link 1 GOhm resistors together to provide decade values from 1 GOhms to 10 GOhms 10 to 100 GOhms Resistor Bank Link 10 GOhm resistors together to provide decade values from 10 GOhms to 100GOhms Resistor banks provide the ability to link each resistor together to obtain a combined measured value from the sum of the resistor bank.
POWER	110V OR 230V , 50/60Hz. IEC Inlet on rear panel
DIMENSIONS	45cm x 44cm x 9cm

PERFORMANCE SPECIFICATIONS			
Range : Preset Decade Outputs			
VALUE	**STABILITY / YEAR**	**VOLTAGE RATING**	**TEMPERATURE COEFFICIENT**
10 MOhm	0.01%	50V	5 ppm / °C
100 MOhm	1%	1kV	50 ppm / °C
1 GOhm	1%	1kV	100 ppm / °C
10 GOhm using 10 x 1 GOhm resistors from 1 to 10 GOhm resistor bank	1%	1kV	100 ppm / °C
100 GOhm using 10 x 10 GOhm resistors from 10 to 100 GOhm resistor bank	1%	1kV	25 ppm / °C

Range : 1 to 10 GOhm Resistor Bank			
VALUE	**STABILITY / YEAR**	**VOLTAGE RATING**	**TEMPERATURE COEFFICIENT**
1 GOhm	1%	1kV	100 ppm / °C
2 GOhm			
3 GOhm			
4 GOhm			
5 GOhm			
6 GOhm			
7 GOhm			
8 GOhm			
9 GOhm			
10 GOhm			

Range : 10 to 100 GOhm Resistor Bank			
VALUE	**STABILITY / YEAR**	**VOLTAGE RATING**	**TEMPERATURE COEFFICIENT**
10 GOhm	1%	1kV	25 ppm / °C
20 GOhm			
30 GOhm			
40 GOhm			
50 GOhm			
60 GOhm			
70 GOhm			
80 GOhm			
90 GOhm			
100 GOhm			

Care & Maintenance

The only maintenance instructions for the 3000HR precision resistance reference is periodic cleaning. See below for details on the cleaning procedure and precautions for handling.

Cleaning the 30000HR

To keep the external enclosure of the 3000HR in good condition, clean the outer case with a soft cloth. Do not use any liquids in cleaning the enclosure – removal of surface dust is all that is recommended.



CAUTION

Do not use cleaning fluids or solvents for cleaning as these may damage the enclosure and affect the plastic materials used in the precision resistance standard.

Handling Precautions

The 3000HR is designed for mechanical stability, but should not be subjected to excessive shock or be dropped. Transportation is recommended using the original packaging with avoidance of extreme changes of temperature.

Servicing Information

The 3000HR is provided certified from the factory, and uses high precision non-adjustable resistance standards and are not user repairable. If the instrument is damaged it should be returned to the factory for repair and recalibration.

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

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

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

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

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

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



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