USER'S HANDBOOK

1081

datron

INSTRUMENTS

digital multimeter

USER'S HANDBOOK

for

THE DATRON AUTOCAL 1081 DIGITAL MULTIMETER

(for maintenance procedures
refer to the Calibration and Servicing Handbook)

850042

Issue 2 (February 1984)

For any assistance contact your nearest Datron Sales and Service Center.
Addresses can be found at the back of this handbook.

Due to our policy of continually updating our products, this handbook may contain minor differences in specification, components and circuit design to the instrument actually supplied. Amendment sheets precisely matched to your instrument serial number are available on request.

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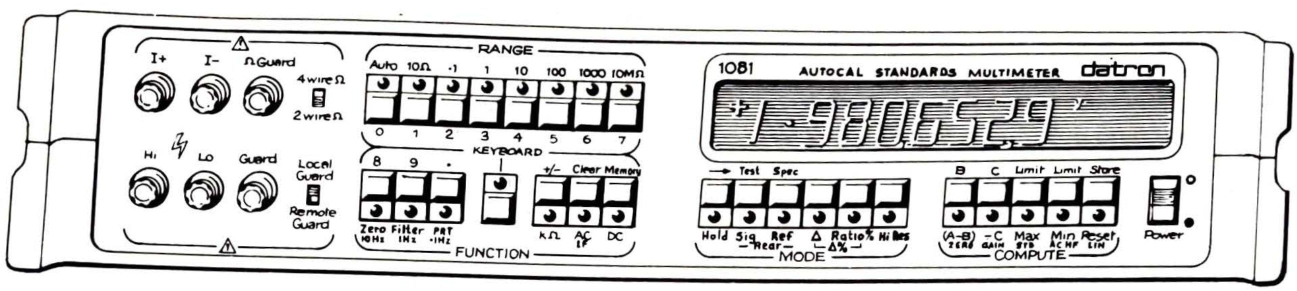
SECTION 1 THE 1081 AUTOCAL STANDARDS MULTIMETER



The Datron 1081 6½/7½ digit AUTOCAL STANDARDS microprocessor-controlled digital Multimeter (DMM) is a high precision measuring instrument. It features exceptionally high stability and systems capability. The instrument provides full measurement capability, computation facilities, self check routines and calibration memory.

Standard and optional measurement facilities

The instrument is offered in two versions, either complete with all options or as a basic DC voltage instrument to which individual options can be added to provide further measurements:

Resistance (including temperature)
True RMS AC voltage
DC coupled true RMS AC voltage
Ratio %, Δ, Δ%

The full range of options is as follows:

Option 10: True RMS AC Converter
Option 20: 4-Wire Resistance Converter
Option 40: Selectable Rear/Reference Input
Option 50: IEEE 488-1978 Standard Digital Interface
Option 52: Remote Trigger
Option 70: Analog Output
Option 80: 115V 60Hz Line Operation
Option 81: 115V 50Hz Line Operation
Option 82: 115V 400Hz Line Operation
Option 90: Rack Mounting Kit

Calibration

The AUTOCAL instruments have been designed to make the removal of the covers for calibration unnecessary, as full calibration of all ranges and functions can be carried out from the front panel.

The procedure for calibrating the instrument is contained in the Calibration and Servicing Handbook.

Accidental or unauthorised use of the calibration routine is prevented by a key operated switch on the instrument rear panel.

Message read-out

The measurement display doubles as a message display, providing a clear read-out of 14 different messages. Full details of the meanings of these displays can be found in sections 2 and 3.

Self test

Pressing the '→' then 'Test' key starts a self test procedure, during which a sequential routine:

- checks, in turn, all the display segments, characters and legends
- verifies the correct functioning of individual measuring circuits
- checks the non-volatile calibration memory

On completion of the test, the instrument returns to the last selected function and range to provide rapid return to measurement. In the event of the self test failing, an error message is displayed.

Computing

The range and function selection keys double as a keyboard for the input of data so that measurements can be compared with previously recorded data or manually input data for display of:

- measurement offset
- percentage deviation
- maximum and minimum value storage
- the exceeding of limits (upper and lower)

Full details of these facilities are given in section 3.

Systems use

The AUTOCAL 1081 instrument can form part of a system by means of the IEEE 488 standard digital interface option. The details for the connections of the instrument to the system and programming details for the controlling machine can be found in section 4.

Accessories

The instrument is supplied with the following accessories:

Description	Part Number
Power cable	920012
Hexagon key 2mm A/F	630101
Hexagon key 2.5mm A/F	630109
Set of calibration keys	700068
User's Handbook	850042
Calibration and Servicing Handbook	850048
Power fuse (230V)	920024
or Power fuse (115V)	920084

In addition, the following accessories are available for use with the 1081 instrument:

Description	Part Number
HVP high voltage probe	400335
RMK rack mounting kit (option 90)	440063
1501 de luxe lead kit	440070
PRT 100: Platinum resistance thermometer probe (100Ω)	630161

Additional documentation

The Calibration and Servicing Handbook contains information required to adjust and service the DMM. It contains detailed description of the circuits, trouble shooting diagrams, calibration procedures, parts lists and circuit diagrams.

Principles of operation

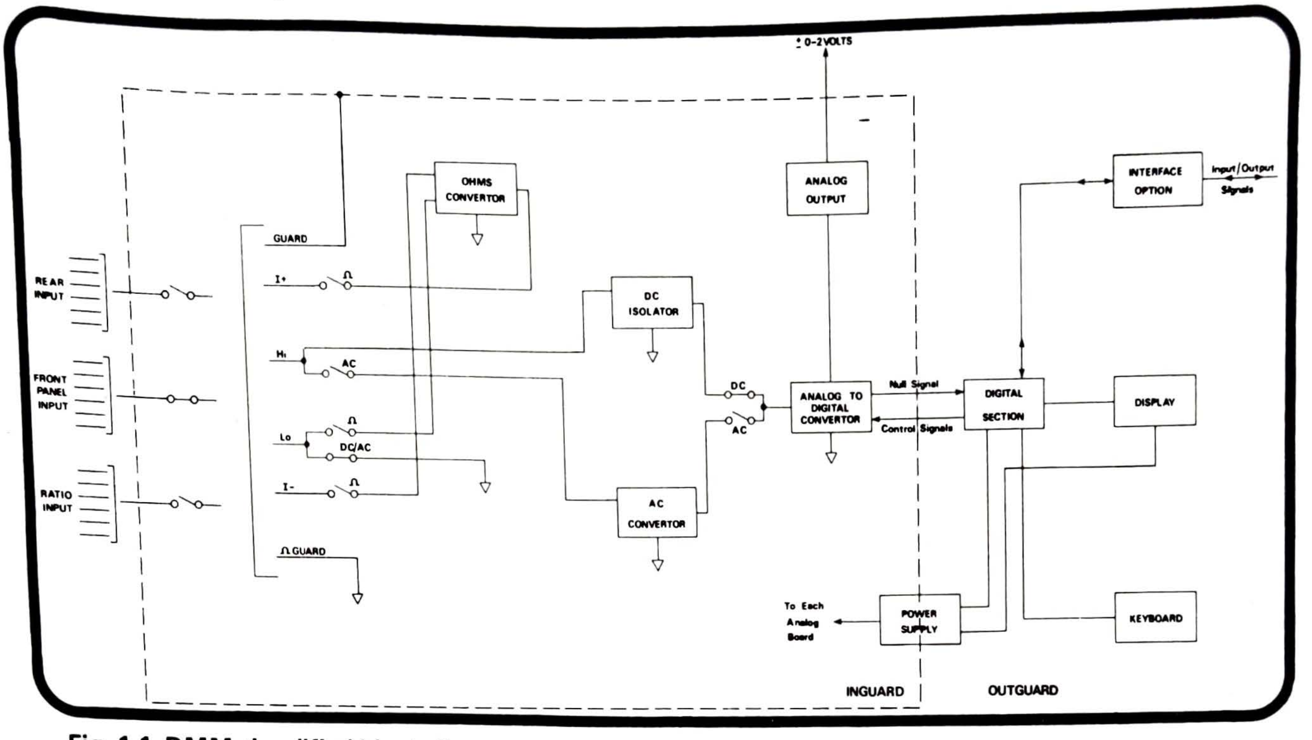


Fig. 1.1 DMM simplified block diagram

Figure 1.1 shows how the DMM achieves its basic measurement functions, its advanced measurement and computing functions and the interfacing with other equipment in systems applications.

Voltage measurement

The instrument comprises a fully floating isolation amplifier with electronically switched gain ranges providing a full range output which is applied to the analog to digital converter. AC voltage measurement is achieved using a True RMS AC converter which converts AC signals to DC and applies the DC voltage to the analog-to-digital converter.

Resistance measurement

Resistance measurement is achieved by passing the current from an internal precision current source through the unknown resistance and sensing the voltage developed across the resistance.

Temperature measurement

Temperature measurement is achieved by passing current from an internal precision current source through a platinum resistance thermometer (PRT) probe and sensing the voltage developed across the probe. This is converted digitally and then displayed in °C (PRT), or Ω (kΩ PRT).

Analog to digital conversion

The signal from the DC isolator or AC converter is applied to the input of a high gain integration amplifier. The integration capacitor starts charging from a zero state at a rate proportional to the magnitude of the incoming signal. The integration period is approximately 160mS.

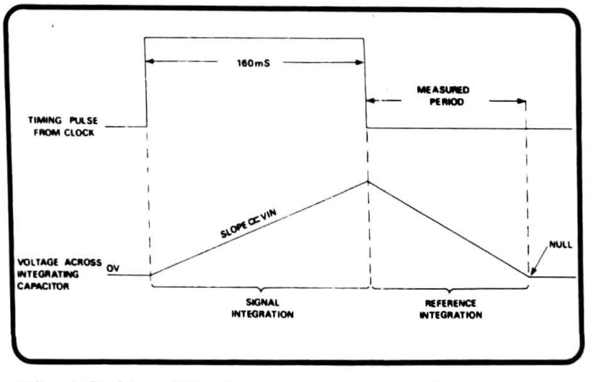


Fig. 1.2 Simplified measurement cycle

At the end of this period, a reference signal of opposite polarity to the input signal is applied and the time taken for the capacitor to discharge to zero volts is measured (null detection), providing an accurate computation of the input signal magnitude.

SECTION 2 BASIC MEASUREMENT PROCEDURES

Preliminaries

Before using the instrument it is important that it has been correctly installed as detailed in section 5.

Maximum input voltages

The following tables give the maximum input voltages to the DMM (front panel) for each of the operating ranges.

For rear panel and ratio inputs, maximum inputs indicated at 1000 or 650V RMS must be reduced to 250V RMS.

The ⚠ symbol is used to remind the user of special precautions detailed in his Handbook and is placed adjacent to terminals and switches that are sensitive to overvoltage conditions.

DC & AC Voltage

	Hi	Lo	I+	I−	GUARD	Ω's GUARD	SAFETY GROUND
Lo	1,000V						
I+	250V [d]	1,000V					
I−	1,000V	250V [d]	1,000V				
GUARD	1,000V	250V [a]	1,000V	250V			
Ω's GUARD	1,000V	0V	1,000V	250V	250V [a]		
SAFETY GROUND	1,000V	650V	1,000V	650V	650V [e]	650V	
LOGIC GROUND	1,000V	650V	1,000V	650V	650V [e]	650V	0V

Table 2.1 Maximum RMS input voltages [b]

Resistance

	Hi	Lo	I+	I−	GUARD	Ω's GUARD	SAFETY GROUND
Lo	250V						
I+	250V [d]	250V					
I−	250V	250V [d]	250V				
GUARD	250V	250V	250V	250V			
Ω's GUARD	250V	250V	250V	250V	250V [a]		
SAFETY GROUND	1,000V	650V	1,000V	650V	650V [e]	650V	
LOGIC GROUND	1,000V	650V	1,000V	650V	650V [e]	650V	0V

Table 2.2 Maximum RMS input voltages [b]

NOTES:

a) With the local guard/remote guard switch set to 'Local Guard', this value reduces to 0V, i.e. the terminals are internally linked.

b) Values specified assume peak voltage ⩽ RMS voltage x $\sqrt{2}$. Also, maximum inputs of 1000 or 650V RMS reduce to 250V RMS for rear and ratio inputs.

Maximum permissible voltage between front and rear inputs is equal to the maximum input at the front input (not switched) or 250V RMS (switched).

c) Logic Grounds for remote interfaces are internally connected to Safety Ground.

d) When the 2-wire Ω/4-wire Ω switch is set to '2-wire Ω', the 'I+' terminal is internally linked to the 'Hi' terminal and the 'I−' terminal is internally linked to the 'Lo' terminal.

e) Maximum slew-rate of 'Guard' with respect to Safety Ground or Logic Ground ⩽ 50V/uS (5 × 10^7 volt Hz) for normal operation (accuracy is degraded as volt Hz product increases).

f) Maximum slew-rate of any terminal to Safety Ground should be ⩽ 1kV/uS (10^8 volt Hz) or the instrument may revert to the 'power up' condition (i.e. select DC 1000V range).

Safety

The 1081 Multimeter is designed to be Class 1 equipment as defined in IEC Publication 348 and UL 1244 concerning safety requirements. Protection is assured by a direct connection via the power cable from ground to exposed metal parts and internal ground screens.

The line connection must only be inserted in a socket outlet provided with a protective ground contact and continuity of the ground conductor must be assured between the socket and the instrument.

WARNING:

ANY INTERRUPTION OF THE PROTECTIVE GROUND CONDUCTOR INSIDE OR OUTSIDE THE INSTRUMENT OR DISCONNECTION OF THE PROTECTIVE GROUND TERMINAL MAY MAKE THE APPARATUS DANGEROUS. INTENTIONAL INTERRUPTION IS PROHIBITED.

THE TERMINALS MARKED WITH THE ϟ SYMBOL CARRY THE POTENTIAL OF THE SOURCE UNDER TEST. THESE TERMINALS AND ANY OTHER CONNECTIONS TO THE SOURCE COULD CARRY LETHAL VOLTAGES. AT NO TIME SHOULD THESE CONDUCTORS BE TOUCHED DURING A TEST OF HIGH VOLTAGES. IF DIFFICULTY IS FOUND WITH THE TEST, ENSURE THAT THE SOURCE IS RENDERED SAFE BEFORE ATTEMPTING TO IMPROVE CONNECTIONS.

Controls

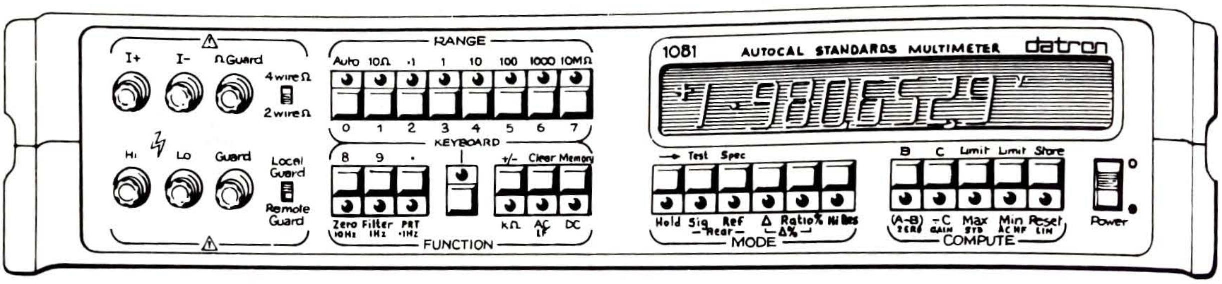


Fig. 2.1 Front panel

Line on/off ('Power') switch

When set to the **Off** position, this switch isolates the instrument from the line supply. When switched to the **On** position, the instrument powers up and automatically selects its DC 1000V range.

After ½ hour, the instrument is near to its full specification, but should be left on for 2 hours before use if full accuracy is required.

Function keys

The four keys 'PRT', 'kΩ', 'AC' and 'DC' – provide the means to select the mode of operation of the instrument and contain LED indicators that light to show the selected function.

'Zero'. This facility is available on all DC voltage and Ohms ranges, by manual or systems operation.

When the 'Zero' key is pressed, the DMM

a) accepts the measured input as a zero offset for the range selected, providing it does not exceed approx 1.5% of full range.

b) stores the offset value in non-volatile memory.

c) compensates ALL SUBSEQUENT READINGS taken on that range by the stored offset value, until the user redefines the zero.

If the measured input offset exceeds 1.5% of full range from the calibrated DMM zero, no offset is stored and the Error 4 message is displayed.

A separate zero offset correction is stored for each range. When the DMM is in 'Auto' during the Zero routine, all ranges are zeroed automatically in ascending order.

CAUTION

The stored offset correction is applied to all readings, so that the correct procedure is to re-zero the DMM whenever the input zero condition is changed. Failure to observe this procedure will cause an incorrect zero compensation to be applied.

'Filter' key. The 'Filter' key is pressed to increase the normal mode AC noise rejection in measurement of DC volts, PRT or resistance. In Filter mode, a block average of 4 is set.

AC Filter keys. The AC Filter keys extend the low frequency response of the instrument to 10Hz, 1Hz or 0.1Hz.

Range select keys

The instrument range of inputs in each function is as follows:

10nV	- 1,000V DC
.1μV	- 1,000V true RMS AC
1μΩ	- 20MΩ

Autorange ('Auto') key. This key commands the instrument to select the optimum ranges for the measurement, saving the operator this task and introducing very little delay.

Mode and compute keys

The function of these keys is given in Section 3.

4 wire/2 wire switch

During resistance measurements, this switch should be set to match the connection arrangement.

Local/remote guard switch

Selection of 'Local Guard' connects the front panel 'Guard' internally to the front panel 'Lo' terminal for voltage measurements, and to the front panel 'Ω Guard' terminal for resistance measurement.

Selection of 'Remote Guard' isolates the 'Guard' terminal from all others and enables a remote connection to be made from the internal guard screens to the source of any common mode voltage.

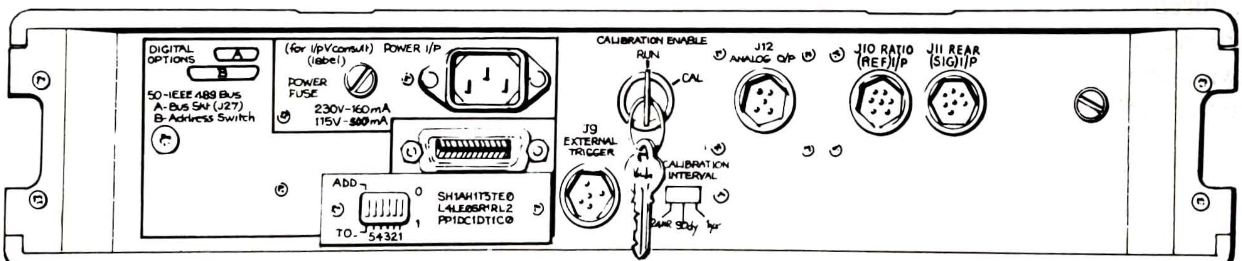


Fig. 2.2 Rear panel

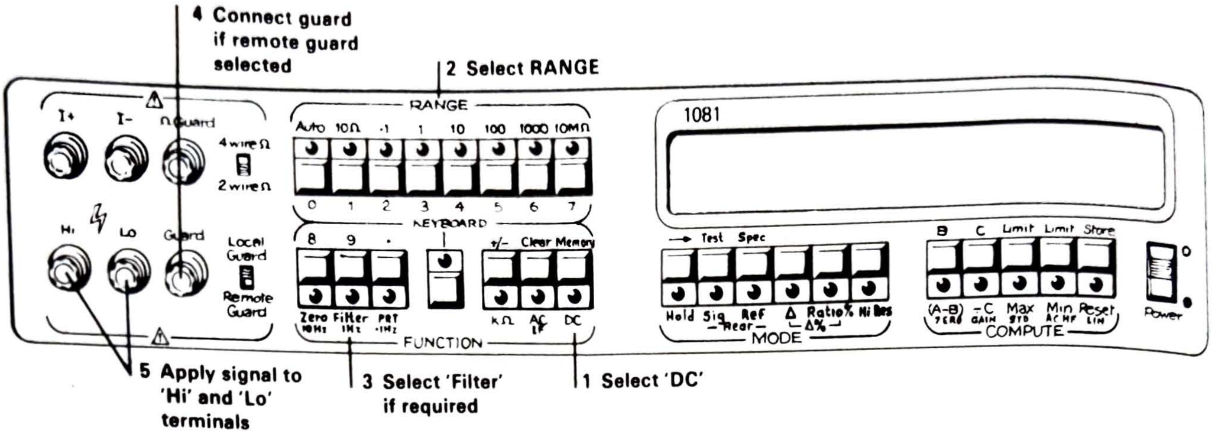
Calibration enable keyswitch

The calibration procedure is detailed in the Calibration and Servicing Handbook. The calibration switch is of the locking type to avoid accidental or unauthorised initiation of the calibration procedure.

Calibration interval switch

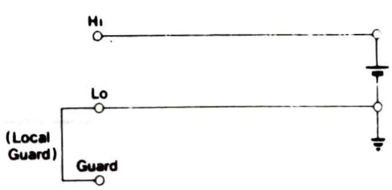
The calibration interval switch should be set to correspond with the intervals that elapse between re-calibrations of the DMM. The setting of the switch determines the selection of specification values displayed when the '→' then 'Spec' key is pressed (see Section 3 – Spec mode).

DC voltage measurement procedure 6½ digits



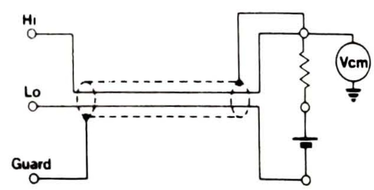
Simple lead connection

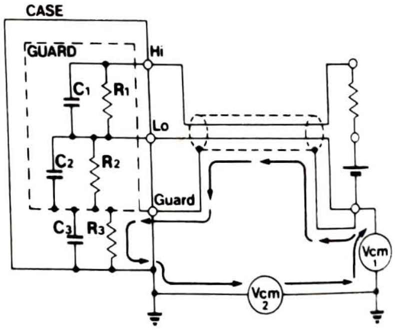
For the majority of applications the simple lead connection shown below with 'Local Guard' selected will be adequate. The disadvantage of this simple arrangement is that the connecting leads form a loop. If a stray alternating magnetic field, e.g. from the line transformer of a neighbouring instrument, passes through the loop it will behave as a single turn secondary winding inducing unwanted AC voltages into the measuring circuit. Use of a twisted pair will reduce the loop area as adjacent twists will automatically cancel any induced voltages. If problems with stray pick-up are encountered, it is recommended that a screened twisted pair cable be used with the screen connected to the 'Lo' or 'Guard' terminal.



Use of remote guard connection

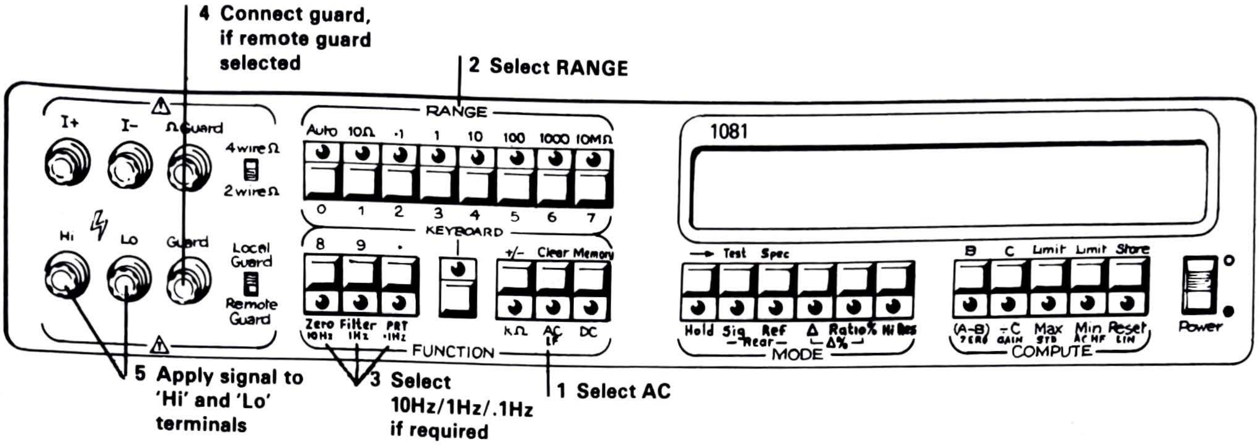
The 'Guard' terminal should be used with 'Remote Guard' selected when the source to be measured presents an unbalanced impedance to the measuring terminals and common mode voltages are present. Regardless of how the 'Hi' and 'Lo' terminals are connected, the 'Guard' terminal should refer to the source of common mode voltage. This will ensure that errors, caused by common mode currents flowing in the measuring circuits, are minimised by providing a separate common mode current path as shown in the examples below.





R1, C1 = Input impedance
R2, C2 = Input to guard leakage impedance
R3, C3 = Guard to case leakage impedance
Vcm1, Vcm2 = Common mode voltages

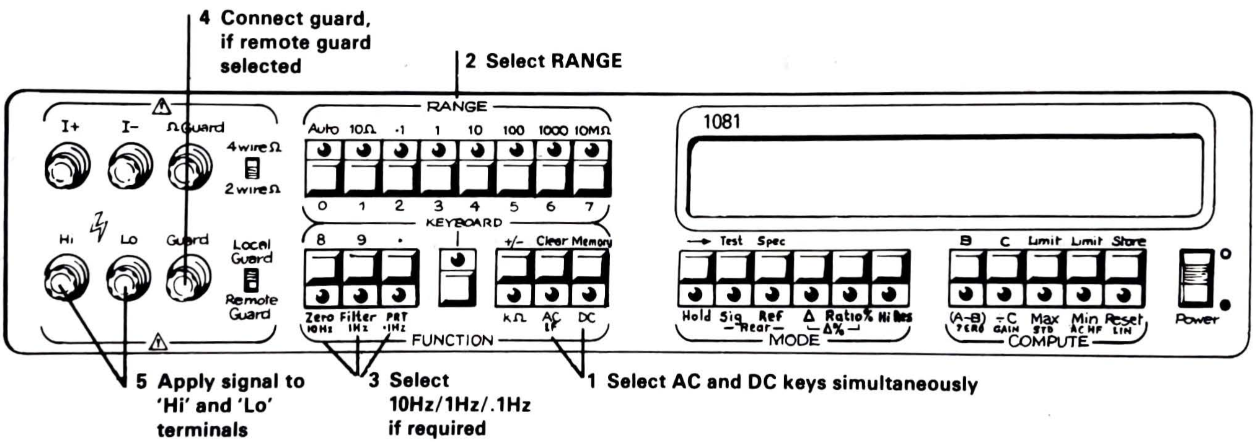
AC voltage measurement procedure 5½ digits



Low frequency measurements

To measure any signal of frequency below 100Hz to full accuracy, DC coupling MUST be selected as shown below. Selection of 10Hz, 1Hz or 0.1Hz filter, increases the settling time as shown in Section 6 – Specifications.

DC coupled AC voltage measurement procedure 5½ digits



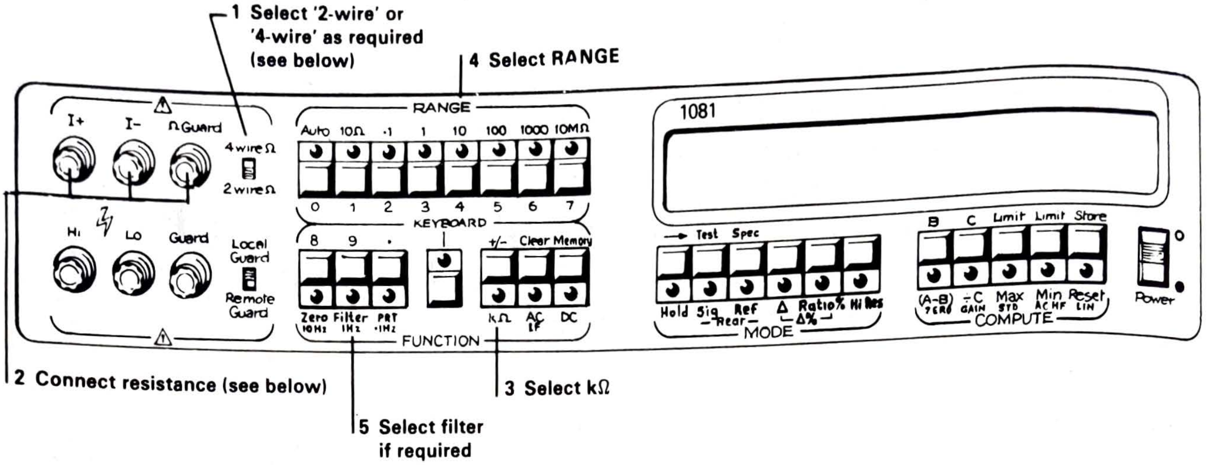
AC voltage measurement

Whilst for DC voltage measurement the resistance of the connection lead is generally unimportant so long as it is small compared with the input impedance of the measuring device, with AC voltage measurement the capacitance may give rise to an appreciable shunting effect causing source loading as well as voltage drop in the leads. The approximate 'Hi' to 'Lo' capacitance of the leads in the Datron lead kit are:
low thermal-emf lead with spade terminals—65pF,
other leads—160pF.
In extreme cases, use of separate leads will give lower capacitance (dependent upon spacing but typically 4pF) but will be liable to corrupt the measurement by adding induced signals. The table below gives the approximate impedances at different frequencies.

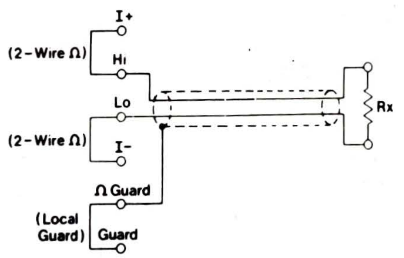
FREQUENCY	LEAD CAPACITANCE		
	4pF	65pF	160pF
100Hz	400MΩ	20MΩ	10MΩ
1kHz	40MΩ	2MΩ	1MΩ
10kHz	4MΩ	200kΩ	100kΩ
100kHz	400kΩ	20kΩ	10kΩ
1MHz	40kΩ	2kΩ	1kΩ

Table 2.4 Connection lead capacitance

Resistance measurement procedure



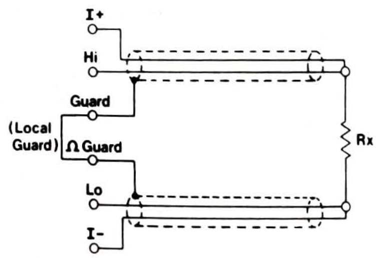
2-wire measurements



For the majority of applications, the simple 2-wire arrangement will be adequate. However, the value displayed will include the resistance of the connecting leads.

Use a screened twisted pair cable to reduce induced voltages, particularly where Rx is high.

4-wire measurements



With a 4-wire connection the lead resistances have negligible effect and only the value of Rx is displayed. The 4-wire connection, as shown above using two screened twisted pair cables, is also suitable for measuring high resistances with long cables since the effects of leakage and capacitance between leads is eliminated. When making very high resistance measurements the 'Ω Guard' terminal should also be connected to a guard screen wrapped around the resistor, or the case it is mounted in, to reduce any errors due to noise.

True 4-wire zero

For accurate measurements of Ohms it is ESSENTIAL that a correctly connected zero source is used when operating 'Input zero' before making a series of resistance measurements.

Two arrangements are shown below, depending upon the resistance to be measured, which ensure that thermal emf effects are eliminated.

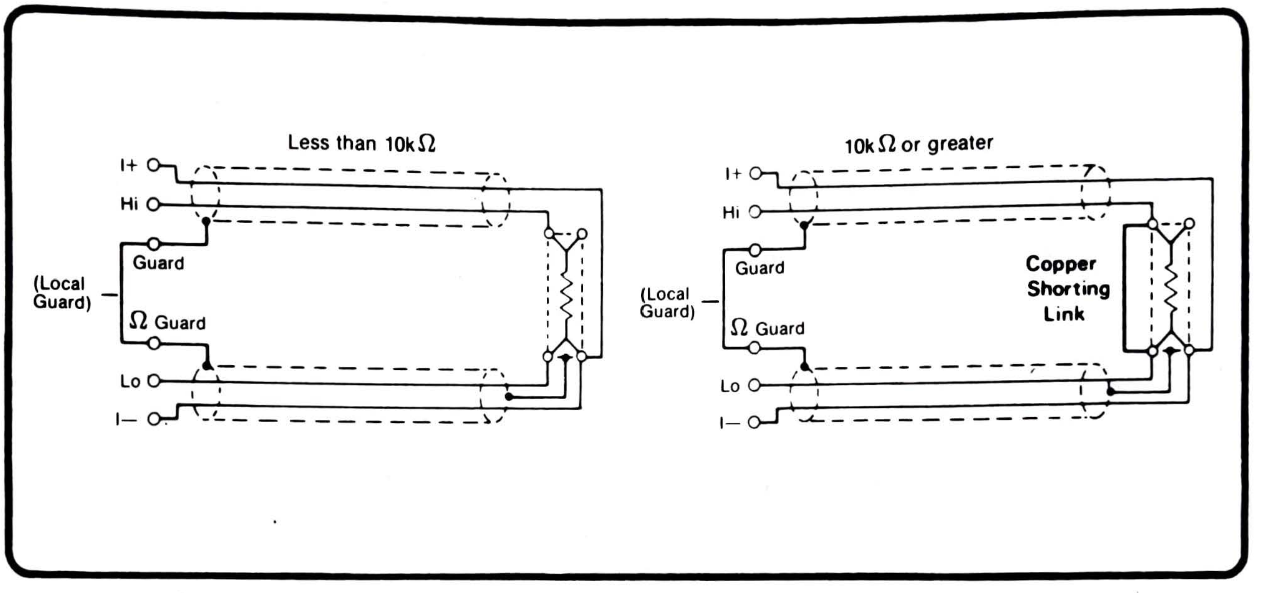


Fig. 2.1 Zero resistance source connections

'In-circuit' measurements

'Ω Guard' can be used to make 'in-circuit' resistance measurements by guarding out parallel resistance paths so that only the value of Rx will be displayed.

Similarly, 'Ω Guard' can be used to reduce the settling time if Rx is shunted by any capacitance and a suitable tapping point is available.

Providing that Ra and Rb are no less than 250Ω (1.5kΩ on 1000kΩ or 10MΩ Ranges), and the Ω Guard resistance (Rg) is less than 5Ω; the actual value Rx can be calculated from the displayed value Rd by:

$$Rx = Rd \times (1 + E).$$

Deviation fraction 'E' can be found within 1% by the simplified formula:

$$E = \frac{(Rd.Rg)}{(Ra.Rb)},$$

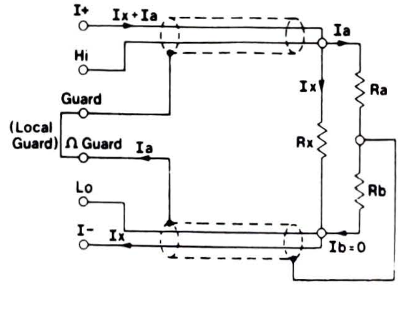
(Where Rg is the Ω Guard lead-resistance from the junction of Ra and Rb, +0.25Ω.)

Example:
If Rd = 100Ω, Rg = 1Ω, Ra = Rb = 10kΩ, then the value of E is given by:

$$E = \frac{100 \times 1}{10k \times 10k} = 10^{-6} \text{ (1ppm of reading);}$$

The value of Rx is thus given by:

$$Rx = 100.(1 + 10^{-6}) \text{ Ohms,}$$
$$= 100.0001 \text{ Ohms}$$



Rear signal input

The measurement source may be connected to the 'REAR SIGNAL I/P' plug instead of the front panel terminals when front panel 'Rear Sig' is selected.

For all rear panel inputs, the maximum limit is 250V RMS.

When using the rear panel input plug the front panel switches '4-wire Ω / 2 wire Ω' and 'Local Guard/Remote Guard' are inoperative. Therefore a connection must always be made to the 'Guard' pin H and for 2-wire resistance measurement external connections must be made from 'Hi' to 'I+' and 'Lo' to 'I−'.

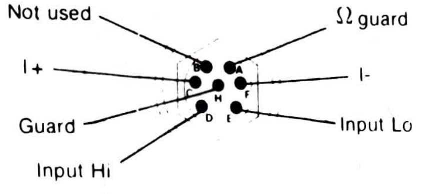


Fig. 2.2 Rear input 7 pin plug

Thermal EMF

Thermal emfs are significant in DC voltage and current resistance measurements, especially when measuring low voltages or large currents. These unpredictable thermal emf errors arise when dissimilar metal junctions are at different temperatures. To minimise thermal emf errors use the same material throughout the measuring circuit, particularly avoid the use of steel probes, nickel plated terminals and tinned copper wire. The table below shows thermal emfs relative to hard drawn copper at 23°C.

MATERIAL	EMF μV/°C
SILVER	+0.03
GOLD	+0.01
TIN	−3
LEAD	−3
NICKEL	−22

If dissimilar metal junctions are used ensure that they are offset by other junctions of the same material at the same temperature and allow for thermal emfs by making the measurement twice with reversed polarity.

A lead with gold plated copper terminals is provided in the Datron lead kit for making low thermal emf connections.

Display messages

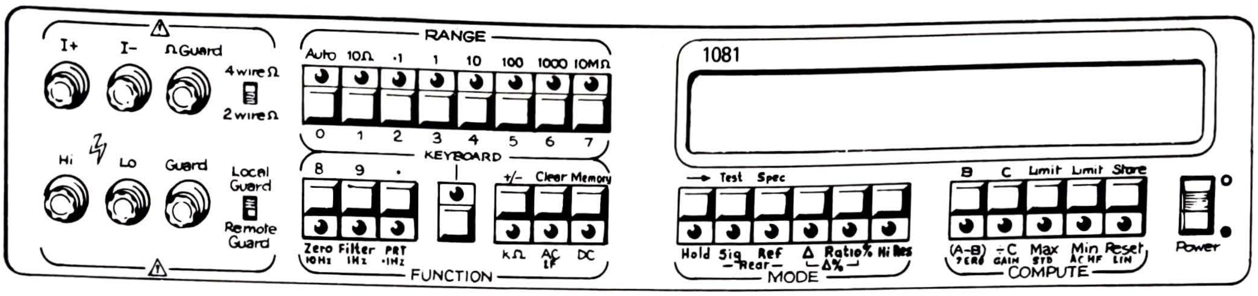
Alpha numeric messages will appear on the display when an input, computational or memory error occurs. A message will also appear when a limit is transgressed and during the self test routine.

Message	Cause	Correction
Error O L	Overload 199999(9)	Reduce input signal or up range
Error 1	Arithmetic Overflow	Adjust C store, rear signal or reference input
Error 2	Invalid Data Entry/Recall	Adjust Data value/Recall
Error 3	Spec > 100% or unspecified	
Error 4	Zero or calibration input error	Adjust applied input and repress key
Error 5	DC Self Test failure	Refer to Calibration & Servicing Handbook
Error 6	kΩ Self Test failure	
Error 7	AC Self Test failure	
Error 9	Arithmetic Underflow	Adjust C store, rear signal or reference input
IP·O	Zero memory error	Repeat input zero procedure
FAIL	Calibration memory error	Refer to Calibration & Servicing Handbook
Hi Lt	Hi Limit transgressed	
Lo Lt	Lo Limit transgressed	
Err Lt	Hi and Lo Limit transgressed	Amend limit values
PASS & Legend	Self Test pass message	
Cont	Continuous Average mode selected	

SECTION 3 ADVANCED OPERATIONAL PROCEDURES

The procedures for exercising the features that supplement the basic measurement functions of the instrument are detailed in this section.

External triggers and 'Hold'



When the instrument is under local control, readings are taken at a rate in accordance with its internal read rate specification. When the 'Hold' key is pressed the reading in progress is completed and displayed, but no further readings are taken.

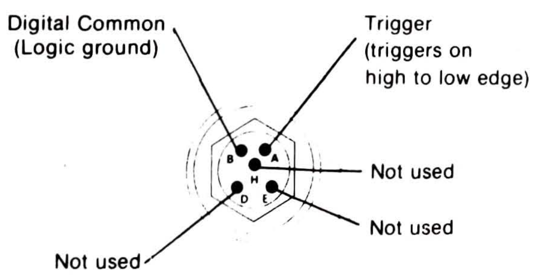


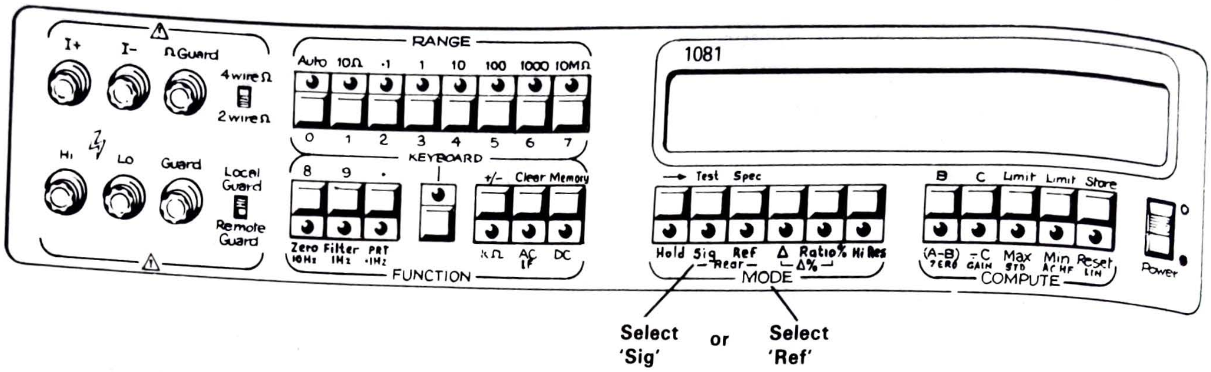
Fig. 3.1 External trigger 5-pin plug

The DMM measurement cycle can be triggered externally, after the internal trigger has been disabled by pressing the 'Hold' key. The trigger occurs on a high to low edge. The external trigger connector is on the rear panel, connection arrangement is shown in Fig. 3.1.

If 'Hold' and 'Auto' are both selected, when triggered, the instrument will change range as required before a reading is taken and held.

Pressing 'Hold' again returns the instrument to its free running condition.

Rear inputs



The two rear input plugs REAR SIGNAL, and REFERENCE can be used as extra signal inputs (250V RMS max) by simply pressing the appropriate key on the front panel.

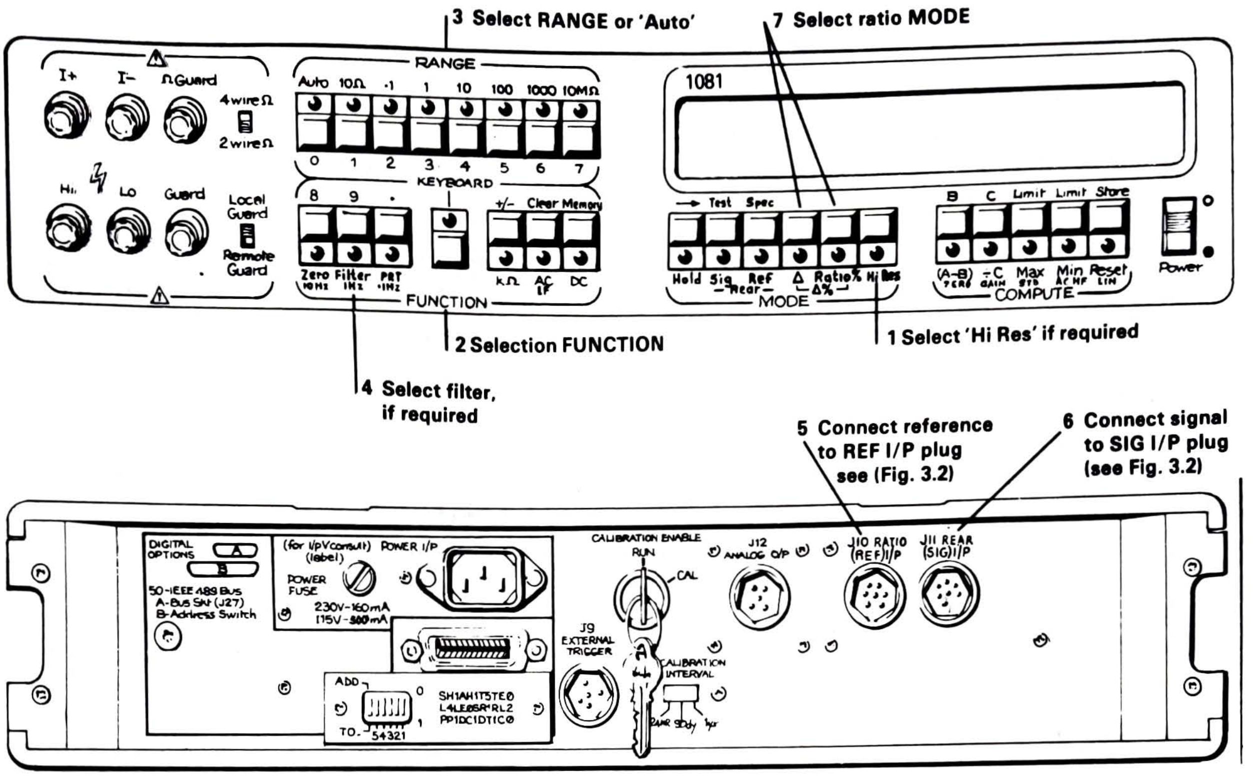
When using rear inputs, Guard is remote and Ω Functions are connected as 4 wire.

For Local Guard, connect 'Guard' to 'Lo' for Voltage functions and to 'Ω Guard' for Ω Functions.

For 2 wire Ω, connect 'Hi' to 'I+', and 'Lo' to 'I−'.

The front 4 wire/2 wire switch and Local/Remote Guard switch are inoperative in rear input modes.

Ratio measurement procedure



The ratio of any two similar function inputs can be displayed by following the procedure shown above. If 'Auto' is selected the two inputs may be of widely different magnitude, although maximum permissible input voltages are limited to 250V RMS when using the rear input plugs.

With the following selections, the display will show a value equal to:

$$\text{'Ratio\%'} = \frac{\text{Rear Signal}}{\text{Ratio Reference}} \times 100\%$$

$$\text{'}\Delta\text{'} = \text{Rear Signal} - \text{Ratio Reference}$$

'Δ %' (both 'Ratio%' and 'Δ') =

$$\frac{\text{Rear Signal} - \text{Ratio Reference}}{\text{Ratio Reference}} \times 100\%$$

An Error 1 indicates an arithmetic overflow
Error 9 indicates an arithmetic underflow

In either case the REF or SIG input signal should be adjusted until a valid ratio reading is obtained.

Deselection of this mode is made by repressing the 'Ratio %' key and/or 'Δ' key (whichever mode is selected).

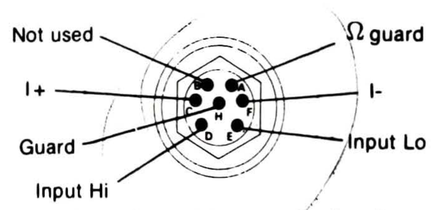


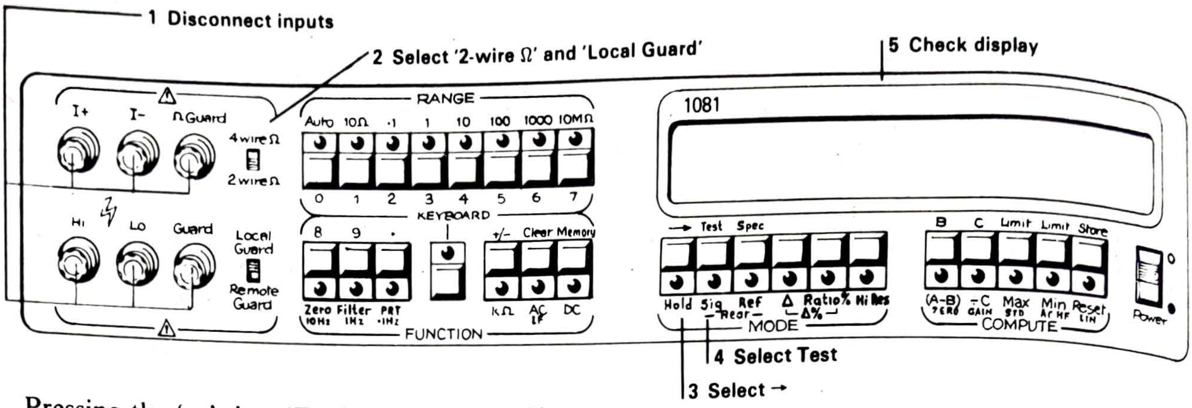
Fig. 3.2 SIG and REF inputs 7-pin plugs

Example of ratio measurements

The instrument's AC converter is a true RMS DC coupled unit, making it possible to perform AC:DC ratio measurements. When used in this way, with an AC source compared with an accurate DC source, the instrument operates as an automatic AC/DC transfer standard with a transfer accuracy as shown in specification section.

Transfer standard measurements should be made with the instrument set to take DC coupled AC measurements (see section 2). Connect the DC source to the SIG input plug and the AC source to the REF input plug, a displayed reading of 100% indicates an equalized state.

Self test



Pressing the '→' then 'Test' keys starts a self test routine. The self test is a part visual, part internal check of the proper operation of the instrument. A visual check is made of the display by the operator and internal checks are executed to verify that the circuits are functioning correctly. Self Test does not check the full measurement accuracy of the instrument.

ALL MEASUREMENT INPUTS SHOULD BE LEFT OPEN CIRCUIT.

'2 wire Ω' should be selected.

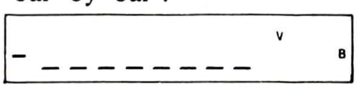
Self test sequence

The routine after pressing 'Test' is as follows:-

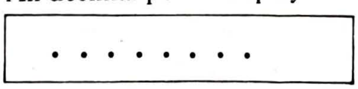
1. Turns off all key LEDs.
2. Display cleared.

Visual check sequence

3. Seven segment digits and legends illuminated 'bar' by 'bar'.

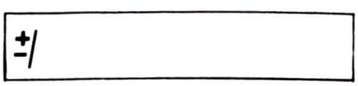


4. All decimal points displayed.

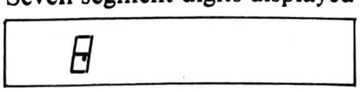


5. All commas displayed.

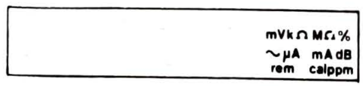
6. Polarity signs and overrange digit displayed.



7. Seven segment digits displayed digit by digit.



8. First then second block of legends displayed.



9. Display cleared.

Internal check sequence

		PASS indication:
10.	Check Ratio.	Adds % legend to display.
11.	Check DC volts. If the following options are not fitted, the routine passes on to the next step.	Adds V legend.
12.	Check Ohms.	Adds Ω legend.
13.	Check AC volts.	Adds ~ legend.
14.	A check is made of the non-volatile memory (i.e. the calibration and input zero memory).	PASS

When the test routine is completed successfully, the instrument will retain the 'PASS' indication. Pressing 'Hold' will return the instrument to the last selected range and function but all mode and compute functions are cancelled.

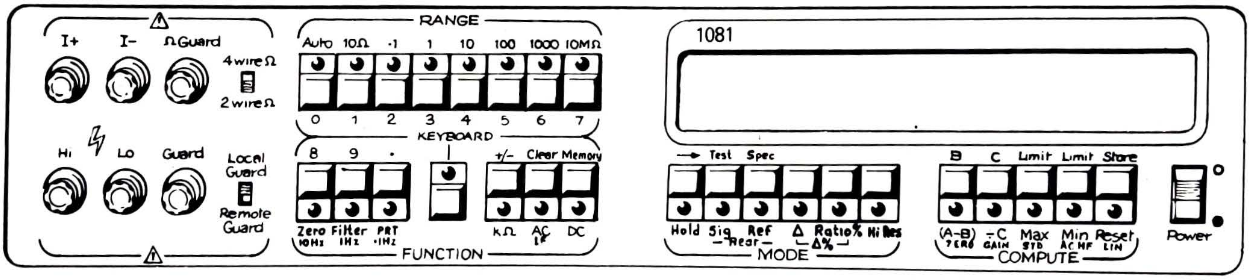
When the 'Test' routine finds an error in the internal checks, an Error message will be held on the display. To clear this state and continue with the self test routine, press 'Test'. Refer to Calibration and Servicing Handbook for fault finding procedure.

An Error 5 indicates DC failure
Error 6 indicates kΩ failure
Error 7 indicates AC failure

FAIL indicates Calibration memory error.

Selecting 'Auto' during 'Test'. The instrument cycles through the test procedure until either a fault appears or 'Auto' is deselected. The instrument then finishes the test sequence in progress.

Spec mode



Depressing '→' then 'Spec' keys causes the instrument to compute and display an error value that relates to the last measurement made. The instrument contains a table of the measurement specification for every function and range, and the maximum limits of uncertainty for the last displayed measurement is displayed as a fraction of that measurement.

This uncertainty value is only available for the measurement itself, not for the computed value of the reading (see 'Computation facility'). Nor is the error value available for 'Hi Res' Mode readings (see 'Hi Res' Mode).

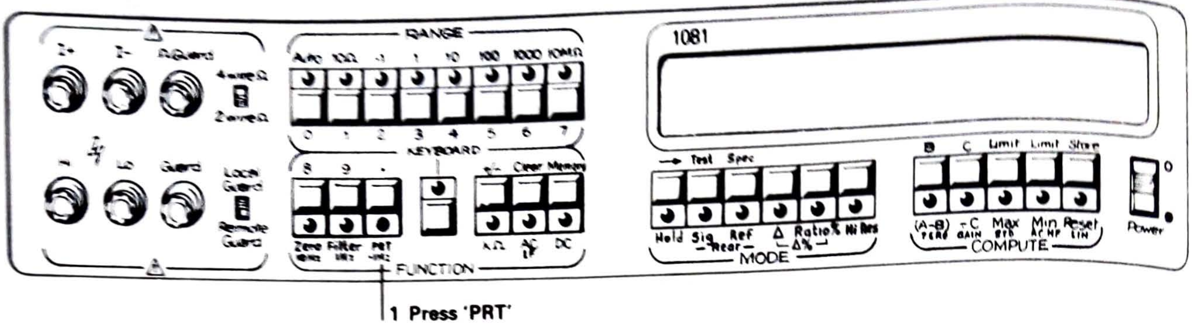
The uncertainty is calculated according to the setting of the calibration interval switch on the rear panel so that the instrument's specification is examined in the area that corresponds to the chosen re-calibration interval.

The display is preceded by a +/− indication and is in ppm or %, depending on magnitude. Very large % errors, such as at near-zero readings, are displayed as a message (Error 3).

Depressing the '→' key again, returns the instrument to normal operation.

Platinum Resistance Thermometer measurements

Temperature Display



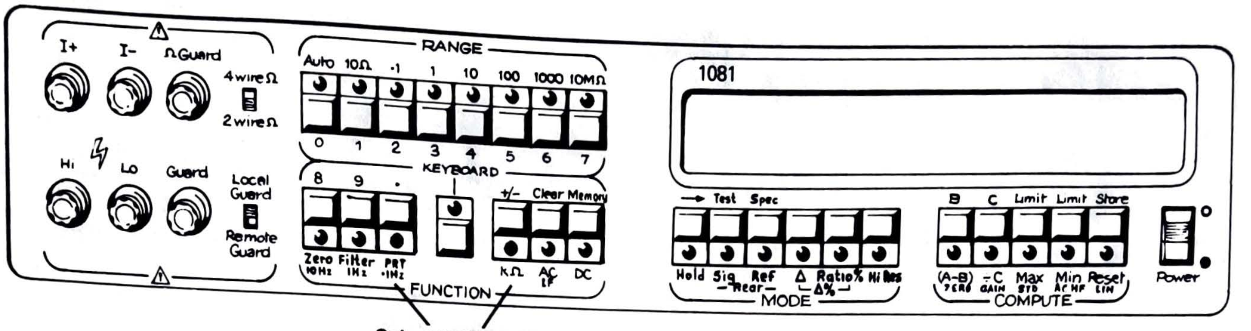
The 1081 can be used with any 100Ω PRT with a 'fundamental interval' of 38.5Ω to produce a direct readout of temperature in °Celsius.

First ensuring 'AC' is not selected, then selecting 'PRT', will automatically provide a 1mA current source at the input connector and produce a display in °C. Normally, 4 wire connections to the PRT are provided, therefore '4 wire Ω' should be selected on the front panel if the front panel input terminals are being used.

For optimum conformity, calibration constants for individual PRTs can be entered using 'Keyboard' when calibration is carried out – refer to Calibration and Servicing Handbook.

A Datron accessory, PRT 100 Platinum Resistance Thermometer Probe, is available for use with the 1081. It is fitted with a mating connector for either rear panel input socket. In this case, either 'Rear' then 'Sig' or 'Ref' should be selected.

Resistance Display



Select 'kΩ' & 'PRT' in close succession

As an alternative to a display readout in °Celsius, a special 'kΩ' range is provided for readout in ohms. This enables the 1081 to be used with PRT probes having other basic resistances and fundamental intervals. Temperature conversion can be made using appropriate tables.

By selecting 'kΩ' and 'PRT' in close succession a fixed 100Ω resistance range is selected with a source current of 1mA provided at the input connector.

The 1081 now operates as for a normal Resistance measurement. '4 wire Ω' or '2 wire Ω' should be selected as appropriate if using the front panel connectors.

Selection of Hi Res will extend the display to 7½ digits.