PRECISION INSTRUMENTS FOR TEST AND MEASUREMENT

LOM-DO5000 SERIES
LOM-DO5000 – LOM-DO5001- LOM-DO5002

Micro-Ohmmeters

User and Service Manual

GENERAL
This instrument has been designed and tested to comply with the Electromagnetic Compatibility Directive 89/336/EEC and Low Voltage Directive 93/68EEC in accordance with EN 61010 -1 :1995 relating to the safety requirements for electrical equipment for measurement, control and laboratory use.
Before connecting the instrument to the mains supply please ensure the following safety precautions have been read and understood.

SAFETY SYMBOLS
The following symbols are used to describe important safety aspects of this instrument, these symbols appear on the instrument and in the operation instructions.

Attention Symbol: Indicates a potentially hazardous condition exists and that it is necessary for the operator to refer to the instruction manual to ensure the safe operation of this instrument.

Hot Surface Warning: Indicates a hot surface that may be at a temperature capable of causing burns, refer to the instruction manual for further safety information.

Caution Risk of Electric Shock: Indicates hazardous voltages may be present, refer to the instruction manual for further safety information.

Protective Conductor Terminal: For protection against electrical shock during a fault condition. This symbol is used to indicate terminals that must be connected to electrical ground before operating equipment.

SUMMARY OF SAFETY PRECAUTIONS
The following general safety precautions must be observed while operating or servicing this instrument. Failure to comply with these precautions may result in personnel injury or death.

INSTRUMENT ELECTRICAL EARTH
This instrument is designed as a Class 1 electrical safety insulation device. To ensure continued protection from electric shock the instrument chassis must be connected to an electrical ground. The instrument is supplied with an AC power cable with an earth connection.

LIVE CIRCUITS DANGER
Do not connect the power supply to or operate this instrument with the protective covers removed. Component replacement and internal adjustments must be made by qualified service personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist with the power cable removed. To avoid injuries always disconnect power and discharge circuits before touching them.

DO NOT MODIFY THIS INSTRUMENT OR SUBSTITUTE PARTS
Because of the danger of introducing additional hazards; do not perform any unauthorised modification or install substitute parts to the instrument. Only fuses with the rated current, voltage and specified type should be used, failure to do so may cause an electric shock or fire hazard. Return the instrument to Automatic Systems Laboratories for service and repair to ensure the safety features are maintained.

DO NOT OPERATE IN EITHER DAMP OR EXPLOSIVE ENVIRONMENTS
This instrument is not designed to operate while wet, in an environment of condensing humidity or in the presence of flammable gases or vapours. The operation of this instrument in such an environment constitutes a safety hazard.

CERTIFICATION
IET Labs certifies that this product met its published specifications at the time of shipment from our factory. All calibration measurements performed in the manufacture of this instrument are traceable to the National Physical Laboratory (London).

ASSISTANCE
For after sales support and product service assistance please contact IET Labs Customer Support Group. Contact information is provided in the operation instruction manual.

Table of Contents

1 INTRODUCTION

1.1 OVERVIEW

The LOM-DO5000 Microhmmeter is a high accuracy instrument designed for industrial and laboratory resistance measurements.

Features include:
- Programmable measuring current user selectable in 100 steps

- Automatic temperature Compensation

- Hi/Lo Limits with red/green front panel warning Pass/Fail lamps

- Switched current mode with automatic averaging ensures elimination of thermal emf errors

- Large graphic LCD display for resistance measurement values as well as configuration settings and statistical results

- Advanced functions include data logging and statistical reporting with max/min, average values peak to peak values and standard deviation

- Analogue output, IEEE-488 and RS232 communication, and PLC interfaces available for automated monitoring and controlling applications

- Rear panel terminals available as an option

- Fast mode 50 measurements/second for production testing

The LOM-DO5000 is a true four wire measuring instrument eliminating the need to compensate for lead resistance. The measured value is displayed in large characters with decimal point and units kΩ, Ω, or mΩ. For maximum accuracy the measuring current may be automatically reversed and the average of measurement displayed. For measurements on unstable samples, a rolling average filter is available.

Resistance measurement accuracy is typically 0.03% (1 year specification) and the value may be displayed with or without temperature compensation, the final accuracy depends upon the current selected.

The front panel measurement connections are made via 4mm sockets located on the front panel (rear panel connection is an option). The connection to a Pt100 temperature sensor is made with a standard DIN connector.

1.2. Definitions and terminology

μΩ microhmm	0.000001 Ohm
mΩ milliohm	0.001Ohm
kΩ kilohm	1000 Ohm
Pt100	Platinum resistance thermometer (100Ω at 0°C)
+U/-U	Voltage connection
+I/-I	Current connection
Four terminal measurement	
Kelvin clips	Crocodile clips with isolated jaws, one side being the current I connection, the other voltage U connection.

1.3 Standard features of the LOM-DO5000 Microhmmeter include:

- Direct display of resistance

- Illuminated display

- Up to 10 Amps measuring current (programmable 10% to 100%)

- Automatic Temperature compensation

- Display hold function

- Display zero function

- 4000 event data logger

- Statistical reporting

- Measuring current reversal with auto average

- Hi/Lo Limits with Red/Green front panel warning LEDs

- Fast measuring mode 50 measurements / second

- **General warning symbol.** This indicates that a hazardous condition may exist.

⚠

You must read the relevant sections in this Operator's Manual before operating the instrument.

1.4. Principles of measurement

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1.5 Specification

1.5.1 Measurement Accuracy LOM-DO5002 – Low current version

Range	Max. Current	Resolution	Accuracy at full rated current	Temp. Coefficient/°C
30 kΩ	100μA	1Ω	±(0.03%Rdg+0.02%FS)	10ppm Rdg + 6ppm FS
3 kΩ	1mA	100mΩ	±(0.03%Rdg+0.01%FS)	10ppm Rdg + 6ppm FS
300Ω	10mA	10mΩ	±(0.03%Rdg+0.01%FS)	10ppm Rdg + 6ppm FS
30Ω	100mA	1mΩ	±(0.03%Rdg+0.01%FS)	10ppm Rdg + 6ppm FS
3Ω	100mA	100μΩ	±(0.03%Rdg+0.01%FS)	10ppm Rdg + 6ppm FS
200mΩ	100mA	10μΩ	±(0.03%Rdg+0.01%FS)	20ppm Rdg + 6ppm FS

The accuracy is quoted at full rated current with auto average current mode
and the display count is 30,000* plus sign and unit
The 200mΩ range has a scale length of 20,000

1.5.2. Programmable current –LOM-DO5002 Low current version

The measurement current is adjustable on each resistance range as follows:

Range	Max Current	Min Current	Steps
30 kΩ	100μA	10μA	1μA
3 kΩ	1mA	100μA	10μA
300Ω	10mA	1mA	100μA
30Ω	100mA	10mA	1mA
3Ω	100mA	10mA	1mA
200mΩ	100mA	10mA	1mA

The accuracy of current is typically ±0.25%

1.5.3 Accuracy against current level – LOM-DO5002 Low current version

Range	100% Current	50% Current	10% Current
30 kΩ	±(0.03%Rdg+0.02%FS)	±(0.04%Rdg+0.02%FS)	±(0.06%Rdg+0.02%FS)
3 kΩ	±(0.03%Rdg+0.01%FS)	±(0.04%Rdg+0.01%FS)	±(0.05%Rdg+0.01%FS)
300Ω	±(0.03%Rdg+0.01%FS)	±(0.04%Rdg+0.01%FS)	±(0.05%Rdg+0.01%FS)
30Ω	±(0.03%Rdg+0.01%FS)	±(0.04%Rdg+0.01%FS)	±(0.05%Rdg+0.01%FS)
3Ω	±(0.03%Rdg+0.01%FS)	±(0.04%Rdg+0.01%FS)	±(0.06%Rdg+0.01%FS)
300mΩ	±(0.03%Rdg+0.01%FS)	±(0.04%Rdg+0.01%FS)	±(0.06%Rdg+0.01%FS)

1.5.4. Temperature compensation

The accuracy of the temperature measurement is ±0.1% and uses a standard
Pt100 sensor. This accuracy does not include errors due to the sensor itself.
The temperature measurement range is 0…+40°C and the resistance
measurement is referenced to 20°C when this option is used.

1.5.5 Conditions of use:

The instrument must be used inside, in a horizontal position
Temperature
    Storage: -10°C…+60°C
    Operation: 0°C…+45°C
Full accuracy is achieved after 10 minutes warm-up and for a relative
humidity <50%
Altitude: up to 2000 metres
Maximum humidity rate: 80% for a temperature of 31°C

1.5.6 Lead resistance

A maximum lead resistance which may be calculated as 0.5Ω/measuring current is permissible in each of the four measuring leads. The display will indicate if the current lead resistance is too high

"**** MEASURENT ERROR Current lead resistance too high ****"

1.5.7 Mains supply

Universal power inlet: Maximum Power consumption 450VA 45/65Hz

Nominal Voltage	Voltage Range	Frequency	Fuse Type
115 V	103…127 V	47…63 Hz	2.5A (T)
230 V	207…253 V	47…63 Hz	1.25A (T)

1.5.8 Weight and Size

Size: 131 x 339 x 324 mm (H W D)
Weight: 9.8 kg

Setting up the LOM-DO5000

2.1 Safety information

Please read and follow these important safety instructions:

- Read the safety information at the beginning of this manual before operating the LOM-DO5000;

- Make the necessary electrical safety connection checks. In particular, select the correct line voltage and make sure that the correct fuse is installed. Incorrect voltage or fuse selection present both an electrical safety and a fire hazard**.** Ensure that the rear panel fan is operating and that the vent is not blocked.

- When connecting to an electrical supply mains supply, the mains cord provided with the equipment should be used, and connected only to a mains supply with a suitable earth connection. Under no circumstance should the equipment be operated with earth disconnected.

2.1.1 Mains voltage selection and Changing the fuse

The mains inlet socket is located on the rear panel, to select the correct mains voltage and to replace the fuse proceed as follows.

- Front panel ON/OFF switch in the OFF position
- Remove the power cord from the inlet socket
- With a small screwdriver, remove the selection sub assembly from the inlet module
- Remove the fuse
- Take off the pale gray plastic piece
- Select voltage: 110 for a 115 volts main and 220 for a 230 volt main (the 240 position is not used).
- Replace the gray plastic piece to display the correct voltage in the sub assembly window.
- Replace the correct value fuse according to the table 1.5.7
- Replace the selection sub-assembly in the inlet module
- Connect the power cord

2.2 Unpacking the instrument

When you unpack the LOM-DO5000, check that the following items are present before starting to use the unit:

- 1 x   LOM-DO5000 Microhmmeter
- 1 x   Mains Cord
- 1 x   Operating manual
- 1 x   Calibration Certificate

Please contact the IET LABS Customer Support Team immediately if any of these items are missing or damaged.

Please note that we offer a wide selection of measuring leads and test fixtures please consult our sales staff to order the items most suited to your application.

3. About the LOM-DO5000

This section introduces you to the features and functions of the LOM-DO5000 Microhmmeter

3.1 The Front Panel
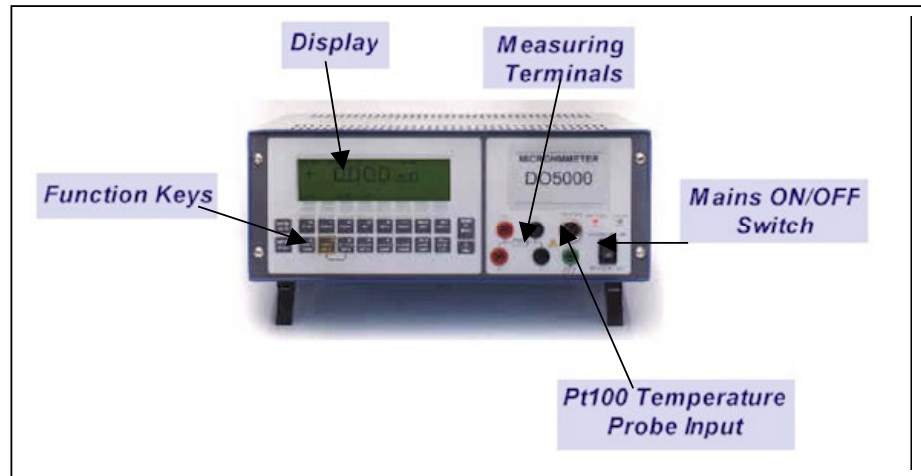
3.2. ON/OFF Switch

The On/Off switch switches the LOM-DO5000 on and off. During Power On the last measurement function setup is restored. The rear mounted cooling fan will always run and the **cooling vent must not be blocked**.

3.3 The Function Keypad

All LOM-DO5000 measurements and programming facilities are accessed through the function keypad. A brief description of key functions is given in the following table. For a detailed description of how to use the keys to configure and operate the LOM-DO5000, refer to section 4

3.4 Table Summary of basic functions

Key Symbol	Description	Function	Direct function or menu
Selection	**of Range**		
3mΩ	Selects 3mΩ range	Selects and displays the measured value using the 3mΩ range	Direct from keypad
30mΩ	Selects 30mΩ range	Selects and displays the measured value using the 30mΩ range	Direct from keypad
300mΩ	Selects 200mΩ range	Selects and displays the measured value using the 200mΩ range	Direct from keypad
3Ω	Selects 3Ω range	Selects and displays the measured value using the 3Ω range	Direct from keypad
30Ω	Selects 30Ω range	Selects and displays the measured value using the 30Ω range	Direct from keypad
300Ω	Selects 300Ω range	Selects and displays the measured value using the 300Ω range	Direct from keypad
3kΩ	Selects 3kΩ range	Selects and displays the measured value using the 3kΩ range	Direct from keypad
30kΩ	Selects 30kΩ range	Selects and displays the measured value using the 30kΩ range	Direct from keypad
Auto	selects autorange	The instrument will select the optimum range required and display the measured value	Direct from keypad

Setting	up measurement	options	
CURR	Current selection	Selects the current to be used for measurement plus single polarity or switched average	Menu
Mode			
COMP	Temperature compensation	Selects temperature compensation	Menu
ZERO	Measurement display zero function	Nulls the display at the current reading and displays measured values relative to the nulled value	Direct from keypad
MES	Measure run/hold	Display hold function triggers measurement and data logger cycles.	Direct from keypad
STOP	Measure stop/start	Stops the current measurement and disconnects the measurement current	Direct from keypad
Logging	**Data and**	**Statistical Displays**	
LOG	Data logging function	Selects the data logging and statistical analysis menu functions	Menu
Options	**and Configuration**		
LIMIT	Limit functions	Selects Hi/Lo limit menu	Menu
MENU	Menu functions	Selects interface options and calibration functions	Menu
Scroll	**and Contrast**	**Control**	
MENU	Up command key; Display contrast, page scroll	Controls the display contrast and page scroll functions	Menu
MENU	Down command key; Display contrast, page scroll	Controls the display contrast and page scroll functions	Menu

3.5. About the LOM-DO5000 Display screen

The liquid crystal graphic display clearly indicates the measured resistance and measurement status as well as displaying available menu options and measurement analysis when selected.

Figure 3.5.1 - Example of Resistance Measurement Mode

```
┌─────────────────────────────────────────────────────────┐
│ AUTO1:              30mΩ 10.0A  (AVE)          Slow       │
│                                                           │
│   +    18.000  mΩ                                         │
│                                                           │
│ T=  +20.0°C  (EXT)          R₂₀=  18.006mΩ (Cu)           │
│                                                           │
│                                                           │
│         Meas                    Cont                      │
└─────────────────────────────────────────────────────────┘
```
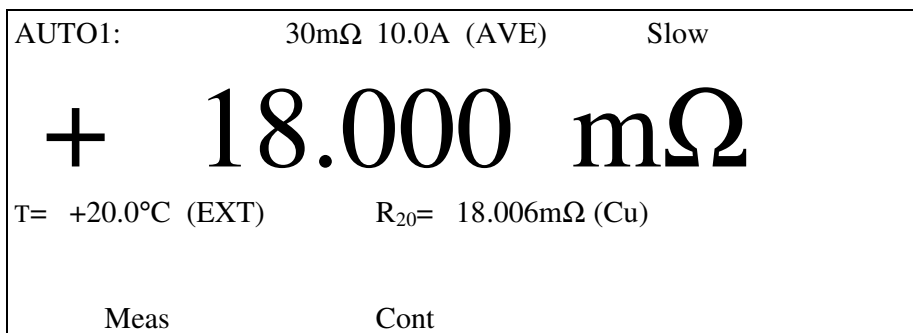
The keypad below the display screen controls the LOM-DO5000. Some keys perform a function directly. For
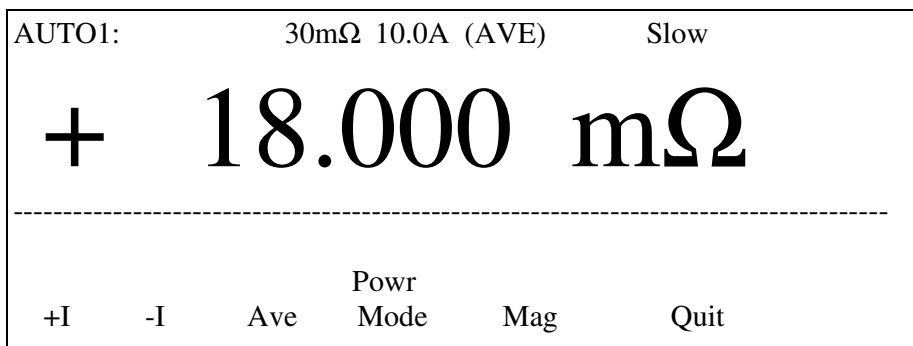
$3m\Omega$

example, selects 3mΩ range.

Other keys switch the display to configuration mode which allows you to select options through a series of menus.

The option menus all follow the same format. The configuration mode is indicated on the screen by a dashed line displayed directly below the main reading. An instruction prompt under the dashed line indicates the current menu. The available menu options are displayed on the bottom row of the display as shown in figure 3.5. Press the corresponding function key to select an option.

Figure 3.5.2 Example of current mode menu

```
┌─────────────────────────────────────────────────────────┐
│ AUTO1:              30mΩ 10.0A  (AVE)          Slow       │
│                                                           │
│   +    18.000  mΩ                                         │
│                                                           │
│ ----------------------------------------------------------│
│                                                           │
│                          Powr                             │
│  +I      -I      Ave     Mode      Mag        Quit        │
└─────────────────────────────────────────────────────────┘
```

Indicates current mode Indicates menu options

The lines printed on the front panel helps you to link the menu option printed on the screen with the correct key on the keypad.

```
┌─────────────────────────────────────────┐
│                                         │
│                                         │
│ +I      -I      Ave                     │
└─────────────────────────────────────────┘
```

3.6. About the Function keys

The top row of function keys are only used to select menu options. The lower row of function keys is enabled only when entering values; these instances are covered later in this section. Both rows of function keys are shown in figure 3.6.1

Figure 3.6.1 - Function keys

The **[Quit]** and **[OK]** menu options consistently use the **[CURR]** and **[MENU]** keys. Use the **[Quit]** key to leave a menu or return to the Resistance Measurement mode screen. Use the **[OK]** key to confirm a particular choice and continue to the next set of menu options.

Not all function keys are used to access the Configuration Mode. Some just invoke the function which is printed on the key. For example pressing **[ZERO]** immediately sets the measured value displayed to zero.

The rest of this section describes each key in detail and gives examples of how to configure the measurement to your requirements.

The last used set up conditions are stored when the instrument is turned off and restored upon switch on.

4. Setting up Measurement Options

Note: It is possible to reset the instrument to the original default start up conditions. From the **[MENU]** mode press **[RESET]** to restore defaults.

4.1 Range Selection

Two modes of range selection are possible, Manual and Auto range. The 8 ranges may be selected individually by pressing the appropriate range key. The range selected is indicated on the top left hand side of the display. Auto range is selected using **[AUTO]** key. This key toggles the selected function as follows; AUTO1 auto ranges starting with the highest range,. **AUTO2** auto ranges starting with the current range selected; **Range** manual range is selected.

4.2. Current Selection

Press **[CURR]** selects the current configuration menu;

			DC/		
+I	-I	Ave	Pulse	Mag	Quit

Select the current direction **+I -I** or **Ave** ; Ave automatically switches the current in the positive and negative directions and displays the average, this eliminates errors due to thermal emf .

Select the current Magnitude **[Mag]** you will be asked to enter the maximum current as a percentage 10…100.

Enter the percentage required using the keys which are numbered in the top right hand corner., press **[OK]** to confirm, the current value for the range selected is displayed at the top center of the screen. **The percentage of maximum current set will be applied to all subsequent measurement ranges selected.**

Select **[DC/Pulse]** this menu permits selection between continuous current measurement and pulsed current. (Option only available for battery version).

4.3 Measurement Mode

Press **[MODE]** to select the measurement mode options

Trig	Read		
Mode	Rate	Filt	Quit

For the greatest flexibility and versatility of measurement the LOM-DO5000 has many advanced features which can be selected from this menu.

Press **[Trig Mode].** To select continuous measurement press **(Cont)** or **(Sing)** to select a single measurement,. this completes one measurement and holds the value on the display. To trigger a new measurement the direct function key **[MEAS]** should be pressed.

Press **[Read Rate]** to select (Fast) or (Slow) measurement mode With Fast mode selected the LOM-DO5000 will measure at 50 measurements per second. This mode is intended for automatic measurements using one of the interfaces to output the measured values or control an external process. The measured value will be displayed in small text on the screen when Fast measurement mode is used.

For manual operation the Slow measurement mode should be selected. This will read at 2 measurements per second and offer the highest accuracy and resolution.

Press **[Filt]** to select the digital filter, this feature should be used when the sample to be measured is unstable and the measured value displayed is constantly changing. The filter is a rolling average of n measurements where n may be set between 1 and 32.

4.4. Temperature Compensation

Press **[Mode]** to select the setup menu for temperature compensation
Press **[Ext]** to select the external temperature sensor.
Press **[Man]** to select the manual compensation temperature, the display will request that you enter the ambient reference temperature.
Press **[Cu]** to select compensation for copper 3930 ppm/°C
Press **[Al]** to select compensation for Aluminum 4100 ppm/°C
Press **[Usr]** to enter alternative user coefficients

The equation used to calculate the corrected resistance is:

$$Rc\ (20°C) = Rx/1+\} \ (tx - 20°C)$$

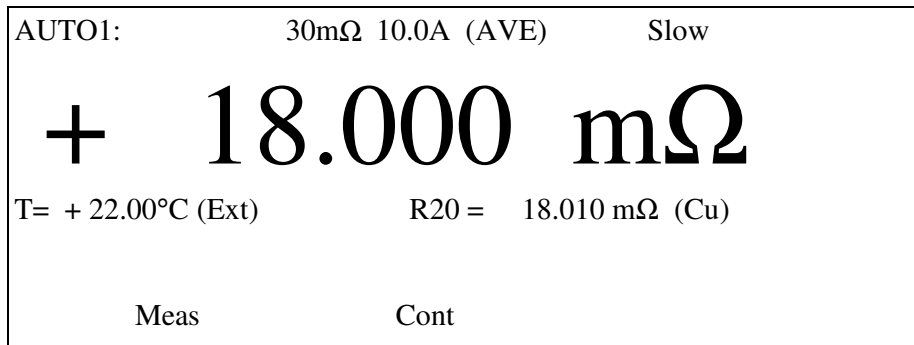where Rc = resistance corrected for a reference temperature 20°C
} = Average temperature coefficient
tx = Component temperature at time of the measurement

The temperature compensation mode should be used when measurements are required to be referenced to 20°C. This is particularly useful when measuring materials with a high temperature coefficient such as copper, as the ambient temperature varies so will the resistance value being measured. Using the temperature compensation mode references all values back to a temperature of 20°C.

The true resistance value measured will be displayed in large digits in the centre of the display and the compensated resistance will be displayed in smaller text below.

Figure 4.4.1 Measurement screen with temperature compensation

```
AUTO1:              30mΩ  10.0A  (AVE)          Slow


+   18.000  mΩ

T=  + 22.00°C (Ext)          R20 =    18.010 mΩ  (Cu)


        Meas               Cont
```

4.5 Limits

Press **[Lim]** To select the Limits menu.

Two options are then available **[Meas]** which enables limits to be set with reference to the measured values or **[O/C]** which enables the open circuit voltage to be limited to either 20mV or 50 mV.

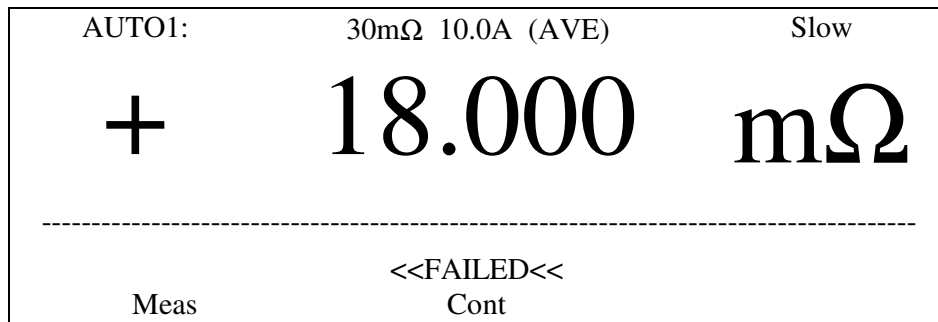Select **[Meas]** to select the measurement limits menu.

Select **[Alm]**to turn the audio alarm (Beeper) on or off.

Select **[Max]** to set the max or upper limit value press **[Chg**] and the screen will prompt you to select the units mΩ…Ω…kΩ. Select the required units and the display will ask for a new max limit value to be entered. Use the numbered keypad to enter the required limit, press **[OK]** to confirm.

Select **[Min]** to set Min or lower limit value, proceed as for setting max limit.

The Green Pass front panel LED will light when the measured value is correct and within the set limits, the Red Fail LED will light and the warning beeper will sound if the measured value is higher than the Max limit set or lower than the Min limit set. The LOM-DO5000 screen will also display PASS or FAILED with >> to show value to high and<< to show value to low.

Figure 4.5.1 Measurement screen with limits

```
┌─────────────────────────────────────────────────────────────┐
│   AUTO1:            30mΩ  10.0A  (AVE)              Slow       │
│                                                               │
│       +        18.000      mΩ                                 │
│                                                               │
│   ------------------------------------------------------------│
│                      <<FAILED<<                               │
│           Meas                    Cont                        │
└─────────────────────────────────────────────────────────────┘
```

To select the open circuit voltage limit from the **[Lim]** menu select **[O/C]** the option of selecting either 20mV of 50mV limit is then available.

4.6 Data Logging Function

Press **[LOG]** to select the data logging menu
Select [**New**] to initiate a new log the screen will prompt you to clear the current log. Press [**Yes**] the screen will ask you confirm, press yes again and the current log will be cleared of all stored values. You are now ready to set up the new log.

Press [**No. Rdgs**] the current number of readings is displayed to accept that value press**[Yes]** to store a different number press **[No]** you will then be asked to enter the value of the number of readings to be stored in the log. Enter the number required between 1 and 4000 and press [**OK**]. Press **[Rev]** to review the current readings stored in the log these will be displayed in table form as shown in Figure 4.6.1

Figure 4.6.1-Data Logging Screen

Log #	Range	Resistance	Date	Time
1	30kΩ	0.000	10/08/99	14:10:35
2	30kΩ	0.000	10/08/99	14:10:37
3	30kΩ	0.000	10/08/99	14:10:38
4	30kΩ	0.000	10/08/99	14:10:40
5	30kΩ	0.000	10/08/99	14:10:42
6	30kΩ	0.000	10/08/99	14:10:44

Once the logging mode has been switched ON the measurement display will be in HOLD mode and the bottom line of information text will show the total number of samples to be stored and the number of measurements already stored. (Samples = 40/40). To start the logging press the **[MES]** key the measurements will start and the values stored. Once the set number of values has been stored in the log the measurements will be stopped.

Press **[Stats]** to display the statistical analysis of the values stored in the log. The following values will be computed and displayed.
Minimum value [Min]   Maximum value [Max]
Mean value [Mean]   Peak to Peak value [PtP]
Standard Deviation [SD]

4.7 Setup Memory

To enable up to 10 measurement configurations to be setup and stored the LOM-DO5000 has 10 memories to store and recall these configurations:-

Press **[MENU]**
Press **[Mem]** to select memory menu
Press **[STOP]** to store the current measurement setup you will be prompted to enter a memory store number 0 to 9, selecting the store number saves the current setup to that store number
Press **[RCL]** to recall a previously stored setup you will be prompted to enter the memory store number that you wish to recall, entering that store number recalls the stored configuration for immediate use.
Press **[List]** to display a list of memories in current use
Press **[CLR]** to clear a previously stored configuration you will be prompted to enter the store number , entering the number will erase the stored parameters from that memory.

The following parameters will be stored when saved to memory:-

PARAMETER	DEFAULT VALUE
Range	30kOhm range
Auto-range	on - auto 1
Current direction	positive
Current Magnitude	100%
Current mode	DC
Trigger mode	continuous
Reading rate	slow
Temperature compensation	off
Temperature compensation mode	manual
Temperature compensation material	copper
Manual compensation temperature	20°C
Filter	off
Filter - No of readings	10
Measurement limits	off
Measurement limits alarm	on
Measurement limit - maximum	30 kOhm
Measurement limit - minimum	0
Open circuit limit	off
Log mode	off
Log mode - No. of readings stored	10

4.8 Display Menu

Press **[MENU]** to select the display menu
Press **[RESET]** to reset measurement configuration to default values.
Press **[MEM]** to select memory menu

Press **[LCD]** to select LCD display menu, Press **[ ]** to turn backlight ON or OFF, Press and hold **[ ]** to lighten then display contrast, Press and hold **[®]** to darken the display contrast.

Press **[Set Up]** to select the configuration menu. **[Beep]** turns the beeper on and off, **[Time Date]** enables the current time and date to be set, **[Lang]** enables the display to be toggled between English and French language, **[Temp Unit]** permits the temperature units to be switched between °C and °F, **[Line Freq]** allows the measurements to be synchronized at 50Hz or 60Hz and should be set in accordance with mains supply frequency used, this is particularly important when measuring in fast mode. Press **[Ver]** to display the model number and software version.

Press **[Rem I/F]** to select the remote interface option menu
Press **[Cal]** to select the Calibration menu which will be fully covered in section ####

4.9 Measure/Hold function

Press **[Mes]** to hold the measured value on the display. **NOTE** this does not interrupt the measuring current which will still be flowing through the resistance being measured. **WARNING** when measuring with 10 Amps measuring current, it is possible to produce small sparks at the current terminals. Press [**Mes**] to resume display of measured values.

4.10 Measure Stop Function

Press **[STOP]** to stop the measurement this disconnects the current from the terminals and internally shorts the current terminals discharging any voltage that may be stored in capacitive samples.

4.11 ZERO Function

Press **[ZERO**] to null the current display reading to zero, all subsequent measurements will be relative to the nulled value. Pressing **[ZERO]** again cancels the zero. Changing range or selecting auto range also cancels the zero.

5. Measuring with the LOM-DO5000

5.1 Connecting to the LOM-DO5000

The LOM-DO5000 uses a four terminal method of measurement which eliminates errors due to lead resistance. The measuring leads plug into the four front panel safety sockets. The sockets are marked +U, -U, +I, & -I. Connections to the resistance to be measured should be as per Figure 5.1.1

Figure 5.1.1 Connection diagram
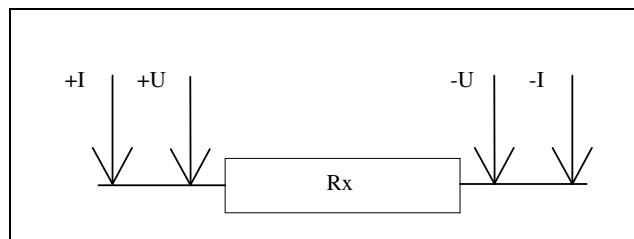
NOTE it is important to connect the I (current) leads outside the U (potential) leads

5.2 Connecting to the resistance

The Digital Microhmmeter LOM-DO5000 employs a four wire method of measurement, i.e. it is necessary to make four connections to the resistance under test. The instrument is supplied with four leads; two for the potential connections which are made across the test resistor at the points between which the resistance is to be determined; and two for the current connections which connect the test resistor to the current supply circuit.

5.2.1 Connect the red leads to the +U and +I sockets and the black leads to the -U and -I sockets.

5.2.2 Connect to the resistance under test as shown in figure 5.1.1, Cleanliness is important and if the sample is not clean, a rub with an abrasive paper to remove oxides is recommended.

5.3 It is not always possible to use the combined current and potential crocodile clips (Kelvin clips), in which case test leads with spade tags, or special fixtures may have to be made to suit the particular application. We offer a variety of different lead and fixture types which are list in section 6.1

Figure **5.3.1** Diagram of different connection configurations

5.4 Resistance measurement

The LOM-DO5000 should be in the measurement **[STOP]** mode. In this mode the measuring current is switched off and the current terminals are shorted internally. Connect the measuring leads as described in section 5.3 before starting the measurement select the current level and mode required as described in section 4.2 **WARNING the maximum measuring current is 10 Amps on the lowest 3 measuring ranges** ensure that the current level selected will not damage the resistance being measured. Select the range required see 4.1 or auto range.

To start the measurement press the **[MEAS]** button the measured resistance value will be displayed on the screen.

5.5 Resistance measurement with temperature compensation

Temperature compensation should be used when measuring the resistance of materials which have a high temperature coefficient. Copper, for example, has a temperature coefficient of 0.3980%/K. The value of the resistance measured will therefore vary with the temperature of the copper. To obtain consistent and meaningful results, the resistance values may be related to a set ambient temperature, normally 20°C.

Example: Copper with a temperature coefficient of 3980ppm/k = 0.3980%/k

Temperature	20°C	25°C	30°C	35°C
Resistance of Copper	18.000 mΩ	18.358 mΩ	18.716 mΩ	19.075 mΩ
% Increase in resistance	0%	1.99%	3.98%	5.97%

To measure with the temperature compensation, proceed as in 4.4 but in addition connect the temperature sensor probe (see section 6 for accessories details and part numbers) to the front panel socket. Select the temperature compensation measurement mode as described in 4.4. Alternatively, if the ambient temperature is stable, a manual value may be entered, in this case a temperature sensor is not required. The true measured resistance value will be displayed in large digits on the LOM-DO5000 screen and the compensated value will be shown in smaller digits below the main display. The measured or set temperature will also be shown.

Figure 5.5.1 Display screen temperature compensation mode

```
 AUTO1:            30mΩ 10.0A  (AVE)              Slow

   +       18.000          mΩ

 T = + 25.00°C (Ext)           R20 =    18.358 mΩ  (Cu)

          Meas                      Cont
```

5.6 Measurement with Limits

The measurement limits function permits the fast easy sorting of components. To select the limits function see section 4.5. Both high and low limit values may be set. If the measured value is within the set limit boundaries then front panel green PASS LED will illuminate. If the measured value falls outside the set limits then the red FAIL LED will light, a warning beeper will also sound and the instrument display will show FAILED with chevron arrows pointing to the left for value to low and to the right for value to high.
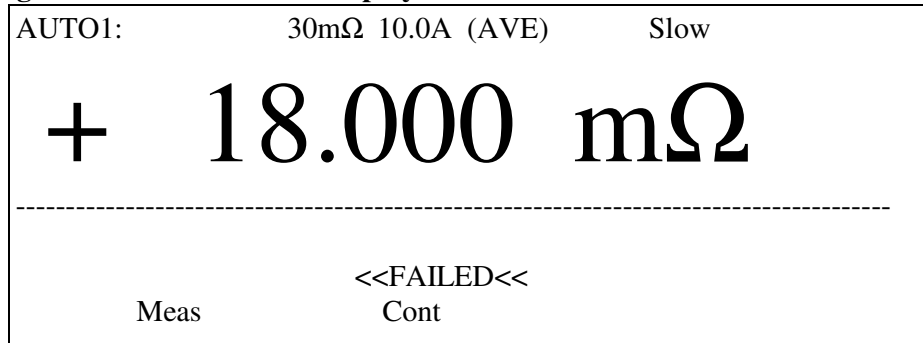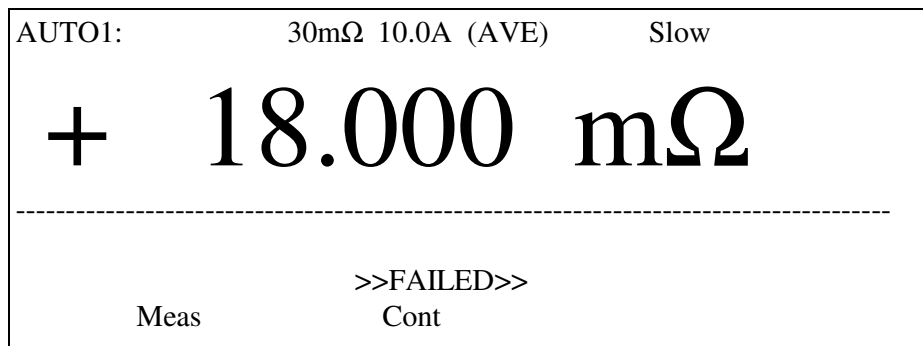
Figure 5.6.1 Measurement display with limits value to low

```
AUTO1:              30mΩ  10.0A  (AVE)        Slow

  +    18.000  mΩ
--------------------------------------------------------------------------------
                          <<FAILED<<
          Meas            Cont
```

Figure 5.6.2 Measurement display with limits value to high

```
AUTO1:              30mΩ  10.0A  (AVE)        Slow

  +    18.000  mΩ
--------------------------------------------------------------------------------
                          >>FAILED>>
          Meas            Cont
```

6 ACCESSORIES

6.1 LEADS The LOM-DO5000 may be used with a variety of lead sets. The following are the available selection. Remember, if you do not see suitable leads for your application ,please consult our customer help desk.

Ordering Code	Description
LS01-P	Duplex Handspikes with 2.5 metre lead length. Pistol grip handles with current and potential spikes suitable for plate or Bussbar measurements.
LS02-P	Duplex Handspikes as a LS01-P but with 2.5 and 15 metre lead lengths
LS03-P	Large Kelvin clips with 3 metre lead length suitable for attaching to rods bars or cables up to 38mm diameter
LS04-P	As LS03-P but with lead lengths 3 and 15 metres
LS05	Executive lead set consisting of 4 x 1 metre leads with banana plugs, 4 x crocodile clips 4 x test prods and 4 x Kelvin clips (KC1) jaw opening 4mm
LS06-P	Kelvin lead set comprising of miniature Kelvin clips (KC2) with 1 meter leads attached terminated with banana plugs Jaw opening 6mm. Suitable for fine wires.

6.2 WIRE CLAMPS For the precise measurement of 1 meter cable samples we offer 2 wire clamp options.

Ordering Code	Description
C01	1 metre wire clamp with hardwood base suitable for cable diameters up to 25mm
C02	1 metre wire clamp with metal base and provision for temperature sensor suitable for wire cross section 1 to 1000mm

6.3 COIN JIG for the measurement of bi-metal coins to ensure the resistance of the two metals is within pre defined limits.

Ordering Code	Description
CJ01	COIN JIG will accept all bi-Metal Coins

6.4 INTERFACES FOR THE REMOTE CONTROL OF LOM-DO5000

Ordering Code	Description
LOM-DO5000-RS232	Talk/Listen Serial RS232 Interface
LOM-DO5000-GPIB	Talk/Listen IEEE-488 Interface
LOM-DO5000-PLC	PLC Interface includes Analogue Output and Potential free Contacts for Hi/Lo limits

6.5 TEMPERATURE PROBE For the sensing of the temperature of the sample under test.

Ordering Code	Description
5000-Pt100	Pt100 Temperature Sensor Probe length 200mm, diameter 6mm. Fitted with 1 Metre Lead and DIN Plug