NDB TECHNOLOGIES INC.

LRM-10 micro-ohmmeter

MU033-GEN-ENG Version 1.4

LRM-10
User Manual

Table of Contents

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Safety Warnings

Follow all the safety rules to avoid dangerous electric shocks. Only properly trained personnel should use the LRM-10 micro-ohmmeter. Safety is the responsibility of the user.

- Read all safety and operating instructions before to use the equipment.
- Retain this User Manual for future reference.
- Heed all safety warnings on the equipment and in the manual.
- Follow all operating instructions.

Safety Symbols

Hazard symbol referring to the instruction manual: The product is marked with this symbol when it is necessary for you to refer to the instruction manual in order to protect yourself against personal injury or to protect against damage to the product.

The hazardous high voltage symbol alerts you of the presence of an un-insulated voltage with enough magnitude to produce an electric shock.

Safety Precautions

- Do not use the LRM-10 micro-ohmmeter in an explosive area.
- Stand clear of all parts of the high-voltage circuit, including all connections, unless the test set is de-energized and all parts of the test circuit are grounded.
- Keep other people away from test activities with suitable barricades or warnings.
- Treat all terminals of high-voltage power equipment as potential electric shock hazards. Voltages may be induced at these terminals because of proximity to energized high-voltage lines or equipment.
- Maintenance must be performed by qualified personnel who are familiar with the construction and operation of the test set and the hazards involved.
- Only use the rechargeable batteries approved by ndb Technologies. Using any other brand/model of rechargeable batteries in this instrument can cause excessive heat, damage the batteries, damage the instrument, cause fire or explosion. If the rechargeable batteries needs to be replaced, contact ndb Technologies to order a new set. Refer to the Battery replacement section of this manual for more details.

Introduction

The LRM-10 is a high precision micro-ohmmeter that can be paired with a great variety of accessories. Many applications are available such as low resistance measurement on circuit breakers, soldering, connectors, wires, metal plates, battery inter-cell connections, Cadweld® exothermic soldering, etc…

Kit content

The kit content is described below:

- LRM-10 digital micro-ohmmeter
- Six rechargeable NiMH AA batteries
- Battery charger
- Set of dual hand probe LRM-4015HD
- Nylon mesh protective bag
- Set of standard measuring cables with clips (DRM-403)
- Communication cable and adapter
- Calibration certificate
- User Manual

Technical specifications

	LRM-10
Measuring range	0.01μΩ to 200Ω
Display	LCD display 128 x 64 pixels
Current	10A, 250mA, 5mA
Resolution	0.01 μΩ
Power supply	Six AA NiMH batteries
Autonomy (number of measurements)	12 000 at 10A, 10 000 at other currents
Operating temperature	-20°C to 50°C*
Charging temperature	0° to 50°C
Storage temperature	-40°C to 50°C
Humidity	0 to 95% non-condensing
Weight	0.86kg
Dimensions	203 x 114 x 51 mm

*Using the instrument below 0°C shortens the battery duration time. Cable length can also affect battery duration time. The instrument's accuracy remains unaffected.

LRM-10 – Scales						
Scale	Current	Measurement error	Scale Error		Common mode reject error	
200 Ω	5mA	0.1%	± 2 counts	0.02 Ω	-	-
20 Ω	5mA	0.1%	± 2 counts	0.002 Ω	-	-
2 Ω	250mA	0.1%	± 2 counts	0.0002 Ω	-	-
200 mΩ	250mA	0.1%	± 2 counts	0.02 mΩ	-	-
20 mΩ	10A	0.1%	± 2 counts	0.002 mΩ	-	-
2 mΩ	10A	0.1%	± 2 counts	0.0002 mΩ	-	-
200 μΩ	10A	0.1%	± 2 counts	0.02μΩ	± 2 counts	0.02μΩ
20 μΩ	10A	0.1%	± 2 counts	0.02μΩ	± 2 counts	0.02μΩ

Overview

The figure below shows an overview of the LRM-10 features.

1. **Probe connector**: Allows the user to connect a probe to the LRM-10 micro-ohmmeter.

2. **Charger & RS232 communication port**: Allows charging the batteries and transferring the measurement data to a computer.

3. **I/O button:** Press to turn ON or OFF the instrument.

4. **Backlight button:** Press to activate the display backlight.

5. **Mode button:** Press to change the measurement mode.

6. **Display:** The LCD screen displays the measurement data.

7. **Go button**: Press to start a new measurement.

8. **Battery compartment:** Only use the recommended batteries.

Settings

Follow the steps below to adjust the instrument's settings.

- Turn ON the instrument by pressing the I/O button.

- Press and hold (approximately 6sec) the MODE button until the System Menu appears, see figure below.

- Press the MODE button to select the parameter to set.

    o **Frequency:** Select the electric network frequency where the LRM-10 micro-ohmmeter will be used (50Hz or 60Hz). This feature allows a reduction of the reading errors due to nearby electromagnetic induction on the test leads.

    o **Language:** Select the preferred language between English and French.

    o **Contrast:** Adjust the display's contrast.

- Press the Backlight button or the GO button to set the parameter.

- When completed, press and hold (approximately 6sec) the MODE button until the System Menu disappears.

Operation

- Connect the test leads to the LRM-10 micro-ohmmeter. Make sure to connect each lead in the proper connector of the same color, on the LRM-10 micro-ohmmeter.
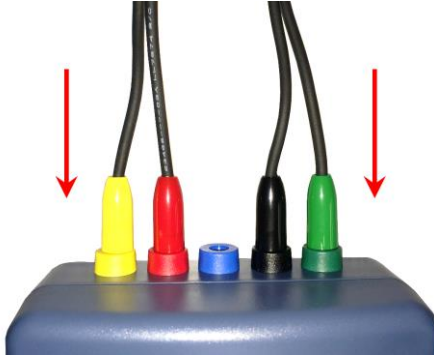
- The yellow and green clips are installed to both extremity of the device under test. They allow a pulsed current to travel through the device under test.
- The red and black clips are installed between the two current injection points (yellow and green). The instrument will measure the voltage drop between the red and black clips. The instrument will then be able to measure the resistance between the red and black clips. See figure below:
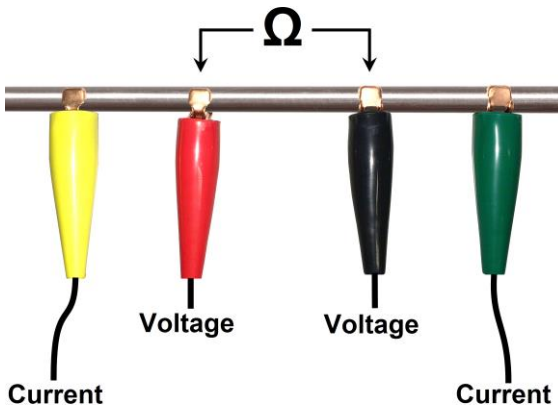
- The result is shown on the display, see the above figure.
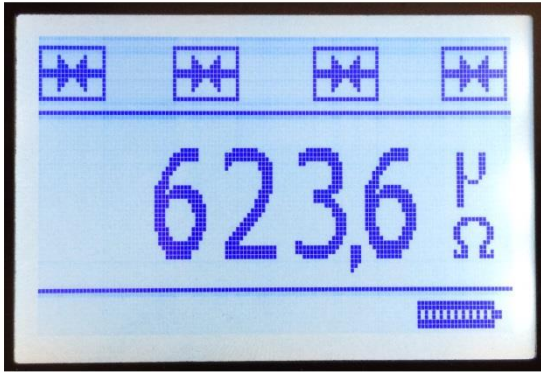
- To manually start a new measurement, press the GO button.

- If the LRM-10 detects a bad connection, the ''BAD CONNECTION'' error message will be displayed. In this case, check the quality of contact of each clip.
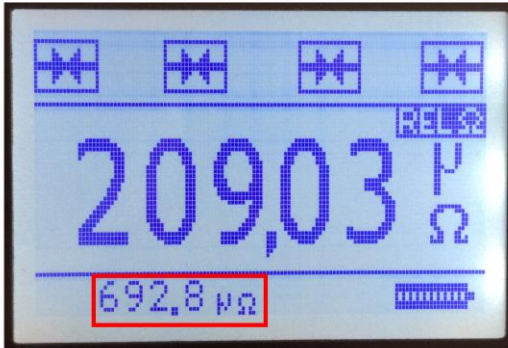
Modes

The LRM-10 instrument features five modes:

Standard mode: Allows taking a resistance measurement and displaying the reading.

Relative mode: A reference measurement is taken in the standard mode, and then the instrument is switched to the relative mode by pressing the MODE button. Taking a second measurement will display the resistance difference between the two readings.

Example: A measurement was taken in the standard mode (692.8 micro-ohms). The MODE button was pressed to select the relative mode. A new measurement was taken. The difference between the previous reading and the new reading is displayed (209.03 micro-ohm). The value in the red rectangle is the reference reading, previously taken in the standard mode.

Relative % mode: Similar to the relative mode, the Relative % mode displays the resistance difference between the two readings, in percentage.

Motor mode: Allows measuring the winding resistance in a very small coil. This mode increases the output's duty cycle in order to saturate the measured coil.

OK/X mode: Allows showing the difference between the previous reading taken in the standard mode, and the new measurement taken in the OK/X mode. After the reading is taken in the standard mode, press the MODE button until you reach the OK/X mode, then take a new measurement by pressing the GO button. If the new reading is lower than the reading from the standard mode, the LRM-10 displays OK, otherwise, it displays X.

Start a new measurement

To start a new measurement, the user can press the GO button on the instrument's keypad.

Another way to start a new measurement is to momentarily (~1 sec) short the blue and green connectors. This feature allows the integration of the LRM-10 micro-ohmmeter in a more complex system where it could be controlled, for example, by a computer or an N/O (normally open) switch.
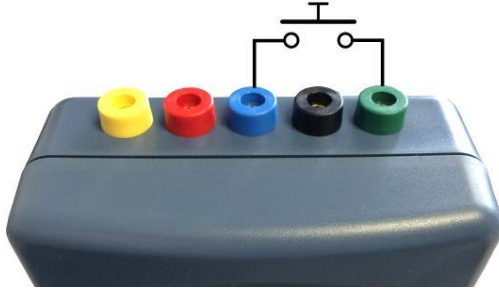
Accessories and spare parts

The following accessories are available for the LRM-10 micro-ohmmeter.

Item number	Description	Figure
NDB-HSC	Hard shell case	
DRM-4014	Nylon mesh protective bag (micro-ohmmeter not included)	
DRM-403	Set of standard measuring cables with clips	

DRM-4015	Double hands probe with replaceable tips	
DRM-4015-2MM	2MM tip for DRM-4015 or LRM-4015HD	
DRM-4015-SP	Long spring pin adapter for DRM-4015 and LRM-4015HD	
DRM-4040-	Set of four pins for DRM-4015 and LRM-4015HD	
LRM-4015HD	Dual hand test probe, heavy duty version, with replaceable tips	
DRM-4017-19	Kelvin clamps 19mm (3/4'')	
DRM-4017-35	Kelvin clamps 35mm (1 3/8'')	
DRM-4012	Exothermic welding test probe (Cadweld®test)	
DRM-4013	Sample resistance 9.5 micro-ohm	
GET-40	Temporary ground cable test set	
GET-401	Torque wrench and socket for GET-40	
XDP-103 and XDP-104	Data transfer kit (cable and RS232 to USB converter)	
NDB-BAT	Battery replacement kit for LRM-10	

Dual hands probes

The DRM-4015 and LRM-4015HD probes are easy to use on any metallic surface. Their spring loaded tips allows a good electrical contact on the conductor to test. The next figure shows the DRM-4015 probes on a metallic surface. The black dots (DRM-4015) or red dots (LRM-4015HD) should always be facing one another while performing the test. This ensures that the voltage reading points are inside the current injection points.
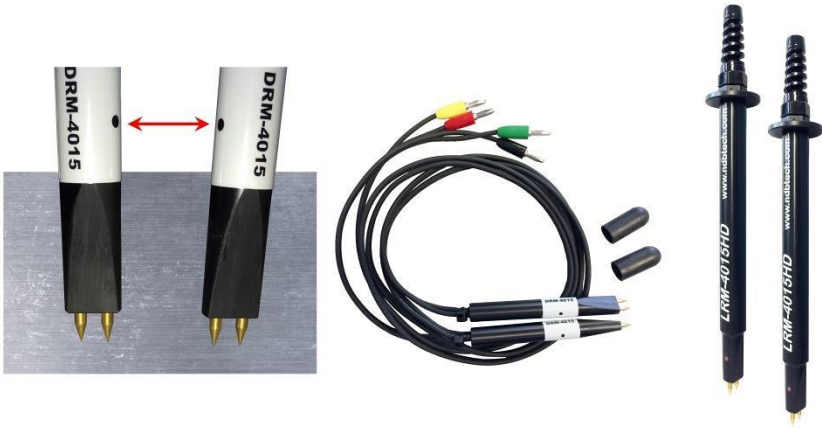
After multiple usages, the probe's tips can start to round which leads to bad electrical contact. To replace the pins, gently pull them out of the probe using long noise pliers. Insert the new pins using the same technique.

Some applications require applying the probe's tips on limited space. The DRM-4015-2MM (figure below top) or DRM-4015-SP (figure below bottom) can be used to achieve this task. To install these adapters, simply remove the standard pins from the probe, and insert the adapter of your choice.

DRM-4015-2MM installed on a DRM-4015 probe:

Kelvin clamp probes

The DRM-4017-19 and DRM-4017-35 kelvin probes are used with the LRM-10 micro-ohmmeter to measure resistance on cables, rods, or any other metallic surface. They integrate the four terminals measurement technique.

14

Exothermic Cadweld® probe

The DRM-4012 probe is designed to allow testing Cadweld® exothermic welding with the LRM-10 micro-ohmmeter. Its special design allows repeatable readings and easy handling.

Note: A sample resistor may be used to test Cadweld® welding in relative mode.

Temporary grounding jumper tester

The GET-40 device is an easy-to-use and accurate Grounding Jumper Tester using four points measuring method. The micro-ohmmeter is installed on top of the GET-40, and the test cables are connected on top of it.

Resistor sample

Resistor samples are available to facilitate the use of the LRM-10 micro-ohmmeter in relative mode. The sample is used to take the initial measurement and to set the reference value. Then, the instrument can be used to measure the unit(s) under test in the relative mode. Refer to the mode section of this manual for more details.

Next figure shows the DRM-4013 (9.5µΩ) installed on the LRM-10 micro-ohmmeter.

Note: Resistor samples are not as precise as calibration shunt resistors. Therefore, they should not be used to validate the instrument precision.

Protection and transport

The DRM-4014 nylon mesh bag and NDB-HSC transportation case are designed to protect the LRM-10 micro-ohmmeter from on water, dirt and impacts that could damage the instrument. Using such protection is suggested to preserve your LRM-10 micro-ohmmeter.

Data transfer

The LRM-10 features the capability to send reading data to a computer using its serial communication port (the same connector is also used to charge the batteries).

- Connect the LRM-10 micro-ohmmeter to a PC computer using the XDP-103 and XDP-104 accessory. See next figure:

- In Windows, open the Control Panel.
- Open Device Manager.
- Select the Serial Port.
- Configure the Serial Port:
    - Bits per second: 19200
    - Data bits: 8
    - Parity: None
    - Stop bit: 1
    - Row control: None

19
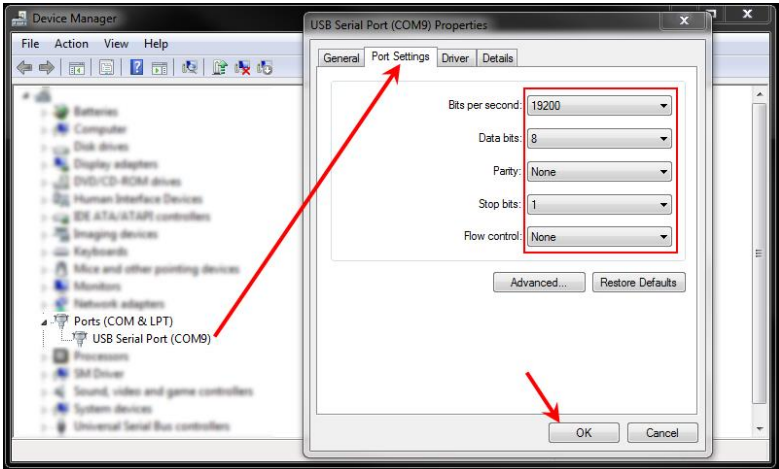
- Start the serial communication software of your choice.
- Start taking measurement on the LRM-10 micro-ohmmeter, the values are shown on the serial communication software.
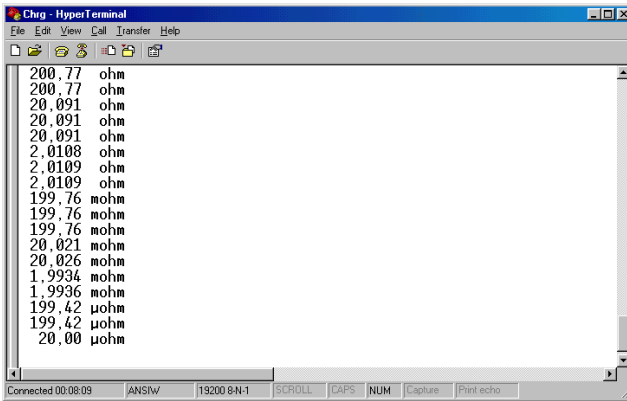
Batteries

The LRM-10 micro-ohmmeter uses six AA type NiMH rechargeable batteries.

o It is recommends to always use the battery model sold by ndb Technologies. The charging circuit was designed to charge this specific battery model. Attempting to use any other battery model could result in permanent damage of the instrument and/or the batteries.
o When installing new batteries, make sure to respect the polarity.