10 Amperes max. test current

Micro-Ohm Meter

Model : MO-2014

OPERATION MANUAL

TABLE OF CONTENTS

1. FEATURES

* 4 terminal devices for accurate measurement of very low resistance.
* Ideal for measuring the resistance of components precisely.
* Ideal for testing protective conductors, lightning conductors and welded points.
* Maximum test current is 10A (60000 uΩ range only).
* Have two working mode , Resistive and Inductive mode, Normal is resistive mode.
* Good / Fail set-function for input quality control.
* Built-in in buzzer sound (GOOD STATUS) to assist the Q.C. judgment.
* Especial "CALCULATE" function to measure cable / wire length.
* Wide measuring range, 5 u Ω - 6K Ω , 6 ranges.
* Large size and back-light LCM display, easy read-out.
* LSI circuit provides high accuracy, reliability and durability.
* Built-in over input protection.
* Durable bench type housing plastic case stand.

2. SPECIFICATIONS

2-1 General Specifications

Test Range (Test Current)	60000 uΩ (10 A DC)
	600 m Ω (1 A DC)
	6000 mΩ (100 mA DC)
	60000 mΩ (10 mA DC)
	600 Ω (1 mA DC)
	6000 Ω (100 uA DC)
Warning Setup	* Warning LCD Indicator * Buzzer
Operating Temp.	0 to 50℃ (32 to 122℉).
Operating Humidit	Less than 80 % R.H..
Power Supply	DC 1.5 V , AA (UM-3)Battery X 8 PCs . AC to DC 9V Power adapter .

Fuse protect	* 10 A / 250 V * Size : 6.3 X 32 mm dia..
Dimension	225 x 125 x 64 mm (8.86 x 4.92 x 2.52 inch)
Weight	Approx. 790 g (1.74 LB).
Standard Accessories	4 wire with 2 Kelvin clips........1 pair Instruction Manual.................1 PC AC/DC 9V power adapter...........1 set
Optional Accessories	* USB cable, USB-01. * RS232 cable, UPCB-02. * Data Acquisition software, SW-U801-WIN., SW-E802. * SD card data recorder, DL-9602SD

2-2 Electrical Specifications (23± 5 ℃)

Range	Resolution	Test current	Accuracy
60000 u Ω	1 u Ω	10 A	
600 m Ω	10 u Ω	1 A	
6000 mΩ	100 u Ω	100 mA	± (0.25 % + 25 d)
60000 mΩ	1000 u Ω	10 mA	
600 Ω	10 mΩ	1 mA	
6000 Ω	100 mΩ	100 uA	± (0.75 % + 3 d)

@ The above accuracy is based on the reading value.
@ Spec. tested under the environment RF Field Strength less
    than 3 V/M & frequency less than the 30 MHz only.

Range	Open Circuit Voltage
60000 u Ω	Approx. DC 4.33 V
600 m Ω	Approx. DC 4.33 V
6000 mΩ	Approx. DC 4.33 V
60000 mΩ	Approx. DC 4.33 V
600 Ω	Approx. DC 4.33 V
6000 Ω	Approx. DC 4.33 V

3. FRONT/REAR PANEL DESCRIPTION
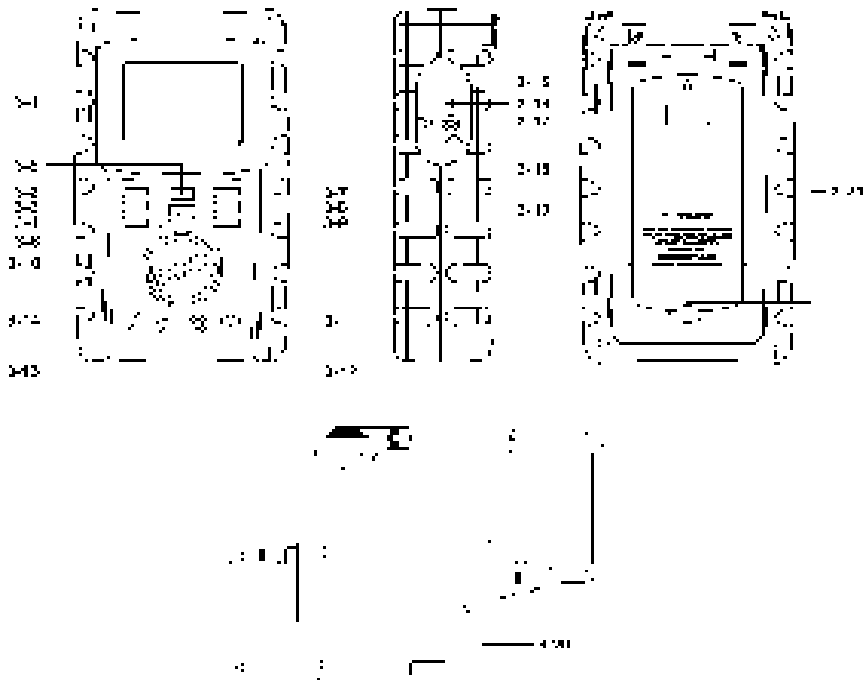
Fig. 1

3-1 Display
3-2 Backlight key button
3-3 Zero key button
3-4 SET / TEST key button
3-5 HOLD key button
3-6 START / STOP key button
3-7 L / ▲ key button
3-8 Beep / ◀ key button
3-9 COMP / ▼ key button
3-10 Power / Range rotary
     switch

3-11 Force Terminal "+"
3-12 Sense Terminal "+"
3-13 Sense Terminal "-"
3-14 Force Terminal "-"
3-15 RS232 socket
3-16 Reset button
3-17 DC 9V power adapter socket
3-18 Battery Cover / Battery
     compartment
3-19 Stand
3-20 AC/DC 9V power adapter
3-21 Battery cover screws

3

4. BASIC 4 WIRES MEASURING PRINCIPLE

The DIGITAL MICRO-OHM METER is a precise, wide range, small resistance and high resolution measuring instrument. As for preventing any measuring errors, especially to avoid the influence of "LEAD STRAY RESISTANCE" or "TEST WIRE'S RESISTANCE", the meter is designed according to the following "4 WIRES MEASURING PRINCIPAL" to maintain the meter in high accuracy.
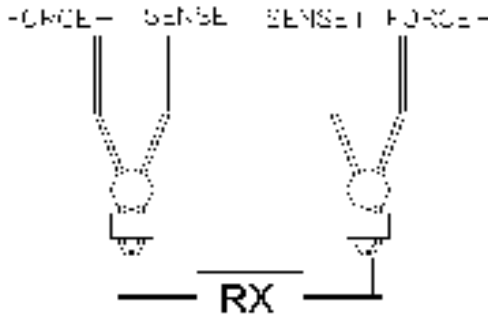
Fig. 2

* Please refer to 2-2 Electrical Specification (page 2), each range exists fixed test current (from 6000 Ω to 60000 uΩ .
* The fixed current flow through the unknown resistor Rx.
* From the terminal " Sense + " and " Sense - " can measure a voltage Vx = Is x Rx.
* According the Vx value, then meter can get the unknown resistance (Rx) values from following formula :

$$Rx = Vx / Is$$

* The measured resistance value between "Sense +" and "Sense -"is not affected by any stray resistance of test wire.

5. PRECAUTION & PREPARATIONS FOR MEASUREMENT

* Please check carefully the meter's power supply is DC 9V power adapter before operating at 60000 uΩ range .

* It's prohibited to input voltage to the 4 wire input terminal (Force +, Sense +, Sense -, Force -) to prevent any internal circuit damage.

6. MEASURING PROCEDURES

6 -1 Buttons instructions

Buttons	Function
Backlight Button	Press this key to turn backlight on and off.
ZERO Button	When the display indicate few reading before measure .
SET/TEST Button	Press this key to do HI / LO limit setup.
	Press this key return to TEST status.
HOLD Button	Press this key to do data hold .
START/STOP Button	Press this key to starting measurement or stop.
L/▲ Button	Press this key to setting work mode (Resistive or Inductive).
	Press this key to adjust up value.
BEEP/◄ Button	Press this key to open / close buzzer function.
	Press this key to select digit unit.
COMP / ▼ Button	Press this key to start "GOOD , FAIL " status judgment.
	Press this key to adjust down value.

6 -2 Symbols & units of display

Symbol & Unit	Function
uΩ ,mΩ ,Ω	Ohm unit
.)))	Appears on the "BEEP" function have started.
HOLD	Appears on the"HOLD" function have started.
GOOD	It is pass Q.C. Appears on finished compare operate.
FAIL	It is higher or lower than maximum or minimum acceptance value . Appears on finished compare operate.
COMP	Appears on the"COMPARE" function.
L	Appears on the"INDUCTIVE" mode.
H I	Appears to showing H I limit.
LO	Appears to showing LO limit.

6 -3 Resistance Measurement

1) Power on the instrument by rotate the "Power / Range rotary switch" (3-10, Fig. 1) to exit the " OFF " position and then select measuring range from 60000 uΩ to 6000 Ω according to your requirement.

Note :
* **Always select the highest range (6000 Ω) if you don't know the resistance value of the resistor and then select lower range in sequence.**
* **At 60000 uΩ (10A)must use DC 9V adapter from socket (3-17, Fig. 1).**
* **Over range LCD shows " ----- ".**
* **Can't measure the resistance value, LCD will show 0.0000, 0.000 or 0.00.**

---

2) Connect the
   * Red cable (with white O ring marker) to " Force + "
      terminal (3-11, Fig. 1)
   * Red cable (no white O ring marker) to " Sense + "
      terminal (3-12, Fig. 1)
   * Black cable (with white O ring marker) to " Force - "
      terminal (3-13, Fig. 1)
   * Black cable (no white O ring marker) to " Sense - "
      terminal (3-14, Fig. 1)
3) Connect the 2 Kelvin clips as following Fig. 3 to measure
   the unknown resistance.
4) Press the "START / STOP" key (3-6, Fig. 1) will start
   measure the unknown device.
   Press once again will stop measure function and
   froze the result at LCM.
5) When your tested material has inductive, you can press
   " L/▲ " key (3-7, Fig. 1) for change to inductor mode
   (at 600 mΩ and 60000 uΩ range) , Display will showing
   " L " mark. normal is resistor mode.

7. HI/LO WARNING SETUP

This instrument has Hi, Lo warning value setup function
and a buzzer which are specially designed for quality
control.
Primary to press the " SET / TEST " (3-4, FIG. 1)
button enter setting mode.

1) Hi warning value setup

   The last digit should flash at " H i warning value " on
   the display . Then press " L / ▲ " buttons (3-7, Fig.
   1) to increase or " COMP / ▼ " buttons (3-9, Fig. 1)
    to decrease digit that you want to alter large value,

press the " BEEP / ◄ " buttons (3-8 , Fig. 1) set
warning value , When user to move 1st digit unit to
next digit unit (10th, 100th. 1000th).
   *** Hypothesize display be set at 180.00 .***

2) | LO warning value setup |

Finished (1) procedure then press the " SET / TEST "
button (3-4, Fig. 1) again, The last digit should flash
at " LO warning value " on the display . Other
operate way same above explain.
   *** Hypothesize display be set at 179.00   .***

3) Finished (1)(2) procedure then press the " SET /
   TEST " button (3-4, Fig. 1) once . The function
   should return to TEST MODE and indicate measure
   value when clipping the resistor.

4) When measuring period press " COMP / ▼ " (3-9 ,
   Fig. 1) button once, The display will show " GOOD "
   or " FAIL " symbol to inform be measure results.

   For example
   a. The value was readout 179.50 , The display
      should show " GOOD " symbol and buzzer sounds.(
      If buzzer function have been press on status, The
      buzzer sounds can to assist Q.C judgment) The
      resistance value within the accuracy Pass the Q.C.

   | *** Press " BEEP / ◄ " (3-8, Fig 1) button once**
   will start buzzer, press once again to disable
   " BEEP " function.* |

   b. The value was readout 180.10 or 178.60, The
      display should show   " FAIL " symbol, The
      resistance value out of the accuracy.

8

8. CALCULATE CABLE/WIRE LENGTH

Before calculate cable length . You should sampling one unit length (meter or feet).
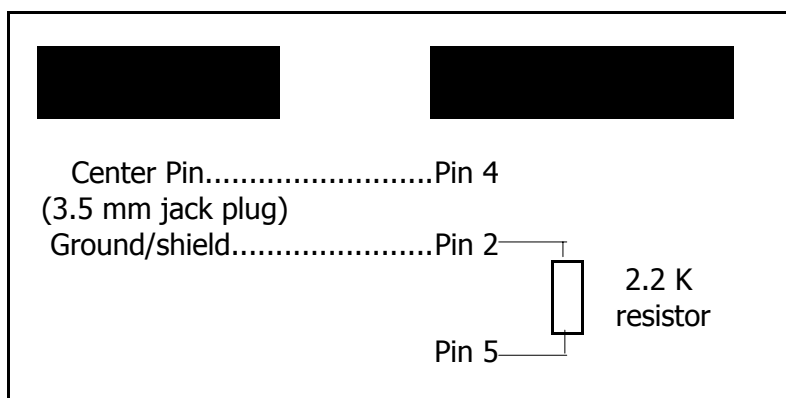
1) Primary to take one sample from a lot of cable or wire then to to measure 1 m or 1 feet length - unit.

2) Measue the unknown cable . wait a moment unitl the reading have been stable . Stop the measure action and hold the range.

3) Press " HOLD " button (3-5, Fig. 1) to release HOLD status.

4) Press " SET / TEST " button (3-4 , Fig.1) more than three secoends into sample unit mode.

5) Then press " L / ▲ " button (3-7 , Fig.1) or " COMP / ▼ " button(3-9 , Fig.1) to select unit (meter or feet).

6) Press " START / STOP " button (3-6 , Fig.1) to sampling unit value.

7) Press " SET / TEST " button (3-4 , Fig.1) to save the value and showing the cable length .
   Now is already measurement unknown cable length.

8) Once press "SET / TEST" button (3-4 , Fig.1) more than 3 secend . Will return to measure mode .

9. RS232 PC SERIAL INTERFACE

The instrument has RS232 PC serial interface via a 3.5 mm terminal (3-15, Fig. 1).

The data output is a 16 digit stream which can be utilized for user's specific application.

A RS232 lead with the following connection will be required to link the instrument with the PC serial port.

Center Pin.........................Pin 4
(3.5 mm jack plug)
 Ground/shield.....................Pin 2

2.2 K resistor

Pin 5

The 16 digits data stream will be displayed in the following format :

Each digit indicates the following status :

D15	Start Word, 02
D14	4
D13	1

D12, D11	Annunciator for Display		
	Ω = 38	mΩ = B1	uΩ = F5
D10	Polarity 0 = Positive 1 = Negative		
D9	Decimal Point(DP), position from right to the left 0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP		
D8 to D1	Display reading, D1 = LSD, D8 = MSD For example : If the display reading is 1234, then D8 to D1 is : 00001234		
D0	End Word, 0D		

RS232 FORMAT : 9600, N, 8, 1

Baud rate	9600
Parity	No parity
Data bit no.	8 Data bits
Stop bit	1 Stop bit

10. BATTERY REPLACEMENT

1) When the left corner of LCD display show "   ", it is necessary to replace the battery. However, in-spec. measurement may still be made for several hours after low battery indicator appears before the instrument become inaccurate.
2) Loose the " Battery Cover Screws " (3-21, Fig. 1) and take away the " Battery Cover " (3-18, Fig. 1) from the instrument and remove the battery.
3) Replace with DC 1.5 V battery (UM3, AA, Alkaline/heavy duty) x 8 PCs, and reinstate the cover.
4) Make sure the battery cover is secured after changing the batteries

1403-MO2014