# DUAL DISPLAY L/C/R METER

# MZ-505C





- 0 MI1972 -

# NOTAS SOBRE SEGURIDAD

Antes de manipular el equipo leer el manual de instrucciones y muy especialmente el apartado PRESCRIPCIONES DE SEGURIDAD.

El símbolo /! sobre el equipo significa "CONSULTAR EL MANUAL DE INSTRUCCIONES". En este manual puede aparecer también como símbolo de advertencia o precaución.

Recuadros de **ADVERTENCIAS Y PRECAUCIONES** pueden aparecer a lo largo de este manual para evitar riesgos de accidentes a personas o daños al equipo u otras propiedades.

# SAFETY NOTES

Read the instruction manual before using the equipment, mainly "SAFETY RULES" paragraph.

The symbol *I* on the equipment means "SEE USER'S **MANUAL**". In this manual may also appear as a Caution or Warning symbol.

**Warning and Caution** statements may appear in this manual to avoid injury hazard or damage to this product or other property.

# SUMARIO CONTENTS



@ English manual.....



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# **DUAL DISPLAY L/C/R METER**

# MZ-505C

# 1 GENERAL

## 1.1 Introduction

This 19.999 count L/C/R hand-held meter is a special microprocessor-controlled meter for measuring functions of inductance, capacitance and resistance. Simple to operate, the instrument not only takes absolute parallel mode measurements, but also capable of series mode measurement. The meter provides direct and accurate measurements of inductors, capacitors and resistors with different testing frequencies. It is selectable for auto and manual ranging.

Front panel pushbuttons maximize the convenience of function and feature selection such as data hold; maximum, minimum and average record mode; relative mode; tolerance sorting mode; frequency and L/C/R selection.

The test data can be transferred to PC through an full isolated optical **RS232C** interface.

A tilt stand provides position flexibility for viewing and operating the meter. The over-melding plastic and rubber case protects the meter to be stronger. With single 9V battery operation is standard for the meter, a DC 12V power adaptor can also be used as an optional power input.



1.2 Specifications			
Parameters measured	L <sup>S</sup> + (Q, D, RS), L <sup>P</sup> + (Q, D, RP), C <sup>S</sup> + (Q, D, RS), C <sup>P</sup> + (Q, D, RP).		
Displays			
L/C/R	Maximum Display 4 ½ digit 19999 counts.		
Q/D/R	Display 4 digit 999.9 count maximum (Autoranging).		
Measuring ranges			
C (120 Hz)	1 pF ~ 10 mF (basic accuracy $0.7\%$ )		
C (1 kHz)	0.1 pF ~ 1000 μF (basic accuracy 0.7 %).		
L (120 Hz)	1 μH ~ 10000 H (basic accuracy 0.7 %).		
L (1 kHz)	0.1 μH ~ 1000 H (basic accuracy 0.7 %).		
R	1 m $\Omega$ ~ 10 MH $\Omega$ (basic accuracy 0.5 %)		
Resolution			
R	Up 0.001 Ω.		
L	Up 0.1 μH.		
С	Up 0.1 pF.		
Ranging mode	Auto & Manual.		
Measuring terminals	2 terminals with sockets.		
Test frequency	1 KHz, 120 Hz.		
Tolerance mode	1 %, 5 %, 10 %, 20 %.		
Measuring rate	1 measurement x seconds, nominal.		
Response time	Approx. 1 second at manual range.		
Auto power-off	10 minutes approx. without		
Temperature coefficient	$0.15 \times (\text{specific accuracy})/^{\circ}$		
	(0-18 °C and 28-40 °C).		



Low battery indicator Voltage measurement Input protection	The symbol $\stackrel{[]}{\xrightarrow[]{\bullet}]{\bullet}}$ appears on the screen. 600 mV AC. Fuse.
POWER SUPPLY Internal External Consumption	Battery 9 V IEC6F22. 12 to 15 V DC. Aprox. 12 mA for operation 0.03 mA After auto power-off
Operating environmental con Altitude Temperature range Max. relative humidity	ditions Up to 2000 m From 0 °C to 40 °C 80 % (up to 31 °C), decreasing lineally up to 50% at 40 °C
Mechanical properties Dimensions Weight	L. 91 x W. 192 x H. 52,5 (mm). Aprox. 365 gr. (Accessories Included).
Standard accessories	Test alligator clips (pair). Kit for RS-232 + software. DC 9V battery (IEC 6F22 ). Instruction Manual.
Optional accessories	SMD Tweezers PP-009.



# **Ranges and accuracies**

Accuracy  $\pm$  (% of reading  $\pm$  num. of digits) at 23°C  $\pm$ 5°C, RH<75%.

#### Resistance

Pango	Maximum	Accuracy		Specified Note		
naliye	Display	at 120 Hz	at 1 KHz	Specified Note		
10 MΩ	10 MΩ	±(2.0%+8 dig)	± (2.0%+8 dig)	After open cal.		
<b>2M</b> Ω	1.9999MΩ	± (0.5%+5 dig)	± (0.5%+5 dig)	After open cal.		
200kΩ	199.99kΩ	± (0.5%+3 dig)	± (0.5%+3 dig)	-		
20kΩ	19.999kΩ	± (0.5%+3 dig)	± (0.5%+3 dig)	-		
2kΩ	1.9999kΩ	± (0.5%+3 dig)	± (0.5%+3 dig)	-		
200Ω	199.99Ω	± (0.8%+5 dig)	± (0.8%+5 dig)	After short cal.		
20Ω	19.999Ω	± (1.2%+4 dig)	± (1.2%+4 dig)	After short cal.		

#### Test Frequency: 120 Hz / 1 KHz

## Capacitance

#### Test Frequency: 120 Hz

Dango	Maximum	Α	Specified	
nange	Display	Capacity.	DF	Note
20mF	10mF	± (5.0%+5 dig) DF<0.1	± (10%+100/Cx+5 dig) (DF<0.1)	After short cal.
2000µF	1999.9μF	± (1.0%+5 dig) DF<0.1	± (2%+100/Cx+5 dig) (DF<0.1)	After short cal.
200µF	199.99μF	± (0.7%+3 dig) DF<0.5	± (0.7%+100/Cx+5 dig) (DF<0.5)	-
20µF	19.999μF	± (0.7%+3 dig) DF<0.5	± (0.7%+100/Cx+5 dig) DF<0.5	-
2000nF	1999.9nF	± (0.7%+3 dig) DF<0.5	± (0.7%+100/Cx+5 dig) DF<0.5	-
200nF	199.99nF	± (0.7%+5 dig) DF<0.5	± (0.7%+100/Cx+5 dig) DF<0.5	After open cal.
20nF	19.999nF	± (1.0%+5 dig) DF<0.1	± (2%+100/Cx+5 dig) DF<0.1	After open cal.



Danga	Maximum		Accuracy	Specified
папуе	Display	Capacity.	DF	Note
2000μF	1000.0µF <sup>(2)</sup>	± (5.0%+5 dig) DF<0.1	± (10%+100/Cx+5 dig) DF<0.1	After short cal.
200μF	199.99µF <sup>(3)</sup>	± (1.0%+5 dig) DF<0.1	± (2.0%+100/Cx+5 dig) DF<0.1	After short cal.
20µF	19.999µF	± (0.7%+3 dig) DF<0.5	± (0.7%+100/Cx+5 dig) DF<0.5	-
2000nF	1999.9nF	± (0.7%+3 dig) DF<0.5	± (0.7%+100/Cx+5 dig) DF<0.5	-
200nF	199.99nF	± (0.7%+3 dig) DF<0.5	± (0.7%+100/Cx+5 dig) DF<0.5	-
20nF	19.999nF	± (0.7%+5 dig) DF<0.5	± (0.7%+100/Cx+5 dig) DF<0.5	After open cal.
2000pF	1999.9pF	± (1.0%+5 dig) DF<0.1	± (2.0%+100/Cx+5 dig) DF<0.1	After open cal.

## Test Frequency: 1 KHz

Notes: Q Value is the reciprocal of DF (dissipation factor). This specification is based on the measurement performed at the test socket.

#### Inductance

#### Test Frequency: 120 Hz

Dango	Maximum	Accura	Specifie	
nange	Display	Inductance	DF	d Note
20000H	10000H	unspecified	unspecified	-
1000H	999.9H	± (1.0%+ Lx/10000% +5 dig) DF<0.5	(2%+100/Lx+5 dig) DF<0.5	After open cal.
200H	199.99H	± (0.7%+ Lx/10000%+5 dig) DF<0.5	(1.2%+100/Lx+5 dig) DF<0.5	-
20H	19.999H	± (0.7%+ Lx/10000%+5 dig) DF<0.5	(1.2%+100/Lx+5 dig) DF⊲0.5	-
2000m	1999.9mH	± (0.7%+ (Lx/10000)%+5 dig) DF<0.5	(1.2%+100/Lx+5 dig) DF<0.5	-
200m	199.99mH	± (1.0%+ Lx/10000%+5 dig) DF<0.5	(3%+100/Lx+5 dig) DF⊲0.5	After short cal.
20m	19.999mH	± (2.0%+ Lx/10000%+5 dig) DF<0.5	(10%+100/Lx+5 dig) DF⊲0.5	After short cal.



## Test Frequency: 1 KHz

	Maximu	Accur	Accuracy	
Range	m Display	Inductance	DF	d Note
2000H	1000.0	unspecified	unspecified	
200H	199.99H	± (1.0%+ Lx/10000%+5 dig) DF<0.5	± (2.0%+100/Lx+5 dig) DF<0.5	After open cal.
20H	19.999H	± (0.7%+ Lx/10000%+5 dig) DF<0.5	± (1.2%+100/Lx+5 dig) DF<0.5	-
2000mH	1999.9mH	± (0.7%+ Lx/10000%+5 dig) DF<0.5	± (1.2%+100/Lx+5 dig) DF<0.5	-
200mH	199.99mH	± (0.7%+ Lx/10000%+5 dig) DF<0.5	± (1.2%+100/Lx+5 dig) DF<0.5	-
20mH	19.999mH	± (1.0%+ Lx/10000%+5 dig) DF<0.5	± (3.0%+100/Lx+5 dig) DF<0.5	After short cal.
2000µH	1999.9μH	± (2.0%+ Lx/10000%+5 dig) DF<0.5	± (10%+100/Lx+5 dig) DF<0.5	After short cal.

Notes: Q Value is the reciprocal of DF.

This specification is based on the measurement performed at the test socket.



# **2 SAFETY RULES**

- \* The safety could not be assured if the instructions for use are not closely followed.
- \* When measuring components in circuit you must previously disconnect the power supply.
- \* When measuring capacitors is necessary to discharge them previously.
- \* When using some of the following accessories **use only the specified ones** to ensure safety:

Battery 9V 6F22.

- \* Observer all **specified ratings** both of supply and measurement.
- \* Use this instrument under the **specified environmental** conditions.
- \* Remember that voltages higher than **70 V DC** or **33 V AC rms** are dangerous.
- \* The user is only authorised to carry out the following maintenance operations:

Replace the battery.

Fuse replacement

On the Maintenance paragraph the proper instructions are given.

Any other change on the equipment should be carried out by qualified personnel.



- \* Follow the cleaning instructions described in the Maintenance paragraph.
- \* Symbols related with safety:





# **3 OPERATING INSTRUCTIONS**

# 3.1 Description of the controls and elements.



Figure 1.- MZ-505C, front panel.

- 1. LCD display.
- 2. O Power ON/OFF button.





7

- 0

Scale button.

4. HOLD

5

6.

8.

- Standby button and data on the backlight.
- Mode Selection button on.
- Test button frequency selection.
- 7. PAL SER E

3

- Button Parallel or Serial selection.
- Resistance function selection button, Capacity and Inductance.
- 9. Q/D/R Selection button Q/D/R.
- 5 10. MIN MAX
- Read-button preset selection Max, Min and Average.
- 11. SET Adjustment Button.
- 12. LIMITS Adjustme
  - Adjustment knob upper and lower limits.
- **13.** Tolerance selection button.
- 14. Input terminals and sockets.
- 15. RS-232 Output optocoupler.
- 16. 12V DC input connector. External power supply.
- 17. Optic interface.



# 3.2 LCD Display illustration



Figure 2.- LCD Display.

- 1. APO On AutoShutdown indicator.
- 2. RS232 RS232 indicator.
- 3. R Record mode indicator.
- 4.  $\Delta$  Mode indicator on.
- 5. MAX Maximum reading indicator.
- 6. TOL Tolerance mode indicator.
- 7. MIN Minimum reading indicator.
- 8. AVG Average reading indicator.
- 9. R Indicator of resistance in series or parallel.



- **10. Q** Quality factor indicator.
- **11. D** Dissipation factor indicator.
- 12. SER Series mode indicator.
- **13. PAL** Parallel mode indicator.
- 14. 8888 Secondary display.
- **15.** % Tolerance (percentage) indicator.
- **16. KM** $\Omega$  Resistance (M $\Omega$  / k $\Omega$  /  $\Omega$ ) indicator.
- 17. 1kHz Frequency indicator.
- 18. 120Hz Frequency indicator.
- **19.** (1)) Beeper tone indicator for tolerance mode.
- **20.** KMΩ Resistance  $(M\Omega / k\Omega / \Omega)$  indicator.
- **21.**  $\mu$ **mH** Inductance ( $\mu$ H / mH, H) indicator.
- 22. nµnpF Capacitance (pF / µF / mF / F) indicator.
- 23. AUTO Auto-ranging indicator.
- 24. H Indicator data retention.
- 25. SET Mode Indicator Set.
- 26. LCR L=inductance, C=capacitance or R=resistance function indicator.



Indicator of high tolerance limits.



- Indicator of low tolerance limits.
- 29. **±=**: Low battery indicator.



## Special indication characters

- SHRT Indicates short connectors for calibration mode
- **OPEN** Indicates open connectors for calibration mode
- **CRL** Indicates calibration mode.
- FUSE Indicates damaged or open fuse.

# 3.3 How to operate

CAUTION



Note: For achieving optimum precision for all L, C and R measurements at either the highest or lowest ranges, it is recommended to calibrate the meter before testing.

#### 3.3.1 Inductance measurement

- 1. Press the  $\bigcup_{2}$  [2] button to turn on the meter.
- Press [8] button to select inductance (L) measurement.
- 3. Insert an inductor into component receptacle socket or connect the test clip to the component leads as required.
- 4. Press [6] button to select testing frequency.
- Press [2007] [9] button to select Q factor for secondary display.



6. Read the display readings for inductance value and quality factor.



Figure 3.- Inductance measurement

#### 3.3.2 Capacitance measurement

- 0

3

- 1. Press [2] button to turn on the meter.
- 2. Press [8] button to select capacitance (C) measurement.
- **3.** Insert a capacitor into the component receptacle socket or connect the test clip to the component leads as required.
- **4.** Press **FRED** [6] button to select testing frequency.
- 5. Press [9] button to select **D** factor for secondary display.



6. Read the display readings for capacitance value and dissipation factor.

# 🗥 Warning

To avoid electrical hazards, discharge the capacitor to be tested before measuring.



Figure 4.- Capacitance measurement

## 3.3.3 Resistance measurement

Press [2] button to turn on the meter.
Press [2] button to select Resistance (R) measurement.



- 0

- Insert a resistor into the component receptacle socket or connect the test clip to the component leads as required.
- 4. Press [6] button to select testing frequency.
- 5. Read the display readings for resistance value.



Figure 5.- Resistance measurement.

# **4 OPERATING INSTRUCTIONS**

## 4.1 Autopower down

If unused for about 10 minutes, the meter will power down automatically. Press [12] button switches to resume power-on mode.

When the power is down, press [2] button to turn on the meter. The operating condition return to what they were before the power was last turned off.

In the MIN MAX record mode, RS-232 communication mode or using DC power-adaptor auto-power down function is disabled automatically.

#### 4.1.1 Continuous Mesurement

microcomputer failure status press

In the power down mode, Push [2] button 2 seconds. Until the APO OFF annunciator appears. Will put the meter into the continuous measurement mode.

[2] button turns the meter on or off. In the

#### 4.1.2 Power Switch

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off.

[2] button until the meter







# 4.2 Frequency select

Set the [6] button switch to **120 Hz** or **1 kHz** according to the specimen to be test. Generally, the electrolytic capacitor is set to **120 Hz**. Others are set to **1 kHz** in general.

# 4.3 Parallel / Series mode

Set the [7] button switch to parallel or series measuring circuit mode. However, in the specimen having a high impedance in general, measurement is made in "parallel equivalent circuit" mode "PAL", while in the specimen having a low impedance, measurement is made in "series equivalent circuit" mode "SER".

Note: For resistances (R) is only available the parallel (PAL) mode.

#### 4.4 RANGE Button

Press [4] button to select the Manual Range mode and turn off the "**AUTO**" enunciator. (The meter remains in the range it was in when manual ranging was selected).

In the Manual Range mode. Each time press [4] button, the range (and the input range enunciator) increments, and a new value displayed. To exit the Manual Range mode and return to autoranging, press and hold down [ANGE] [4] button for 2 seconds. The "AUTO" enunciator turns back on.

# 4.5 L/C/R Function button (only main indicator)

The key switch the measurement parameter in sequence Q-D-R-Q..., the enunciator is indicated on LCD.

When the meter is turned on, it is set to the measurement parameter selected that was in use when the meter was last turned off.

# 4.6 Q/ D/ R FUNCTION BUTTON (secondary display)

The [9] key switch the measurement parameter in sequence Q-D-R-Q..., the enunciator is indicated on LCD.

When the meter is turned on, it is set to the measurement parameter selected that was in use when the meter was last turned off.

## 4.7 HOLD. > 2sec.

3

Press the HOLD [4] key to enter the data hold mode, the "HOLD" enunciator is displayed.

When Hold mode is selected, the meer stops all further measurements. Press [4] 2 seconds to start backlit function, press this key for 2 seconds to exit the Backlit function.

After starting the Backlit for 1 minute, the Backlit function will exit by itself.





## 4.8 MIN/MAX BUTTON

Press [6] to enter the **MIN/MAX/AVG** mode, and stop the auto shut down function. In addition to power and hold key, the other keys cannot be activated. When the meter samples about 6 times, and then beeper will emit a sound. When a new Max/Min data being recorded and then beeper will emit 2 sounds.

Main display value (second display value) cycles through (a) = 0 (f) present value (parameter value)  $\rightarrow$  Max value (parameter value)  $\rightarrow$  Min Value (parameter value)  $\rightarrow$  Max value minus Min value (times to test)  $\rightarrow$  The Average Value's displauy (times to test).

The meter will ignore and not to record if overload ("OL") situation happens in the comparative processes or in the capacitance range 50 counts.

The average value's display is true average recording. It can save up to 3000 times, the "**AVG**" annunciator will flash when recording times reaching 2991 to 3000 times. When recording over 3000 times the "**AVG**" will stop to record and it will also display the average value on the LCD. The meter continues to record the **MAX/MIN** value.

Under the **MAX/MIN** function, press [4] key to stop recording temporarily but store the former recording value in advance, pres [4] again to go on recording.

In order to prevent any mistakes or losses taken, you have to press 2 sec to exit the Max/ Min function and cancel the original recordings.

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6



# 4.9 SET

- 1. The [11] can only be activated only before you have not used any other functions.
  - 6
- 2. Press [11] to enter the SET mode, and change to manual range mode automatically.
- While in the SET function, the main display is cleared, the second display shows "SET" annunciators, LCD shows, ^, TOL, ^,^ flashing. There are only 5 keys that you can use

4. OPEN, SHORT calibration:

Press [7] [11], LCD will display **CAL OPEN**, and press FAL [7] (ENTER), the program enters "OPEN" calibration, after completing the open. The LCD displays CAL, Shrt, press [7]. The program enters Short calibration. If you do not want to proceed Short Calibration, and press [7] [11], to exit. When LCD shows **CAL SHRT**, press [7] (ENTER) key. The program enters "SHORT" calibration. And then back to normal situation.



#### 5. Hi/Lo Limits Settings:

Press [12], LCD only shows "**A**" flashing. The previous setting **Hi** will also appear and let user to do the modifications. When you input **Lo** setting value, the annunciator "**V**" is flashing. The previous setting **Lo** will also appear and let user to do the modifications.

When the **Lo** setting value is greater than the **Hi** setting value, the LCD shows **Err** and back to the **Hi** setting mode. Please to enter the new **Hi/Lo** setting value.

#### 6. TOL Hi/Lo Limits Setting:

Press [13], LCD shows TOL flashing. The previous setting standard value will also appear and let user to do the modifications. When you in out + TOL setting value, the annunciators "TOL" "A" are flashing. The previous setting + TOL will also appear and let user to do the modifications. When you input - TOL setting value, the annunciators "TOL" "V" are flashing. The previous setting - TOL will also appear and let user to do the modifications.

#### 7. REL Setting:

7

Press REL, LCD shows D flashing. The previous standard setting value ell also appear and let user to do the modifications.



#### 8. Data Setting:

7

When using the character on the name plate to input data, the previous setting will appear, and the place that waits to be entered will flash. **INPUT** starts from the largest digit to enter, the largest digit only 1, In that case the original setting will flash. The original setting is 0, and the bottom part of seven segments will flash. Press "1" is 1, press any keys is 0, press "ENTER" to exit without change. **TOL Hi/Lo** limits setting without largest digit. There is no annunciator flashing after entering 5 digits, In the mean time enters +/- symbols, press "0" to change +/- symbols, press other keys to input + symbol.

**Caution:** Press **"ENTER**", emit two beeps, the data store in volatile storage. The data will store in nonvolatile storage region whee the meter power off. In this mode the automatic power-off feather is disabled.

# 4.10 REL. Relative mode (only Main display)

Press [5] key to the Relative mode. The displayed reading is stored as a reference value, the display is zeroed and annunciator

" $\Delta$ " is displayed. Press [5] key again to exit the Relative mode.

For example: the displayed reading is 100.0, then press [5] to store as a reference value, and the display become zero, to store 100.0 as a standard reference value, if our input signal is 99,5 then the reading will be 99.5-100.0 that equals -0.5.

7



The user (see "**SET**" in this manual can also set the relative value). When the desired relative value has been entered, press  $^{7}$  ReL [5] key to enter the Relative mode, and press  $^{7}$  [11] key to use Relative value as a reference value. Press  $^{7}$  REL [5] again to exit the relative Mode.

#### 4.11 HI/LO LIMITS

Press [12] to enter the **Hi/Lo LIMITS** mode, and change to manual range mode, the original **Hi/Lo LIMITS** value and annunciators " T" appear in the same time individually.

When the input exceeds Hi limits, the "**A**" is blinking and emits a continuous tine. When the input goes below the **Lo** limits, the "**V**" is blinking and the beeper emits a pulse tone. This warns users that out of setting ranges, press "**Hi/Lo LIMITS**" again to exit this mode.

In additions, the meter will ignore and not to record if overload ("**OL**") situation happens in the comparative processes or in the capacitance range 50 counts.

#### 4.12 TOL

Press [13] to enter the tolerance mode, and change to manual range mode automatically, the original preset standard value and enunciators "TOL" appear in the same time individually. How to set standard value please refer to **SET** in this manual. When entering **TOL** mode, the Main display is the present value and the second display is tolerance value.



There are 4 preset values in the **TOL** mode for instant use, just to press  $\overline{\text{TOL}}$  [13] again to cycle through 1%, 5%, 10%, 20% then back to the present. When entering the **TOL** mode, and the enunciator " $\checkmark$ " " $\checkmark$ " will appear in the same time, when the input exceeds Hi limits, the " $\checkmark$ " is blinking and also emits a continuous tone. When the Input goes below LO limits, the " $\checkmark$ " is blinking and the beeper emits a pulse tone. This warns users that out of setting ranges.

The standard value can be set by **SET** function, press refer to **SET** setting in this manual. When standard value have set, and g press TOL [13]then press SET [11] to use preset **TOL** setting.

In additions, the meter will ignore and not to record if overload ("**OL**") situation happens in the comparative processes or in the capacitance range 50 counts. Press **Tol** [13] 2 sec to exit this function.

# 4.13 Automatic fuse status detection

When the meter detects that the protective fuse is open, the "**FUSE**" character will appear and an internal beep will sound continuously. In this situation, none of the function keys can be operated and all other meter functions will be discontinued. Fuse replacement is required.





Figure 6.- Fuse detection.

# 4.14 Calibration

The calibration process is activated automatically in certain types of measurement and according to the range, although also it is possible to be carried out manually in any range. Simply press  $^{\circ}$  [11] button for more twice to enter the calibration mode and calibration prompts will be displayed. If on screen appears the indication (*DPEN*) hold the test leads terminals open. If it appears indication (*SHRT*) short-circuit the test leads terminals and press "CAL" key again. After calibration is completed, the meter will be restored to normal display and ready for normal usage.



Figure 7.- Open / Short calibration

The function calibrates the meter's internal parameters as well as external connector residues and measurement cables for further measuring. It is highly recommended to calibrate extremely high or low ranges for L, C and R before making precision measurements.



Calibration prompts will be displayed automatically every time those ranges are manually or functionally selected, (e.g. **REL**, **TOL**, **REC** etc.), and calibration is recommended. Simply follow the open connector ( $\begin{aligned} \begin{aligned} \label{eq:select} \begin{aligned} \label{eq:select} \label{eq:select} \end{aligned}$  or short connector ( $\begin{aligned} \begin{aligned} \begin{aligned} \label{eq:select} \begin{aligned} \label{eq:select} \begin{aligned} \label{eq:select} \label{eq:select} \begin{aligned} \begin{aligned} \begin{aligned} \begin{aligned} \label{eq:select} \begin{aligned} \b$ 

- **Notes:** 1.- Changing measurement frequencies is handled the same as selecting a different hardware range, and so automatic calibration prompts will be displayed in the recommended ranges.
  - 2.- Be sure to use same testing position after short calibration.

# 4.15 Low battery indication

When the "Description of the symbol flashes on the display, the battery voltage is below normal working voltage and is weakening. Replace battery with a new one to maintain accuracy of the meter.





# 5 MAINTENANCE

# 

To avoid electrical shock, do not perform any service unless you are qualified to do so.

## 5.1 Service

If the instrument fails to operate, to check battery and test leads, and replaces them if necessary. If the instrument still can't work, double check operating procedure as described in this instruction manual. When servicing, use specified replacement parts only. The meter must be completely turned off while replacing either the fuse or battery.

## 5.2 Battery replacement

The meter is powered with a single 9V battery, IEC6F22 carbonzinc or alkaline battery. Replace battery if the low battery sign  $(\underbrace{\overline{[+-]}})$  is displayed and flashing. Use the following procedures to replace the battery:

- 1. Remove the screws with suitable screwdriver and remove battery cover as figure 10.
- 2. Replace the degraded battery with a new battery respecting the indicated polarity.





Figure 8.- Battery replacement

## 5.3 Fuse replacement

The meter can self-detect if its input protective fuse is either open or damaged. In this case, the LCD will display the symbol "FUSE" and an audible beep will sounds continuously, warning the user to replace the damaged fuse to maintain the instrument operating. While replacing the fuse, the power of the meter must be completely shut off.

- 1. Loosen screw with suitable screwdriver and remove battery cover as figure 10.
- 2. Loosen screws with suitable screwdriver and remove bottom cover as figure 11.
- 3. Replace the damaged fuse with specified one.

# FUSE TYPE SHOULD BE 5 x 20 mm. and: 0.1 A F 250 V AVOIDING THESE DIRECTIONS COULD DAMAGE THE EQUIPMENT







Figure 9.- Fuse replacement.

# 5.4 Cleaning recommendations

English

To clean the cover, take care the instrument is disconnected

Do not use scented hydrocarbons or chlorized solvents. Such products may attack the plastics used in the construction of the cover.

The cover should be cleaned by means of a light solution of detergent and water applied with a soft cloth.

Dry thoroughly before using the system again.





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