ELC-131D
DUAL DISPLAY
L/C/R METER
USER MANUAL

ESCORT

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DUAL DISPLAY L/C/R METER

OPERATOR'S MANUAL

Table of Contents

Section I

Section II

Section III

Section IV

Section V

Section I

Introduction

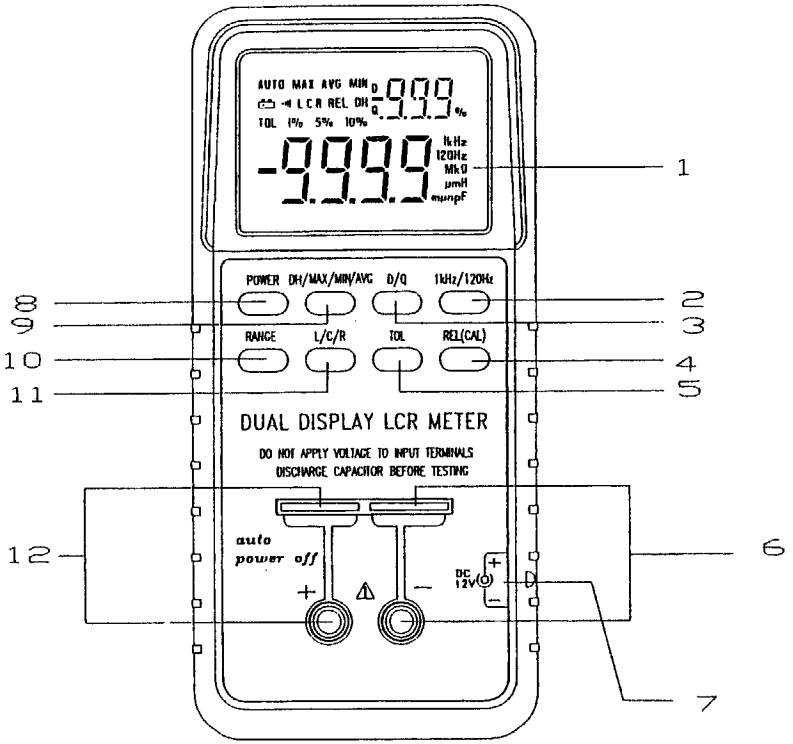
This 10,000-count L/C/R hand held meter is a special microprocessor-controlled meter for measuring functions of inductance, capacitance and resistance. Extremely simple to operate, the instrument not only takes absolute parallel mode measurements, but is also capable of series mode measurement. The meter provides direct and accurate measurements of inductors, capacitors and resistors with dual testing frequencies of 120Hz and 1kHz. It is auto and manual ranging selectable. When not in use for more than five minutes with power on, the meter will automatically shut off to prolong battery life.

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.

A tilt stand provides position flexibility for viewing and operating the meter. While single 9V battery operation is standard for the meter, a DC 12V power adaptor can also be used as an optional power input.

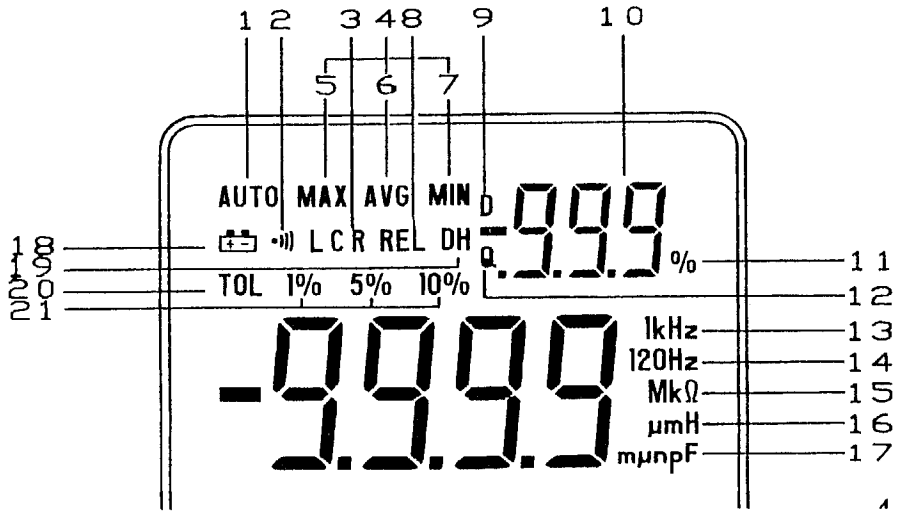
Front Panel Illustration

1. LCD display
2. 1kHz/120Hz selection button
3. Dissipation and quality factor selection button
4. Relative mode and calibration selection button
5. Tolerance mode selection button
6, 12. Input terminals and sockets
7. DC 12V adaptor inputs
8. Power on/off button
9. Data hold; Maximum, Minimum and Average reading selection button
10. Range selection button
11. Inductance, Capacitance and Resistance function selection button



LCD Display Illustration

1. Auto : Autoranging indicator
2. •)) : Beeper tone indicator for tolerance mode
3. LCR : L, C or R function annunciator
4. MAX AVG MIN : Recording mode annunciators
5. MAX : Maximum reading annunciator
6. AVG : Average reading annuciator
7. MIN : Indicates the minimum reading
8. REL : Relative mode annunciator
9. D : Dissipation factor annunciator
10. 999 : Secondary display
11. % : Tolerance (percentage) annunciator
12. Q : Quality factor annunciator
13. 1kHz : Frequency annunciator
14. 120Hz : Frequency annunciator
15. MkΩ : Resistance (Ohm) annunciator
16. μmH : Inductance (Henry) annunciator
17. mμnpF : Capacitance(Fara) annunciator
18. ▭ : Indicates the battery power is weakening
19. DH : Data hold annunciator
20. Tol : Tolerance mode annunciator
21. 1% 5% 10% : Tolerance sorting (percent) annunciator



Special Indication Characters

SrE : Indicates short connectors

OPn : Indicates open connectors

PAL : Indicates parallel mode

SEr : Indicates series mode

CAL : Indicates calibration mode

FUSE : Indicates damaged or open fuse

Section II

Safety Information

This manual contains information and warnings which must be followed to ensure safe operation as well as to maintain the meter in a safe condition.

- This meter is for indoor use, altitude up to 2,000 m.
- The meter is safety-certified in compliance with EN61010(IEC 1010-1) Installation Category II 50V, Pollution Degree 2 environment,
- Use the meter only as specified in this manual. Otherwise, the protection provided by the meter may be impaired.
- The power for the meter is supplied by a single standard 9V battery. But also a line operation is possible using a 12V AC to DC adaptor. If a power adaptor is selected, please be sure to use with the one which fulfilled the safety requirements of a relevant IEC standard.

*Note: The CPU of the meter can self-detect if its 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 old fuse to maintain the accuracy of measurement. While replacing the fuse, the power of the meter must be completely shut off.

WARNING

When measuring in-circuit components, firsts de-energize the circuits before connecting to the test leads.

The warnings and precautions should be read and well understood before the instrument is used. The must be carefully observed during use.

This instrument is recommended to be used by a suitably trained and competent person.

A **WARNING** identifies conditions and actions that pose hazard(s) to the user; a **CAUTION** identifies conditions and actions that may damage the transducer. International electrical symbols used are explained in Table 1.

⎓	DC - Direct Current
⏚	Ground
⧈	Double Insulation
⚠	See Explanation in the Manual

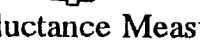
Table 1. International Electrical Symbols

Section III

General Specifications

Parameters Measured : L/C/R, D/Q

Measurement Circuit Mode :

1) Capacitance/Resistance Measurement–
   Defaults to parallel mode for all ranges
    : Parallel measured mode
2) Inductance Measurement–
   Defaults to series mode for all ranges
    : Series measured mode

Both Series and Parallel mode data can be obtained through simple key operation (See page 23)

Displays :

L/C/R : Max display 9999 except 10mF(120Hz), 1mF(1kHz) measurement ranges with max display 1999

D/Q : Max display 999 (AUTO RANGE)

Measurement Terminals : 2 terminals with sockets

Ranging Mode : Auto & manual

Test Frequency : 1kHz & 120Hz

Freq Accuracy : ±0.01% (1kHz = 1008.06Hz; 120. Hz = 122.07Hz)

Measurement Rate: 1 measurement/second, nominal

Test Signal Level : 0.9 Vrms approx.

Response Time : Approx. 1 second/DUT (device under test) (@ manual range)

Temperature Coefficient :

0.05 x (Specified Accuracy)/°C (0°C-<18°C or 28°C -50°C)

Operation Temperature : 0°C to 40°C; 0 - 70% R.H.

Storage Temperature : -20°C to +50°C; 0 - 80% R.H.

Power Requirements :
1) Battery : DC 9V Battery
2) Ext. DC Adaptor : DC 12Vmin - 15Vmax (LOAD 50mA min)

Low Battery Indication : Approx. 6.8V
Power Consumption : Approx. 40 mA; 0.3mA @Auto Power-off
Protective Fuse : 0.1A fast-blow 250V AC (Please refer to Safety Information)
Auto Power-Off Time : Approx. 5 mins.
Dimensions : 37 mm(H) x 90 mm(W) x 192(L)
Weight : 390g

ACCESSORIES

Standard accessories:

1. Test alligator clips(pair): it is different to IEC requirements.
2. DC 9V Battery.
3. Fuse: 0.1 A / 250V AC fast blow.
4. User manual.

Optional accessories:

1. EH 80Y: Holster.
2. 12V(min) ~ 15V(max)/Load 50mA min DC power Adaptor
   EA50: AC120V
   EA55: AC 240V

Electrical Specifications

All accuracies are @23C°±5C°; < 75% R.H.

Resistance

Range	Max Display	Accuracy		Specified Note
		Test Freq.120Hz	Test Freq.1kHz	
10MΩ	9.999MΩ	±(2% + 8 counts) *(note 3)	±(2% + 8 counts) *(note 3)	after open cal.
1MΩ	999.9kΩ	±(0.5% + 5 counts)	±(0.5%+5 counts)	after open cal.
100kΩ	99.99kΩ	±(0.5% + 3 counts)	±(0.5%+3 counts)	—
10kΩ	9.999kΩ	±(0.5% + 3 counts)	±(0.5%+3 counts)	—
1kΩ	999.9Ω	±(0.5% + 3 counts)	±(0.5%+3 counts)	—
100Ω	99.99Ω	±(0.8% + 5 counts)	±(0.8%+5 counts)	after short cal.
10Ω	9.999Ω	±(1.2%+ 8 counts)	±(1.2%+ 8 counts)	after short cal.

Notes:

1. This specification is based on the measurement performed at the test socket.
2. Dut & Test lead to be properly shielded to GND (DC "-") if necessary.
3. This specification is based on internal power (battery) operation.

Capacitance

Test Freq. 120Hz

Range	Max Display	Accuracy		Specified Note
		Cx*	DF	
10mF	9.99mF *note 4	±(5% + 5 counts) (DF<0.1)	±(10% +100/Cx + 5 counts) (DF<0.1)	after short cal.
1000μF	999.9μF	±(1% + 5 counts) (DF<0.1)	±(2% + 100/Cx + 5 count) (DF<0.1)	after short cal.
100μF	99.99μF	±(0.7%+3 counts) (DF<0.5)	±(0.7% +100/Cx +5 counts) (DF<0.5)	——
10μF	9.999μF	±(0.7%+3 counts) (DF<0.5)	±(0.7% +100/Cx +5 counts) (DF<0.5)	——
1000nF	999.9nF	±(0.7%+3 counts) (DF<0.5)	±(0.7% +100/Cx +5 counts) (DF<0.5)	——
100nF	99.99nF	±(0.7%+5 counts) (DF<0.5)	±(0.7% +100/Cx +5 counts) (DF<0.5)	after open cal.
10nF	9.999nF	±(1% + 5 counts) (DF<0.1)	±(2% +100/Cx +5 counts) (DF<0.1)	after open cal.

Test Freq. 1kHz

Range	Max Display	Accuracy		Specified Note
		Cx*	DF	
1000μF	0.999mF *note 4	±(5%+ 5 counts) (DF<0.1)	±(10%+100/Cx + 5 counts) (DF<0.1)	after short cal.
100μF	99.99μF	±(1%+ 5 counts) (DF<0.1)	±(2%+100/Cx + 5 counts) (DF<0.1)	after short cal.
10μF	9.999μF	±(0.7%+3 counts) (DF<0.5)	±(0.7%+100/Cx + 5 counts) (DF<0.5)	——
1000nF	999.9nF	±(0.7%+3 counts) (DF<0.5)	±(0.7%+100/Cx + 5 counts) (DF<0.5)	——
100nF	99.99nF	±(0.7%+3 counts) (DF<0.5)	±(0.7%+100/Cx + 5 counts) (DF<0.5)	——
10nF	9.999nF	±(0.7%+5 counts) (DF<0.5)	±(0.7%+100/Cx + 5 counts) (DF<0.5)	after open cal.
1000pF	999.9pF	±(1%+ 5 counts) (DF<0.1)	±(2%+100/Cx + 5 counts) (DF<0.1)	after open cal.

Notes:

1. Q Value is the reciprocal of DF
2. This specification is based on the measurement performed at the test socket.
3. Dut & Test lead to be properly shielded to GND (DC "-") if necessary.

*4. This reading can be extended to 1999 MAX display with accuracy not specified.

*5. Cx= Counts of displayed C value. e.g. C=88.88μF than Cx=8888.

Inductance

Test Freq. 120Hz

Range	Max Display	Accuracy		Specified Note
		Lx* (DF<0.5)	DF (DF<0.5)	
10000H	9999H	*Note 4	*Note 4	——
1000H	999.9H	±[1%+(Lx/10000)% +5 counts]	±(2%+100/Lx +5 counts)	after open cal.
100H	99.99H	±[0.7% + (Lx/10000)% +5 counts]	±(1.2%+100/Lx +5 counts)	——
10H	9.999H	±[0.7% + (Lx/10000)% +5 counts]	±(1.2%+100/Lx +5 counts)	——
1H	999.9mH	±[0.7% + (Lx/10000)% +5 counts]	±(1.2%+100/Lx +5 counts)	——
100mH	99.99mH	±[1% + (Lx/10000)% +5 counts]	±(3%+100/Lx +5 counts)	after short cal.
10mH	9.999mH	±[2% + (Lx/10000)% +5 counts]	±(10%+100/Lx +5 counts)	after short cal.

Test Freq. 1kHz

Range	Max Display	Accuracy		Specified Note
		Lx* (DF<0.5)	DF (DF<0.5)	
1000H	999.9H	*Note 4	*Note 4	——
100H	99.99H	±[1% + (Lx/10000)% +5 counts]	±(1.2%+100/Lx +5counts)	after open cal.
10H	9.999H	±[0.7% + (Lx/10000)% +5 counts]	±(1.2%+100/Lx +5counts)	——
1H	999.9mH	±[0.7% + (Lx/10000)% +5 counts]	±(1.2%+100/Lx +5counts)	——
100H	99.99mH	±[0.7% + (Lx/10000)% +5 counts]	±(1.2%+100/Lx +5counts)	——
10mH	9.999mH	±[1.2% + (Lx/10000)% +5 counts]	±(5%+100/Lx +5counts)	after short cal.
1mH	999.9μH	±[2% + (Lx/10000)% +5 counts]	±(10%+100/Lx +5counts)	after short cal.

Notes:

1. Q Value is the reciprocal of DF
2. This specification is based on the measurement performed at the test socket.
3. Dut & Test lead to be properly shielded to GND (DC "-") if necessary.

*4. Not specified.

*5. Lx= counts of displayed L value. e.g. L=88.88H, then Lx=8888.

Section IV

How to Operate

⚠ Caution

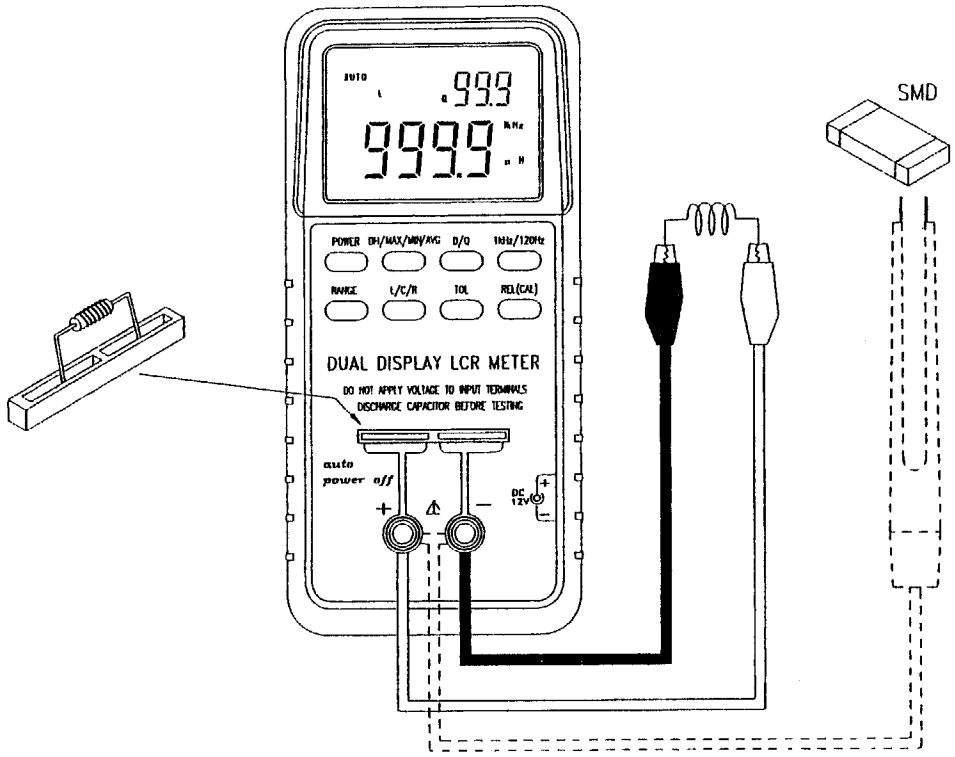
- When measuring within a circuit, the circuit must be de-energized before connecting the test leads.
- Instruments which are used in dusty environments should be wiped and cleaned regularly.
- Do not leave the instrument exposed to direct heat from the sun for long periods.
- Before removing the cover, ensure that the instrument is disconnected from any circuit and in power "off" position.

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.

1 Inductance Measurement

1. Press the "POWER" key to turn on the power
2. Press the function key to select Inductance test range
3. Insert an inductor into component receptacle socket or connect the test clip to the component leads as required
4. Press frequency key to select 1kHz or 120Hz testing frequency
5. Read the display readings for inductance value and quality factor

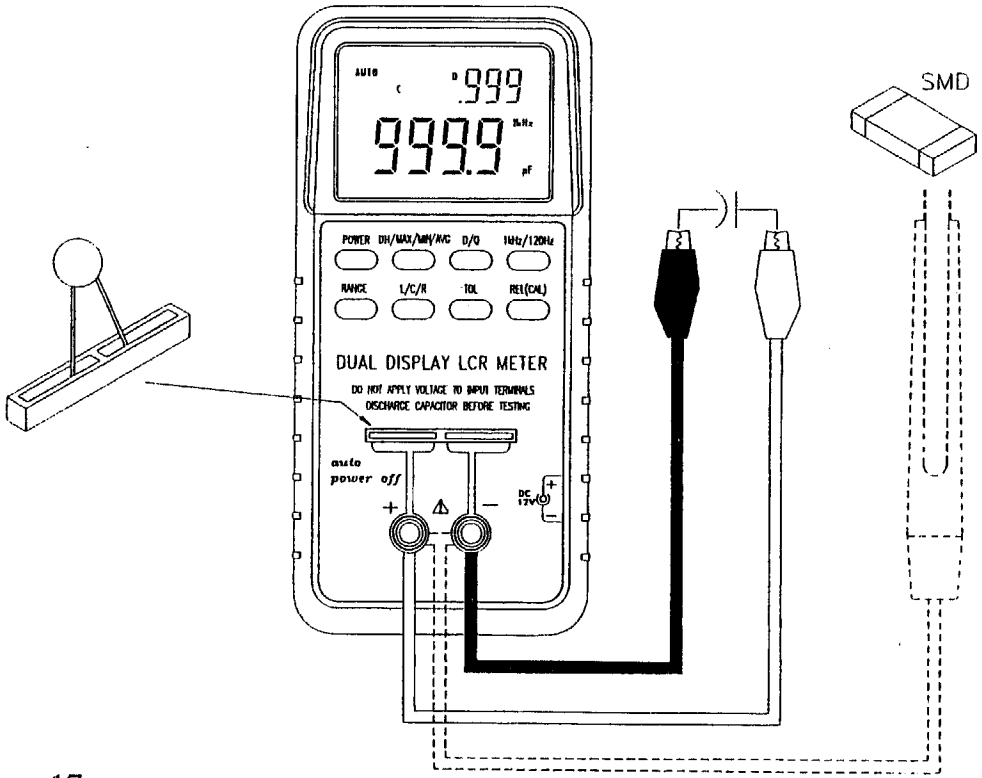


2 Capacitance Measurement

1. Press "POWER" key to turn on the power
2. Press the function key to select Capacitance test range
3. Insert a capacitor component into the component receptacle socket or directly connect the test clip to the component leads as required
4. Press frequency key to select 1kHz or 120Hz testing frequency
5. Read the display readings for capacitance value and dissipation factor

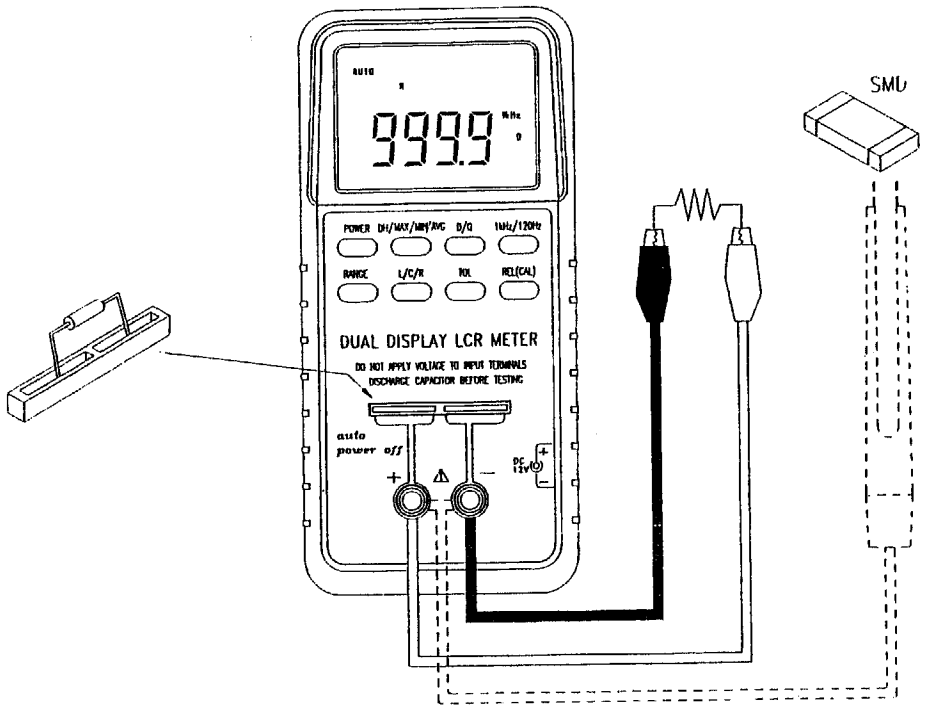
Note:

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



3 Resistance Measurement

1. Press "POWER" key to turn on the power
2. Press the function key to select Resistance test range
3. Insert a resistor into the component receptacle socket or connect the test clip to the component leads as required
4. Press the frequency key to select 1kHz or 120Hz testing frequency
5. Read the display reading for resistance value



Software Operating Instructions

1 Data Hold

This data hold function allows the operator to freeze the display. To enter this mode, press the "DH" pushbutton; press again to release.

2 Static Recording™

Press the "DH/MAX/MIN/AVG" pushbutton for one second to enter the static recording mode. The maximum and minimum readings are then stored in memory, while a beeping tone is produced when a new tested value has been recorded. Push the same button to cycle through the maximum, minimum and average of the present readings. The MAX, MIN or AVG annunciators will turn on to indicate what value is being displayed. Whenever the "MAX AVG MIN" annunciators appear on the LCD simultaneously, the display reading is always a present value.

To exit this mode, press and hold the pushbutton for one second.

Notes:

1. Static recording captures only stable values and updates the memory; it will not record any "OL"(overload) value for any of the L/C/R functions. In addition, the meter will not record values which are below 50 counts in Capacitance measurement.
2. Static recording is only available in manual ranging; however, activation while in autoranging will automatically set the meter to manual ranging and cause calibration prompts to be displayed in the recommended ranges.

3 Dissipation Factor/ Quality Factor

The "D/Q" value can be displayed interchangeably by pressing the "D/Q" button when the meter is set to Inductance or Capacitance ranges. It does not apply to resistance measurement.

4 120Hz/1kHz

Default testing frequency is 1kHz range; to select the 120Hz range, simply press the "120Hz/1kHz" key.

5 L/C/R Function Selector

Simply press the "L/C/R" pushbutton to cycle through the desired L, C or R function respectively.

6 Relative

Press the "REL" key to enter the relative mode. This sets the display at zero and stores the displayed reading as a reference value. It will then display all subsequent readings in terms of their plus or minus value in comparison to the original stored value. Press the button again to exit the relative mode.

Notes:

1. The relative mode cannot be activated if the display value is either "OL" or "0000".
2. Relative mode is only available in manual ranging; however, activation while in autoranging will automatically set the meter to manual ranging and cause calibration prompts to be displayed in the recommended ranges.
3. The relative mode cannot be activated if the meter is set at autoranging with data hold activated.

7 Tolerance

The tolerance modes are 1%, 5% and 10% respectively for the Inductance, Capacitance and Resistance functions. To enter this tolerance mode, insert the appropriate component as a standard value into the socket or connect the component to the test probes, then press the "TOL" pushbutton to set this value as the standard reference tolerance. Similarly, any value which appears on the LCD display, such as DH or MAX/MIN/AVG, can be used as a standard value to sort components. Press the key again to cycle through 1%, 5% and 10% tolerance as desire.

This feature is designed for convenient component sorting. An audible tone will beep three times whenever the component under test exceeds the set tolerance. Conversely, a single "beep" tones indicates the component under test is within the set tolerance rate.

Notes:

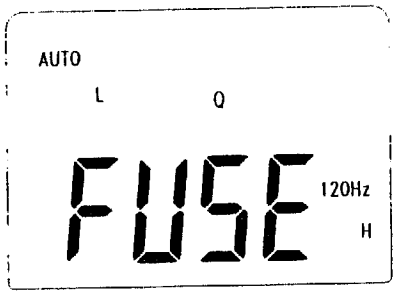
1. The tolerance mode cannot be activated if the tested display is either "OL" or"0000"; nor can it be activated if the tested capacitance value is below 10 counts.
2. Tolerance mode is only available in manual ranging; however, activation while in autoranging will automatically set the meter to manual ranging and cause calibration prompts to be displayed in the recommended ranges.
3. The tolerance mode cannot be activated if the meter is set at autoranging with data hold mode activated.

8 Auto/Manual Range

Default is automatically set at autoranging status when the meter is powered on. For specific measurement, press the "Range" pushbutton to select manual ranging. To return to the autoranging mode, press and hold the "Range" pushbutton for one second.

9 Fuse Detection

When the CPU of the meter detects that the 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.



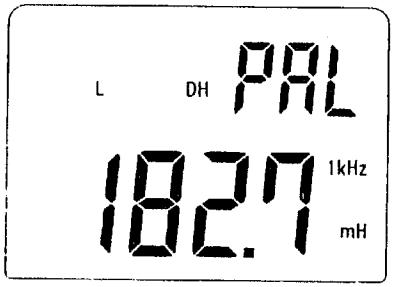
10 Low Battery Indication

When 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.

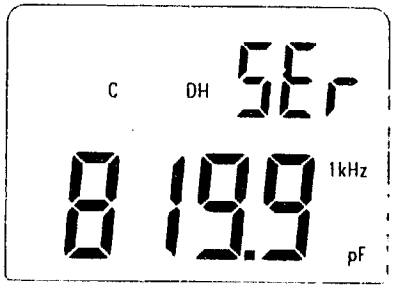
11 Parallel/Series Mode

The meter is capable of displaying Parallel and Series mode data for all ranges. The parallel mode is default for Capacitance and Resistance measurements and the series mode is default for Inductance measurement. However, each data can be transformed to the other mode reading in the following manner:

1) To get parallel mode data under the Inductance measurement, press the DH key and then press and hold D/Q button for one second. When the " PAL " character appears on the secondary display, the main digital reading displayed will be the parallel mode data. Press D/Q button again to exit.



2) Similarly, to get the series mode data either under the Capacitance or Resistance measurement, press the DH key and then press and hold D/Q button for one second. When the " SEr " character appears on the secondary display, the main digital reading displayed will be the series mode data. Press D/Q button again to exit.



12 Auto Power Off/ Disable Auto Power Off

When the meter has not been used for five minutes after the last operation was made, a one second "beep" tone will sound. The meter will then automatically enter a "sleep" mode and there will be no display on the LCD. To reactivate the meter, simply press any pushbutton. After re-activating, the last operating condition still remains unchanged.

When the meter is to be used for long periods of time, auto power off can be disabled by pressing and holding either "DH/MAX/MIN/AVG", "RANGE" or "L/C/R" pushbuttons while pressing the power on. After releasing the buttons, two"beep" tones will sound to confirm that the auto power off has been disabled.

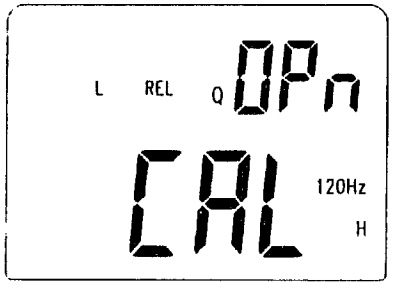
By using a 12V AC adaptor as an optional power source, auto power off is disabled automatically.

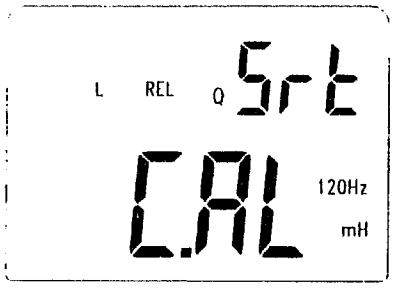
Note:

It is recommended that the meter should always be switched off when not in use.

13 Calibration

Calibration is available to all ranges. Simply press and hold "REL(CAL)" key for one second to enter the calibration mode and calibration prompts will be displayed. Follow the prompts for open connector (OPn) or short connector (Srt) connection and press the "REL(CAL)" button. After calibration is completed, the meter will be restored to normal display and ready for normal usage.





This function calibrates the meter's internal parameters as well as external connector residues. 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, (eg. Rel, Tol, MIN/MAX/AVG etc.), and calibration is recommended. Simply follow the open connector (OPn) or short connector (Srt) instruction and then press the "REL(CAL)" button. You may skip the calibration by pressing the"D/Q" button.

Note:

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.

Section V

Fuse Replacement

⚠ **Caution:** The meter must be completely turned off while replacing either the fuse or battery.

1. Loosen screws with suitable screwdriver and remove bottom cover as shown in Fig. 1.
2. Lift the PC board as shown in Fig. 2.
3. Replace the damaged fuse with a **0.1A/250VAC fast blow fuse.**
4. When finished with the replacement, replace the shielding paper smoothly as shown in Fig. 1, then refasten the PC board and the bottom cover respectively.

Battery Replacement

1. Loosen screws with suitable driver and remove bottom cover as shown in Fig. 1.
2. Replace the degraded battery with a new DC 9V(NEDA 1604 or equivalent) battery.
3. Close bottom cover as shown in Fig. 1.

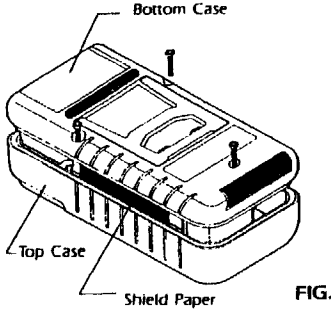


FIG. 1

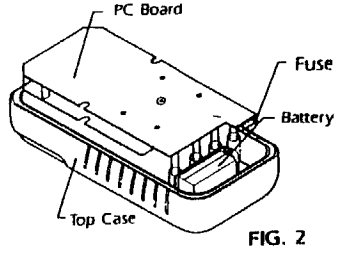


FIG. 2

☐ CLEANING

To clean the instrument, use a soft cloth dampened in a solution of mild detergent and water. Do not spray cleaner directly onto the instrument, since it may leak into the cabinet and cause damage. Do not use chemicals containing benzine, benzene, toluene, xylene, acetone or similar solvents.