



True RMS Datalogging Multimeter

Model: 72-3540

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Please read these instructions carefully before use and retain for future reference.

IMPORTANT SAFETY INFORMATION

- When using electrical appliances basic safety precautions should always be followed.
- Never use a damaged meter. Before use, always check the meter case for cracks or any missing parts.
- Inspect the test leads for any damaged insulation or exposed metal. If any test lead is damaged, replace it before using the meter.
- Before using the meter, ensure the battery cover is closed and latched. Before
 opening the battery cover, remove the test leads from the meter.
- Do not use the meter when removing the cover or opening the case.
- When the meter works at a voltage of 30V (rms) in AC, 42V (peak) in AC or over 60V in DC, special care should be taken as there is a danger of electric shock.
- Use the proper terminals, function and range for your measurement. Do not operate the meter separately.
- When measuring the current, shut off the power to the circuit, then connect the
 meter to the circuit. The meter and the circuit must be connected in series.
- When making electrical connections, connect the common test lead before
 connecting the main test lead. When disconnecting, disconnect the main test lead
 before disconnecting the common test lead. If the meter works improperly, do not
 use it. The protection measures of the meter may have failed. If in doubt, send the
 meter for repair.
- Do not store or use the meter in an environment of high temperature, humidity, inflammable, explosive and strong magnetic field.
- When using the probes, keep your fingers behind the finger guards.
- Do not use the low-pass filter to verify hazardous voltage, for there may be a
 voltage over the indicated value. Firstly, measure the voltage to check whether it is
 hazardous in the case of not connecting a filter, then select low-pass filtering.
- Before testing resistance, continuity, conductance, diode or capacitor, shut off the power to the circuit and discharge all high-voltage capacitors.
- Before measuring the current, check the fuses of the meter.
- Do not measure voltage or current higher than the allowed input values. When the range of measured values cannot be determined, set the functional range switch at the maximum-range position.
- When the low battery symbol is on the LCD, the battery should be charged as soon as possible in order to ensure measurement accuracy.
- Do not arbitrarily change the wiring within the meter to avoid damaging the meter and endangering safety.
- Test a known voltage before use to confirm the product is functioning correctly.
- If you need to replace the test lead, replace it with a test lead of the same or higher grade of CAT III 1000V/CATIV 600V.
- When the meter detects voltage ≥30V or overload, the symbol "♠" will display as a warning for a potential hazardous voltage.

WHAT'S INCLUDED

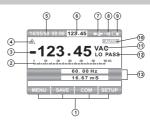
- One Datalogging Multimeter
- A pair of test leads
- Two K type temperature probes
- One user manual
- One temperature connector
- One charging adaptor
- One charging connector
- One USB cable
- One CD
- One zip bag

PRODUCT OVERVIEW

1. Case	
2. LCD	
3. Function keys	
4. Rotary switch	
5 Input terminals	



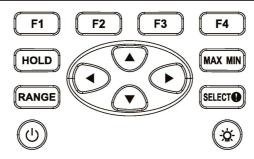
LCD



Function	Description		
1. Label of function keys	Indicates auxiliary functions under current measuring interface.		
2. Simulation bar	Analogue display of input signals.		
3. Minus sign	Indicates negative reading.		
4. Lighting symbol	Danger - High voltage.		
5. Time and date	Indicates the time and date set in internal clock.		
6. Small measurements	Real-time input values are displayed when the primary.		
7. Telecommunication	Indicates the time and date set in the internal clock.		
8. Buzzer	Indicates the button sound is enabled.		
9. Battery capacity	Indicates the capacity level of rechargeable battery.		
10. Range indicator	Indicates the current range and range mode for the meter.		
11. Unit	Indicates the measurement unit.		
12. Aided function display	Indicates the aided measuring function, such as LPF.		
13. Aided display	Indicates the aided measuring information on input signals.		

BUTTONS

Button	Function			
ტ	Turn on or off the meter power.			
F1 F2 F3 F4	Select the sub-functions and modes related to the functions of the rotary switch.			
Cursor buttons are used to select menu items, scroll reading information and input data.				
HOLD	Keep the current reading on the display.			
RANGE Switch the range mode of the meter to manual mode, then ta turns to switch between all the available ranges. Press and hold the button to return to automatic range meas				
MAX MIN	N Starts to record MIN MAX values.			
SELECT Press to select the complex function. Press and hold to access "Help" menu.				
- <u>Ö</u> -	Press the button change the backlight brightness. Press and hold to turn off the backlight.			



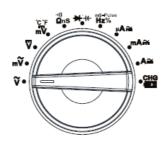
INPUT TERMINALS

Terminal	Description				
А	Input terminals for measuring the current (maximum duration is 30 seconds for 20A overload and suspend for 10 minutes) and frequency from 0A to 10.00A.				
μA mA	Input terminals for measuring the current and frequency from 0A t 600mA.				
СОМ	Common terminals for all measurements.				
°C Hz +← V Ω →	Input terminals for measuring voltage, continuity, resistance, diode, conductance, capacitance, frequency, period and duty cycle.				

- In addition to the above, four terminals are used for charging and temperature measurement through corresponding connectors.
- "Lead Error!" will show on the the display as a warning if the probes are inserted incorrectly.

ROTARY SWITCH

Switch Symbol	Function			
V	Measurement of AC voltage.			
mŨ	Measuremnt of mV in AC and mV in AC+DC.			
V	Measurement of voltage in DC and AC+DC.			
m <mark>V</mark> °C °F	Measurement of mV in AC and temperature.			
ΩnS·າ)	Measurement of resistance, continuity and specific conductance.			
> - ←	Diode test and capacitance measurement.			
Hz% mS-Pulse	Measurement of frequency, duty cycle and pulse width.			
μ Α ≅	Measurement of μA in AC, DC and AC+DC.			
mA∺	Measurement of mA in AC, DC and AC+DC.			
A≃	Measurement of ampere in AC, DC and AC+DC.			
CHG	Battery charge.			



GENERAL SPECIFICATION

Max. voltage between any terminal and ground	1000V		
Fuse protection of mA or µA input terminals	0.8A H 1000V fuse type 6 x 32mm		
Fuse protection of A input terminals	10A H 1000V fuse type 10 x 38mm		
Max. display	60000		
Range	Auto/manual		
Polarity	Auto		
Operating temperature	-20°C~50°C		
Storage temperature	-30°C~60°C		
Relative humidity	≤80% (0°C~30°C), ≤75% (30°C~40C), ≤45% (40°C~50C°)		
Electromagnetic compatibility	In the RG-field of 1V/m: overall accuracy = specified accuracy + 5% of range. No specified index for the RF-field over 1V/m.		

No specified index for RF-field over 1V/m			
Operating altitude	0~2000m		
Temperature coefficient	0.1 x (specified accuracy)/°C (<18°C or >28°C)		
Internal battery	Lithium battery of 7.4V~2200mAh		
Power adaptor	Input of 100V~240V, 50/60Hz		
External diameter and internal diameter	5.5mm (external) 2.5mm (internal)		
Low battery	symbol shows on the LCD		
Dimensions	225 x 100 x 60mm		
Weight	608g (inc. battery)		
Safety standards	IEC/EN61010-1, EN61010-2-030, EN61010- 2-033 in pollution degree 2, CAT III 1000V, CATIV 600V		
IP rating	IP65		

ELECTRICAL SPECIFICATION

Accuracy	± (% reading + digits), one-year calibration period. If the temperature variation of environment reaches ±5°C, the accuracy can be adopted after 2 hours.		
Ambient temperature	23°C ±5 °C		
Ambient humidity	≤75%RH		
Temperature coefficient 0.1 x (accuracy)/C (<18C or >28°C)			

AC VOLTAGE

Range	Resolution	Accuracy Tolerance: ± (% reading + digits)			
60mV	0.001mV	45~1kHz	1k~10kHz	10k~20kHz	20k~100kHz
OUTIV	0.0011110	±(0.6% + 60)	±(1.2% + 60)	±(3% + 60)	±(4% + 60)
600mV 0.01mV	0.01m\/	45~1kHz	1k~10kHz	10k~20kHz	20k~100kHz
	0.011110	±(0.3% + 30)	±(1.2% + 40)	±(3% + 40)	±(4% + 40)
6V 0.000	0.0001\/	45~1kHz	1k~10kHz	10k~20kHz	20k~100kHz
	0.00017	±(0.3% + 30)	±(1.2% + 40)	±(3% + 40)	±(4% + 40)
60V	0.001V	45~1kHz	1k~10kHz	10k~20kHz	20k~100kHz
		±(0.3% + 30)	±(1.2% + 40)	±(3% + 40)	±(4% + 40)

	45~1kHz	1k~10kHz	10k~20kHz	20k~100kHz	
600V	0.01V	±(0.3% + 30)	±(1.2% + 40)	±(3% + 40)	Only for reference
1000V 0.1V	45~1kHz	1k~5kHz	5k~10kHz	10k~100kHz	
	0.1V	±(0.6% + 30)	±(3% + 40)	±(6%+40)	Only for reference

- Input impedance: about 10MΩ.
- Overload protection: 1000V.
- Display: True virtual value for 10% to 100% of the range.

DC VOLTAGE

Range	Resolution	Accuracy tolerance: ± (% reading + digits)
60mV	0.001mV	± (0.025% + 20)
600mV	0.01mV	
6V	0.0001V	± (0.025% + 5)
60V	0.001V	
600V	0.01V	(0.039/ ± 5)
1000V	0.1V	(0.03% + 5)

AC VOLTAGE + DC VOLTAGE

Range	Resolution	Accuracy Tolerance: ± (% reading + digits)		
60mV	60mV 0.001mV	50~1kHz	1k~10kHz	10k~20kHz
OUIIIV	0.0011110	±(1% + 80)	±(1.2% + 60)	±(3% + 60)
600mV	0.01mV	45~1kHz	1k~10kHz	10k~20kHz
0001117	0.011110	±(0.3%+30)	±(1.2%+40)	±(3%+40)
6V	0.0001V	45~1kHz	1k~10kHz	10k~20kHz
OV.	0.00017	±(0.3%+30)	±(1.2%+40)	±(3%+40)
60V	0.001V	45~1kHz	1k~10kHz	10k~20kHz
000	0.0017	±(0.3%+30)	±(1.2%+40)	±(3%+40)
600V	0.01V	45~1kHz	1k~10kHz	10k~20kHz
6007	0.010	±(0.3%+30)	±(1.2%+40)	±(3%+40)
1000\/	0.1)/	45~1kHz	1k∼5kHz	5k~10kHz
1000V	0.1V	±(0.6%+30)	±(3%+40)	±(6%+40)

- Input impedance: about $10M\Omega$.
- Overload protection: 1,000V.
- Display: true virtual value for 10% to 100% of the range.

AC CURRENT

Range	Resolution	Accuracy Tolerance: ±	(% reading + digits)
6004	0.044	45~1kHz	1k~10kHz
600µA	0.01µA	±(0.6% + 40)	±(1.2%+40)
60004	0.1	45~1kHz	1k~10kHz
6000µA	0.1μA	±(0.6%+20)	±(1.2%+40)
60mA	0.001mA	45~1kHz	1k~10kHz
OUTIA	0.00 IIIIA	±(0.6%+40)	±(1.2%+40)
600mA	600mA 0.01mA	45~1kHz	1k~10kHz
OUUIIA		±(0.6%+20)	±(1.2%+40)
40)/	10V 0.001A	45~1kHz	1k~10kHz
100		±(1%+20)	±(3%+40)

- Display: true virtual value for 10% to 100% of the range.
- Overload protection: μAmA range: 0.8AH 1000V fuse type φ 6x32mm.
- 10A range: 10AH 1000V fuse type φ 10x38mm.
- Switch on for 30 seconds and suspend for 10 minutes for 20A. Not specified for over 10A.

DC CURRENT

Range	Resolution	Accuracy tolerance: ± (% reading + digits)
600µA	0.01µA	± (0.08% + 10)
6000µA	0.1µA	± (0.08% + 10)
60mAV	0.001mA	± (0.08% + 20)
600mAV	0.01mA	± (0.15% + 10)
10A	0.001A	(0.5% + 10)

- Overload protection: μAmA range: 0.8A H 1000V fuse type φ 6x32mm 10A range: 10AH 1000V fuse type φ 10x38mm.
- Switch on for 30 seconds and suspend for 10 minutes for 20A. Not specified for over 10A.

AC CURRENT + DC CURRENT

Range	Resolution	Accuracy Tolerance: ± (% reading + digits)	
60.14	0.044	50~1kHz	1k~10kHz
60µA	0.01µA	±(0.8% + 40)	±(2.0% + 40)
60004	0.4	50~1kHz	1k~10kHz
6000μΑ 0.1μΑ	±(0.8% + 20)	±(2.0% + 40)	

60mA	60mA 0.001mA	50~1kHz	1k~10kHz
OUTIA	0.00 IIIIA	±(0.8% + 40)	±(2.0%+40)
600m A	600mA 0.01mA	50~1kHz	1k~10kHz
600IIIA		±(0.8% + 20)	±(2.0% + 40)
600V	0.0014	50~1kHz	1k~10kHz
600V 0.001A	0.001A	±(1.2% + 20)	±(3% + 40)

- Display: true virtual value for 10% to 100% of the range.
- Overload protection: μAmA range: 0.8A H 1000V fuse type φ 6x32mm.
- 10A range: 10AH 1000V fuse type φ 10x38mm.
- Measurements must not last for more than 30 seconds. Allow 10 minutes to discharge between measurements. Do not attempt measurements over 10A.

RESISTANCE

Range	Resolution	Accuracy tolerance: ± (% reading + digits)
600Ω	0.01Ω	In REL state: ± (0.05% + 10)
6kΩ	0.0001kΩ	
60kΩ	0.001kΩ	± (0.05% + 2)
600kΩ	0.01kΩ	
6ΜΩ	0.0001ΜΩ	± (0.3% + 10)
60ΜΩ	0.001ΜΩ	± (2% + 10)

Overload protection: 1,000V.

Humidity: <50%.

CAPACITANCE

Range	Resolution	Accuracy tolerance: ± (% reading + digits)
6nF	0.001nF	± (3% + 10)
60nF	0.01nF	± (2.5% + 5)
600nF	0.1nF	
6μF	0.001µF	1 (20/ 1.5)
60µF	0.01µF	± (2% + 5)
600µF	0.1μF	
6mF	1μF	± (5% + 5)
60mF	10μF	Not specified

Overload protection: 1000V.

Display digits: 6000.

CONDUCTANCE

Range	Resolution	Accuracy tolerance: ± (% reading + digits)
60NS	0.01NS	± (2% + 10)

Overload protection: 1,000V.
Humidity for 60MΩ: <50%.

TEMPERATURE

Range	Resolution	Accuracy tolerance: ± (% reading + digits)
-40°C~40°C		± (2.0% + 30)
40°C~400°C	0.1	± (1.0% + 30)
400°C~1000°C		± 2.5%
-40°F~104°C		± (2.5% + 50)
104°F~752°F	0.2°F	± (1.5% + 50)
752°F~1832°F		± 2.5%

- Overload protection: 1000V.
- Two-channel temperature measurement can be performed via temperature connectors.
- Temperature sensor: Applicable to K-type thermocouple. Spare parts are point contact K-type thermocouple (only applicable to the measurement when temperature is below 230°C).

FREQUENCY

Range	Resolution	Accuracy
60Hz	0.001Hz	± (0.02% + 8)
600Hz	0.01Hz	
6kHz	0.0001kHz	
60kHz	0.001kHz	± (0.01% + 5)
600kHz	0.01kHz	± (0.01% + 5)
6MHz	0.0001MHz	
60MHz	0.001MHz	

- Overload protection: 1000V.
- Input amplitude: 10Hz~30MHz: 600mV ≤ a ≤ 30Vrm.

Greater than 30MHz: not specified.

DUTY CYCLE

Range	Resolution	Accuracy tolerance: ± (% reading + digits)
10%~90% (10Hz~2KHz)	0.01%	± (1.2% + 30)

PULSE WIDTH

Range	Resolution	Accuracy tolerance: ± (% reading + digits)
250mS	0.001mS~0.01mS	± (1.2% + 30)

- Overload protection: 1000V.
- When the rise time is less than 1µs, the signals centre on the trigger level.
- The pulse width is greater than 2µs for 10Hz to 200kHz. The pulse width depends on signal frequency.

CONTINUITY TEST

Range	Resolution	Remark
- 1))	0.01Ω	Open circuit voltage is around 3V. When the buzzer selects short circuit for sound warning, the resolution is less than $10\Omega.$ If the buzzer continuously sounds, the resolution is greater than $50\Omega.$ The buzzer does not sound. When the buzzer selects open circuit for sound warning, the resolution is greater than $50\Omega.$ The buzzer continuously sounds, the resolution is less than $10\Omega.$ The buzzer does not sound.

Overload protection: 1000V.

DIODE TEST

Range	Resolution	Remark
→	0.0001V	Open circuit voltage is around 3V. The forward voltage drop value of the measured PN junction is approximately ≤3V. When the buzzer activates, it will beep briefly for the normal semiconductor junction. If the semiconductor junction shorts out it will beep continuously. Silicon PN junction drops between 0.5~0.8V as the normal value.

Overload protection: 1000V.

MEASUREMENT OPERATIONS

METER POWER CONTROL

Manually start up and shut down the meter power.

- · Press and hold the power button to start the meter.
- When the meter is on, press and hold the power button to shut the meter down.
- The meter cannot be powered off when charging.

Indicators for Battery Capacity

- The meter is powered by lithium battery. The indicators for the battery capacity are in the top right corner of the display.
- Various indicators for battery capacity are described in the following table:

Symbol	Battery capacity
4	Full capacity
-	Half capacity
4_1	Empty

When the battery capacity is lower than 3% of full capacity the meter will automatically shutdown.

Backlight Control

- If the display is not visible in low-light situations, press to switch the backlight brightness.
- Press and hold the key to turn off the screen and enter power saving mode.
- When in power saving mode, the power button will flash green to indicate that the meter is still collecting data.
- Press any button or turn the rotary switch to turn on the backlight again.

Auto Power-Off

- If no buttons are pressed or there is no turn of the rotary switch within the set time the meter will automatically shutdown.
- Press and hold the power button to restart the meter.
- When the "POWER OFF" setting has been set to "OFF", auto power-off will be disabled.

Power Saving Mode

• Set the "brightness down", "display off" and "power off" times for backlight brightness via the "AUTO POWER SAVE" option.

METER SETTINGS

 Press the function button SETUP to set and view the relevant information on the meter. Press the directional buttons to select the relevant menu items of the meter as follows:

Keypad Tone

- Set to "ON" to enable button sounds and "OFF" to disable button sounds.
- The sound symbol in the top right-hand corner will appear when sound is on and disappear when the sound is switched off.

Lead Alarm Buzzer

 Set to "ON" to enable the alarm sound for an incorrect probe insertion and to "OFF" to disable the alarm sound for a mis-inserted probe.

Communication

- Set to "ON" to enable USB or Bluetooth communication. The symbol will appear in the top left-hand corner.
- Set to "OFF" to disable USB or Bluetooth communication and the symbol will disappear.

Date & Time

Press the function button SET to set the date and time.

- Use the left and right directional buttons to select the required edit position, then
 press the up and down directional buttons to enter different numbers.
- Press the function button OK to confirm.
- To cancel the settings, press the function button CANCEL.

Auto Power Save

- Press the function button SET to set the control time of the automatic reduction for backlight brightness of the display and auto power-off time.
- Press the left and right buttons to move the cursors to select different settings.
- Press the up or down button to enter the time for power saving mode.

Menu Item	Description	Set Value
Brightness Down	Control time of automatic reduction for backlight brightness.	ON: 1-60 min. OFF: Function disabled.
Display Off	Off time of display	ON: 1-60 min. OFF: Function disabled.
Power Off	Auto power-off time	ON: 1-60 min. OFF: Function disabled.

- Press the function button **OK** to confirm the above settings.
- To cancel the setting, press the function button CANCEL.

More Settings

- Press the function button ENTER to set the language, memory format, reset the meter settings, check the product model, serial number and available memory space.
- Press the directional buttons to select the relevant menu items for the meter as follows:

Help Menu Language

- Press the function button SET to set the languages of help information.
- Press the left and right directional buttons to select a different language, then
 press the function button OK to confirm.

Memory Format

- Press the function button FORMAT to enter the memory format, then press the function button YES to confirm.
- To cancel the format, press the function button NO.

Reset All Settings

- Press the function button RESET to reset the menu with default settings, then
 press the function button YES to confirm.
- To cancel the reset, press the function button NO.

About

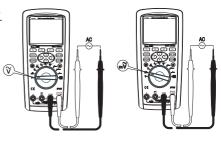
 Press the function button ABOUT to check the product model, serial number and available memory space.

AC VOLTAGE

- Insert the red test lead into the V terminal and the black test lead into the COM terminal.
- Set the rotary switch to $\tilde{\mathbf{V}}$ or $\mathbf{m}\tilde{\mathbf{V}}$ as shown in the image below.
- Read the measured voltage values on the display. True virtual values are displayed for AC measurement.
- Press the function button MENU to access the sub-menus in which basic AC voltage measurements can be modified.
- Press the directional buttons to choose between the sub-menu options.
- Each sub-menu, when highlighted, will present additional options for measurement display.
- The red cursor button indicates the selected item.

Warnings

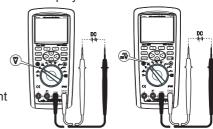
- Do not input a voltage higher than 1000V.
 Higher voltage may be measured but it risks damaging the meter.
- When measuring high voltage, extra care should be taken to avoid an electric shock.
- After completing all the measuring operations, disconnect the connection between the test leads and the circuit under test.



- The response mode of AC coupled true RMS is adopted for the conversion of AC with sinusoidal input calibration. The accuracy of non-sinusoidal wave must be adjusted based on the following:
 - For crest of 1.4~2.0, the accuracy should be adjusted by 1.0%.
 - For crest of 2.0~2.5, the accuracy should be adjusted by 2.5%.
 - For crest of 2.5~3.0, the accuracy should be adjusted by 4.0%.

DC VOLTAGE

- Insert the red test lead into the V terminal and the black test lead into the COM terminal.
- Set the rotary switch to DC V or DC mV as shown below. Connect the test leads to the power or load under test in parallel.
- Directly read the measured voltage values on the display.
- Press the function button MENU to enter one menu item in which basic DC voltage measurement can be modified.
- Press the directional buttons to choose between the sub-menu options.
- Each sub-menu, when highlighted, will present additional options for measurement display.
- The red cursor button indicates the selected item.



Warnings

- Do not input a voltage higher than 1000V. Higher voltage may be measured but it risks damaging the meter.
- When measuring high voltage, extra care should be taken to avoid an electric shock.
- After completing all the measuring operations, disconnect the connection between the test leads and the circuit under test.

AC & DC CURRENT

- Insert the red test pen into the μA, mA or A terminal and the black test lead into the COM terminal.
- Set the rotary switch to the position as shown below. Press SELECT to choose
 the required AC or DC to be measured. Connect the test leads to the test circuit in
 series.
- Directly read the measured current values on the display. True virtual values are displayed for AC measurement.
- Press the function button
 MENU to enter a sub-menu
 option in which basic AC or DC
 current measurement can be
 modified.
- Press the directional buttons to choose between the options.
- The red cursor button indicates the selected item.



Warnings

- Before connecting to the test circuit in series, turn off the power to the circuit first and discharge all the high-voltage capacitors.
- Use proper input terminals and functions for measurement. If the current size cannot be estimated, the range of large current should be measured first.
- When the test lead is inserted into the input terminal of current, do not connect
 its test probe to any circuit in parallel as it will blow the fuses within the meter and
 damage the meter.
- After completing all the measuring operations, disconnect the connection between the test leads and the circuit under test.

RESISTANCE

- Insert the red test lead into the Ω terminal and the black test lead into the COM terminal.
- Set the rotary switch to the measurement Ω nS · · ·) where Ω is the default resistance measurement. Connect the test leads to both ends of the measured resistance.
- Directly read the measured resistance values on the display.

Warnings

If the open circuit of the measured resistance or resistance value exceeds the

- maximum range of the meter, "OL" will show on the display.
- When measuring in-circuit resistance, all of the power within the measured circuit must be shut off before measurement and all of the capacitors must be discharged to ensure a correct measurement.
- When measuring low resistance, the test lead will bring about measurement errors of resistance between 0.10 and 0.20Ω. To obtain accurate readings, relative measurement can be adopted.
- Firstly, short the input test lead, then press the MENU button and press F2 to enter the relative measurement.
- Carry out the measurement of low resistance after the meter has automatically subtracted the display value of the shorted test lead.
- If the resistance value is greater than 0.50Ω for a shorted test lead, the test lead should be checked to see if any are loose.
- When measuring resistance above 1MΩ, the readings require a few seconds to stabilise. It is normal for measurement of high resistance. In order to obtain stable readings, short test lines can be used for the measurement.
- Do not input a voltage higher than 30V in AC (rms), AC (peak 42V) or 60V in DC to avoid personal injury.
- After completing all of the measuring operations, disconnect the connection between the test leads and the circuit under test.

CONDUCTANCE

- Insert the red test lead into the Ω terminal and the black test lead into the COM terminal.
- Set the rotary switch to the measurement Ω nS ·

)). Press the SELECT button to select conductance measurement 60nS.
- Connect the test leads to both ends of the measured resistance.
- Directly read the measured conductance value on the display.

- When measuring the in-circuit resistance, all of the power within the measured circuit must be shut off before measurement and all of the capacitors must be discharged to ensure the correct measurement.
- Do not input a voltage higher than 30VAC (rms), AC (peak 42V) or 60V DC in order to avoid personal injury.
- After completing all the measuring operations, disconnect the connection between the test leads and the circuit under test.



CAPACITANCE

- Insert the red test lead into the + terminal and the black test lead into the COM terminal.
- Set the rotary switch to the measurement → + ← and press the SELECT button to select capacitance measurement.
- Connect the test leads to both ends of the measured capacitance (see right).
- Directly read the measured capacitance on the display.

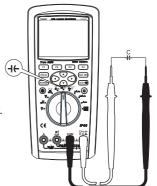
Warnings

- If the measured capacitance shorts or capacitance value exceeds the maximum range of the meter "OL" will show on the display.
- For the measurement of capacitance within small range, relative measurement REL should be adopted to avoid the influence of distributed capacitance for correct readings.
- For the measurement of capacitance greater than $600\mu F$, allow for more time to gain the correct readings.
- To ensure the measuring accuracy, the capacitor should be discharged completely then put into the meter to measure, especially for a capacitor with high voltage in order to avoid damage to the meter and personal injury.
- Do not input a voltage higher than 30VAC (rms), AC (peak 42V) or 60V DC in order to avoid personal injury.
- After completing all of the measuring operations, disconnect the connection between the test leads and the capacitor under test.

CONTINUITY TEST

- Insert the red test lead into the Ω terminal and the black test lead into the **COM** terminal.
- Set the rotary switch to the measurement Ω nS · i) and press the SELECT button to enter one of the sub-menu options.
- If pressing the SHORT button, then the buzzer selects short circuit for alarm sound. If the measured resistance between both ends is <10Ω, the buzzer continuously sounds. If it is >50Ω the buzzer does not sound.
- When pressing the **OPEN** button, the buzzer selects open circuit. For the alarm to sound continuously, the measured resistance between both ends must be $>50\Omega$. If it is $<10\Omega$, the buzzer does not sound.
- Directly read the measured resistance value on the display.

- When measuring the in-circuit resistance, all of the power within the measured circuit must be shut off before measurement and all of the capacitors must be discharged to ensure correct measurement.
- Do not input a voltage higher than 30VAC (rms), AC (peak 42V) or 60V DC in order to avoid personal injury.
- After completing all of the measuring operations, disconnect the connection between the test leads and the circuit under test.



DIODE

- Insert the red test lead into the terminal and the black test lead into the COM terminal. The polarity of the red test lead is positive, and negative for the black test lead.
- Set the rotary switch to the measurement → + + ← where the diode measuring mode → is default. Connect the test leads to both ends of the measured diode as shown in the image below right.
- Directly read the approximate forward PN junction voltage of the measured diode on display.
- Press the function button MENU to view the menu options. If you select the ALARM button, the buzzer sounds.
- If the semiconductor junction shorts out, it will beep continuously.
- Silicon PN junction drops between 0.5~0.8V as the normal value.
- If you select the **NORMAL** button, the buzzer will not sound.

Warnings

• If the measured diode is in open circuit or the polarity is reversed, "OL" will display.

- When measuring the in-circuit diode, all of the power within the measured circuit must be shut off before measurement and all of the capacitors must be discharged.
- Open-circuit voltage of the diode test is around 3V.
- Do not input a voltage higher than 30V in AC (rms),
 AC (peak 42V) or 60V in DC to avoid personal injury.
- After completing all measurement operations, disconnect the connection between the test leads and the circuit under test.

FREQUENCY / DUTY CYCLE MEASUREMENT / PULSE WIDTH

- Insert the red test lead into the V terminal and the black test lead into the COM terminal.
- Set the rotary switch to the measurement Hz% ms-Pulse.
- Press the SELECT button to choose between Hz / Duty% / ms-Pulse.

 Connect the test leads to the signal source under test in parallel as shown below right.

 Directly read the measured values of frequency / duty cycle / pulse width on the display.

- The simulation bar displays the frequency of the measured signal for duty cycle and pulse width.
- Do not input a voltage with higher frequency than 30Vrms to avoid personal injury.
- After completing all measurement operations, disconnect the connection between the test leads and the circuit under test

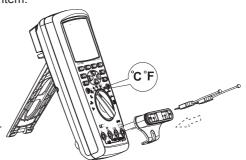


TEMPERATURE

- Set the rotary switch to the measurement function "m\overline{V} °C °F" then press the **SELECT** button to choose between celsius (°C) or fahrenheit (°F).
- Insert the temperature connector into four terminals and connect two temperature probes to the temperature connector.
- The probes detect the surface of the object under test as shown below right.
- Directly read the temperature values on the two surfaces under test on the display.
- Press the function button MENU to open one menu option and then press F2
 in which basic temperature measurements can be modified to enter the relative
 measuring mode.
- Press F4 to close the window of additional functions and use the cursor buttons to select menu options.
- The red cursor indicates the selected item.

Warnings

- The ambient temperature for the meter must not exceed the range from 18°C to 28°C, otherwise it will cause measurement errors. The measurement effects are more obvious at low temperatures.
- Remove the temperature probes after completing all of the measurement operations.



LPF MEASUREMENT

- Insert the red test lead into the V terminal and the black test lead into the COM terminal.
- Set the rotary switch to V and connect the test leads to the lower or load to be tested in parallel as shown right.



- Press the function button MENU to view the menu options. Use the cursor buttons to select "Low Pass", then press the MENU function button to enter LPF measuring mode.
- The meter performs the measurement in AC mode. The AC signals go through a
 filter which holds up the voltage higher than 1kHz. As shown right, the low-pass
 filter can measure the composite signals of sinusoidal wave generated by inverter
 and variable-frequency motor.

- To avoid electric shock or personal injury, do not use the low-pass filter to verify hazardous voltage, as the voltage over the indicated value may exist.
- Firstly, measure the voltage by disconnecting the filter to see any hazardous voltage, then select the filter function.
- In LPF measuring mode, the meter will turn to manual mode. Press the RANGE button to select a range. When the low-pass filter is enabled, the automatic range is unavailable.

- Do not input a voltage above 1000V. Higher voltage may be measured but it poses the risk of damaging the meter.
- After completing all of the measurement operations, disconnect the connection between the test leads and the circuit under test.

dBV

- Insert the red test lead into the V terminal and the black test lead into the COM terminal.
- Set the rotary switch to the $\tilde{\mathbf{V}}$ position and connect the test leads to the power or load to be tested in parallel.
- Press the MENU function button to enter one of the menu options. Press the cursor buttons to select the menu option dBV, then press the dBV function button to enter dBV measurement.
- dBV is primarlily shown and AC voltage value is secondly shown on the display.
 AC voltage of the measured signal is displayed on the simulation bar.

dBm

- Insert the red test lead into the V terminal and the black test lead into the COM terminal.
- Set the rotary switch to the V position and connect the test leads to the power or load to be tested in parallel.
- Press the MENU function button to enter one of the menu options. Press the cursor buttons to select the menu option dBm.
- A reference impedance (resistance) must be used for the measurement of dBm to calculate dB value on the basis of 1mW.
- Press the function button **RES** to select a reference impedance value.
- Use the ▲ or ▼ button to scroll between the 10 defined reference values: 4, 8, 16, 25, 32, 50, 75, 600, 1000 and 1200.
- Press the function button **EDIT** and the cursor buttons to select any one of the reference impedance values between $4\Omega\sim1200\Omega$. Press the function button **OK** to set reference values.
- Press the function button dBm to enter dBm measurement.
- dBm is primarily shown and AC voltage value is shown secondly on the display.
 AC voltage of the measured signal is displayed on the simiulation bar.

MAXIMUM & MINIMUM VALUE

- Press MAX MIN to activate the measurement of maximum and minimum values.
- Real time measurements are primarily displayed.
- Maximum, average and minimum values, elapsed time, start date and time corresponding to the three values are secondly displayed.
- Press the function button RESTART to re-activate the measurement of maximum and minimum values.
- Press the function button EXIT to exit the measurement of maximum and minimum values.

RELATIVE VALUE

- Press the function button MENU to enter the next interface, then press the function button REL to enter the measuring mode of relative values, then press the function button REL to activate the measurement of relative values.
- By this time, the measurements _ basic values are primarily displayed and the relative value and real-time measurements are secondly displayed.
- Press the function button MENU to select basic measurements to exit the measurement of relative values.

PEAK DETECTION

- Press function button MENU to select the Peak option, then press the function button PEAK to activate peak detection.
- Response time is 1ms. Transient values can be more accurately measured by using peak recording function.

COMPARE MODE COMP

Press the function button COMP to enter the measurement of compare mode.
 Press the ▼ or ▲ buttons to select the settings of compare mode as follows:

Pass Mode

- Press the function button EDIT to enter the setting mode of compare types. Press
 ▲ or ▼ to set one of the four types as follows:
 - Inner (low value ≤ input value ≤ high value)
 - Outer (input value < low value or input value > high value)
 - < value
 - > value
- Press the function button OK to confirm the above settings. To cancel the settings, press the function button CANCEL.

Beep Mode

 Press the function button EDIT to enter buzzer start mode. Press ▼ or ▲ to select on of the following three items:

- PASS ON

It indicates that the buzzer starts to sound when the compare results shows as PASS.

- FAIL ON

It indicates that the buzzer starts to sound when the compare result shows as FAIL.

- OFF

Buzzer off. Press the function button **OK** to confirm the above settings. To cancel the settings, press the function button **CANCEL**.

Low Value or High Value or Value

- Press the function button EDIT to compare reference values. Press the

 or

 buttons to move the cursors to select locations and the

 or

 buttons to enter different numbers.
- Press the function button OK to confirm.
- To cancel the settings, press the function button CANCEL.
- After completing the settings, press the function button **START** to start the

measurement of compare mode. Press the function button **EXIT** to exit the measurement of compare mode.

RECORDING MEASUREMENT DATA

 Press the function button SAVE to enter the modes of single recording, continuous recording and inquire recording. Press the cursor buttons to select the following modes:

Save

 Press the function button SAVE to record the current measuring data for once up to 20,000 pieces.

View Save

- Press the function button VIEW to view one-time recorded data.
- Press or hold the function button PREV to view the previous recorded data.
- Press or hold the function button NEXT to view the next recorded data.
- Press the function button **DELETE** to delete the current recorded data.
- Press the function button RETURN to return to the last menu.
- In addition to displaying the recorded data, the location and total number of current recorded data are displayed in the lower left corner.
- The date and time of the current data recording are displayed in the lower right corner.

Delete All Save

- Press the function button DELETE to delete all one-time recorded data.
- Press the function button YES to confirm.
- To cancel the operation, press the function button **NO**.

Record

- Press the function button ENTER to enter the continuous recording mode with maximum recording pieces up to 10,000.
- Press ▲ or ▼ and move the cursor to select the three settings as follows:

- Edit Name

Press the function button **EDIT** to enter the continuous recording items.

- Press either ✓ or ► to move the cursor and select the edit locations.
- Press the F1 button to switch the input mode to "uppercase" mode, then press ▲
 or ▼ to input uppercase letter.
- Press the F2 button to switch to the input mode to "lowercase" mode, then press
 ▲ or ▼ to input lowercase letter.
- Press F3 to switch the input mode to "digital" mode and press the ▲ or ▼ buttons to enter numbers or symbols.
- Press F4 to save and exit edit mode.

- Set Interval

- Press the function button EDIT to set the interval time of continuous recording.
- Press or hold the

 or

 buttons to move the cursors to select edit locations.
- Press or hold the ▲ or ▼ buttons to enter different numbers.
- Note: the interval time can be set from 1sec ~ 60 mins.

- Set Duration

- Press the function button EDIT to set the duration time of continuous recording.
- Press or hold the

 or

 buttons to move the cursors to select edit locations.
- Press or hold the ▲ or ▼ buttons to enter different numbers. The duration time
 can be set as days, hours and minutes.

- Max Duration

- Indicates the maximum time for continuous recording. After completing the settings, press the function button START to start a continuous recording as shown right.
- The character "REC" shows on the display and flashes with a red dot. The relevant display information is shown in the following table:



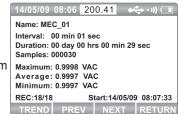
Information	Description
Elapsed Time	Run time displayed in hours: minutes: seconds
Remaining Time	Time left displayed in hours: minutes: seconds
Samples	Total recording points for present recorded events
Start	Time and date from the start of the recording

- To manually stop recording, press the function button STOP.
- When you've stopped recording, return to the menu and you

can view the relevant operations in the following menu:

- View Record

- Press SAVE and then select VIEW RECORD from the sub-menu in order to see the recordings.
- The basic display information is in the following table:



Information	Description	
Name	Name of record event	
Interval	Interval time	
Duration	Actual duration time after continuous recording stops	
Samples	Total recording points for present record events	
Maximum	Maximum value for all recorded data	
Average	Average value for all recorded data	
Minimum	Minimum value for all recorded data	
REC	Position of the present recording / number of recordings	
Start	Date and time from which the recording began	

- Press the function button PREV to display basic information on the previous record
- Press the function button NEXT to display the basic information on the next record.
- Press the function button RETURN to go back to the previous menu.
- Press the function button TREND to view the trend chart of the present record as shown right:
- The display information of trend data is explained in the following table:



- 1) Measured value corresponding to cursor
- 2) Date and time for measurement corresponding to cursor
- 3) Cursor
- 4) Trend time
- 5) Time label of X-axis to display during elapsed time
- 6) Name of record event
- 7) Time and date from the start of the recording
- View the trend chart. Press or hold the F2 button to move the cursor left and F3 to
 move the cursor to the right.
- The cursor will move one data to the left or right for each press.
- Hold down F2 or F3 to speed the cursor up.
- Press ▲ or ▼ to scale the graph vertically and ◀ or ► to scale the graph horizontally.
- Press the F1 button to delete this record and again (YES) to confirm, or NO to cancel the deletion.

- Delete All Record

 Press the function button DELETE to delete all recordings. Press the function button YES to confirm, or NO to cancel the operation.

COMMUNICATION

- Turn on communication by pressing **SETUP**, before moving the cursor to "Communication".
- Press F1 to turn on and the Bluetooth symbol will appear in the top right hand corner of the screen.
- The meter carries a USB communication by connecting the USB cable to a PC.
- It can also use a bluetooth module (optional) and mobile phone for bluetooth communication.





CLEANING & MAINTENANCE

General Maintenance

- Clean the meter casing with a damp cloth and a mild detergent.
- Do not use any chemicals, abrasives or solvents that could damage the meter.
- Dirt or moisture on the terminals can affect readings. Clean the terminals according to the following steps:
 - Turn off the meter and remove all test leads.
 - Clean up the dirt on the terminals.
 - Soak a clean cotton swab in mild detergent and water and clean each terminal with the cotton swab. Dry each terminal with canned compressed air to force water and detergent to flow out of the terminals.
 - In case of anything abnormal for the meter, stop using it and send it for repair. When the meter needs to be verified or repaired, qualified service personnel are required in order to carry out any work needed.

Testing the Fuse

- Insert a test lead into the terminal as shown right and contact the probe tip at the other end of the test lead with the metal in the terminal of current input.
- If the message "Lead Error!" (connection error for test lead) appears, it shows that the probe tip is inserted too deeply into the terminal of current input.
- Draw out the test lead a little until the error message disappears and "OL" (overload) or the resistance reading appears on the display.
- If the resistance reading for the "A" terminal is less than 0.5Ω, it shows that the fuse F2 is normal.
- If the reading is "OL", you need to replace F2.
- If the resistance reading of " μ A m" is less than 1.2M Ω , it shows that the fuse F1 is normal.
- If the reading is "OL", F1 needs to be replaced.

Replacing the Fuse

- Inspect or replace the fuse as shown in the figure below right, according to the following steps:
 - Turn off the meter and remove the test leads from the terminals.
 - Use a flat-head screwdriver to turn the screw anti-clockwise on the battery cover then remove the battery cover.
- Gently pry one end of the fuse and then remove it from the clip!
- The fuse installed for the mA or μA input terminal is 0.8AH 1000V fuse type 6x32mm (F1), while the fuse installed for the A input terminal is 10AH 1000V fuse type 10x38mm (F2).





CHARGING THE BATTERY

- When the battery indicator, in the top right hand corner of the display is less than 5% of full capacity, the meter should be immediately charged, otherwise it will affect the measurement accuracy.
- Set the rotary switch to "CHG" and the display will read "please plug in AC adapter!"
- Connect the power connector to the four terminals in the meter, then insert the power adaptor into the power connector.
- "Charging..." on the display indicates that it is charging.
- When the battery is fully charged, the red light is off and it will no longer charge.





INFORMATION ON WASTE DISPOSAL FOR CONSUMERS OF ELECTRICAL & ELECTRONIC EQUIPMENT.

This symbol indicate that separate collection of Waste Electrical and Electronic Equipment (WEEE) or waste batteries is required. Do not dispose of these items with general household waste. Separate for the treatment, recovery and recycling of the materials used. Waste batteries can be returned to any waste battery recycling point which are provided by most battery retailers. Contact your local authority for details of the battery and WEEE recycling schemes available in your area.

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