

# MultiDisplay MultiMeter

- Make your job efficiency

## Quick Start Guide



This guide provides an overview, detail User Manual are available on the accompanying CD-ROM. Please execute the program of "Start DMM.htm" or "autorun.htm" on the CD-ROM. It will guide you to find the related document.

## SAFETY INFORMATION

This meter is a hand-held, battery-operated instrument for testing and troubleshooting power electronic systems. If this device is damaged or something is missing, contact the purchasing place immediately.

A **WARNING** identifies conditions and actions that may cause hazard(s) to the user; a **CAUTION** identifies conditions and actions that may damage this Device. Following **Table-1** explain international electrical symbols used on this meter.

**Table- 1 International Electrical Symbols**

	AC - Alternating Current
	DC - Direct Current
	AC and DC - Alternating and Direct Current
	Ground
	Double Insulation
	See Explanation In The Manual

### **Warnings and Cautions**

**To avoid electric shock, injury, or damage to this instrument and ensure that you use the meter safely, follow the safety guidelines listed below:**

- Read this operation manual completely before using this device and follow all safety instructions.
- This device is for indoor use, altitude up to 2,000 m.
- Avoid working alone.
- Use the device only as specified in this manual; otherwise, the protection provided by the meter may be impaired.
- Never measure Voltage when the current measurement is selected.
- Do not use this device if it looks damaged.
- Inspect the leads for damaged insulation or exposed metal. Replace damaged leads.
- Disconnect the power and discharge all high-voltage capacitors before testing in the resistance, continuity, and diode function.
- Be cautions when working above 70V DC or 33VRMS and 46.7V peak, such voltages may cause a shock hazard.
- Always keep your hands behind the protective guard of the probe as measuring.
- Select the proper function and disconnect the test leads from test points before changing functions.
- Always use specified battery.
- The meter is safety-certified in compliance with EN61010 (IEC 1010-1, IEC 1010-2-031) Installation Category IV 600V/ III 1000V Pollution Degree 2. In order to maintain its insulation properties, please be sure to use with the standard or compatible test probes.
- CE requirement: Under the influence of R.F field according to standard, the supplied test leads will pick up induced noise. To have better shielding effect, a short-twisted lead should be used.

## QUICK START



### WARNING

Read "SAFETY INFORMATION" before using this device.

1. Turn the function switch to select combined function for "V".
2. Press the "DUAL" button momentarily to set frequency measuring on secondary display.
3. Connect the **INPUT** terminals by test leads to the source to be tested.



Figure- 1 Dual display for ACV/ Hz Measurement

# MULTI-DISPLAY MULTIMETER

## ■ INTRODUCTION

The meter is robust for industrial fields and laboratories. Smart charger provides you a chance to protect Earth environment because rechargeable battery of NiMH. The ambient temperature can be display with main measurement, which can help you to do monitor the electrical value and record environment variation, simultaneously.

### Main Features:

- DCV, ACV, DCA, ACA, OHM, Diode check, Audible continuity, Temperature, Frequency, Duty cycle and Pulse Width tests
- AC+DC true RMS measurement for both voltage and current
- Built-in rechargeable battery
- Smart Charger design without battery removed
- Ambient temperature display with main measurement
- Battery capacity indication
- Brightness EL backlight
- Resistance measurement up to 500M $\Omega$
- Conductance measurement from 0.01nS (100G $\Omega$ ) ~ 50nS
- Capacitance measurement up to 100mF.
- Frequency counter up to 20MHz
- The % scale readout for 4-20mA or 0-20mA measurement
- dBm with selectable reference impedance
- 1ms Peak hold to catch inrush voltage and current easily
- Temperature test with the selectable 0 $^{\circ}$ C compensation
- J/K types temperature
- Frequency, Duty cycle and Pulse width measurements.
- Dynamic Recording for Min/Max/Average
- Data Hold with Manual or Auto Trigger and Relative modes
- Diode and Audible Continuity Test
- Square Wave Output with selectable frequency and duty cycle
- Bi-directional optic computer interface with SCPI commands
- Safe, precision and speed closed case calibration
- 50,000 count precision True-RMS digital multi-meter and designed to meet IEC-1010 CAT. III 1000V and CAT. IV 600V standards

# GETTING START WITH YOUR METER

## ■ Display Illustration

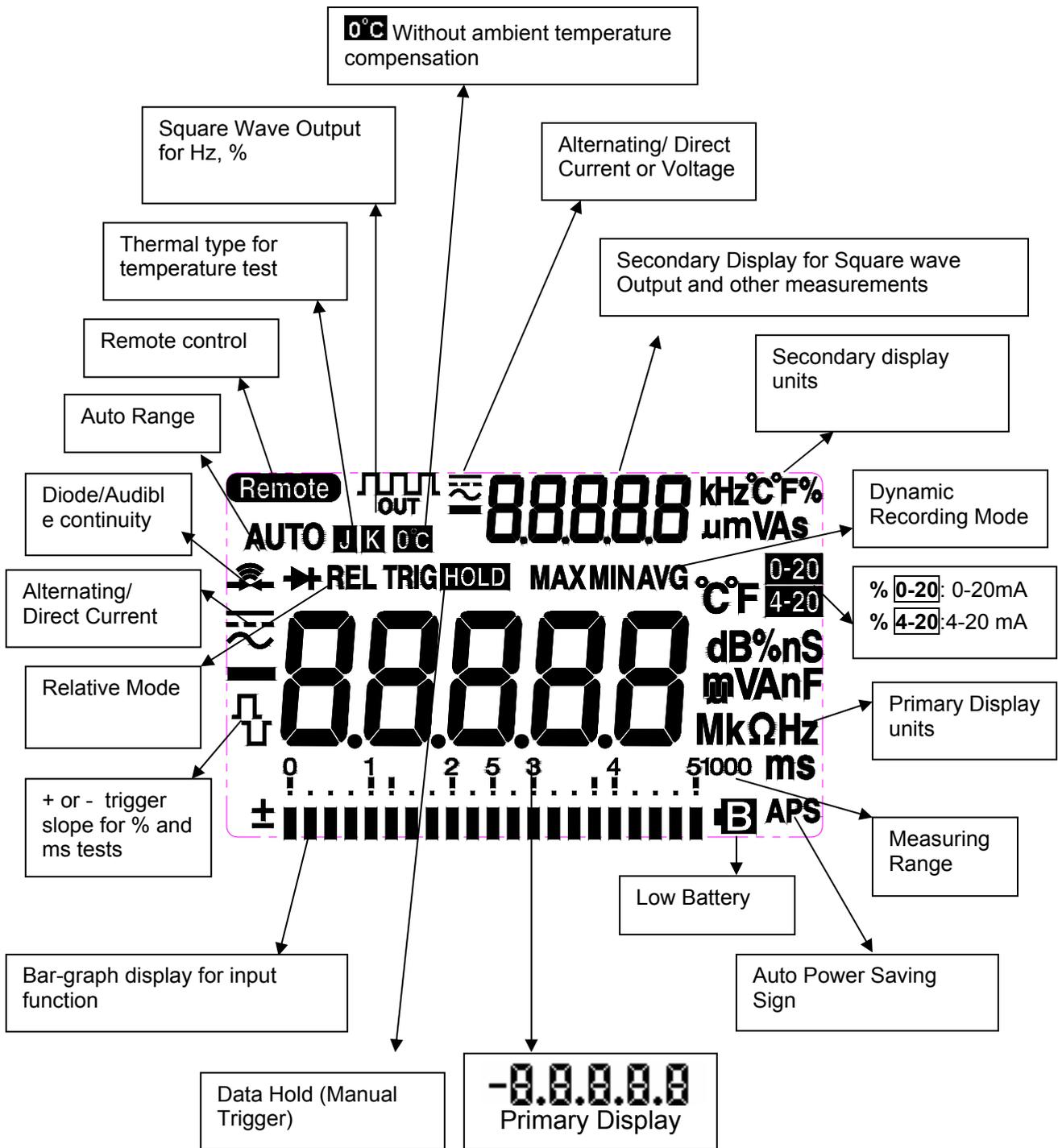


Figure- 2 LCD Display

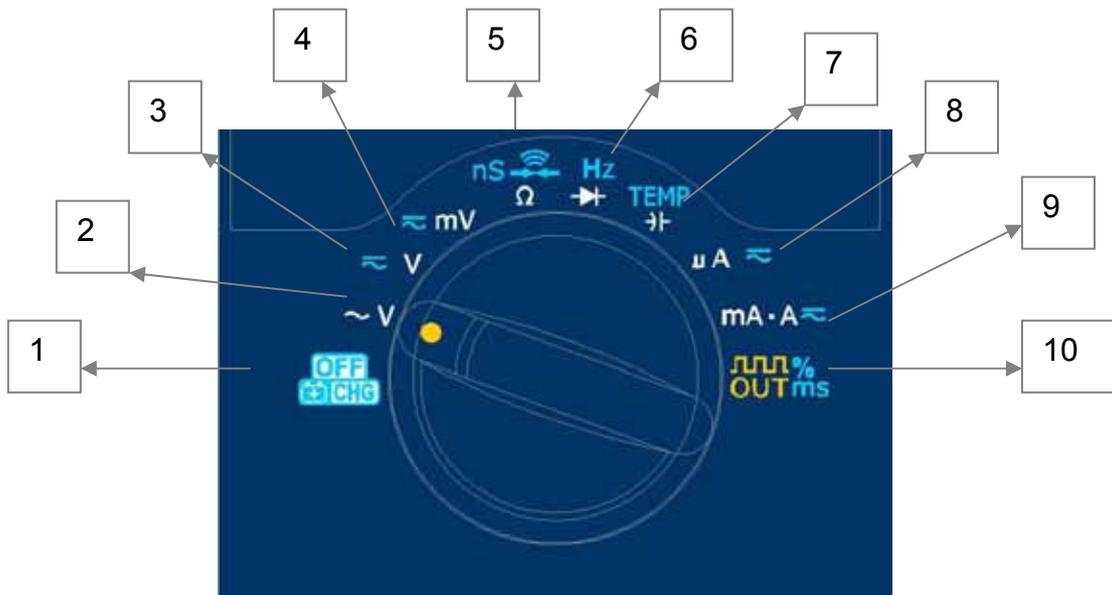
■ **Rotary Switch**

**⚠ WARNING**  
**Be sure to remove the test leads from measuring source or target before changing rotary switch.**

To turn this device ON and select a function you want by turning the rotary switch.

**Table- 2 Rotary Switch position**

Position	Function
1	OFF
2	~ V
3	≈ V
4	≈ mV
5	Resistance/ Continuity/ nS
6	→ / Hz (FC)
7	⚡ TEMP
8	μA ≈
9	mA·A ≈
10	⏏ OUT



**Figure- 3 Rotary Switch for selecting function**

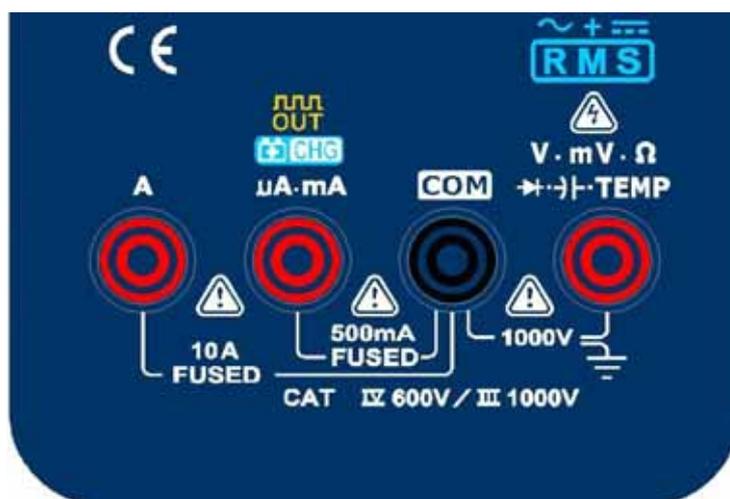
## ■ TERMINALS

**⚠ WARNING**  
**To avoid damaging this device, do not exceed the input limit.**

To avoid damaging the meter, do not exceed the input limit as below table:

**Table- 3 Input limit specification**

ROTARY SWITCH FUNCTION	INPUT TERMINAL		OVERLOAD PROTECTION
~ V	V.Ω. →	COM	1000 V R.M.S.
~ V			
~ mV			
Ω			
→ (Diode)			
Capacitance ⇄			
Temperature			
~ μA	μA mA	COM	440mA/ 1000V 30kA fast-acting
~ mA			
~ A	A	COM	11A/ 1000V 30kA fast-acting
OUT	OUT	COM	



**Figure- 4 Terminals**

## PUSH-BUTTON OPERATIONS

The operation of push-button is shown as below. When push the button, a related symbol will be lit, and the beeper will sound. Turning the rotary switch to another position will reset current operation of push buttons.

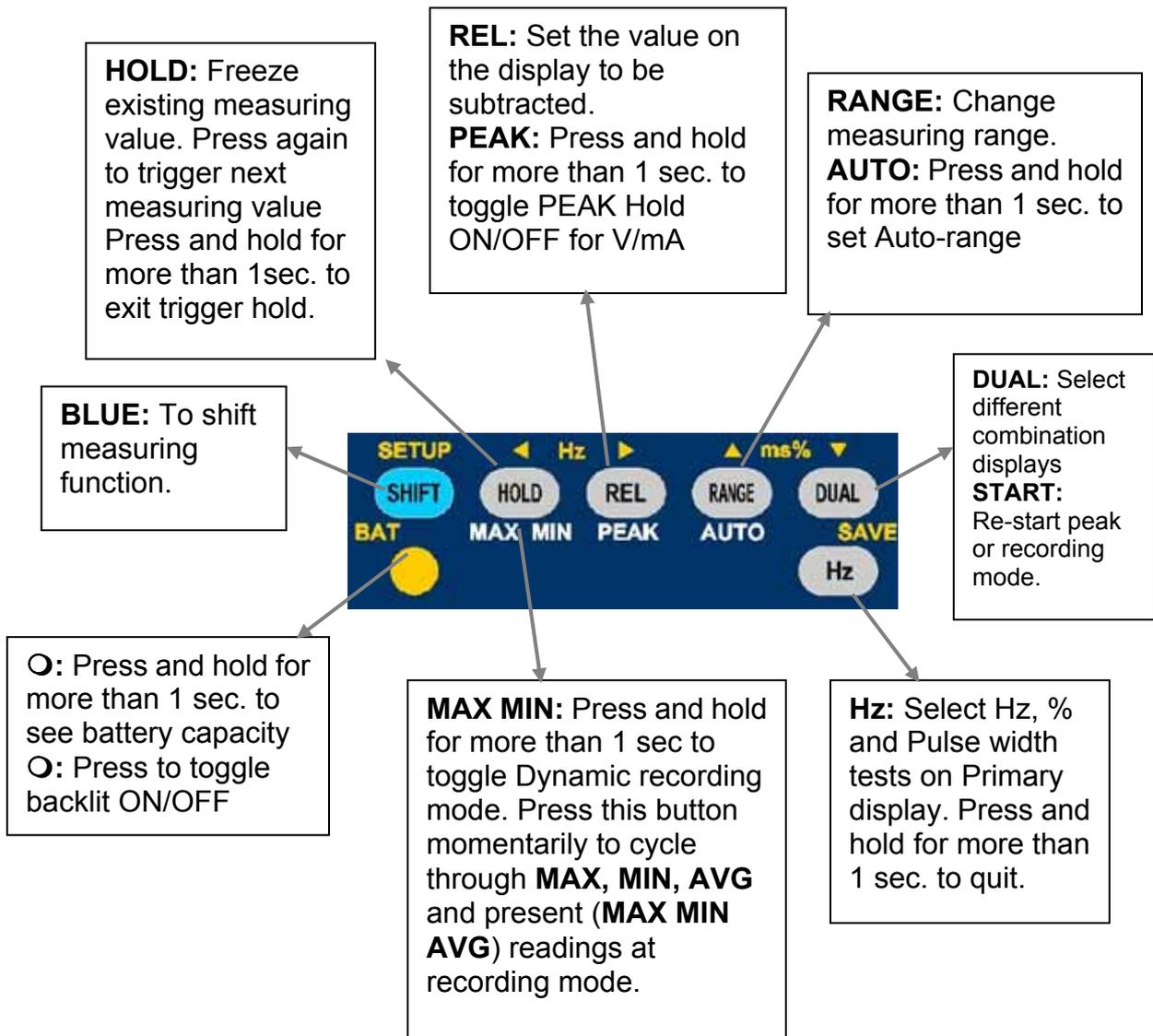


Figure- 5 Pushbuttons

## POWER-ON OPTION

Press and hold **SETUP (Blue)** button, then turn rotary switch to any on position form OFF. Release push button when you hear a tone, the meter will enter setup mode then. These parameters will be remained in non-versatile memory even the meter is turned off. User can configure related parameters on setup mode by following procedures:

1. Press “◀ (LEFT)” or “▶ (RIGHT)” button to select which menu item to be set.
2. Press “▲ (UP) or ▼ (DOWN)” button to change the parameter.
3. Press “**BLUE**” button to select digit to be adjusted, the selected digit will be flashed.
4. Push “**SAVE**” button momentarily to save your change.
5. Push “**BLUE**” button for more than one second to exit setup mode.

### ■ **Factory Default**

Following Table describes the outline of the setup menu item and indicates the factory settings.

**Table- 4 Descriptions for Outline of Setup Menu Item**

Menu item	Factory Setting	Selectable Parameters
<b>Baud Rate</b>	9600	2400, 4800, 9600, 19200
<b>Parity</b>	None	Odd, even or none
<b>Data bits</b>	8	8 bits or 7 bits (Stop bit is always 1 bit)
<b>ECHO</b>	OFF	ON or OFF
<b>Print</b>	OFF	ON or OFF
<b>Percentage scale</b>	4-20mA	4-20mA and 0-20mA for % scale readout
<b>Frequency</b>	0.5Hz	Set minimum measuring frequency, 0.5, 1, 2 or 5 Hz.
<b>Beep</b>	2400	The driving frequency can be set for 2400, 1200, 600 or 300 Hz. “OFF” means to disable beep.
<b>Temperature * n1</b>	°C	Four combinations can be selected: 1. °C only 2. °C/ °F can be selected. 3. °F only 4. °F/ °C can be selected.
<b>Refresh Hold</b>	OFF	OFF means Data Hold (Manual Trigger), set 100~1000 variation counts to enable refresh hold.
<b>Auto power save</b>	15	1~99 minutes, “OFF” means to disable auto power off.
<b>Backlit</b>	30	1~99 seconds, “OFF” means to disable turning off backlit automatically.
<b>T-type decibel</b>	K	K type or J type
<b>Ref</b>	600Ω	Reference impedance for dBm display can be set from 1~9999Ω.
<b>EtEMP</b>	OFF	Enable (On)/ Disable (OFF) Environment temperature (EtEMP) to be displayed with main measurements.

Notes:

1. The temperature menu item will be selected by pushing “○” button for more than one second to enter temperature option.

## GENERAL SPECIFICATIONS

<b>Display</b>	Both primary and secondary displays are 5-digit liquid crystal display (LCD) with maximum reading of 51000 counts.
<b>Measuring rate (approx.)</b>	<ul style="list-style-type: none"> <li>● 3.75 times per second except <math>\Omega</math>/ capacitance measurements (AC+DC: 1 time per second).</li> <li>● 1 time per second for frequency or duty cycle measurement. (&gt;1Hz)</li> <li>● 0.5 times per second for Pulse Width measurement. (&gt;1Hz)</li> </ul>
<b>Low battery indicator</b>	The "B" appears when the battery voltage drops below 6.0V (approx.)
<b>Operating temperature:</b>	0°C to 50 °C
<b>Storage temperature</b>	-20°C to 60°C with BATTERY REMOVED.
<b>Relative Humidity (R.H.):</b>	Maximum 80% R.H. for temperature up to 31°C decreasing linearly to 50% R.H. at 50°C
<b>Temperature coefficient</b>	0.15 * (specified accuracy) / °C (from 0°C to 18°C or 28°C to 50°C)
<b>Common Mode Rejection Ratio</b>	>90 dB at DC, 50/60 Hz±0.1% (1k $\Omega$ unbalanced)
<b>Normal Mode Rejection Ratio</b>	> 60 dB at 50/60 Hz±0.1%
<b>Battery type:</b>	Rechargeable battery 9V Ni-MH (Nickel-Metal Hydride battery), the GP17R8H is recommended Alkaline: ANSI/ NEDA: 1604A / IEC: 6LR61 Carbon-zinc: ANSI/ NEDA: 1604D / IEC: 6F22
<b>Power Consumption</b>	250mVA maximum (with backlit).
<b>Battery life</b>	<ul style="list-style-type: none"> <li>■ 24 hours for DC voltage measurement (approx.) (The new Ni-MH 170mA batteries have been fully charged.)</li> <li>■ 80 hours for DC voltage measurement (approx.) (Based on new alkaline 9V/545mAH battery).</li> </ul>
<b>Charging time</b>	<135 minutes at the environment of 10°C to 30 °C (If the battery has been deep-discharged, a prolonged charging time is required to bring the battery back to full capacity.).
<b>Weight</b>	680 grams with holster and battery/ 940 grams with full package
<b>Dimension</b>	41 (H) * 90 (W) * 192 (L) mm without holster
<b>Standard Accessories</b>	Starting Guide, Test leads (a pair), User Manual in CD-ROM, Hang-belt and 9V Ni-MH Rechargeable battery.
<b>Optional Accessories</b>	Communication package, K-type input adapter and Thermocouple probe, DC 24V adaptor and two transfer adaptors.
<b>Safety</b>	Designed in compliance with EN61010-1 (IEC1010-1) for CAT-IV 600V/ CATIII 1000V, Pollution Degree II Environment. EMC designed in compliance with EN61326

## ELECTRICAL SPECIFICATIONS

Accuracy is given as  $\pm$ (% of reading + counts of least significant digit) at 23°C  $\pm$  5°C, with relative humidity Less than 80% R.H.

### □ DC mV/ Voltage

Range	Resolution	Accuracy	Overload Protection
50mV	0.001mV	0.05% +50 *N2	1000V for the circuits <0.3A short circuit.
500mV	0.01mV	0.025% +5	
1000mV	0.1mV		
5V	0.0001V	0.03%+5	1000V
50V	0.001V		
500V	0.01V		
1000V	0.1V		

Notes:

1. Input impedance: >1G $\Omega$  for 50mV~1000mV ranges. For 5V~1000V ranges, 10M $\Omega$  (nominal) for single display and parallel connected with 1.1M $\Omega$  as dual display.
2. The accuracy could be 0.05%+5, always use relative function to zero thermal effect (short test leads) before measuring the signal.

### □ AC mV/ V (TRUE RMS: From 5% to 100% of range)

Range	Resolution	Accuracy				
		20~45 Hz	45~1k Hz	1k~10k Hz	10k~20k Hz	20k~100k Hz
50mV	0.001mV	1%+60	0.4%+40	0.7%+40	1.5%+40	3.5%+120
500mV	0.01mV	1%+60	0.4%+25	0.4%+25	1.5%+40	3.5%+120
1000mV	0.1mV	1%+60	0.4%+25	0.4%+25	1.5%+40	3.5%+120
5V	0.0001V	1%+60	0.4%+25	0.4%+25	1.5%+40	3.5%+120
50V	0.001V	1%+60	0.4%+25	0.4%+25	1.5%+40	3.5%+120
500V	0.01V	1%+60	0.4%+25	0.4%+25	1.5%+40	3.5%+120*3
1000V	0.1V	1%+60	0.4%+40	0.4%+40	1.5%+40*3	No spec.

### □ AC+DC mV/ VOLTAGE (TRUE RMS: From 5% to 100% of range)

Range	Resolution	Accuracy				
		30~45 Hz	45~1k Hz	1k~10k Hz	10k~20k Hz	20k~100k Hz
50mV	0.001mV	1.2%+80	0.4%+60	0.7%+60	1.5%+60	3.5%+220
500mV	0.01mV	1.2%+65	0.4%+30	0.4%+30	1.5%+45	3.5%+125
1000mV	0.1mV	1.2%+65	0.4%+30	0.4%+30	1.5%+45	3.5%+125
5V	0.0001V	1.2%+65	0.4%+30	0.4%+30	1.5%+45	3.5%+125
50V	0.001V	1.2%+65	0.4%+30	0.4%+30	1.5%+45	3.5%+125
500V	0.01V	1.2%+65	0.4%+30	0.4%+30	1.5%+45	3.5%+125*3
1000V	0.1V	1.2%+65	0.4%+45	0.4%+45	1.5%+45*3	No spec.

Notes:

1. Overload Protection: 1000V R.M.S.; 1000V R.M.S. for the circuits <0.3A short circuit for mV ranges.
2. Input impedance: >1G $\Omega$  for 50mV~1000mV. 1.1M $\Omega$  (nominal) in parallel with <100pF for 5V~1000V ranges
3. Input voltage is lower than 200Vrms.
4. Crest factor<=3

**□ PEAK HOLD (Capturing changes)**

Signal width	Accuracy for DC mV/ Voltage/ Current
Single event >1ms	2%+400 for all ranges
Repetitive >250µs	2%+1000 for all ranges

**□ FREQUENCY**

Range	Resolution	Accuracy	Min. Input Freq.
99.999Hz	0.001Hz	0.02%+3 <600kHz	1Hz
999.99Hz	0.01Hz		
9.9999kHz	0.0001kHz		
99.999k Hz	0.001kHz		
999.99k Hz	0.01kHz		

- Overload protection: 1000V; <20,000,000VxHz

**Sensitivity for Voltage Measurement**

FREQUENCY SENSITIVITY AND TRIGGER LEVEL				
INPUT RANGE	MINIMUM SENSITIVITY (RMS SINEWAVE)		Trigger Level for DC coupling	
(Maximum input for specified accuracy = 10 x Range or 1000V)	20 Hz-200 kHz	>200 kHz~ 500kHz	< 100 kHz	>100kHz ~ 500 kHz
50 mV	10mV	25mV	10mV	25mV
500 mV	70mV	150mV	70mV	150mV
1000mV	120mV	300mV	120mV	300mV
5V	0.3V	0.5V	0.6V	1.5V
50V	3V	5V	6V	15V
500V	30V< 100kHz	No. Spec	60V	No Spec.
1000V	50V <100kHz	No. Spec	120V	No Spec.

The accuracy for duty cycle and pulse width is based a 5V square wave input to the DC 5V range. For AC coupling, the duty cycle range can be measured within 5%~95% as the signal frequency >20Hz.

**DUTY CYCLE:**

MODE	RANGE	Accuracy of Full Scale
DC coupling	0.01%~99.99%	0.3% per kHz+0.3%

**PULSE WIDTH:**

RANGE	Resolution	Accuracy
500ms	0.01ms	0.2%+3
2000ms	0.1ms	0.2%+3

Notes:

Positive or negative pulse width must be greater than 10µs and the range of duty cycle should be considered. The range of pulse width is determined by the frequency of the signal.

**Sensitivity for Current Measurement**

Input Range	Minimum Sensitivity (RMS Sine-wave)	
	20Hz~20kHz	
500µA	100µA	
5000µA	250µA	
50mA	10mA	
500mA	25mA	
5A	1A	
10A	2.5A	

- Maximum input, please refer to AC Current measurement.

**□ dB (decibel calculation)**

dB base	Reference	Default Reference
1mW (dBm)	1~9999Ω	600Ω
1V (dBV)	1V	1V

Notes:

1. The accuracy and bandwidth is depended on the accuracy of voltage measurement, and an additional calculation error of 0.3dB should be added.

**□ DIODE CHECK/ AUDIBLE CONTINUITY**

Range	Resolution	Accuracy	Test Current	Open Voltage
Diode	0.1 mV	0.05% +5	Approx. 1.0mA	<+4.8V DC

Notes:

1. Overload protection: 1000V R.M.S. for the circuits <0.3A short circuit.
2. Built-in buzzer sounds when reading is below 50 mV approx.

**□ RESISTANCE**

Range	Resolution	Accuracy	Test current	Overload Protection
500Ω *N2	0.01Ω	0.05% +10	1.0mA	1000V R.M.S. for the circuits <0.3A short circuit
5kΩ *N2	0.0001kΩ		0.38mA	
50kΩ	0.001kΩ		38μA	
500kΩ	0.01kΩ		3.8μA	
5MΩ	0.0001MΩ	0.15%+5	345nA	
50MΩ *N3	0.001MΩ	1% +5	200nA	
500MΩ	0.01MΩ	3%+10<200MΩ/ 8%+10>200MΩ	200nA	
500nS*N4	0.01nS	1%+10	200nA	

Notes:

1. Maximum open voltage: <+4.8V
2. The accuracy of 500Ω and 5kΩ is specified after Relative function, which is used to substrate the test lead resistance and the thermal effect.
3. For the range of 50MΩ, the RH is specified for < 60%.
4. The accuracy is specified for <50nS and after Relative function as open test lead.
5. Instant Continuity: Built-in buzzer sounds when resistance is less than 10.0Ω

**□ CAPACITANCE**

Range	Resolution	Accuracy	Measuring rate as full scale	Max. Display
10.000nF	0.001nF	1%+8	4 times/ sec.	11000 counts
100.00nF	0.01nF	1%+5		
1000.0nF	0.1nF			
10.000μF	0.001μF			
100.00μF	0.01μF		3%+10	
1000.0μF	0.1μF	0.1 times/ sec.		
10.000mF	0.001mF	0.01 times/ sec.		
100.00mF	0.01mF			

Notes:

1. Overload protection: 1000V R.M.S. for the circuits <0.3A short circuit.
2. With film capacitor or better, use Relative mode to zero residual.

## □ TEMPERATURE

Thermal Type	RANGE	Resolution	Accuracy
K	-200~ 1372°C/ -328~ 2502°F	0.1°C/0.1°F	0.3% +3°C/ 0.3%+6°F
J	-210~ 1200°C/ -346~ 2192°F	0.1°C/0.1°F	0.3% +3°C/ 0.3%+6°F

Notes:

- The accuracy does not include the tolerance of thermocouple probe, and the thermal sensor plugged into the meter should be putting on the place will be operating for 1 hour at least.

## □ DC CURRENT

Range	Resolution	Accuracy	Burden Voltage / Shunt	Overload Protection
500μA	0.01μA	0.05% +5 *N1	0.06V (100Ω)	440mA 10x38mm AC/DC 1000V 30kA/ fast-acting 11A
5000μA	0.1μA	0.05% +5 *N1	0.6V (100Ω)	
50mA	0.001mA	0.15% +5 *N1	0.09V (1Ω)	
500mA	0.01mA	0.15% +5 *N1	0.9V (1Ω)	
5A	0.0001A	0.2% +10	0.2V (0.01Ω)	
10A *N2	0.0001A	0.2% +5	0.4V (0.01Ω)	

## □ AC CURRENT (TRUE RMS: From 5% to 100% of range)

Range	Resolution	Accuracy			
		20~45 Hz	45~2k Hz	2k~20k Hz	20k~100k Hz
500μA*N4	0.01μA	1.5% +50	0.7% +20	3% +80	5% +80
5000μA	0.1μA	1.5% +40	0.7% +20	3% +60	5% +80
50mA	0.001mA	1.5% +40	0.7% +20	3% +60	5% +80
500mA	0.01mA	1.5% +40	0.7% +20	3% +60	5% +80
5A	0.0001A	2% +40*N3	0.7% +20	3% +60	No Spec.
10A *N2	0.0001A	2% +40*N3	0.7% +20	<3A/ 5kHz	No Spec.

## □ AC+DC CURRENT (TRUE RMS: From 5% to 100% of range.)

Range	Resolution	Accuracy			Overload Protection
		30~45 Hz	45~2k Hz	2k~20k Hz	
500μA*N4	0.01μA	1.6% +55	0.8% +25	3.1% +85	440mA 10x38mm AC/DC 1000V 30kA/ fast-acting 11A
5000μA	0.1μA	1.6% +45	0.8% +25	3.1% +65	
50mA	0.001mA	1.7% +45	0.9% +25	3.2% +65	
500mA	0.01mA	1.7% +45	0.9% +25	3.2% +65	
5A	0.0001A	2.2% +50*N3	0.9% +30	3.2% +70	
10A *N2	0.0001A	2.2% +45*N3	0.9% +25	<3A/5kHz	

Note:

- Always use relative function to zero thermal effect with open test lead before measuring the signal. If not use Relation function, additional 20 digits to the DC current accuracy. The thermal effect could be occurred as follows:
  - Wrong operation to measure voltage by resistance, diode, and mV measurements.
  - After battery charging completed.
  - After measuring the current greater than 500mA, it is suggested to cool down the meter for two times of measuring time you applied.
- 10A continuous, and the additional of 0.5% to specified accuracy as measure the signal greater than 10A~20A for 30 seconds maximum. After measured current for > 10A, to cool down the meter for two times of measuring time you applied before low current measurement.
- Input current < 3Arms
- Input current > 35μArms
- Crest factor ≤ 3

## □ FREQUENCY COUNTER

### Divide 1 (secondary display “- 1 –“)

Range	Resolution	Accuracy	Sensitivity	Min. Input Freq.
99.999Hz	0.001Hz	0.002%+5	100mV R.M.S.	0.5Hz
999.99Hz	0.01Hz			
9.9999kHz	0.0001kHz			
99.999k Hz	0.001kHz			
999.99k Hz	0.01kHz			
9.9999MHz	0.0001MHz	<2MHz	200mV R.M.S.	

### Divide 100 (secondary display “-100–“)

Range	Resolution	Accuracy	Sensitivity	Min. Input Freq.
9.9999MHz	0.0001MHz	0.002%+5	300m V R.M.S	1MHz
99.999MHz	0.001MHz	<20MHz	500mV R.M.S	

Notes:

1. The maximum measurement level is < 30Vpp.
2. The minimum measurement frequency of Low frequency is set by Power-ON option to speed up the measuring rate.
3. All frequency counters are susceptible to error when measuring low-voltage, low-frequency signals. Shielding inputs from external noise pickup is critical for minimizing measurement errors
4. The accuracy for duty cycle and pulse width is based a 5V square wave input without dividing signal.

### DUTY CYCLE:

RANGE	Accuracy of Full Scale
0.01%~99.99%	0.3% per kHz+0.3%

### PULSE WIDTH:

RANGE	Resolution	Accuracy
500ms	0.01ms	0.2%+3
2000ms	0.1ms	0.2%+3

Note: Positive or negative pulse width must be greater than 10 $\mu$ s and the range of duty cycle should be considered. The range of pulse width is determined by the frequency of the signal.

## □ SQUARE WAVE OUTPUT

OUTPUT	Range	Resolution	Accuracy
Frequency	0.5, 1, 2, 5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 80, 100, 120, 150, 200, 240, 300, 400, 480, 600, 800, 1200, 1600, 2400, 4800 Hz	0.01Hz	0.005 % +2
Duty cycle *N1	0.39% ~ 99.60 %	0.390625%	0.4% of full scale *N3
Pulse width *N1	1 / Frequency	Range/256	0.2ms+ Range/256
Amplitude	Fixed 0~+2.8V	0.1V	0.2V

NOTE:

1. The plus or minus pulse width must be greater than 50  $\mu$ s for adjusting the duty cycle or pulse width under different frequency. Else, the accuracy and range will be different to definition.
2. Output impedance: 3.5k $\Omega$  maximum.
3. For signal frequency greater than 1 kHz, additional 0.1% per kHz to be added to accuracy.

## MAINTENANCE



### WARNING

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

### ■ SERVICE

If the instrument fails to operate, 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 guide or instruction manual in CD-ROM. When servicing, use specified replacement parts only. Following table will guide you to identify basic problems:

Malfunction	Identification
No LCD indication as power ON by rotary switch	<ul style="list-style-type: none"><li>• Check battery and charge or replace battery.</li></ul>
No beeper tone	<ul style="list-style-type: none"><li>• Check setup mode whether the beeper has been set to OFF. Then select the driving frequency you want</li></ul>
Failed on current measuring	<ul style="list-style-type: none"><li>• Check Fuse</li></ul>
No charging indication	<ul style="list-style-type: none"><li>• Check external adaptor whether the output is DC 24V and plug into the charging terminals completely.</li><li>• Line power voltage (100V~240V AC 50Hz~ 60Hz)</li></ul>
Failed on Remote control	<ul style="list-style-type: none"><li>• The optical side of cable connected to meter, the text side of cover should be up.</li><li>• Check the baud rate, parity, Data bit, Stop bit (default is 9600, n, 8, 1)</li><li>• Driver install for USB- RS232.</li></ul>

### ■ CLEANING



### WARNING

To avoid electrical shock or damage to the meter, do not get water inside the case.

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 benzene, benzene, toluene, xylene, acetone or similar solvents to clean the instrument. After cleaning, make sure the instrument is dried completely before using.