Chapter 1
Introduction

Although this manual describes the operation of both Model Basic ☐ and Enhanced-type ☐ Millimeters (hereafter referred to as "the Meter"), all illustrations and examples assume use of Model Enhanced-type.

⚠Warning

Read "Safety Information" before you use the Meter.

Summary

The meter is a handled, battery-operated tool for measuring electrical parameters. It has all the features of a digital millimeter and measures AC voltage, DC voltage, AC current, DC current, resistance, capacitance, frequency, duty cycle ratio, dBm, TC, RTD, Diode Test, and Continuity Check.
Besides, it has the following features:

- Three ways of measuring rate: FAST (**F**), SLOW (**S**), SMOOTH (∿); It is 14 times / sec for voltage and current in the FAST (F). The update rate of Bar Graph bases on the measuring rate, the fastest rate: 14 times / sec.
- Select either a fixed range or the auto range feature.
- Display Hold, Auto Hold, Peak Hold (It can capture pulse as short as 500 us).
- AC voltage, current measurement True RMS response.
- AC voltage measurement's bandwidth:
  Basic type: 20Hz ~ 30 KHz
  Enhanced type: 20Hz ~ 100 KHz
- AC current measurement's bandwidth is 20Hz ~ 30 KHz.
- Choose 1Ω ~ 2400Ω reference impedance in decibels measurement.
- AC + DC measurements.

- The low pass filter can improve measurement performance on composite sine waves that are typically generated by inverters and variable frequency motor drives.
- High current measurement with configuration clamp.
- Eight type of thermocouple measurement, two type of thermal resistance measurement, high precision of automatic compensation for reference-junction temperature, display °C or °F.
- Large LCD screen could display the other characteristic of one input signals.
- Built-in real-time clock, for the records and measurement provide with accurate time.
- The meter has two types of memory data: saved readings and logged readings. It is convenient for viewing memory data. In addition, its memory could store up to 1000 group independent measuring data.
- Backlight automatically shut down and automatic power-down features.
- Large LCD display with white light.
- Using panel calibration technology, no need to open the case can be calibrated.
- Available alkaline batteries, Ni-Hi battery, battery door can be convenient to replace the battery and fuse.
- USB-IR jack to connect with a PC.
- By friendly man-machine interface, you can get data in meter conveniently. You can storage ,deal with and manage the data which display by graph and form.

Open-case Inspection

Open the case to check, if the meter is damaged or something is missing, contact the place of purchase immediately. Contact the distributor for information about DMM accessories.

Accessories: A copy of user's manual
A set of industrial test lead
USB Interface cable (USB_DMM)
DMMVIEW_D CD disk

Safety Information

The meter complies with IEC61010.1:2001 over voltage II Pollution Degree 2. Use the meter only as specified

in this manual. Otherwise, the protection provided by the meter may be impaired.
A **Warning** identifies conditions and actions that pose hazards to the user.
A **Caution** identifies conditions and actions that may damage the meter or the equipment under test.
A **Notice** identifies symbols of the operation and explanations of the features. International symbols used on the meter and in this manual are explained in Table 1-1.

⚠Warning

To avoid possible electric shock or personal injury, follow these guidelines.

- **Use the meter as the instructions of the producer; otherwise, the protective function shall be invalid.**
- **Do not use the meter if it is damaged. Before you use the meter, inspect the case. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors.**
- **Take the leads off the meter before unlock the battery door.**
- **Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. Replace damaged test leads before you use the meter.**
- **Do not use the meter if it operates abnormally. Protection may be impaired. When in doubt, have the meter serviced.**
- **Do not operate the meter around explosive gas, vapor, or dust.**
- **Do not apply more than the rated voltage, as marked on the meter, between terminals or between any terminal and earth ground.**
- **Make sure the meter works normally as per testing a known voltage. Do not use the meter if it operates abnormally. When in doubt, have the meter serviced.**
- **To avoid possible electric shock caused by false reading due to exist ting alternating voltage in all the direct current functions, including manual and auto ranging, make sure whether there is any alternating voltage existing or not before selecting a direct**

voltage range equals to or higher than the alternating voltage.

- **To avoid false readings, which could lead to possible electric shock or personal injury, replace the batteries as soon as the low battery indicator appears.**
- **Do not touch the exposed wine, connector or unused input jack or circuit under test when the meter is working.**
- **Use only type AAA batteries, properly installed in the meter case to power the meter.**
- **Use caution when working above 30 V ac rms, 42 V peak, or 60 V dc. Such voltages pose a shock hazard.**
- **Avoid working alone.**
- **When using the probes, keep your fingers behind the finger guards on the probes.**
- **Connect the common test lead before you connect the live test lead. When you disconnect test leads, disconnect the live test lead first.**
- **To avoid possible fire or electric shock, do not connect TC with the live circuit.**

⚠Caution

To avoid possible damage to the meter or to the equipment under test:

- **Set the rotary switch on the right range. Do cut off the testing leads and circuit before switching. Forbid to switch during the measuring process.**
- **Cut off the power and complete discharge before measuring resistance, continuity, diodes, or capacitance with the live circuit.**
- **Before measuring current, check the meter's fuses (see Chapter 6 "Testing the Fuses"). Turn power OFF to the circuit before connecting the meter to the circuit. Remember: Plug the meter with the circuit when measuring current and do not connect test lead in parallel with any circuit.**

Symbols

Symbols used on the meter and in this manual are explained in Table 1-1.

Table 1-1. International Electrical Symbols

Symbols	Meaning	Symbols	Meaning
~	Alternating current	⏚	Earth ground
⎓	Direct current		Fuse
≂	Alternating and direct current	⧈	Double insulated
⚠	Important information	+	Battery
CE	Complies with European Union (European Union) requirements		
CAT II **CAT III**	Overvoltage Category **II**, Pollution Degree 2 per IEC61010 refers to the level of Impulse Withstand Voltage protection provided. Typical locations include: Single-phase receptacle connected loads, Appliance, portable tools, and other household and similar loads, Outlet and long branch circuits, Outlets at more than 10 meters from CAT III source, Outlets at more that 20 meters from CAT IV source. Overvoltage Category **III**, Pollution Degree 2 per IEC61010 refers to the level of Impulse Withstand Voltage protection provided. Typical locations include: Three-phase distribution including single-phase commercial lighting, Equipment in fixed installations, Lighting systems in larger buildings.		

Chapter 2
Getting Acquainted

Introduction

Study this chapter to be acquainted with all the features and functions of the meter.

Turning the Meter On

To turn the meter on, press ⏻ to power on and press ⏻ again for more than 2 seconds to power off.
When the power is turned on, the meter starts to make self-diagnosis internally and displays on full screen. After this, appropriate operation should be carried out.

⚠Attention

Power-on: To ensure the correct operation of the meter with power on. It is good practice to turn off the power supply pausing 5 seconds, and then restart the meter.

Automatic Power Off

The meter will go into automatic power- off mode if you have not changed the rotary switch position or pressed a button for a set period. The automatic power off is preset to 10 minutes. From the Setup menu (see Chapter 5 “Changing the Default Settings”), users can decide whether they want to use the function of the automatic power-off or not.

Backlight On

To turn the backlight on, press ⏻ to turn on and press ⏻ again to turn off.

Automatic backlight off

The automatic backlight off is preset to 10s. If user doesn’t turn off backlight within 10s, the meter will turn off backlight automatically. From the Setup menu (see Chapter 5 “Changing the Default Settings”), users can decide whether they want to use the function of the automatic backlight off or not.

Low Battery Indicator

The battery indicator  in the upper right corner of the display notifies you that the batteries are low and should be replaced.

⚠Warning

To avoid false readings, which could lead to possible electric shock or personal injury, replace the batteries as soon as the battery indicator  appears.

If the battery indicator  appears, it will lead to the shut-up of the storage function.

Outer Structure

See Figure 2-1.

Input Jack

Figure2-2 and Table2-1 explain the input jacks.

Rotary Switch

Figure2-3 and Table2-2 explain the measuring functions of the rotary function switch positions.

Display Unit

Figure 2-4 and Table 2-3 explains the meaning of the every displaying unit.

Communication interface

You could use the USB_DMM and the DMMVIEW_D software to transfer the content stored in the meter and real time measuring value to a PC.(See Chapter 4 “Using Memory & Communications Features”)

Pushbuttons

Figure2-5 and Table 2-4 show the pushbutton function.

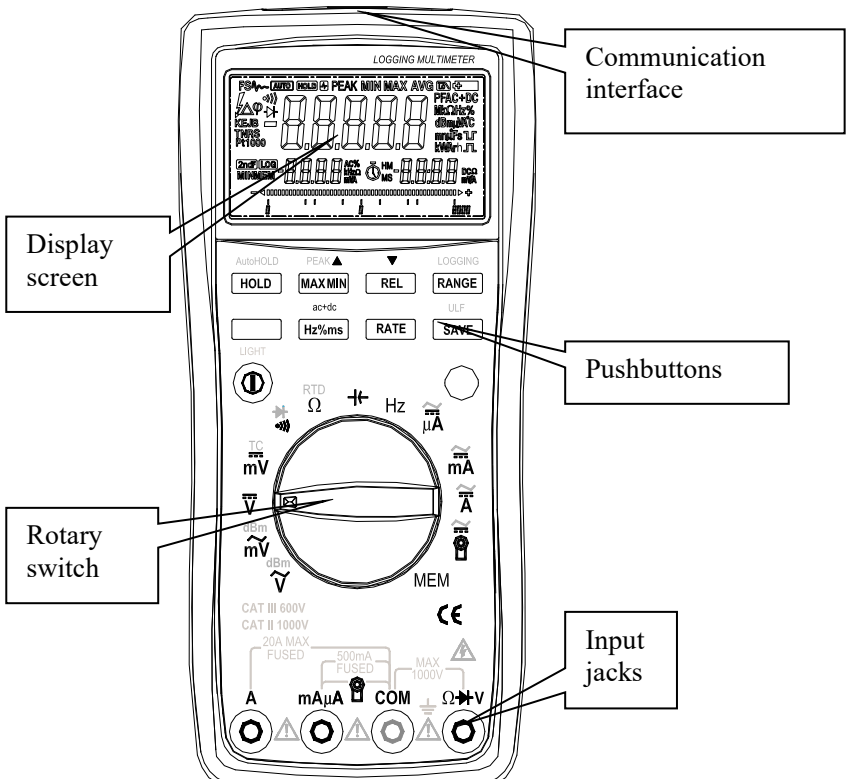

Figure 2-1.Outer Structure

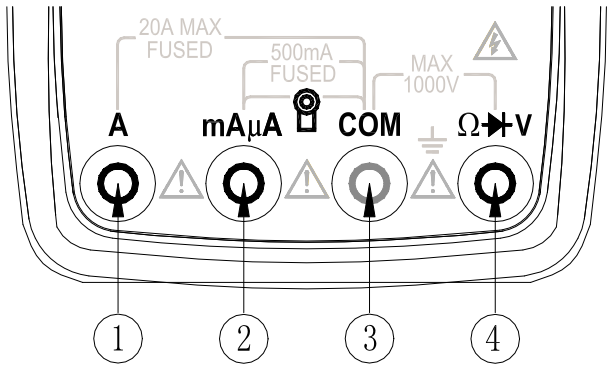

Figure 2-2.Input Jacks

Table 2-1.Input Jacks

Item	Function
①	Measuring Signal (+): direct and alternating current (A), frequency.
②	Measuring Signal (+): direct and alternating current (mA, μA), frequency
③	Public (return) Jacks of all the measurement (-)
④	Measuring Signal (+): direct voltage, direct mV voltage, alternating voltage, alternating mV voltage, resistance, diodes, continuity, frequency, RTD, TC, dBm , AC+DC

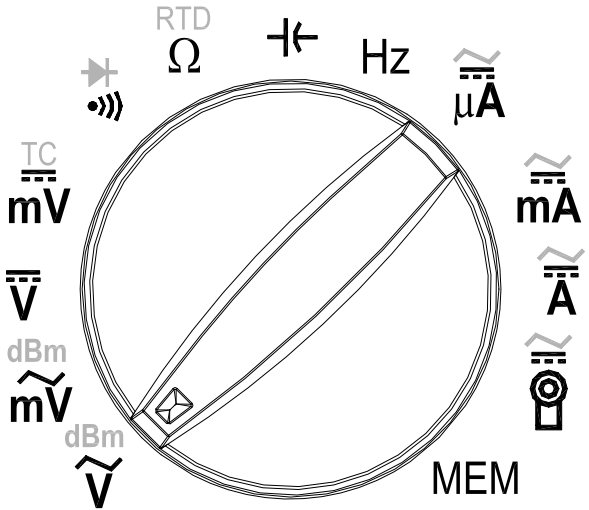

Figure 2-3. Rotary Switch

Table 2-2. Rotary Switch

Position	Rotary Switch Function	○Blue Pushbutton Function
dBm V	ACV Measurement	dBm Measurement
dBm mV	ACmV Measurement	dBm Measurement
V	DCV Measurement	None
TC mV	DCV Measurement	TC Measurement
	Continuity testing	Diode testing
RTD Ω	Resistance Measurement	RTD testing
	Capacitance	None
Hz	frequency measurements	FREQ_LOW,MID,HIG
μA	DC uA measurement	Alternating current measurement
mA	DC mA measurement	Alternating current measurement
A	DC A measurement	Alternating current measurement
	current measurement with clamp(DCA)	current measurement with clamp(ACA)
MEM	Read or clear the stored data in the meter. See Chapter 4 for the detailed information	None

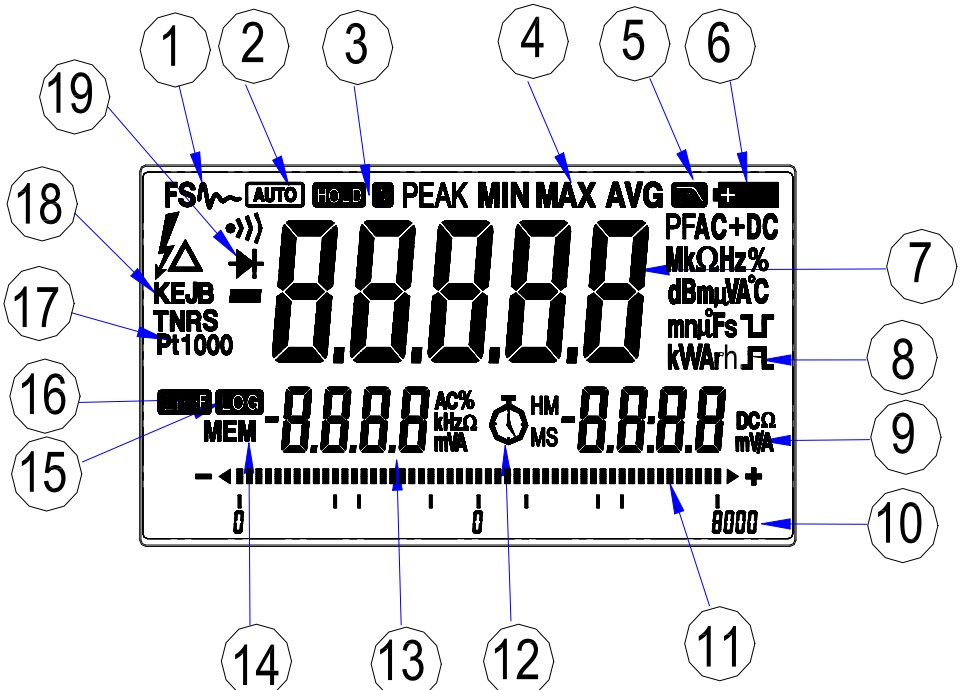

Figure 2-4. Display Unit

Table 2-3.Display Unit

No.	Unit	Meaning
1	FS	Select measuring rate:FAST,SLOW,SMOOTH
2	AUTO	Toggles in auto-ranging mode
3	HOLD HOLD PEAK	Display Hold:To hold present value in the main display Peak Hold:Valid only in DCV position Peak Hold
4	MIN MAX AVG	Ultimate value measurement,primary display shows MIN, MAX, AVG value in cycle while first secondary display shows measuring value and secondary display shows corresponding time
5		Low pass filter mode
6		Low battery indicator. The indicator in the display notifies you that the batteries are low and should be replaced. ⚠**Warning** **To avoid false readings, which could lead to possible electric shock or personal injury, replace the batteries as soon as the low battery indicator appears.**
7	88888	Primary Display(50000digital)

8	Ω, kΩ, MΩ	The unit of resistance: Ohm, Kilohm, Megohm.
	Hz, kHz, MHz	The unit of frequency: Hertz, Kilohertz, and Megahertz.
	A, mA, µA	The unit of current: Amperes (amps), Milliamp, Microamp.
	V, mV	The unit of voltage: Volt, Millvolt
	nF, µF	The unit of capacitance: Nanofarad, Microfarad, Millifarad.
	°C,°F	Degrees Celsius (default) or Fahrenheit.
	dBm	For ac volts functions, reading is shown in decibels of power above or below 1 mW(dBm).
	AC+DC	Alternating current and direct current.
	%	REL% measurement, Shows that the relative percentage.
		Short or open beep in continuity test. Positive pulse width or negative width in pulse Width measurement.
9		In MAX / MIN model for the clock displayed. Reference resistance displayed for dBm. In clamp-current function, the conversion ratio of voltage vs current showed. In the TC function, if cold junction compensation is on, displays room temperature. In the AC + DC function, shows the value of DC.
10		Range display. Digits display range in use.

11		Bar Graph The polarity indicator both ends of the bar graph show the polarity of the input; the arrow right of the bar graph indicates an overload condition.
12		Elapsed Time Display
13		In dBm and TC, RTD, clamp-current function, display accordingly voltage, resistance or voltage. In the MAX / MIN, HOLD, AUTO HOLD, REL% mode, display measuring value. In the AC + Hz mode, display AC measuring value; in AC + DC mode, show DC measuring value. In storage data and viewing data mode, display index number.
14	MEM	Save stored mode
15		Log stored mode
16		Select the yellow button ( ) function
17	PT100,PT1000	The type of RTD
18	K,E,J,B,T,N,R,S	The type of TC
19		Continuity test function is selected.
		>30 V ac and/or dc may be present at the input terminals
		Relative measured value
		Diodes Test

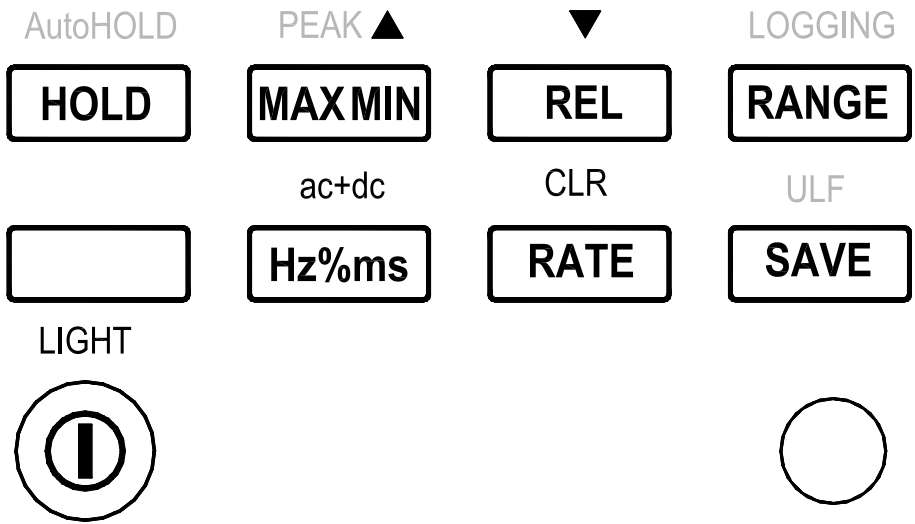

Figure 2-5. Pushbuttons

Table 2-4. Pushbuttons

Pushbutton	Description	Yellow Button Function	Description
Note **Press ▭ to access "Yellow Button Functions", and 2ndF will be on display. Press ▭ more than 1 second, System time will be on display.**			
○	Press ○ to access blue functions on the rotary switch. In frequency mode, press ○ to select the frequency band: low frequency band, medium frequency band or high frequency band. In the real-time clock setup mode, press ○ to change the clock settings items. In the system setup mode, press ○ to change the default-operating configuration of the meter by changing setup options made at the factory.	▭ ○	Press ▭ ○ to enter real-time clock setup mode.
AutoHOLD HOLD	Press to freeze the display value. Press again to release the display.	▭ AutoHOLD HOLD	Press to begin Auto HOLD; the last stable reading is displayed. To exit Auto HOLD mode, press the key again.

PEAK ▲ MAXMIN	In measuring mode, press the key to start retaining min, max, and average values. Press successively to display MAX, MIN, and AVG value. Press for more than 2 seconds to stop. In MEM mode, press to read the previous record of present storage area.	PEAK ▲ MAXMIN	Press the key to start PEAK mode, where short duration events are stored. Press again to exit.
▼ REL	In the measurement mode, press to store the present reading as an offset reference and subsequent readings show only the relative difference from this value. Press again to show the difference as a percentage of the reference. In the PEAK mode, press to store the present PEAK value as an offset reference and the subsequent readings show only the relative difference from this value. Press again to exit PEAK_REL model. In MEM mode, press to view the next data stored.	None	
LOGGING RANGE	In the measurement mode, Exit AUTO and enter MANUAL ranging. In MANUAL, select next input range. Press the key more than 2 seconds, to enter AUTO mode. In MEM mode, press the key to view the logged reading memory.	LOGGING RANGE	If logged area is empty, press to enter logged mode. Press the key once again to exit.

ac+dc Hz%ms	In AC measurement mode, successively press the key to select AC + Hz, positive pulse and duty cycle, negative pulse width and duty cycle and AC measurement. In DC measurement mode, press the key measurement to enter AC + DC mode. Press once again to exit. In the frequency measurement function, press the key to select positive pulse width and duty cycle or negative pulse width and frequency.	None	
CLR RATE	In the measurement mode, press the key to select the rate of measurement. In the PEAK mode, the key is to carry out the PEAK Clear. In MEM mode, press the key to clear the present memory.	None	
ULF SAVE	In the measurement mode, press the key to add the current displayed reading to saved reading memory. In MEM mode, press the key to view saved reading memory. In the real-time clock setup mode and in the system setup mode, press the key to save the setting value.	[ ] ULF SAVE	Press the key for low-pass filter ( ).
⏻	Turn on the power or backlight. Press for less than 2 seconds to turn on or off the backlight and more than 2 seconds to power off.	[ ] ⏻	Press the key to enter the operating configuration of meter.

Display Hold Mode (D.H)

Press AutoHOLD HOLD to enter the Display HOLD mode, then freezes the present reading in the primary display (The “HOLD” is displayed). New readings now appear in the first secondary display. (See Figure 2-6). Press AutoHOLD HOLD again to exit the Display HOLD mode.

Note

In the MIN MAX mode, Display Hold functions like a toggle, interrupting and resuming the MIN MAX operations.

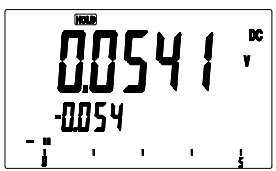

Figure 2-6. D.H Mode

In AC + Hz, AC + DC, pulse width and duty cycle measuring mode, press AutoHOLD HOLD and then freezes the whole display screen.

With the meter, you cannot use Display Hold while logging data. Contrarily, you cannot log data while Display Hold.

Auto HOLD Mode (A.H)

⚠Warning

Auto HOLD mode does not capture unstable or noisy readings. Do not use Auto HOLD mode to determine that circuits are without power.

Press AutoHOLD HOLD to enter theAuto HOLD mode. Auto HOLD mode freezes the present reading in the primary display (The “HOLD A” is displayed). New readings now appear in the first secondary display. See Figure 2-7.

When the meter detects a new, stable reading (>4% change from last stable reading), it beeps and displays the new reading in the primary display. You can also force a primary display update by pressing AutoHOLD HOLD.

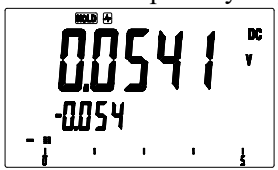

Figure 2-7. A.H Mode

If you remove the test leads (open the input), the meter retains the last frozen primary display.
You cannot use Auto HOLD while MAX MIN, REL, AC+Hz, AC+DC or PEAK mode is active .You cannot initiate logging while Auto HOLD function is active. Contrarily, you cannot initiate Auto HOLD while logging data.

Press AutoHOLD HOLD again to exit the Auto HOLD mode.

Peak HOLD Mode (P.H)

Peak HOLD can capture transient signal events as short as 500 us, but with decreased accuracy; only 4 display digits are allowed.
Peak HOLD mode is only available in DC voltage and current.

Press PEAK▲ MAXMIN to enter the PEAK mode, peak value in the primary display (The "PEAK" is displayed). See Figure 2-8. It beeps when the meter detects a new value of PEAK. Press PEAK▲ MAXMIN to exit the PEAK mode. Press CLR RATE to clear the value off and the new peak value would be captured. Press ▼ REL to operate REL.

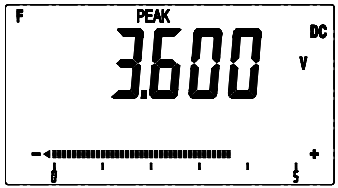

Figure 2-8.P.H Mode

Using MIN MAX Mode

The MIN MAX mode stores minimum (MIN) and maximum (MAX) input values. MIN MAX mode also calculates an average (AVG) of all readings taken since the mode was activated (except "OL"). When the input goes below the stored minimum value or above the stored maximum value, the meter beeps and stores the new value. In addition, the meter displays the present measurement value in the first secondary display and the new value in the primary display.

Press PEAK▲ MAXMIN the MAX, MIN and AVG value will be stored as the present displaying reading, and "MAX" will be on display first. Each subsequent press of PEAK▲ MAXMIN steps through the minimum (MIN), average (AVG)and back to the maximum reading.

→ MAX → MIN → AVG ┐
└──────────────────┘

The Auto Ranging will be shut off and fixed the present range after entering max min mode. Therefore, set the right range before entering this mode.

To exit this mode, press PEAK▲ MAXMIN for more than 2 seconds or set the rotary switch to any other position.

Using the HOLD function in the MAX MIN or PEAK mode

You can press AutoHOLD [HOLD] to enable HOLD mode while MAX, MIN or PEAK mode is active. No further minimum, maximum, or average updates occur while the HOLD mode is enabled. Press AutoHOLD [HOLD] again to exit the HOLD mode.

Using Relative Mode (REL)

Selecting Relative mode causes the meter to zero the display and store the present reading as a reference for subsequent measurements.

- Press ▼ [REL] once to select the Relative Mode. (The meter enters manual range when you enter the Relative Mode.) The reference appears in the second secondary display. The new measurement shows the first secondary display. The difference between the reference and a new measurement appears in the primary display (See figure 2-9).
- Press ▼ [REL] a second time to enter the REL% mode and display the difference as ± 10 % of the reference reading.
  In REL%, △% appears on the display.
- Press ▼ [REL] a third time to exit the Relative Mode.

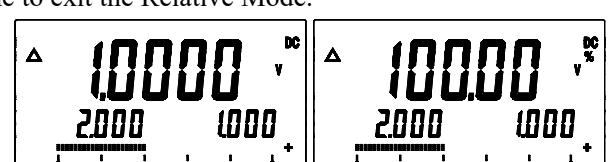

Figure 2-9. Relative Mode

⚠Warning

Do be careful for the possible dangerous voltage in the relative **mode.**

Selecting the Range

Press LOGGING RANGE to select a fixed range.

Auto ranging ("AUTO"lighted in the display) always comes on initially when you select a new function. In auto range, the meter selects the lowest input range possible, ensuring that the reading appears with the highest available precision (resolution).

If AUTO is already on, press LOGGING RANGE to enter MANUAL ranging in the present range. You can then select the next manual range each time you press LOGGING RANGE. Return to auto ranging by pressing LOGGING RANGE more than 2 seconds.

Note

You cannot use LOGGING RANGE in continuity, diode test, low frequency, and pulse width and duty cycle, MAX MIN, REL features. It only has the Manual range with the TC, RTD functions.

Using AC+DC or AC + Hz Mode

In the AC function, press ac+dc Hz%ms once to enter the AC + Hz measuring mode. Now the primary reading displays frequency, and the first secondary reading displays AC value. Press ac+dc Hz%ms the second time to enter the positive pulse width and duty cycle mode. The primary reading displays positive pulse width value and the first secondary reading display positive duty cycle. Press ac+dc Hz%ms the third time to enter the negative pulse width and duty cycle mode.

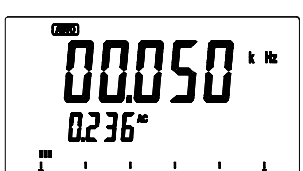

Figure 2-10 Measuring AC + Hz mode

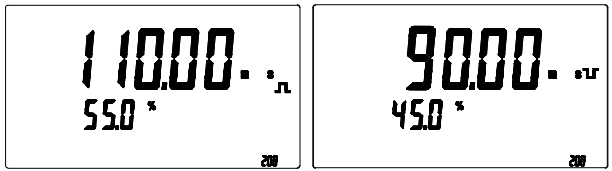

Figure 2-11 Measuring pulse width and duty cycle mode

The primary reading displays negative pulse width value and the first secondary reading display negative duty cycle. (See Figure 2-10 and Figure 2-11) Press ac+dc Hz%ms the fourth time to exit the AC + Hz mode.

In the DC function, press ac+dc Hz%ms to enter the AC + DC measuring mode. Now the primary reading displays AC+DC value. The secondary readings display AC value and DC value display, respectively. (See Figure 2-12) Press ac+dc Hz%ms again to exit the AC + DC mode.

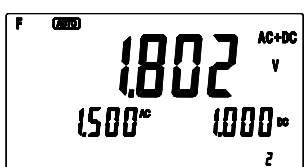

Figure 2-12 Measuring AC+DC mode

In hereinbefore two modes, some modes are invalid such as Auto HOLD, PEAK, MAX MIN, REL% etc.

Selecting Measuring rate

The meter has different measuring rate in different function. User can press CLR RATE to select appropriate rate in accordance with the measuring needs. As shown in table 2-5:

It is invalid to press CLR RATE when capacitance, frequency, pulse width mode is selected.

Table 2-5 Measuring rate

function	rate		
	FAST	SLOW	SMOOTH
	F	S	∿
DC voltage, current, TC	14/s	7/s	1/s
AC voltage, current	14/s		1.8/s
resistance, RTD	7/s		1.8/s
diode, Continuity	14/s		

Low pass filter

The meter has a low pass filter. Press [ ] [SAVE] to activate low pass filter mode ( ) while measuring AC voltage, dBm, AC current, AC frequency. The meter continues measuring in the chosen ac mode, but now the signal diverts through a filter that blocks unwanted voltages above 1 kHz. See Figure 2-13. 1 kHz, refer to Figure 3. The lower frequency voltages pass with reduced accuracy to the measurement below 1 kHz. The low pass filter can improve measurement performance on composite sine waves that are typically generated by inverters and variable frequency motor drives.

Press [ ] [SAVE] again to turn off low pass filter.

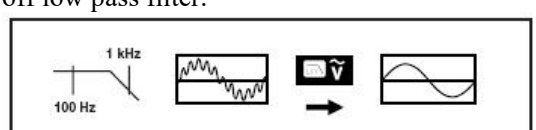

Figure 2-13 low pass filter

⚠Warning

To avoid possible electric shock or persona injury, do not use the Low Pass Filter option to verify the presence of hazardous voltages. Voltages greater than what is indicated may be

present. First, make a voltage measurement without the filter to detect the possible presence of hazardous voltage. Then, select the filter function.

Display system time

Press ▭ more than one second to display system time in the basic measuring state. It includes year, month, day, and hour and minute (See Figure 2-14). After 1 second, automatically withdraw from the time show.

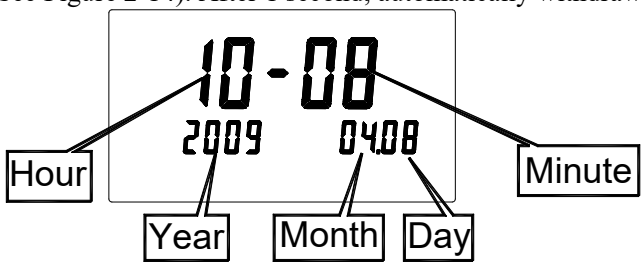

Figure 2-14 Display System time

Chapter 3
Making Measurements

Introduction

Chapter 3 explains how to make measurements.

Most measurement functions can be selected by using the rotary switch.

White letters or symbols identify primary functions; blue letters or symbols identify alternative functions. Press the blue button to access these alternate functions. Frequency-related functions could be selected when the rotary switch is in any of the AC voltage and current position.

Measuring Voltage

Voltage is the difference in electrical potential between two points. The polarity of ac (alternating current) voltage varies over time, while the polarity of direct current voltage is constant over time.

Ranges available in volts functions are:

- dBm $\widetilde{V}$
  5.0000V, 50.000V, 500.00V, 750.0V
- $\overline{V}$
  5.0000V, 50.000V, 500.00V, 1000.0V
- dBm $\widetilde{mV}$
  50.000 mV, 500.00 mV
- TC $\overline{mV}$
  50.000 mV, 500.00 mV, 2200.0 mV

Measuring AC Voltage (See Figure 3-1)

1. Set the rotary switch to dBm $\widetilde{V}$ position, and “AC” “V” will be on display or set the rotary switch to dBm $\widetilde{mV}$ position, and “AC” “mV” will be on display

2. Insert the black lead into "**COM**" terminal, and the red lead into the "**Ω⊣◀+V**" terminal.
3. Connect the leads to the testing power.
4. Read the measuring results from the screen.

Press ac+dc Hz%ms to display the frequency, pulse width and duty cycle of the tested signals.

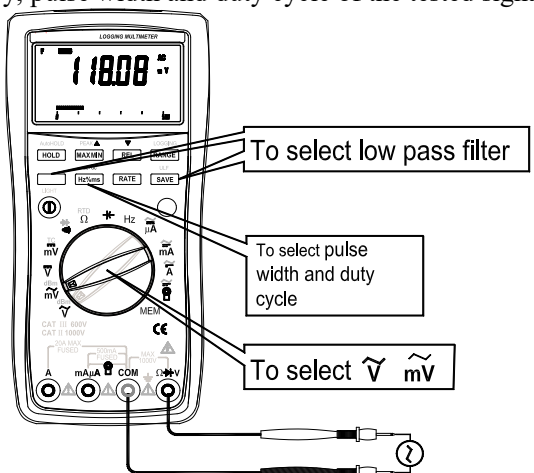

Figure 3-1 AC Voltage Measurement

⚠Warning

- **Do not apply more than DC 1000 V or AC 750V rms voltage; the meter will possible be damaged though the value could be displayed.**
- **Indicator"** ⚡ **" is on display for safety note when 30 V ac and/or dc voltage present at the**

input terminals.

- **The meter beeps constantly if the input voltage is more than AC 750V rms, which is over the meter's range.**

dBm Measurements in AC Volts Functions(See Figure 3-2)

The ac volts functions allow you to display readings as deviations in dB (decibels) above or below an established level.

Set up dBm measurements with the following procedure:

1. Make an AC volt or millivolt measurement to be used as a reference point.
2. Press (○) to select dBm. The dBm value appears in the primary display and the ac volts reading appears in the first secondary display. Reference impedance appears in the second secondary display
3. Press (○) again to turn dBm off.

Normally, dB is measured as dBm, which is a measure of decibels relative to 1 milliwatt. The meter assumes a resistance of 600 in making this calculation. This resistance can be set for any value for 1Ω to 2400Ω, using the meter's setup capabilities (see Chapter 5.) to change the resistance.

Note

If dBm is displayed, check that the reference resistance value closely matches the impedance of the system being measured.

dBm is calculated with the following formula:

$$dBm = 10 \times \lg(1000 \times AC\ Voltage^2 / Reference\ Impedance)$$

Where "AC Voltage" is the measurement value and displayed on the first secondary display.

Measuring DC Voltage (See Figure 3-3)

1. Set the rotary switch to V position, and "DC", "V" will be on display or set the rotary switch to mV position, and "DC" "mV" will be on display.
2. Insert the black lead into "**COM**" terminal, and the red lead into the "**Ω⊣◀V**" terminal.

3. Connect the leads to the tested power.
4. Read the measuring results from the screen.

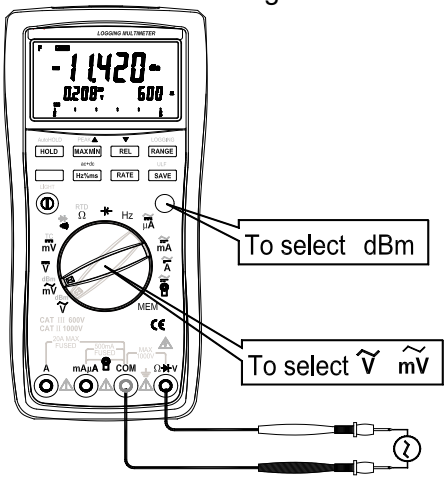

Figure 3-2 dBm Measurements

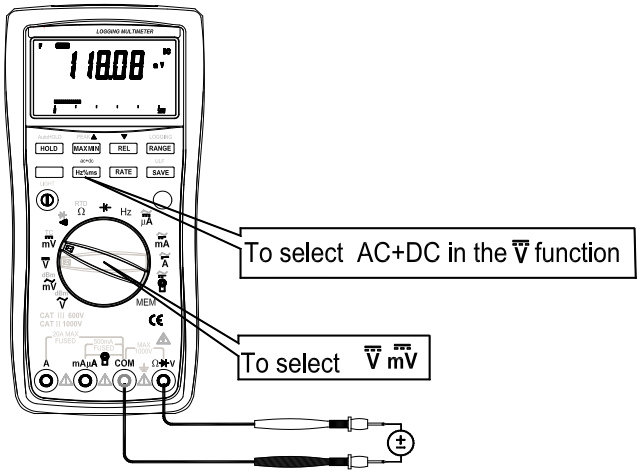

Figure3-3.DC Voltage Measurement

⚠Warning

- **Do not apply more than DC 1000 V or AC 750V rms voltage; the meter will possible be damaged though the value could be displayed.**
- **Indicator "** ⚡ **" is on display for safety note when 30 V ac and/or dc voltage present at the input terminals.**
- **The meter beeps constantly if the input voltage is more than DC 1000V rms, which is over the meter's range.**

Measuring TC (See Figure 3-4)

1. Set the rotary switch to TC mV position, and press blue button (○) to select TC measurement, press LOGGING RANGE to select type of thermocouple.
2. Insert TC into "**COM**" and "**Ω⏩V**" terminals, make sure the TC jack with symbol "+" is connected into the "**Ω⏩V**" terminal.
3. Read the measuring results from the screen.

The temperature is shown on the primary display, the thermo-electrical potential on the first secondary display and the ambient temperature on the second secondary display (if RJC is turn on).User can set whether open or close RJC (see Chapter 5).

⚠Warning

To avoid possible electric shock or personal injury, do not connect the TC with the live circuit.

Measuring Resistance (See Figure3-5)

⚠Warning

To avoid possible damage to the meter or to the equipment under test, disconnect circuit power and discharge all high-voltage capacitors before measuring resistance.

The meter's resistance ranges are 500.00Ω, 5.0000KΩ, 50.000KΩ, 500.00KΩ, 5.0000MΩ, 50.000MΩ and 500.0MΩ.

To measure resistance, proceed as follows:

1. Set the rotary switch to RTD Ω position.
2. Insert the black lead into "**COM**" terminal, and the red lead into the "**Ω⏩V**" terminal.
3. Connect the leads to the tested power.
4. Read the measuring results from the screen.

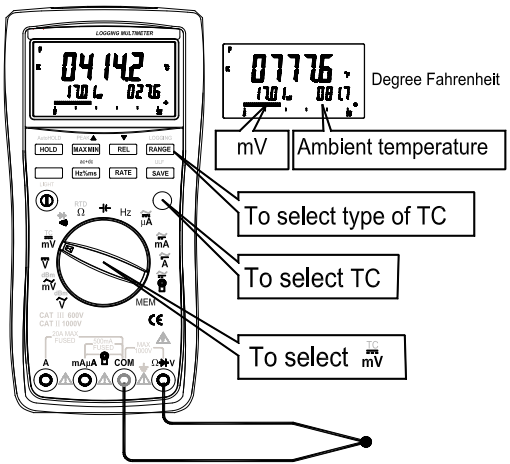

Figure 3-4.TC Measurement

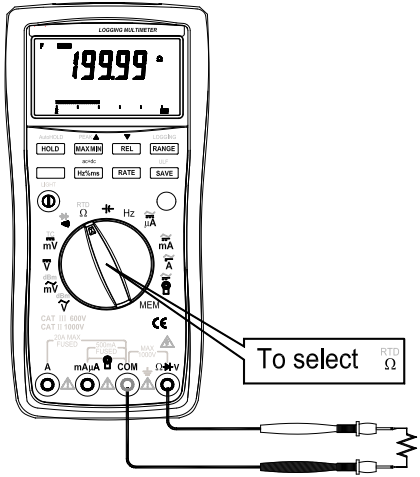

Figure 3-5. Resistance Measurement

⚠Caution

- **"OL" appears on the display if the resistance under test is open or the value surpasses the maximum range.**
- **Because the meter's test current flows through all possible paths between the probe tips, the measured value of a resistor in a circuit is often different from the resistor's rated value.**
- **The test lead can add 0.1Ω to 0.2Ω of error to resistance measurements. To test the leads, touch the probe tips together and read the resistance of the leads. If necessary, you can press REL to automatically subtract this value.**

- **Wait for several seconds for stable reading when measuring resistance more than 1MΩ.**

Measuring RTD (See Figure3-6)

1. Set the rotary switch to RTD Ω position, and press blue button (○) to select RTD testing.
2. Insert the black lead into "**COM**" terminal, and the red lead into the "**Ω⏭V**" terminal.
3. Connect the leads to the tested RTD.
4. Read the measuring results from the screen.

Testing Diodes (See Figure3-7)

⚠Warning

To avoid possible damage to the meter or to the equipment under test, disconnect circuit power and discharge all high-voltage capacitors before testing diodes.

Use the diode test to check diodes, transistors, and silicon-controlled rectifiers (SCR), and other semiconductor devices. The test sends a current through a semiconductor junction, and then measures the junction's voltage drop. A typical junction drops 0.5 V to 0.8 V.

To test a diode, proceed as follows:

1. Set the rotary switch to position, and press blue button (○) to select diodes testing.
2. Insert the black lead into "**COM**" terminal, and the red lead into the "**Ω⏭V**" terminal. The polarity of the black lead and red lead is "-"and "+" respectively.

Forward-bias reading: Place the red test lead on the component's positive terminal and place the black lead on the component's negative terminal. The reading is the approximate value of junction's voltage drop about 0.5 V to 0.8 V.

Reverse-bias reading: Place the black test lead on the component's positive terminal and place the red lead on the component's negative terminal. The display shows "OL".

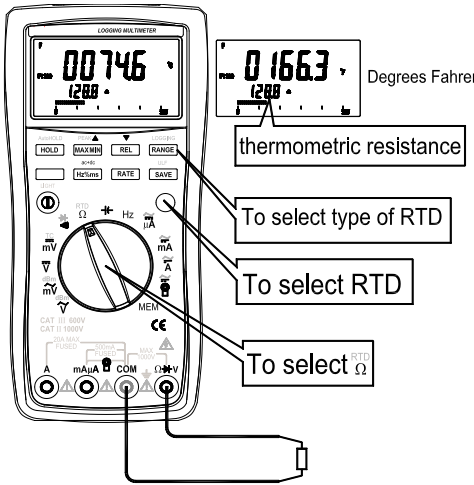

Figure 3-6. RTD Measurement

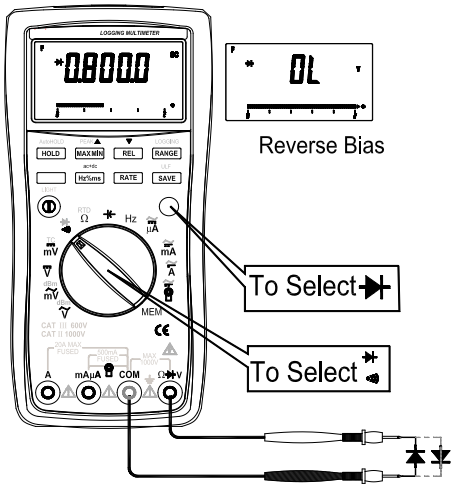

Figure 3-7. Diode Test

Note

In the live diodes testing, the resistance of other pathways and between the probe tips will affect the reading of reverse-bias voltage.

Testing for Continuity (See Figure 3-8)

⚠Warning

To avoid possible damage to the meter or to the equipment under test, disconnect circuit power and discharge all high-voltage capacitors before testing for continuity.

Continuity is the presence of a complete path for current flow. The continuity test features a beeper that sounds if a circuit is complete. The beeper allows you to perform quick continuity tests without having to watch the

display.
You can select whether the beeper comes on for open or short conditions (See to chapter 5).
To test continuity, proceed as follows:
1. Set the rotary switch to position.
2. Insert the black lead into "**COM**" terminal, and the red lead into the "**Ω⏩V**" terminal.
3. Connect the leads to the two ends of the tested circuit.

Measuring Capacitance (See Figure3-9)

⚠Warning

To avoid possible damage to the meter or to the equipment under test, disconnect circuit power and discharge all high-voltage capacitors before measuring capacitance.

Capacitance is the ability of a component to store an electrical charge. The unit of capacitance is the farad (F). Most capacitors are in the nanofarad (nF) to microfarad (μF) range.
The meter's capacitance ranges are 9.999nF,99.99nF,999.9μF,9.999μF,99.99μF, 999.9μF,9.999mF,99.99mF.
To test capacitance, proceed as follows:
1. Set the rotary switch to position to select capacitance measurement.
2. Insert the black lead into "**COM**" terminal, and the red lead into the "**Ω⏩V**" terminal.
3. Connect the leads to the tested capacitance. Read the measuring results from the screen.

⚠Caution

- **"OL" appears on the display if the tested capacitance is open or the value surpasses the maximum range.**
- **If the tested capacitance is polar capacitance, then connect the red lead with the positive point and the black lead with the negative point.**
- **High capacitance test needs more time, and 7.5s is necessary in 99.99mF position.**
- **To improve the measurement accuracy of small value capacitors, press REL with the**

test leads open to subtract the residual capacitance of the meter and leads.

- **The remaining voltage of capacitance, insulated impedance and dielectric absorption could cause measuring errors.**

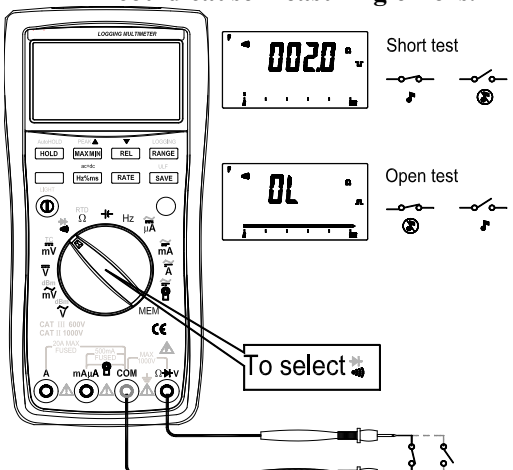

Figure 3-8. Continuity Test

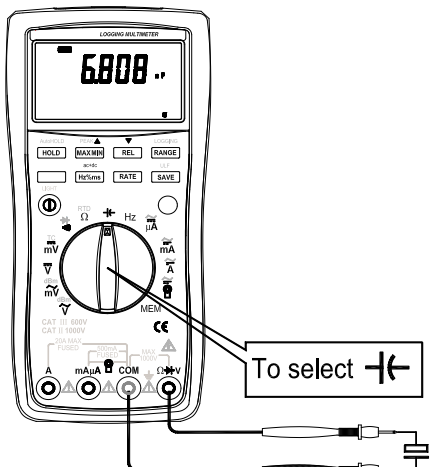

Figure 3-9. Capacitance Measurement

Measuring Current (See Figure3-10)

⚠Warning

- **Never attempt an in-circuit current measurement where the open-circuit potential to earth is greater than 1000 V. You may damage the meter or be injured if the fuse blows during such a measurement.**
- **You must open the circuit under test, then place the meter in series with the circuit.**

⚠Caution

To avoid possible damage to the meter or to the equipment under test, check the meter's fuses before measuring current. Use the proper terminals, function, and range for your measurement. Never place the probes across (in parallel with) any circuit or component when the leads are plugged into the current terminals.

To measure ac or dc current, proceed as follows:

1. Turn off power to the circuit and discharge all high voltage capacitors.
2. Insert the black lead into the COM terminal. Insert the red lead in an input appropriate for the measurement range as shown in Table 3-1.

Note

To avoid blowing the meter's 500 mA fuse, use the mA*μ*A terminal only if you are sure the current is less than 500 mA.

3. If you are using **A** terminal, set the rotary switch to Ā . If you are using **mA μA** terminal, set the rotary switch to μĀ for current below 5000μA, or mĀ for current above 5000μA.
4. The default setting is direct current, and the screen shows "DC"; press blue pushbutton (○) once to select alternating current measurement and the screen shows "AC".
5. Open the circuit path to be tested. Touch the red probe to the more positive side of the break; touch the black probe to the more negative side of the break. Reversing the leads will produce a negative reading, but will not damage the meter.
6. Turn on power to the circuit, and read the measuring results from the screen.
7. Press ac+dc Hz%ms to measure AC+DC Current when Measuring DC current. Press ac+dc Hz%ms to measure frequency, duty cycle when Measuring AC current.
8. Turn off power to the circuit and discharge all high voltage capacitors. Remove the meter and restore the

circuit to normal operation.

⚠Notice

- **Start measuring from the high range if the current can't be evaluated.**
- **For safety, the measuring time should be limited within 15s, while the interval should be more than 10 min when measuring high current.**
- **If the input current is more than 20.00A, then the inner beeper sounds constantly indicating the value surpass the range.**

Table 3-1.Current Measurement

Rotary Switch	Input	Ranges
μA	mAμA	500.00μA 5000.0μA
mA	mAμA	50.000mA 500.00mA
A	A	5.0000A 20.000A

Measuring Current by current clamp (See Figure3-11)

The meter could measure up to 2000A of AC or DC current by configuring conversion ratio of current clamp such as 10mV / A, 1mV / A, 0.1 mV / A.

To measure ac or dc current, proceed as follows:

1. Set the rotary switch to position to select current clamp measurement.
2. Insert the black lead into "**COM**" terminal, and the red lead into the "**mAuA**" terminal.
3. The default setting is direct current, and the screen shows "DC"; press blue pushbutton(○) once to select alternating current measurement and the screen shows "AC ".

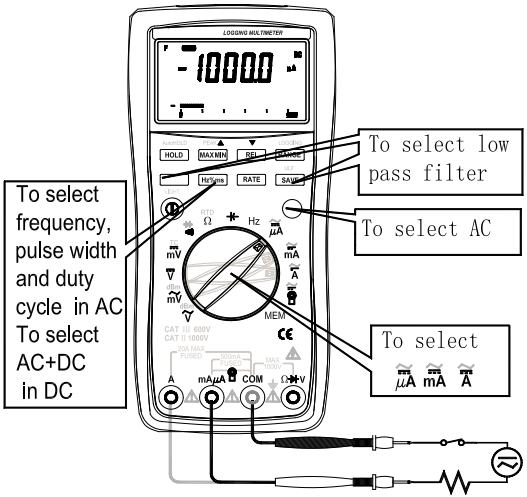

Figure 3-10. Current Measurement

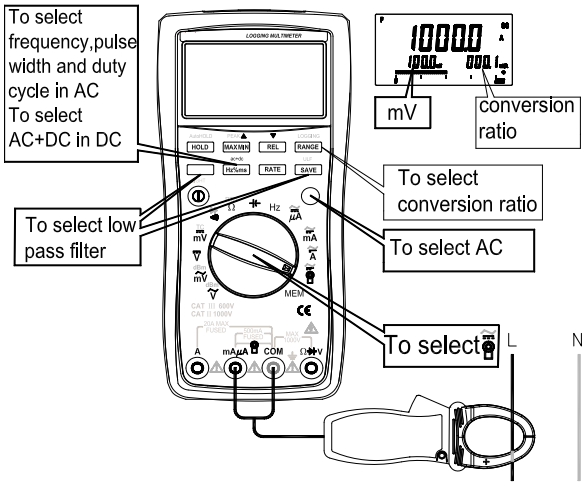

Figure 3-11. Measuring Current by current clamp

4. Open clamp head, clip measured wire, read the measuring results from the screen.
5. Press RANGE to select conversion ratio of current clamp.
6. Press Hz%ms to measure AC+DC Current when measuring DC current. Press Hz%ms to measure frequency, duty cycle when measuring AC current.

Measuring Frequency, Pulse width and Duty cycle (See Figure 3-12)

Frequency is the number of cycles a signal completes each second. The meter measures the frequency of a voltage or current signal by counting the number of times the signal crosses a threshold level each second. Duty cycle (or duty factor) is the percentage of time a signal is above or below a trigger level during one cycle.

The pulse width function allows you to measure the amount of time a signal is high or low within a given period. The measured waveform must be periodic; its pattern must repeat at equal time intervals.

Press ac+dc Hz%ms to measure Frequency, Pulse width and Duty cycle ratio in AC function, the frequency is automatic range.

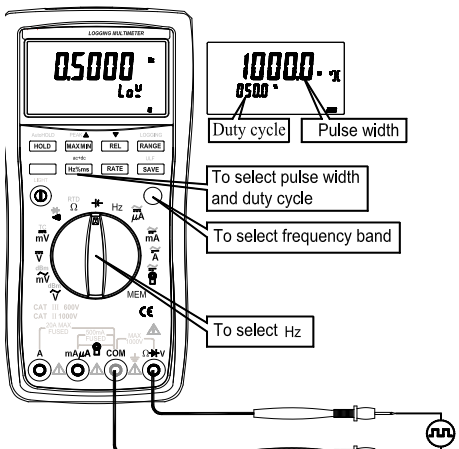

Figure 3-12. Pulse width and Duty cycle

Table 3-2 lists the frequency, pulse width and duty cycle range.

Measure Frequency and Duty cycle in Hz function. Proceed as follows:

1. Set the rotary switch to **Hz** position to select frequency measurement.
2. Insert the black lead into "**COM**" terminal, and the red lead into the "**Ω⊣◀V**" terminal.
3 Press (○) to select frequency band.
4. Connect the leads to the tested frequency.

5. If the low or middle frequency band, press ac+dc Hz%ms to measure positive pulse width and Duty cycle, press ac+dc Hz%ms again to measure negative pulse width and Duty cycle.
6. Read the measuring results from the screen.

Table 3-2 Frequency pulse width and Duty cycle ratio

Function	LCD mark	Range		Note
Hz	LoU	9.9999Hz	Manual	Press (○)to select measuring frequency's range
	n id	99.999Hz 999.99Hz 9.9999KHz 99.999KHz	Manual Automatic	
	HiJ	999.99KHz 9.9999MHz 99.999MHz	Manual Automatic	
AC voltage current		99.999Hz 999.99Hz 9.9999KHz 99.999KHz	Automatic	Press ac+dc Hz%ms to select
Positive pulse width and Duty cycle	⎍	200.00ms 2000.0ms 0.1%～99.9%	Manual	
Negative pulse width and Duty cycle	⎎	200.00ms 2000.0ms 0.1%～99.9%	Manual	

Chapter 4
Using Memory & Communications Features

Introduction

Chapter 4 shows you how to use memory and communication features available on the meters.

Types of Memory

The meter has two types of memory data: SAVE mode and LOGG mode.

Saved readings include primary and secondary readings and functions, the time stamp, and display icons representing various features in effect.

LOGG includes two working mode that are Event Logging and Time Logging. You can setup the meter that is Event Logging or Time Logging. (See to chapter 5)

Time Logging: it stores the current data into memory once the setting interval time is up.

Event logging compresses the input being measured by the meter into a series of events. Each event is represented by a sample at the start of the event, a duration, starting time, ending time, and the highest, lowest and average values detected during the event. The meter readings are classified by event type. The two event types you will see most often are:

Input events are logged when the input reading changes beyond the ±4% of input event settings. Input events are described as either stable or unstable. Stable input events contain readings that fall inside the ±4% of settings. Unstable input events contain readings that fall outside the ±4% of settings.

The defining of stable or unstable input events: it starts the unstable period when the input reading changes beyond the ±4% of input event settings; it starts the stable when the input readings fall inside the ±4% of setting for 1s at least.

Interval events are logged when the user-defined logging interval has ended. Interval events can be thought of as a series of readings divided into sections by time.

Table 4-1.Memory Capacity

Memory Mode	Memory Capacity
SAVE mode	100
LOG mode	900

⚠Notice

- Undertake “clearing memory data” operation first if the date storage functions are used firstly.
- The data storage mode is unavailable when the meter is in D.H, A.H function. The range cannot be changed when the data storage functions are active.
- In MEM position, “- - - -”on the screen indicates data storage is empty and could save the data; “FULL” on the screen indicates data storage is full and will stop saving.
- In LOG mode, no data could be saved if there is a recording (no matter the storage is full or not).
- The user should clear off the memory and then start to save. In LOG mode, the meter will return to measuring mode when the storage is full.
- Low battery indicator Appears on the screen to indicating forbid saving.

SAVE Mode

Saving the current readings to meter’s memory, press ULF SAVE to complete a manual save and beeps. At this moment, “ SAVE“ displays on primary display, the index number display increments by one. After one second, the meter returns to the measurement mode. “ FULL“ appears if no room is available in the saved readings memory (after 100 saves).

Starting Logging

Proceed as follows:

1. Set the LOGG mode: Event Logging or Time Logging (see to chapter 5).

2. Set the interval time of storage real time data (see to chapter 5). In Time Logging mode, if the interval time is set 0, then the meter will store all the measurement signals; in event record, if the interval time is set 0, then the meter only has input event.
3. Press [LOGGING] [RANGE] to start logging mode. If the LOGG readings memory has data, then display "FULL", can't storage data; otherwise, start logging mode, display "LOG"on screen. Each store a record, the buzzer sounded beeps, the primary display shows the current measurement data, the index number display increments by one in the first secondary, the second secondary display shows recording time. "FULL" appears if no room is available in the logged readings memory (after 900 log).

Stopping Logging

Logging stops when one of the following occurs:

- Press [LOGGING] [RANGE] .
- Change the rotary switch position.
- Logged readings memory becomes full.

Viewing Memory Data

⚠Warning

To avoid electric shock, disconnect the test leads when the rotary switch is in the MEM position.

1. Disconnect the input leads at the measurement source.
2. Turn the rotary switch to the MEM position and read the last SAVE record in meter default state.
3. Press [ULF] [SAVE] for saved reading, "**MEM**" appears in the display.
   Press [LOGGING] [RANGE] for logged reading, "**LOG**" appears in the display.
4. Press [PEAK▲] [MAXMIN] or [▼] [REL] to forward / backward to read the current record of data. If the storage is empty, then display ----; otherwise shows record data on the primary display, the first secondary display shows record

number. If in LOGG mode, the second secondary shows record time.

Clearing Memory

⚠Warning

To avoid electric shock, disconnect the test leads when the rotary switch is in the MEM position.

Use the following procedure to clear memory data:

1. Disconnect the input leads at the measurement source.
2. Turn the rotary switch to the MEM position. At this moment, default clear saved readings memory.
3. Press ULF SAVE to select clearing saved reading memory, "**MEM**" appears in the display.
4. Press LOGGING RANGE to select clearing logged reading memory, "**LOG**" appears in the display.
5. Press CLR RATE, "CLR" appears in the display and press CLR RATE again to clear the current memory; " YES "displays on screen, confirm cleared the area data, after 1 second display "----"; else press other button to cancel.

Using Communications

⚠Notice

Make sure your PC has been connected with the earth ground when employing this function.

Refer to the DMMVIEW_D Software Guide or the on line help.

You can use the USB Interface Cable and DMMVIEW_D software to transfer the contents of a meter and real time measuring value to a PC, and data processing.

Introduction

The meter allows you to change the default-operating configuration of the meter by changing setup options made at the factory.

Many of these setup options affect general meter operations and are active in all functions. Others are limited to one function or group of functions.

Selecting Setup Options

To enter the Setup mode, turn the meter on, the first press and then press .

In the Setup mode, each setup option appears in the first secondary display and the default value appears in the primary display. Press ○ to change the setup option. Press SAVE to store the set value ("SAVE" on the primary display indicates the maintained item has been stored).

To exit the Setup mode, press .

Adjust the system time

To adjust system time, turn the meter on, the first press and then press ○ .

In the adjust system time mode, each setup option appears in the primary display and the default value appears in the secondary display. Press ○ to change the setup option. Press SAVE to store the set value ("SAVE" on the primary display indicates the maintained item has been stored).

To exit the adjust mode, press .

Table 5-1. Changing the Default Settings

Selection		Function	Factory Default
APOF	Power off time	Set Range: 0~9999 min, use ac+dc Hz%ms or CLR RATE to select digit flashes. Use PEAK MAXMIN or REL to increment or decrement digit. Set zero to cancel auto power-off function.	10 minutes
bLOF	Backlight time	Set Range: 0~9999, use ac+dc Hz%ms or CLR RATE to select digit flashes. Use PEAK MAXMIN or REL to increment or decrement digit. Set zero to cancel auto turn backlight off function.	10 seconds
tEPU	Temperature units	Use PEAK MAXMIN or REL to select °C or °F.	°C
tCJ	Cold Junction Compensation	Use PEAK MAXMIN or REL to select ON or OFF.	ON
CnOS	dBm reference value	Set Range: 1~2400, Use ac+dc Hz%ms or CLR RATE to select digit flashes. Use PEAK MAXMIN or REL to increment or decrement digit.	600Ω
bEEP	buzzer	Use PEAK MAXMIN or REL to select ON or OFF.	ON
Cnbb	Beep	Use PEAK MAXMIN or REL to select SHOT or OPEN	SHOT
L9tn	LOGG mode	Use PEAK MAXMIN or REL to select time record (TIME) or event record(LOGG).	TIME
L9tE	LOGG mode interval time	Set Range: 1~9999 min, Use ac+dc Hz%ms or CLR RATE to select digit flashes. Use PEAK MAXMIN or REL to increment or decrement digit.	1 second
FACt	Restore factory default	Press USER SAVE, "SAVE" appears in the primary display to indicate return to the factor default.	- - - - -

Table 5-2. Adjusting the System Time

Selection		Function	Default
t iME	24-Hour	Set Range: 00:00:00～23:59:59, use ac+dc Hz%ms or CLR RATE to select digit flashes. Use PEAK▲ MAXMIN or ▼ REL to increment or decrement digit.	00:00:00
dAtE	Date	Set Range:2000.01.01 ～ 2099.12.31, use ac+dc Hz%ms or CLR RATE to select digit flashes. Use PEAK▲ MAXMIN or ▼ REL to increment or decrement digit.	2000.01.01

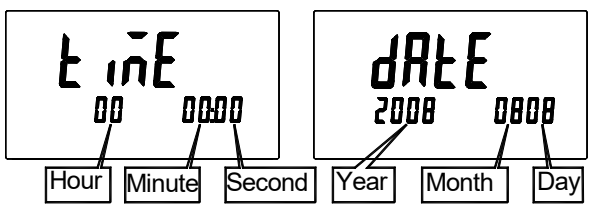

Figure 5-1. Adjusting the System Time

Chapter 6
Maintenance

Introduction

This section provides some basic maintenance procedures. Repair, calibration, and servicing not covered in this manual must be performed by qualified personnel. For maintenance procedures not described in this manual, contact a Service Center.

General Maintenance

- Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.
- Take off the battery if you will not use the meter for a long time.
- Dirt or moisture in the terminals can affect readings and can falsely activate the Input Alert feature. Clean the terminals as follows:

1. Turn the meter off and remove all test leads.
2. Shake out any dirt that may be in the terminals.
3. Soak a new swab with alcohol. Work the swab around in each terminal.

Testing the Fuses

⚠Warning

To avoid electrical shock or personal injury, remove the test leads and any input signals before replacing the battery or fuses. To prevent damage or injury, install ONLY specified replacement fuses with the amperage, voltage, and speed ratings.

To check the fuse, proceed as follows:

1. Set the rotary switch on mA or μA.
2. Insert the black lead to **COM** jack and red lead to **mA μA** jack.
3. Using an ohmmeter, check the resistance between the meter tested leads .If the resistance is about 1Ω, the fuse is good. An open reading means that fuse F1 is blown.

4. Set the rotary switch on Ã .
5. Insert the black lead to COM jack and red lead to **A** jack.
6. Using an ohmmeter, check the resistance between the meter tested leads .If the resistance is about 0.01Ω, the fuse is good. An open reading means that fuse F2 is blown

Table 6-1. Fuse Specifications

F1	20A/250V FAST Φ6×30mm
F2	0.2A/250V FAST Φ5×20mm

Replacing the Fuses

⚠Warning

To avoid electrical shock or damage to the meter, only use replacement fuses specified in Table 6-1.

Referring to Figure 6-1, replace the meter's fuses as follows:

1. Turn the meter off and remove the test leads from the terminals.
2. Take off protector of the meter. Then remove the battery access door by using a standard-blade screwdriver to turn the battery door screws one-quarter turn counterclockwise.
3. Remove either fuses by gently prying one end loose, then sliding the fuse out of its bracket.
4. Install ONLY specified replacement fuses with the amperage, voltage, and speed ratings.
5. Reinstall the battery door. Secure the door by turning the screws one-quarter turn clockwise.
6. Reinstall the meter's protector.

Replacing the Batteries

The meter needs four AAA alkaline batteries.

⚠Warning

To avoid electrical shock:

- **Remove test leads from the meter before opening the battery door.**
- **Close and latch the battery door before using the meter.**

⚠Notice

- **The new and old Batteries can not be mixed**
- **Take out the batteries if the meter won't be used for a long time**
- **Despise the old batteries in accordance with the local law.**

Replace the batteries as follows. Refer to Figure 6-1

1. Remove the test leads and turn the meter OFF
2. Take off the protector of the meter and then with a standard blade hand screwdriver, turn each battery door one-quarter turn counterclockwise, so that the slot is parallel with the screw picture molded into the case.
3. Replace the batteries and reinstall the battery door. Secure the door by turning the screws one-quarter turn clockwise.
4. Reinstall the meter's protector.

⚠Caution

Make sure the battery's odes are in accordance with the symbols illustrated in battery pool when replacing them.

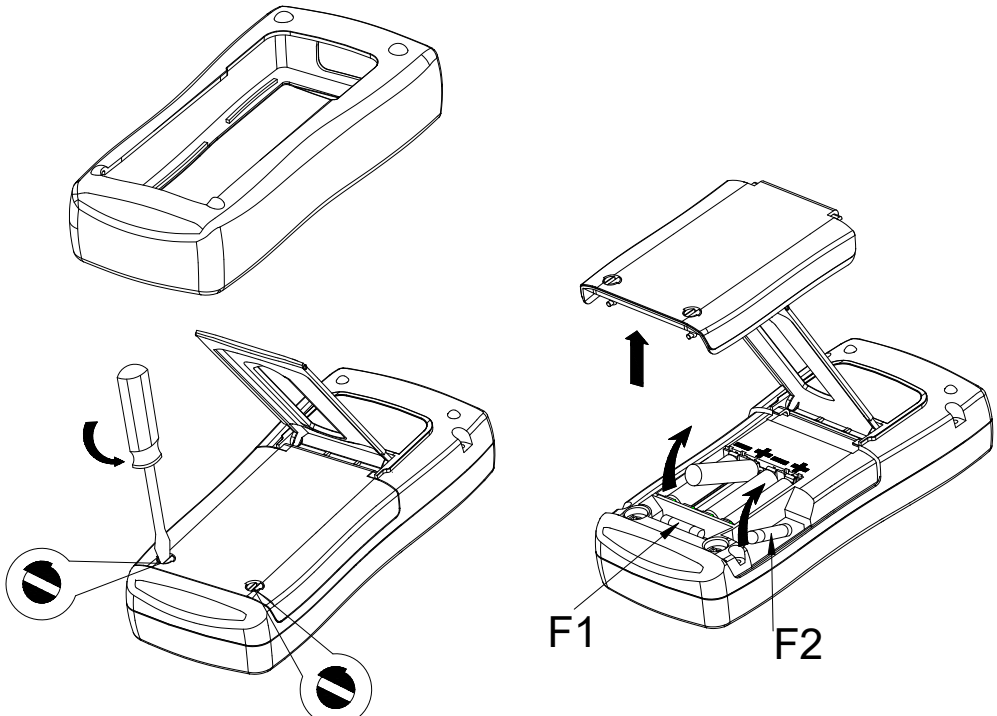

Figure 6-1. Battery and Fuse Replacement

Chapter 7
Specifications

Safety and Compliance

Maximum voltage between any terminal and earth ground.	1000V dc or ac RMS voltage
Compliance	Complies with IEC61010.1-2001 Over voltage II Pollution Degree 2. (Safety Standard issued by IEC)
Surge Protection	6kV(According IEC61010-1:2001)
Fuse Protection for mA or μA inputs Fuse Protection for A input	0.5A 250V FAST Fuse 20A 250V FAST Fuse
Identification tags	CE

Physical Specifications

Display(LCD)	Digital: 55000 counts primary display; 5500 counts secondary display; updates 14/second. Analog: 51 segments, updates 14/second.
Operating Temperature	0°C to 50 °C
Storage Temperature	-10 °C to + 55 °C
Relative Humidity	0 °C to + 30 °C ≤75% 30 °C to + 40 °C ≤50%
Altitude	0-2000m(according to IEC61010 CAT II,1000V; CAT III,600V)
Battery Type	4×AAA alkaline battery,NEDA,LR03
Power	MAX 150mVA / 275mVA(turn backlight on)
Temperature coefficient	0.15 × (specified accuracy)% / °C, range<18 °C or >28 °C)
EMC	Complies with IEC61326-1,Group 1,Class B
Size	205×95×42mm(plus protector)
Weight	About 500g(plus protector)
Calibration Interval	1 Year

Feature Summary

Double digital display Analog display	Primary: 55000 counts; Secondary: 5500 count Analog: 51 segments, updates 14 times /second.
Backlight	White LED backlight for clear readings in poorly lighted areas
AC+DC TRMS AC TRMS specified to 100kHz (only Enhanced type)	Choices for AC only, AC , DC and AC+DC dual display
dBm	User selectable impedance references for dBm
ULF mode	The low pass filter can improve measurement performance on composite sine waves that are typically generated by inverters and variable frequency motor drives.
Auto HOLD	Holds readings on display
Continuity / Open test	Beeper sounds for resistance readings below threshold, or to indicate a momentary open circuit.
Duty cycle / Pulse width	Measure signal on or off time in % or milliseconds
MIN MAX mode	Record maximum, minimum, and average values. 24-hour clock for MAX or MIN, elapsed time for AVG.
PEAK mode	PEAK captures peaks to 500us.
24-Hour clock	Display Year, Month, Date, Hour, minutes of Gregorian calendar.
Closed-Case Calibration	No internal adjustments needed.
Battery / Fuse Access Door	Battery or fuse replaceable without voiding calibration
communication	isolation USB interface

Basic Specifications

Function		Range / Description
DC voltage		0 to 1000V
AC voltage,TRMS		Basic type: 5mV~760V Enhanced type: 2.5mV~760V
Basic Accuracy		Basic type: DC voltage: 0.03% AC voltage: 0.7% Enhanced type: DC voltage: 0.02% AC voltage: 0.4%
DC current		0 to 20A(current clamp up to 2000A)
AC current,TRMS		0 to 20A(current clamp up to 2000A)
Resistance		0 to 500MΩ
Capacitance		0.001nF to 99.99 mF
Diode		3.5V
TC Test		R, S, K, E, J, T, B, N
RTD Test		Pt100, Pt1000
Frequency		0.5Hz to 99.999MHz
Storage reading	SAVE	100 groups
	LOGG	900 groups

Detailed Accuracy Specifications

Accuracy is specified in the followed measuring rate:

Function	Measuring Rate		
	FAST	SLOW	SMOOTH
	F	S	
DC Voltage, DC Current, TC			●
AC Voltage, AC Current			●
Resistance, RTD			●
Diode Test, Continuity Check	●		

Accuracy is specified for a period of one year after calibration, at 18 ºC to 28 ºC, with relative humidity to 75%. Accuracy specifications are given as: ± ([% of reading] + [number of least significant digits])(“Counts” refers to the number of increments or decrements of the least significant digit).

AC mV, ACV, AC uA, AC mA and ACA specifications are ac couple, true rms and are valid from 5 % of range to 100% of range. AC crest factor can be up to 3.0 at full-scale.

DC Voltage Measurement

Function	Range	Resolution	Accuracy	
			Basic type	Enhanced type
DC mV	50.000mV	0.001 mV	0.1%+20	0.05%+10
	500.00mV	0.01mV	0.03%+5	0.02%+2
	2200.0mV	0.1mV	0.03%+5	0.02%+2
DCV	5.0000V	0.0001V	0.05%+5	0.025%+5
	50.000V	0.001V	0.05%+5	0.025%+5
	500.00V	0.01V	0.07%+5	0.03%+2
	1000.0V	0.1V	0.07%+5	0.03%+2

AC Voltage Measurement

Basic type

Function	Range	Resolution	Accuracy				
			20Hz~45Hz	45Hz~65Hz	65Hz~1KHz	1KHz~10KHz	10KHz~30KHz
AC mV	50.000mV	0.001 mV	2%+100 [2]	0.7%+30	0.7%+30	1%+30	2%+100
	500.00mV	0.01mV	2%+100 [2]	0.7%+30	0.7%+30	1%+30	2%+100
ACV	5.0000V	0.0001V	1.5%+80	0.7%+30	1%+100	2%+100	2%+100
	50.000V	0.001V	1.5%+80	0.7%+30	1%+100	2%+100	2%+100
	500.00V	0.01V	1.5%+80	0.7%+30	2.5%+100	-----	-----
	1000.0V	0.1V	1.5%+80	0.7%+30	2.5%+100	-----	-----
ULF			2.5%+100	2%+60 [4]-6%-80		-----	-----

1. Apply to 10～100% of range .
2. Frequency range takes up 30 Hz.
3. The bandwidth of 1000V is up to 5 kHz.
4. Specification increases linearly from -2% at 200 Hz to -6% at 440 Hz. The rang is up to 440 Hz.

Enhanced type

Function	Range	Resolution	Accuracy					
			20Hz~45Hz	45Hz~65Hz	65Hz~1KHz	1KHz~10KHz	10KHz~20KHz	20KHz~100KHz
AC mV	50.000mV	0.001 mV	2%+60	0.4%+30	0.4%+30	0.4%+30	1%+40	5%+100 [1]
	500.00mV	0.01mV	2%+60	0.4%+30	0.4%+30	0.4%+30	1%+40	5%+100 [1]
ACV	5.0000V	0.0001V	1.5%+60	0.4%+30	1.5%+30	1.5%+30	1%+40	5%+100 [1]
	50.000V	0.001V	1.5%+60	0.4%+30	1.5%+30	1.5%+30	1%+40	5%+100 [1]
	500.00V	0.01V	1.5%+60	0.4%+30	3%+200	-----	-----	-----
	1000.0V [2]	0.1V	1.5%+60	0.4%+30	3%+200	-----	-----	-----
ULF			2%+80	2%+40 [3] -6%-60		-----	-----	-----

1. <20kHz apply to 5～100% of range, ≥20kHz apply to 10 ～100% of range.
2. 1000V applies to 10～100% of range.
3. Specification increases linearly from -2% at 200 Hz to -6% at 440 Hz. The rang is up to 440 Hz.

AC + DC Voltage measurement

Basic type

Function	Range	Resolution	Accuracy		
			45Hz~1KHz	1KHz~10KHz	10KHz~30KHz
DCV+ACV	2.000V	0.001V	0.7%+30	1%+30	2%+60
	20.00V	0.01V	0.7%+30	1%+30	2%+60
	200.0V	0.1V	0.7%+30	1%+60	-----
	1000V	1V	0.7%+30	1%+60 [2]	-----
ULF			2%+60 [3] -6%-80	-----	-----

1. Apply to 10～100% of range.
2. Frequency range is up to 5KHz.
3. Specification increases linearly from -2% at 200 Hz to -6% at 440 Hz. The rang is up to 440 Hz.

Enhanced type

Function	Range	Resolution	Accuracy			
			45Hz~1KHz	1KHz~10KHz	10KHz~20KHz	20KHz~100KHz
DCV+ACV	2.000V	0.001V	0.4%+30	0.4%+30	1%+40	5%+100 [1]
	20.00V	0.01V	0.4%+30	0.4%+30	1%+40	5%+100 [1]
	200.0V	0.1V	0.4%+30	0.4%+30	-----	-----
	1000V [2]	1V	0.4%+30	0.4%+30	-----	-----
ULF			2%+40 [3] -6%-60	-----	-----	-----

1. <20kHz apply to 5 ～100% of range,≥20kHz apply to 10 ～100% of range.
2. 1000V applies to 10～100% of range.
3. Specification increases linearly from -2% at 200 Hz to -6% at 440 Hz. The rang is up to 440 Hz.

DC Current Measurement

Function	Range	Resolution	Accuracy	
			Basic type	Enhanced type
DCuA	500.00μA	0.01μA	0.15%+20	0.15%+10
	5000.0μA	0.1μA	0.15%+10	0.15%+2
DCmA	50.000mA	0.001mA	0.15%+20	0.15%+10
	500.00mA	0.01mA	0.15%+10	0.15%+2
DCA	5.0000A	0.0001A	0.5%+20	0.5%+10
	20.000A [1]	0.001A	0.5%+20	0.5%+10
DC_Clamp [2]	50.000A	0.001A	0.5%+30	0.15%+10
	500.00A	0.01A	0.5%+30	0.15%+10
	2000.0A	0.1A	0.5%+30	0.15%+10

1. <10A to allow continuous measurement; 10A~20A continuous measurement time not more than 30s, intervals time not less than 15 minutes.
2. Accuracy does not contain a current-clamp error.

AC Current Measurement

Basic type

Function	Range	Resolution	Accuracy			
			20Hz~45Hz	45Hz~1KHz	1KHz~10KHz	10KHz~30KHz
AC uA	500.00uA	0.01uA	1.5%+80	0.8%+30	1%+50	2%+60
	5000.0uA	0.1uA	1.5%+80	0.8%+30	1%+50	2%+60
AC mA	50.000mA	0.001mA	1.5%+80	0.8%+30	1%+50	2%+60
	500.00mA	0.01mA	1.5%+80	0.8%+30	1%+50	2%+60
ACA	5.0000A	0.0001A	2%+40	1.5%+20	3%+80	-----
	20.000A [1]	0.001A	2%+40	1.5%+20	3%+80	-----
AC_Clamp [2]	50.000A	0.001A	-----	0.7%+30	-----	-----
	500.00A	0.01A	-----	0.7%+30	-----	-----
	2000.0A	0.1A	-----	0.7%+30	-----	-----
ULF			2.5%+100	2%+60 [4] -6%-80	-----	-----

1. <10A to allow continuous measurement; 10A~20A continuous measurement time not more than 30s, intervals time not less than 15 minutes.
2. Accuracy does not contain a current-clamp error.
3. 1000V applies to 10～100% of range.
4. Specification increases linearly from -2% at 200 Hz to -6% at 440 Hz. The rang is up to 440 Hz.

Enhanced type

Function	Range	Resolution	Accuracy			
			20Hz~45Hz	45Hz~1KHz	1KHz~10KHz	10KHz~30KHz
ACuA	500.00uA	0.01uA	1%+20	0.7%+15	0.7%+30	1.5%+20 [3]
	5000.0uA	0.1uA	1%+20	0.7%+15	0.7%+30	1.5%+20 [3]
ACmA	50.000mA	0.001mA	1%+20	0.7%+15	0.7%+30	1.5%+20 [3]
	500.00mA	0.01mA	1%+20	0.7%+15	0.7%+30	1.5%+20 [3]
ACA	5.0000A	0.0001A	1.5%+20	1.5%+10	3%+60	-----
	20.000A [1,4]	0.001A	1.5%+20	1.5%+10	3%+60	-----
AC_Clamp [2]	50.000A [4]	0.001A	-----	0.7%+30	-----	-----
	500.00A [4]	0.01A	-----	0.7%+30	-----	-----
	2000.0A [4]	0.1A	-----	0.7%+30	-----	-----
ULF			2%+80	2%+40 [5] -6%-60	-----	-----

1. <10A to allow continuous measurement; 10A~20A continuous measurement time not more than 30s,intervals time not less than 15 minutes.
2. Accuracy does not contain a current-clamp error.
3. <20kHz apply to 5 ～100% of range, ≥20kHz apply to 10 ～100% of range.
4. Apply to 10～100% of range.
5. Specification increases linearly from -2% at 200 Hz to -6% at 440 Hz. The rang is up to 440 Hz.

AC+DC Current Measurement

Basic type

Function	Range	Resolution	Accuracy		
			45Hz~1KHz	1KHz~10KHz	10KHz~30KHz
DCA+ACA	200.0uA	0.1uA	0.8%+30	1%+50	2%+60
	2000uA	1uA	0.8%+30	1%+50	2%+60
	20.00mA	0.01mA	0.8%+30	1%+50	2%+60
	200.0mA	0.1mA	0.8%+30	1%+50	2%+60
	2.000A	0.001A	1.5%+20	3%+80	
	20.00A [1]	0.01A	1.5%+20	3%+80	
	20.00A [2]	0.01A	0.8%+30	-----	-----
	200.0A [2]	0.1A	0.8%+30	-----	-----
	2000A [2]	1A	0.8%+30	-----	-----
ULF			2%+60 [4] -6%-80	-----	-----

1. <10A to allow continuous measurement;10A~20A continuous measurement time not more than 30s, Intervals time not less than 15 minutes.
2. Accuracy does not contain a current-clamp error.
3. Apply to 10～100% of range.
4. Specification increases linearly from -2% at 200 Hz to -6% at 440 Hz. The rang is up to 440 Hz.

Enhanced type

Function	Range	Resolution	Accuracy		
			45Hz~1KHz	1KHz~10KHz	10KHz~30KHz
DCA+ACA	200.0uA	0.1uA	0.7%+15	0.7%+30	1.5%+20 [3]
	2000uA	1uA	0.7%+15	0.7%+30	1.5%+20 [3]
	20.00mA	0.01mA	0.7%+15	0.7%+30	1.5%+20 [3]
	200.0mA	0.1mA	0.7%+15	0.7%+30	1.5%+20 [3]
	2.000A	0.001A	1.5%+10	3%+60	-----
	20.00A [1.4]	0.01A	1.5%+10	3%+60	-----
	20.00A [2.4]	0.01A	0.7%+30	-----	-----
	200.0A [2.4]	0.1A	0.7%+30	-----	-----
	2000A [2.4]	1A	0.7%+30	-----	-----
ULF			2%+40 [5] -6%-60	-----	-----

1. <10A to allow continuous measurement;10A~20A continuous measurement time not more than 30s, Intervals time not less than 15 minutes.
2. Accuracy does not contain a current-clamp error.
3. <20kHz apply to 5～100% of range,≥20kHz apply to 10～100% of range.
4. Apply to 10～100% range.
5. Specification increases linearly from -2% at 200 Hz to -6% at 440 Hz. The rang is up to 440 Hz.

Resistance Measurement

Function	Range	Resolution	Accuracy	
			Basic type	Enhanced type
Resistance	500.00Ω	0.01Ω	0.08%+10[1]	0.05%+2 [1]
	5.0000KΩ	0.0001KΩ	0.08%+5	0.05%+2
	50.000KΩ	0.001KΩ	0.08%+5	0.05%+2
	500.00KΩ	0.01KΩ	0.08%+5	0.05%+2
	5.0000MΩ	0.0001MΩ	0.2%+5	0.15%+2
	50.000MΩ	0.001MΩ	1%+10	1%+2
	100.0MΩ	0.1 MΩ	3%+10	3%+2
	500.0MΩ		10%+10	10%+2

1. Using relative mode (REL %) to zero residual reading.
2. Accuracy does not contain lead resistance caused by error.

Capacitance Measurement

Function	Range	Resolution	Accuracy
			Basic / Enhanced type
Capacitance	9.999nF	0.001nF	1%+20 [1]
	99.99nF	0.01nF	1%+5
	999.9nF	0.1nF	1%+5
	9.999μF	0.001uF	1%+5
	99.99μF	0.01uF	1%+5
	999.9μF	0.1uF	2%+5
	9.999mF	0.001mF	3%+5
	99.99mF	0.01mF [2]	3%+5

1. Using relative mode (REL %) to zero residual reading.
2. Least significant digit not active above 10 mF.

Frequency Count Accuracy

Function	Range	Resolution	Accuracy	Sensitivity
			Basic / Enhanced type	
frequency	9.9999Hz	0.0001Hz	0.02%+3	300mV_RMS
	99.999Hz	0.001Hz	0.02%+1	
	999.99Hz	0.01Hz	0.02%+1	
	9.9999KHz	0.0001KHz	0.02%+1	
	99.999KHz	0.001KHz	0.02%+1	
	999.99KHz	0.01KHz	0.02%+1	600mV_RMS
	9.9999MHz	0.0001MHz	0.02%+1	
	99.999MHz	0.001MHz	0.02%+5	
1. Reading will be 0.00 for signals below 0.5 Hz				

Pulse width, duty cycle ratio Accuracy

Function	Range	Resolution	Accuracy
			Basic / Enhanced type
Pulse width	199.99ms	0.01ms	0.2%+3
	1999.9ms	0.1ms	0.2%+3
Duty cycle ratio	0.1%～99.9%	0.1%	0.3% / KHz+0.3%
1. Positive, negative pulse width must be more than 10 us. 2. The range of pulse width depends on input frequency. 3. 0.5Hz to 1kHz, signals trigger level in the middle.			

Voltage with the frequency counter sensitivity

Range	Approximate VAC sensitivity (RMS Sine wave)
	20Hz~100kHz [3]
50mV	5mV
500mV	20mV
5V	500mV
50V	5V
500V	20V
1000V	150V

1. The highest input＝10×range(the highest 1000V). The noise effects accuracy in low frequency and amplitude.
2. The input signal is less than 2×10^{7} V-Hz.
3. The basic type's frequency is up to 30KHz.

Current with the frequency counter sensitivity

Range	Approximate VAC sensitivity (RMS Sine wave)
	20Hz~30kHz
500uA	50uA
5000uA	200uA
50mA	5mA
500mA	20mA
5A	150mA
20A	2A

TC Measurement

Function	Range	Resolution	Accuracy	
			Basic type	Enhanced type
R	0°C~1767°C	1°C	0.5%+1°C	0.2%+1°C
	32°F~3212°F	1°F	0.5%+1.8°F	0.2%+1.8°F
S	0°C~1767°C	1°C	0.5%+1°C	0.2%+1°C
	32°F~3212°F	1°F	0.5%+1.8°F	0.2%+1.8°F
K	-200.0°C~1372.0°C	0.1°C	0.5%+0.5°C	0.2%+0.5°C
	-328.0°F~2501.6°F	0.1°F	0.5%+1°F	0.2%+1°F
E	-200.0°C~720.0°C	0.1°C	0.5%+0.5°C	0.2%+0.5°C
	-328.0°F~1328.0°F	0.1°F	0.5%+1°F	0.2%+1°F
J	-200.0°C~950.0°C	0.1°C	0.5%+0.5°C	0.2%+0.5°C
	-328.0°F~1742.0°F	0.1°F	0.5%+1°F	0.2%+1°F
T	-250.0°C~400.0°C	0.1°C	0.5%+1°C	0.2%+1°C
	-418.0°F~752.0°F	0.1°F	0.5%+1.8°F	0.2%+1.8°F
N	-200.0°C~1300.0°C	0.1°C	0.5%+1°C	0.2%+1°C
	-328.0°F~2372.0°F	0.1°F	0.5%+1.8 °F	0.2%+1.8 °F
B	600°C~1820°C	1°C	0.5%+1°C	0.2%+1°C
	1112°F~3308°F	1°F	0.5%+1.8°F	0.2%+1.8°F

1. By using ITS-90 temperature scale
2. The accuracy does not include the error of internal temperature compensation caused by a sensor.

RTD Measurement

Function	Range	Resolution	Accuracy	
			Basic type	Enhanced type
Pt100	-200.0°C~800.0°C	0.1°C	0.5%+0.5°C	0.2%+0.5°C
	-328.0°F～1472.0°F	0.1°F	0.5%+1°F	0.2%+1°F
Pt1000	-200.0°C～630.0°C	0.1°C	0.5%+0.5°C	0.2%+0.5°C
	-328.0°F～1166.0°F	0.1°F	0.5%+1°F	0.2%+1°F
1. By using ITS-90 temperature scale 2. Attached lead resistance is excluded				

Diode Test

Range	Resolution	Accuracy
		Basic / Enhanced type
2.2000V	0.0001V	1%+20

Continuity Check

Range	Resolution	Accuracy
		Basic / Enhanced type
500.0Ω	0.1Ω	● short-circuit alarm: 20Ω ● open-circuit alarm: 100Ω

Peak Hold

Function	Resolution	Accuracy
	Basic / Enhanced type	
DCV,DCA	±100 counts	>500us

Burden voltage

Function	Range	Burden Voltage
A	20.000A	0.04V/A
	5.0000A	0.04V/A
mA-uA	50.000mA	1.8mV/mA
	500.00mA	1.8mV/mA
	500.00uA	103uV/uA
	5000.0uA	103uV/uA

Input feature

Function	Input Impedance (nominal value)					
V	10MΩ,<100pF					
DC mV	>2.5GΩ					
AC mV	1MΩ,<100pF					
	Common Mode Rejection Ratio		Normal Mode Rejection			
DCV,DC mV	120dB(dc to 50Hz / 60Hz/1KΩ)		80dB(50Hz / 60Hz)			
ACV,AC mV	80 dBm(dc to 50Hz / 60Hz/1KΩ)					
	Open Circuit Test Voltage		Full-scale voltage			
Ω	2.2V		2.2V			
Diode	< 3.6V		2.2V			
Continuity	< 3.6V		500mV			
	Typical Short-Circuit Current					
Ω	500Ω	5KΩ	50KΩ	500KΩ	5MΩ	50MΩ
	0.9mA	0.2mA	20uA	2uA	1uA	0.1uA
Diode	0.8mA(Typical Value)					
Continuity						

Notice of the Instruction Manual

- The present operation instruction is subject to change without notice.
- The content of the operation instruction is regarded as correct. Whenever any user finds its mistakes, omission, etc., he or she is requested to contact the manufacturer.
- The present manufacturer is not liable for any accident and hazard arising from the customer misuse or inadvertent operation.
- The functions described in this operation instruction should not be used as grounds to apply this product to a particular purpose.