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# Chapter 1

## **Meter Safety Standards**

This style of digital multimeter is designed and manufactured according to the safety requirements set out by the IEC1010-1 standards for electronic test instruments and the hand-held digital multimeters. Its design and manufacture is strictly based on the provisions in the 600V CAT II of IEC1010-1 and the Stipulation of 2-Pollution Grade.

The meter conforms to the European Union's following requirements:89/336/EEC

(EMC Electromagnetic Compatibility ),73/23/EEC(LVD Low Voltage Protection)and 93/68/EEC(CE Mark).



### **Warning**

- Must use power socket with reliable earth line, or should connect earth line to the shell (there is a peg on the back panel for connecting earth).
- Before use of the meter firstly check up if there is any crack on the outer shell or if it lacks any plastic part, and check up whether the testing line is damaged or has any exposed metal. The meter can be used only if no any insulating problem be found.
- Carefully read the operating methods and safety prompts in this manual. Using it not based on the methods specified in this manual may cause the meter damaged.
- Non-normal meter must not be used. It should be sent for repairing.
- The meter must not be used in an environment with combustible gases, steam or dust pollution.
- It should be careful to work when measuring votage higher than 30Vac(effective value)or 50Vdc for such voltage having

## ***Safety Information***

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the risk of shock. Avoid the body directly touching ground or any metal substance in which there may be ground potential during measuring. The body should be kept insulated from ground with dry insulating shoes, insulating pads or insulating clothes.

- When performing measurement with a test probe your fingers should be put behind a finger-protector.
- Must not try to measure a voltage higher than 1000VAC or 1000VDC, the meter may be damaged and the operator's safety may be threatened if the limit for voltage measurement be exceeded.
- Must not make any voltage measurement when the testing line being inserting into the current hole.
- Repair and calibration of the meter must be carried out by experienced professionals, unprofessionals should not repair and calibrate the meter by themselves.
- There are three mode of meter, A model has datalog/USB Communication/RS232 Communication. B model has all functions of A, and has extra two function, SD Card record/USB DISK record. C model has all functions of B, and has one extra function, LAN Communication.

## Chapter 2

### Characteristics

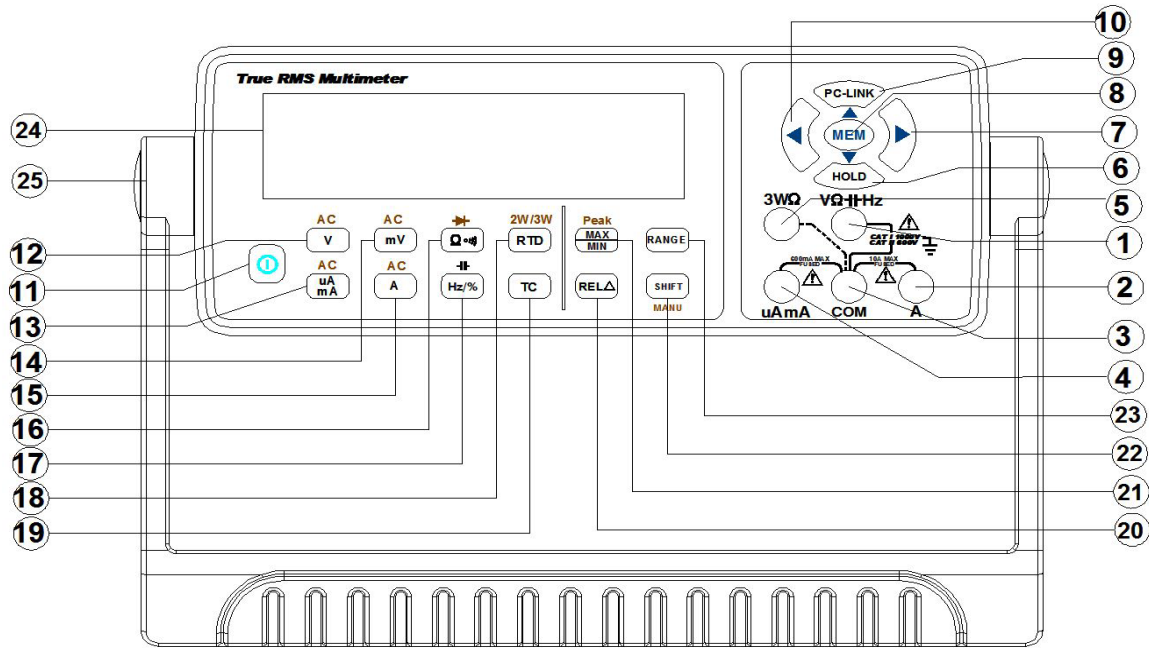
- 63000 counts measurement
- ACV and DCV measurements reach up to 1000V.
- DC measurement accuracy reaches up to 0.03%.
- 0.01  $\Omega$  resistance resolution and 1  $\mu$  V voltage resolution.
- Linear frequency measurement, logic frequency/duty ratio measurement.
- Capacitance measurement from 0.0001nF to 60mF.
- AC/DC true RMS measurement.
- Maximum value/minimum value measurement, relative value measurement.
- VFD double display function
- All operations by buttons
- Data logger saves data to Internal E2prom, USB-Disk or SD-Card.
- RS-232C, USB, Bluetooth, LAN communication interface can be choose.
- Display, record and graphics software of computer.
- Overload protection.

True RMS Bench Model Multimeter  
**Introduction to the Meter**

**Explanation on Front Panel**

The front panel is shown as in Figure 2-1,

Explanation being as follows:



**(1) V  $\Omega$  Hz end**

It is the input end for all measurement functions except for current measurement, connected with a red meter probe.

**(2) A end**

It is the positive input end for measurement of 6A/10A current, connected with a red meter probe

**(3) COM end**

It is the negative input end for all measurements, connected with a black meter probe.

**(4)  $\mu$ A/mA end**

It is the positive end for measurement of  $\mu$ A or mA current, connected with a red meter probe.

**(5) 3W  $\Omega$  end**

Three line RTD measure mode.

**(6) HOLD key**

Used to maintain the measurement data unchanging, by pressing the key again it will resume the measurement.

**(7) LEFT key**

On the normal mode, press the LEFT key to enter the view mode. On the other mode, it will decrease the number or change mode.

**(8) MEM key**

To enter the memory setting or start log or exit log or exit view mode. On memory setting mode press MEM key for two seconds to start log. On logger mode press MEM key for two seconds to end the log. On normal mode press MEM key to enter the memory setting mode.

## ***Introduction to the Meter***

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### **(9) PC-LINK key**

If you have set the communication style in the menu setting mode, press PC-LINK to open the interface on meter. And PC-LINK symbol will be light. Press PC-LINK key again to close the interface on meter.

### **(10) RIGHE key**

On the normal mode, press the RIGHT key to enter the view mode. On the other mode, it will increase the number or change mode.

### **(11) POWER switch**

Used for putting on or off the operating power for the meter.

### **(12) V key**

Voltage switch. Press V key to enter DC voltage measure. SHIFT + V to enter the AC voltage measure.

### **(13) uA/mA key**

Press one time uA/mA key to enter the DC mA measure, press second time to enter the DC uA measure.

Press one time SHIFT + uA/mA to enter AC mA measure, press second time SHIFT + uA/mA to enter the AC uA measure.

### **(14) mV key**

Press mV key to enter the DC mV measure.

Press SHIFT + mV to enter the AC mV measure.

### **(15) A key**

Press A key to enter DC ampere measure.

Press SHIFT + A to enter AC ampere measure.

**(16)  $\Omega$  key**

Press  $\Omega$  key to switching OHM/CONT/DIODE function measurement.

**(17) Hz% key**

Press Hz% key to enter frequency measure.

Press SHIFT + Hz% to enter cap measure.

**(18)RTD buttons**

Press RTD key to enter RTD measure

SHIFT + RTD to switch two-wire or three-wire measurement.

**(19) TC key**

Press TC key to enter thermocouple measurement. Press again, it will change to other type thermocouple measurement.

**(20) REL $\Delta$  key**

By pressing REL $\Delta$  to enter the relative measurement state. The meter will remember the beginning value measured at the time when pressing the key(it is called the initial value), and after that the value displayed in the meter will be equivalent to the present value reduce the initial value. By pressing the key again the relative measurement state will be exited.

**(21) MAX/MIN key**

Press MAX/MIN key to enter the record state for the maximum and minimum value and simultaneously display the maximum value. By pressing this key again it will be possible to display the minimum value.

Keep press the key longer 2 seconds, it will exit MAX/MIN mode.

**(22) SHIFT key**

Press SHIFT key to enter secondary function on some keys. SHIFT key usually used with other key.

Keep press SHIFT key longer 2 seconds, the meter will enter the MENU setting mode.

**(23) RANGE key**

For various kinds of measurements it is used manually to select range. Under the automatic range state (AUTO displaying), it will enter manual range state(MANU display at VFD windows) with a press on RANGE, after that the range will be changed . When the RANGE key being released after pressing for two seconds the meter will return back to the automatic state. When performing CONT measurement, diode measurement, AC mV measurement, TC measurement, RTD measurement pressing RANGE will be void.

Keep press RANGE key longer 2 seconds, it will exit manual range mode and return to normal range mode.

## Explanation on Back Panel

The back panel is shown as in figure 2-2, explanation being as follows:

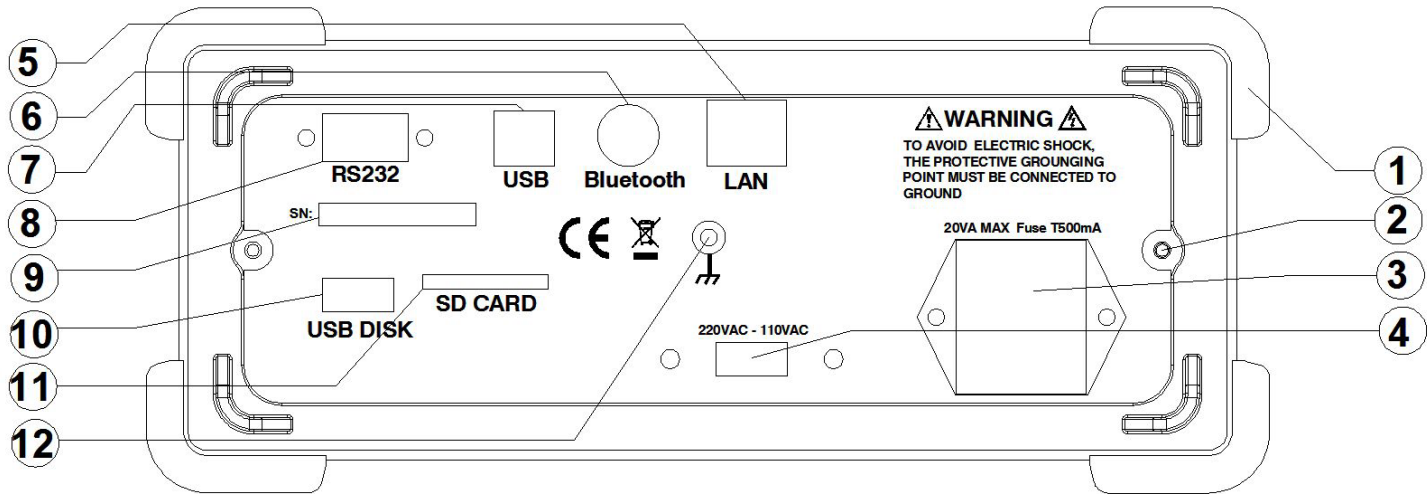


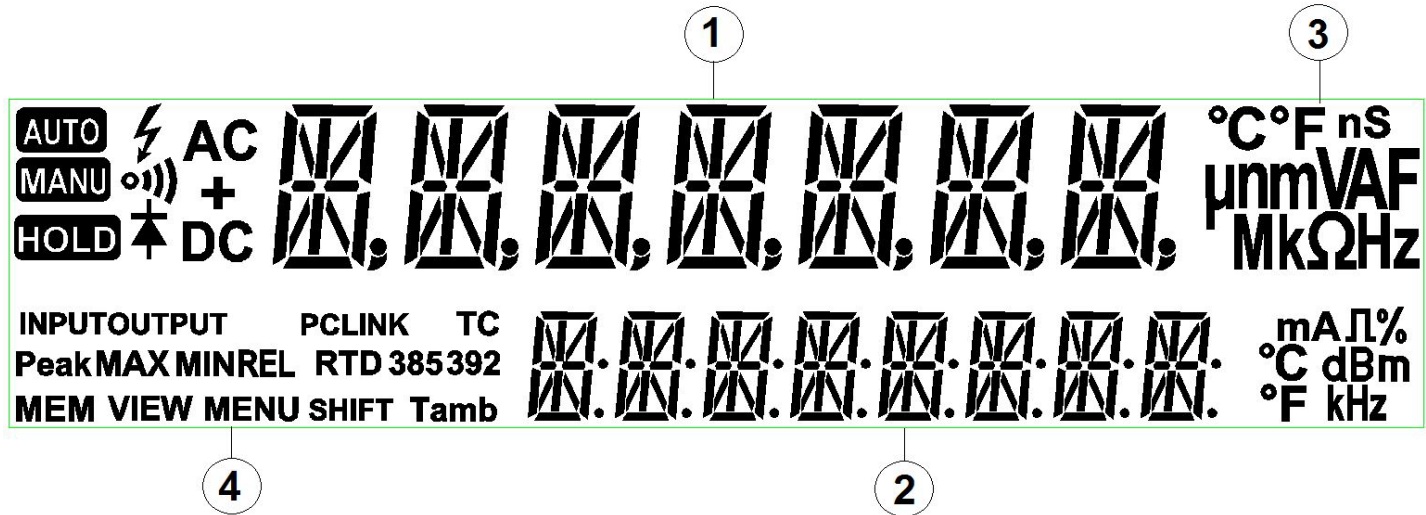
Figure 2—2

***Introduction to the Meter***

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- (1) Rubber protect holder.
- (2) Case screw.
- (3) Power socket. Build-in fuse.
- (4) Power selection switch, be used to select 110V or 220V power supply. Before leaving factory it is turned on the position of 220V
- (5) Network communication interface. (RJ45)
- (6) Bluetooth communication interface. (Mini-DIN6)
- (7) USB communication interface. (USB-A)
- (8) RS-232 communication interface. (DB9)
- (9) Serial number.
- (10) USB DISK memory.
- (11) SD CARD memory.
- (12) Earth connection. If the ground line in power socket is not connected to earth reliably, must be connect wire to earth.

### Explanation on Display



- (1) Main display area.
- (2) Secondary display area.
- (3) The unit display.
- (4) The function and mode symbol indicate.

### **Function Descriptions**


Along with the conventional measurement functions this meter also possesses some special functions which being described as follows:

- True Root-Mean-Square value (TRUE RMS) measurement: all the measurement values of this meter on the AC voltage and AC current are true RMS values.
- Automatic and manual ranges: When turning on the meter's power switch the meter defaults the automatic range state(AUTO displaying), and simultaneously it will automatically select the proper range according to the measured electric parameters. If OL being displayed under automatic range, it indicates the measured value exceeding the meter's maximum range. Pressing the RANGE key under the automatic range the meter will enter the manual range(MANUAL displaying), then pressing the RANGE key again it will be possible to select the required range. If OL displaying under the manual range, it indicates the measured value exceeding the maximum range of manual.
- Press the RANGE key under the manual range for two seconds and then release it, the meter will go back to the automatic range state.
- Logic impulse duty ratio measurement: logic impulse duty ratio refers to:  $(\text{high level width}/\text{impulse cycle}) \times 100\%$
- Diode measurement: during diode measurement the meter is indicating to the forward voltage drop of the diode
- Relative measurement: during relative measurement the meter remembers internally the instantaneously measured value(called initial value)when pressing the REL  $\Delta$  key, and the later displaying value being:

present value – initial value

**12** The relative measurement value reflects the changes of the measured value. It also can be used to take off the errors

brought about by lead resistance during measuring low resistance. Due to subtraction calculation, negative value may appear during measuring AC current, resistance.

- Maximum/minimum value measurement: by pressing MAX/MIN keys the meter can enter the maximum/minimum value state, and it will continuously update the maximum/minimum values based on the new measurement results. Pressing the MAX/MIN key can display the maximum value, the minimum value in cycles. After exiting the MAX/MIN measurement state the recorded maximum value/minimum values will disappear. Press the MAX/MIN key under the maximum/minimum value state for two seconds and then release it, the meter will exit the maximum/minimum value state.
- Data memory function: this instrument can storage the measurement data at intervals time. It can memorize up to 38400 data in build-in and numerous data in USB Disk or SD Card ,the build-in data can be redisplay to the screen by pressing button VIEW (left key or right key).
- High voltage indicator: when measuring a voltage and the voltage reaches DC 40V/ AC36V, symbol (  ) lights.
- Menu setting description: press the SHIFT key for two seconds and then release it, the meter will enter the communication interface setting, by press the left key or right key to select the USB/RS232/BLUETOOTH to send the measured data and change status according to the computer. And then you can press the SHIFT key under the menu setting state to enter the PT TYPE function state to select 385/392 type by press the left key or right key. If you press the shift again under the menu setting state the meter will enter temperature unit select,you can press left key or right key to change the temperature unit in FER( °F ) or CEL( °C ) when measure the temperature. If everything is selected you can press the SHIFT key for two seconds ,the meter will exit the menu setting.

## Chapter 3 Operation Methods

### ACV/Hz Measurement

The voltage measurement range is of AC 0.0001V~1000V and the measurement method is as follows:

1. Turn on the power and press the **SHIFT** button and after **V** button.
2. Insert the red and black testing lines into **VΩHz** end and **COM** end respectively.
3. Connect the meter to the two ends of the measured voltage with the red and black probes.
4. Read the meter's data from the main display area, and read the signal's frequency on the secondary display area. When **OL** displaying on the meter, it indicates the measured voltage exceeding the meter's range and it is necessary to remove both the red and black probes from the measured circuit immediately. The Voltage frequency can be measured fewer than 60KHZ.
5. By pressing the **RANGE** key it is possible to select range manually. While displaying OL during manual range measurement, it is necessary to select a larger range. When OL displaying under the maximum range, it indicates the voltage exceeding 1000V, so it is necessary to remove both the red and black probes from the measured circuit immediately.

Notes: in case of probe hanging in the air, the voltage inducted by the testing line may cause unstable readings on the display screen, but that will not affect the accuracy of measurement.



**Warning: Not try to measure a voltage higher then 1000 volt**

## DCV Measurement

The voltage measurement range is of DC 0.0001V~1000.0V and the measurement method is as follows:

1. Turn on the power and press the **V** button.
2. Insert the red and black testing lines into **VΩHz** end and **COM** end respectively.
3. Connect the meter to the two ends of the measured voltage with the red and black probes.
4. Read the meter's data from the main display area, When **OL** displaying on the meter, it indicates the measured voltage exceeding the meter's range and it is necessary to remove both the red and black probes from the measured circuit immediately.
5. By pressing the **RANGE** key it is possible to select range manually. While displaying OL during manual range measurement, it is necessary to select a larger range. When OL displaying under the maximum range, it indicates the voltage exceeding 1000V, so it is necessary to remove both the red and black probes from the measured circuit immediately.

Notes: in case of probe hanging in the air, the voltage inducted by the testing line may cause unstable readings on the display screen, but that will not affect the accuracy of measurement.



**Warning: Not try to measure a voltage higher then 1000 volt**

## DC mV/AC mV Measurement

The DC voltage measurement range is 1uV~600mV but AC voltage range is 0.01mV~500mV, the methods is as follows:

1. Turn on the power switch and press **mV** key to enter the DC mV mode. (SHIFT+mV =AC mV)

## ***Operation Methods***

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2. Insert the red testing line into the **V  $\Omega$  Hz** end and the black testing line into the **COM** end.
3. When performing DCmV measurement, connect the red probe to the positive polarity of the measured voltage and the black probe to its negative polarity. While performing ACmV measurement, it will be done by connecting the red probe and the black probe into the two ends of the measured voltage.
4. Read the measured value from the main display area. If performing AC mV measurement, the secondary display area is the signal's frequency. If OL displaying on the main display area, it indicates the measured voltage exceeding the range of the meter and it is necessary to remove both the red and black probes from the measured circuit immediately.
5. When performing DCmV measurement, by pressing the **RANGE** key it is possible to select range manually. If OL displaying during manual range measurement, it is necessary to select a larger range. If OL displaying under the maximum range, it is necessary to remove both the red and black probes from the measured circuit immediately. When performing ACmV measurement manual range, press the **RANGE** key is void.

Notes: In case of probe hanging in the air, the voltage inducted by the testing line may cause unstable readings on the display screen, but that will not affect the accuracy of measurement.



**Warning: Estimate the Voltage before measurement, not to exceed 220V rms .**

## TC Measurement

The TC measurement range as blew table, the methods is as follows:

Thermocouple name	Minimum test temperature	Maximum test temperature	Resolution
TCK	-200 °C /-328 °F	1370 °C /2498 °F	0.1 °C / °F
TCJ	-200 °C /-328 °F	1030 °C /1886 °F	0.1 °C / °F
TCE	-200 °C /-328 °F	780 °C /1436 °F	0.1 °C / °F
TCN	-200 °C /-328 °F	1300 °C /2372 °F	0.1 °C / °F
TCT	-200 °C /-328 °F	400 °C /752 °F	0.1 °C / °F
TCB	600 °C /1112 °F	1800 °C /3272 °F	1 °C / °F
TCR	-50 °C /-58 °F	1750 °C /3182 °F	1 °C / °F
TCS	-20 °C /-4 °F	1750 °C /3182 °F	1 °C / °F

1. Turn on the power switch and press the TC key to switch the type of the thermocouple. There are eight type of thermocouple for your choose.
2. Insert the positive terminal into the **VΩHz** end and the negative terminal into the **COM** end.
3. When performing TC measurement, connect the red probe to the positive polarity of the measured thermocouple and the black probe to its negative polarity.
4. Read the measured value from the main display area, the room temperature on the secondary display area. If OL displaying on the main display area, it indicates the measured temperature exceeding the range of the meter or connect is unstable and it is necessary to remove the thermocouple from the measured environment.
5. When performing thermocouple measurement manual range, press the **RANGE** key is void.

Notes: In case of probe hanging in the air, the main display area will display OL. What kind of the thermocouple you used,

## Operation Methods

you should choose this type on the meter to measure. Press the TC key to switch the thermocouple.

The second display view will show the ambient temp

### RTD Measurement

The RTD measurement range as blew table, the methods is as follows:

Type	385 TYPE		392 TYPE		MAX	MIN	Resolution
	MAX	MIN	MAX	MIN			
PT100/PT500/PT1000	800 °C /1472°F	-200 °C /-328°F	660°C/ 1220°F	-200 °C /-328°F			0.1°C/ °F
CU50					150	-50	0.1°C/ °F
NI120					260	-80	0.1°C/ °F

1. Turn on the power switch and press the RTD key to switch the type of the RTD. There are eight type RTD for you to choose. 385 or 392 type you can set it on the menu setting. Two-line or three-line switch press SHIFT + RTD.
2. if select 2-wire measure, insert the red testing line into the **VΩHz** end and the black testing line into the **COM** end. If select 3-wire measure, source terminal is use to **3WΩ** end, **VΩHz** is test end and **COM** is common end.
3. When performing RTD measurement, connect the red and black probes to the two ends of RTD and read the temperature value from the main display screen. The secondary display area should be showing the RTD type and the 2-wire or 3-wire information.
4. Read the temperature value from the main display area. If OL displaying on the main display area, it indicates the measured temperature exceeding the range of the meter or connect is unstable and it is necessary to remove the RTD from the measured environment.
5. When performing RTD measurement manual range, press the **RANGE** key is void.

Notes: In case of probe hanging in the air, the main display area will display OL. What kind of the RTD you used, you should choose this type on the meter to measure. Press the RTD key to switch the RTD type.

### **(Logic) Frequency/Duty Ratio Measurement**

The frequency range is 4Hz~60MHz, while the duty ratio measurement range and method are as follows:

Duty cycle mode range (Input sensitivity > 2V<sub>pp</sub> @ duty cycle = 5.0% & 95.0%)

<b>Freq. range</b>	<b>Duty range*</b>
60.000Hz 600.00Hz	5.0% - 95.0%
6.0000KHz	10.0 % - 90.0%
60.000KHz	20.0% – 80.0%

1. Turn on the power switch and press Hz% button.
2. Insert the red testing line into the **V Ω Hz** end and the black testing line into the **COM** end.
3. Connect the red testing line to high logic level, the black one to low logic level.
4. Read the measured value from the main display area. The secondary display area is the signal's duty cycle. If the frequency of the measured signal is lower than the meter's measurement range, the reading will be displayed as zero.

## Operation Methods

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5. By pressing the **RANGE** key it is possible to select range manually. While displaying OL during manual range measurement, it is necessary to select a larger range. When OL displaying under the maximum range, it indicates the frequency exceeding 60MHz, so it is necessary to remove both the red and black probes from the measured circuit immediately.

Notice: Duty measurement can not be measure over 60.000 KHz.


### Resistance/continuity /Diode Measurement

The measurement range of diode is of 0~2.2V.

The measurement range of resistance is of 0~60MOHM

The measurement range of continuity is of 0~600OHM

The measurement methods are as follows:

1. Turn on the power switch and press the  $\Omega$   to switching Resistance/Continuity/Diode.
2. Insert the red testing line into the **V  $\Omega$  Hz** end and the black testing line into the **COM** end.
3. For the resistance measurement, connect the red and black probes to the two ends of resistor and read the resistance value from the main display area. While displaying OL during manual range measurement, it is necessary to select a larger range. When OL displaying under the maximum range, it indicates the resistor is larger than 60M $\Omega$ . As for the continuity measurement, connect the red and black probes to the two measured points respectively. In case of the resistance between the two points being less than about 50  $\Omega$  ~ 60  $\Omega$ , the buzzer will sound while the display screen displaying the value of resistance. If OL displaying, it indicates the resistance between the two points is larger than 600  $\Omega$ . As for the Diode measurement connect the red probe to the positive polarity of the diode and the black probe

to its negative polarity, while the display screen will display the forward voltage drop. Connect the black probe to the positive polarity of the diode and the red probe to its negative polarity, if OL displaying on the display screen, it indicates the backward resistance of the diode being normal, while OL not displaying, it indicates that the drop of diode.

Notes: In case of performing diode/resistance/continuity test on circuit board, it is necessary firstly to turn off the power of the circuit board and then perform the measurement. As there may be other parallel circuits, so the displayed value of test is not surely the results listed in items 3.

### **Capacitance Measurement**

The measurement range of capacitance is of

0.1PF~60mF and the measurement methods are as follows:

1. Turn on the power switch and press SHIFT + Hz% button.
2. Insert the red and black testing lines into the **VΩHz** input end and the **COM** input end respectively.
3. If exists voltage in the capacitor, connect the two ends of the capacitor for a short time to discharge.
4. Connect the red and black probes to the two ends of the capacitor, if the measured capacitor is heteropolar, it is necessary to connect the red probe to the positive polarity of the capacitor and the black probe to its negative polarity.
5. Read the capacitance from the display screen. While displaying OL during manual range measurement, it is necessary to select a larger range. When OL displaying under the maximum range, it indicates the capacitance value >63mF, the meter will display OL, while capacitance value <0.1PF, it will display zero.
6. It is possible to select range manually by pressing the **RANGE** key.

## Operation Methods

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Notes: When performing measurement on 600  $\mu$  F—63000  $\mu$  F capacitor, in order to ensure measurement accuracy the meter takes a relative long time to discharge capacitor, so it is relatively slow in refreshing the measured value. In addition, not to perform Capacitance measurement on a circuit board on which there are other parallel devices, for that may leads to very large error.

### DC $\mu$ A/mA or AC $\mu$ A/mA Measurement

The measurement range of DC/AC  $\mu$ A current is 0.01  $\mu$  A~6000  $\mu$  A, mA current is 1 $\mu$ A~600mA and the measurement methods are as follows:

1. Turn on the power switch and press  $\mu$  A/mA button(SHIFT +  $\mu$ A/mA=AC  $\mu$ A/mA).
2. Repeat step 1, may change the  $\mu$ A to mA.
3. Insert the red testing line into the **mA/  $\mu$  A** input end and the black testing line into the **COM** input end.
4. Turn off the power of the measured circuit, connect the red and black probes to the measured circuit in serial way and then turn on the power of the measured circuit.
5. Read the measured value from the main display area. If it displays as positive during the DC measurement, it means the current is flowing into the meter from the red testing line, while it displaying as negative, it means the current is flowing into the meter from the black testing line. If it displays as OL, it means current exceeding range. When performance AC  $\mu$ A/ $\mu$ A measurement, the secondary display area is the signal's frequency. While displaying OL during manual range measurement, it is necessary to select a larger range. When OL displaying under the maximum range, it indicates the resistor is larger than 600mA/6000 $\mu$ A.



**Warning: Estimate the current before measurement, not to exceed 0.63A current of the fuse .**

### **DC Ampere/AC Ampere Measurement**

The measurement range of DC/AC current is 0.1mA~10A, and the measurement methods are as follows:

1. Turn on the power switch and press A button.(SHIFT + A =AC Ampere)
2. Insert the red testing line into the A input end and the black testing line into the **COM** input end.
3. Turn off the power of the measured circuit, connect the red and black probes to the measured circuit in a serial way and then turn on the power of the measured circuit again.
4. Read the measured value from the main display area. During the **DC** measurement, if it displays as positive, it means the current is flowing into the meter from the red testing line, while it displays as negative, it means the current is flowing into the meter from the black testing line. During the AC measurement the secondary display area is the signal's frequency. While displaying OL during manual range measurement, it is necessary to select a larger range. When OL displaying under the maximum range, it indicates the current is larger than 10A.



**Warning: Estimate the current before measurement, not to exceed 10A current of the fuse .**

### **Linear Frequency Measurement**

The measurement range is of 4Hz~60KHz and the measurement methods are as follows:

1. When performing voltage or current measurement, in case of measured value being AC or including AC elements, it is possible to measure and display the alternating frequency on the second display zone. The range is automatic, it is null to press the **RANGE** key.

### **Relative Value Measurement**

All measurements can employ relative measurement. Press **REL Δ** key to enter relative measurement and the meter will record the initial value when pressing the key. And the main display zone value is:

$$\text{Displayed value} = \text{present measurement value} - \text{Initial value}$$

Press **REL Δ** again to exit relative measurement. Changes of measurement value may be found in relative measurement which also can be used for the small resistance measurements, for example, when performing resistance measurement, connect the red testing line and the black testing line in short, press the **REL Δ** key to record the values of resistance (resistance of both the red and black lines), and after that performing resistance measurement again the lead resistance will have been taken off from the second display zone value.

Notes: Due to subtraction, the relative value is a negative data sometime.

### **Maximum Value/Minimum Value measurement**

Pressing the **MAX/MIN** key the meter will enter the maximum value, minimum value record state and display the maximum value on the second display zone. The meter measures the present value and continuously judges if it is necessary to update the maximum or minimum value. Pressing the **MAX/MIN** key again it is possible to select displaying the minimum value. Under the maximum and minimum value record state, press the **MAX/MIN** key for two seconds and then release it, the meter will exit the **MAX/MIN** record state.

### **Peak Value measurement**

Press the SHIFT + MAX/MIN the meter will enter the peak mode. The meter provides a peak hold function to capture the real peak value for voltage or current measurement mode. In a case of a 1V sine wave input voltage, the peak hold function gets a maximum peak value of 1.414V and minimum peak value of -1.414V ideally. Press SHIFT + MAX/MIN under the peak mode to exit the peak mode. Peak mode is unavailable, when at the DCmV/AC mV/OHM/DIODE/CONT/RTD/TC/frequency/capacitance measurement.

### **Data Hold**

By pressing the **HOLD** key it is possible to hold the measurement value and the state at the moment of pressing the **HOLD** key. While pressing the key again data measurement will be resumed.

### **Data memory and redisplay**

When measuring it is possible to storage the measured data intervals in the Build-IN/USB DISK/SD CARD, and the operation methods are as follows:

1. Turn on the power switch, and select the measurement function.
2. Confirm the range in manually or in automatically.
3. Press the MEM key to enter memory setting.

Step 1: Set interval times (in seconds). Press the **left key** (DEC) or **right key** (INC) to change the intervals. The minimum is 1, the maximum is 43200s(12 hour).

Step 2: If already set the interval time, press **MEM key** to set the record number. Press the **left key**(DEC)or **right key**(INC) to change the record number, press the **left key** or **right key** and hold, the number will increase or decrease more faster than press one time. The minimum is 1, the maximum is 31424.

## **Operation Methods**

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- Step 3: This is the last step. Press the **MEM key** again to enter set saved place, there is three options by press the **left key** or **right key** to select. The first one is “INT” it means save the data in build-in E2PROM memory, the data can be redisplay on the screen. Press **right key** there is SD CARD & USB DISC, it means the data will be saved in USB DISC or SD CARD, and the data can not redisplay. If the SD CARD or USB DISC if big enough, on the step 2 set the maximum(31424) , which means that there is no maximum number of records.
4. If completed the above settings, press **MEM key** for two seconds, to start the data log. During the recording, MEM will be lighted, in addition to termination of the operation records, and other operations are invalid. Finish the record task by keep press the **MEM key** for two seconds, or it will auto finish while the log number is full.
  5. Redisplay just display the data on the build-in E2PROM memory. If there is data on the E2PROM, while the meter on the normal mode, press the **left key** or **right key**, you can view the recorded data. Press the **MEM key** to exit the view mode.

### **Menu Setting**

Keep press **SHIFT key** longer 2 seconds to enter MENU setting. You can set the communication interface, RTD-PT type, temperature unit.

1. Communication interface setting:

If you see the COMMUN on the first screen press the **left key** or **right key** to select the communication interface, there are USB, RS232, Bluetooth can be choose.

2. RTD-PT type setting:

Press the **SHIFT key** under the menu setting mode, you can set the PT TYPE, there are 385style and 392 style for you to choose, by press the **left key** or **right key**.

### 3. Temperature unit setting:

Press the **SHIFT key** again under the menu setting mode, you can select the temperature unit by press the **left key** or **right key**, there are two units FER(°F) and CEL(°C).

Press the **SHIFT key** again, it will come back to communication settings. If everything set ok, press the **SHIFT key** for two seconds, the meter will back to the normal mode, and performance you have set.

## **Connected to Computer RS-232C/USB/BLUETOOTH/LAN Interface**

Pressing the **PC-LINK** key, the meter can receive the command form the computer. The meter can send the measured data and state to computer while the computer sends the commands. Then computer will be able to record, analyze, draw and print all the measurement on computer as long as you insert one end of the RS-232C/USB/BLUETOOTH cable into the socket on the back panel of the meter and another end into the computer RS-232C/USB/BLUETOOTH interface and run the record and graphics software (options).

### 1. RS-232C/USB/BLUETOOTH interface:

It can be use only 1 interface to connect to computer at the same time. Your can choose RS232 or USB or Bluetooth at the meter MENU setting option.

All of these interface use COM port communicate with computer.

The COM port setting is: **9600Bps, 8bit data, 1bit stop, not parity bit, not flow control.**

- a. RS-232 use DB-9 connection, only use 2, 3, 5 Pin.
- b. USB use USB-B connection. Operation system needs to install drivers to support virtual COM port.
- c. Bluetooth use Mini-DIN6 connection. There is a Bluetooth adapter connects to meter. After Bluetooth pairing, it should be support a virtual COM port service. (The **Pairing password is 1234**)

## **Operation Methods**

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2. LLAN interface:
3. The LAN use RJ45 connection, it can be joined to a Ethernet. LAN interface use UDP protocol transmission.

Default **IP address is 192.168.1.25.**

You can use RS-232C/USB/BLUETOOTH interface command to set IP address and MAC address. Use “IP”, “MAC” command line to set IP address and MAC address. (Please read “meter programmer guide” document to get more information)

The **UDP port number is 1200.**

## **Chapter 4 Technological Specifications**

### **General Features**

- Voltage between the measurement end and ground is of 1000V AC/DC. 1000V CAT I/600V CAT II, pollution degree 2.
- 63000 counts, automatic/manual range, basic sampling rate 2 t/s.
- When measuring mV, logic frequency, diode, resistance and capacitance, the maximum overload protection voltage will be 220V(RMS),while measuring of  $\mu$  A/mA the protection current being 0.64A,and measuring of A, the protection current being 10A.
- Over range indication OL.
- Fuse being 0.63A/1000V(  $\mu$  A/mA end) and 10A/1000V (A end) and 0.5A/250V(Power fuse).
- RS-232C/USB/BLUETOOTH/LAN interface.
- Operating temperature: 5°C~30°C (41°F~86°F) (relative humidity 0~80%)  
31°C~41°C (87.8°F~105.8°F) (relative humidity 0~50%)



● **AC Voltage**

Range	Resolution	Accuracy		
		40Hz-6KHz	6KHz-20KHz	20KHz~60KHz
600mV	0.01mV	$\pm(0.8\% + 80)$	unspecified	unspecified
6V	0.1mV	$\pm(0.8\% + 80)$	$\pm(1\% + 80)$	$\pm(2.5\% + 80)$
60V	1mV	$\pm(0.8\% + 80)$	$\pm(1\% + 80)$	$\pm(2.5\% + 80)$
600V	10mV	$\pm(0.8\% + 80)$	$\pm(1\% + 80)$	unspecified
1000V	0.1V	$\pm(0.8\% + 80)$	unspecified	unspecified

Notes: above accuracies can be guaranteed within 10%-100% of the full range.

● **AC Current**

Range	Resolution	Accuracy	Voltage Drop
		60Hz~6KHz	
600 $\mu$ A	0.01 $\mu$ A	$\pm(0.8\%+80)$	50 $\mu$ V/ $\mu$ A
6000 $\mu$ A	0.1 $\mu$ A	$\pm(0.8\%+80)$	
60mA	1 $\mu$ A	$\pm(0.8\%+80)$	0.5mV/mA
600mA	10 $\mu$ A	$\pm(0.8\%+80)$	
6A	0.1mA	$\pm(0.8\%+80)$	5mV/A
10A	1mA	$\pm(1.0\%+80)$	

Notes: above accuracies can be guaranteed within 10%-100% of the full range

● **DC Current**

Range	Resolution	Accuracy	Voltage Drop
600 $\mu$ A	0.01 $\mu$ A	$\pm(0.15\%+15)$	50 $\mu$ V/ $\mu$ A
6000 $\mu$ A	0.1 $\mu$ A	$\pm(0.15\%+10)$	
60mA	1 $\mu$ A	$\pm(0.15\%+10)$	0.5mV/mA
600mA	10 $\mu$ A	$\pm(0.15\%+10)$	
6A	0.1mA	$\pm(0.5\%+10)$	5mV/A
10A	1mA	$\pm(0.5\%+10)$	

Notes: above accuracies can be guaranteed within the full range

● **Resistance**

Range	Resolution	Accuracy
600 $\Omega$	0.01 $\Omega$	$\pm(0.1\%+10)$
6K $\Omega$	0.1 $\Omega$	$\pm(0.1\%+5)$
60K $\Omega$	1 $\Omega$	$\pm(0.1\%+5)$
600K $\Omega$	10 $\Omega$	$\pm(0.1\%+5)$
6M $\Omega$	100 $\Omega$	$\pm(0.1\%+10)$
60M $\Omega$	1K $\Omega$	$\pm(0.5\%+10)$

Notes: above accuracies can be guaranteed within the full range

## ***Technological Specifications***

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### ● **Capacitance**

Range	Resolution	Accuracy
6nF	0.0001nF	±(2%+150)
60nF	0.001nF	±(2%+150)
600nF	0.01nF	±(2%+150)
6 μ F	0.0001uF	±(2%+100)
60 μ F	0.001uF	±(2%+100)
600 μ F	0.01 μ F	±(3%+100)
6mF	0.0001mF	±(3%+100)
60mF	0.001mF	±(3%+100)

Notes: above accuracies for film capacitor or better can be guaranteed within the full range.

### ● **Diode**

Range	Resolution	Accuracy
2.2V	0.1mV	±(1%+5)

Notes: the test current is about 1mA

### ● **Logic Frequency**

Frequency Range	Sensitivity	Accuracy
4Hz~60MHz	Vpp>2 square wave	±(0.01%+10)

● **Linear Frequency**

Frequency Range	Voltage/Current Range	Sensitivity	Accuracy
4Hz~60KHz (sine wave)	600mV	6mV	±(0.01%+20)
	6V	0.6V	
	60V	6V	
	600V	60V	
	1000V	600V	
	μ A	60 μ A	
	mA	6mA	
	A	0.6A	

Notes: Low voltage or low frequency would lower the accuracy.

● **Duty Ratio**

Frequency Range	Duty Ratio Range	Resolution	Accuracy
4Hz~60KHz	10%~90%	0.01%	± 10%

● **Thermocouple**

Type	Resolution	Accuracy	
		Thermocouple	Ambient temperature(CJC)
TCK	0.1°C/°F	±0.7°C/ 33.26°F	±0.7°C/ 33.26°F
TCJ	0.1°C/°F	±0.7°C/ 33.26°F	±0.7°C/ 33.26°F
TCE	0.1°C/°F	±0.7°C/ 33.26°F	±0.7°C/ 33.26°F
TCN	0.1°C/°F	±0.7°C/ 33.26°F	±0.7°C/ 33.26°F
TCT	0.1°C/°F	±0.7°C/ 33.26°F	±0.7°C/ 33.26°F
TCB	1°C/°F	±2°C/35.6°F	±0.7°C/ 33.26°F
TCR	1°C/°F	±2°C/35.6°F	±0.7°C/ 33.26°F
TCS	1°C/°F	±2°C/35.6°F	±0.7°C/ 33.26°F

● **RTD**

Type	Resolution	Accuracy
PT100	0.1°C/°F	±0.4°C/ 32.72°F
PT500	0.1°C/°F	±0.4°C/ 32.72°F
PT1000	0.1°C/°F	±0.4°C/ 32.72°F
CU50	0.1°C/°F	±0.4°C/ 32.72°F
NI120	0.1°C/°F	±0.4°C/ 32.72°F

## **Chapter 5 Maintenance**

### **Replacement of Fuse**

It must take off the red and black testing lines from the measured circuit and take out the power line from the meter before replacement of fuse. It should only use fuse of the same model and the same electric specifications. The meter has three fuses. The power fuse is 0.5A/250V in the power socket.

The  $\mu\text{A}/\text{mA}$  fuse is 0.63A/1000V inside the case (to replace it, take off cover firstly, then you can see 0.63A fuse on the board). The ampere fuse is 10A/1000V inside the case (to replace it, take off cover firstly, then you can see 10A fuse on the board).

Notes: generally, fuses will not be blown under the normal use of the meter. In case of blowing it is necessary first to find out the reasons for the blowing and then take an account on the use of the meter. Generally, blowing may attribute to:

- Perform voltage measurement when in the position of current.
- Current exceeds range.

### **Meter Calibration**

There is no any component which can be used for calibration in the meter, calibration of the meter is implemented depending on the built-in software in the meter. Professionals and accuracy-even-higher standard signal sources are required for calibration of the meter. Users possessing such conditions may contact us for calibration methods when there is a need on calibration meter, while those who having not such conditions can contact us for calibration matters.

## ***Maintenance***

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### **Others**

- In case of any default being found this meter must not be used continuously.
- When the meter needs repair, please send it to experienced professionals or the appointed maintenance department for repairing.
- It should use soft cloth but not organic solvents which have corrosive and dissolving effect on the shell of meter to clean the meter, and it should guard against water dropping into the meter.