

Introduction

⚠Warning

Read “Safety Information” before using the meter.

ProcessMeter (referred to as “the meter ”)is a handheld, battery-operated tool for measuring electrical parameters. It has all the features of a digital multimeter (besides the feature of RTD and TC), it could also output signals of direct voltage, current, resistance, temperature and frequency as well.

If the meter is damaged or something is missing, contact the place of purchase immediately.
Contact a distributor for information about DMM (digital multimeter) accessories.

Safety Information

The meter complies with IEC61010.1-93 Overvoltage Category II .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 hazard(s) to the user; a **Caution** identifies conditions and actions that may damage the meter or the equipment under test; an **Attention** 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.

⚠Warning

To avoid possible electric shock or personal injury:

- Do not use the meter if it is damaged. Before using the meter, inspect the case. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors.
- Make sure the battery door is closed and latched before operating the meter.
- Remove test leads from the meter before opening the battery door.
- Inspect the test leads for damaged insulation or exposed metal. Check test leads before using 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.
- Use only type AAA batteries, properly installed in the meter case to power the meter.
- When servicing the meter, use specified replacement parts.
- Use caution when working above 30V ac rms, 42V ac pk, or 60V dc. Such voltages pose a shock hazard.
- When using the probes, keep fingers behind the finger guards on the probes.
- Connecting the common test lead before connecting the live test lead. When disconnecting test leads, disconnect the live test lead first.
- Do not touch the charging connector when the test lead is connected.

⚠Caution

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

- Disconnect the power and discharge all high-voltage capacitors before testing resistance or continuity.
- Use the proper jacks, function, and range for the measurement or sourcing application.

Table 1. International Symbols

Symbol	Meaning	Symbol	Meaning
~	Alternating current		Earth ground
≡	Direct current		Fuse
⎓	Alternating or Direct current		Double insulated
⚠	Risk of danger. Important information. See manual		Battery
CAT II	CAT11 Overvoltage (Installation) Category11, Pollution Degree 2 per IEC61010 refers to the level of Impulse Withstand Voltage protection provided. Typical locations include: Plug and the connecting electric equipments, home appliance, convenient, tools, domestic plug, plugs 10m distant from type 3m circuit or 20m distant from type 4 circuit.		

How to Get Started

If familiar with the DMMs in general, read “Using the Output Functions,” review the tables and figures in “Getting Acquainted the meter,” and begin using the meter.

If unfamiliar with DMMs in general, read “Measuring Electrical Parameters” in addition to the sections referenced in the previous paragraph.

The sections following “Using the Output Functions” contain information about the power-up options, and battery and fuse replacement instructions. Later, use the Product Overview to refresh your memory about the various functions and features that can be used.

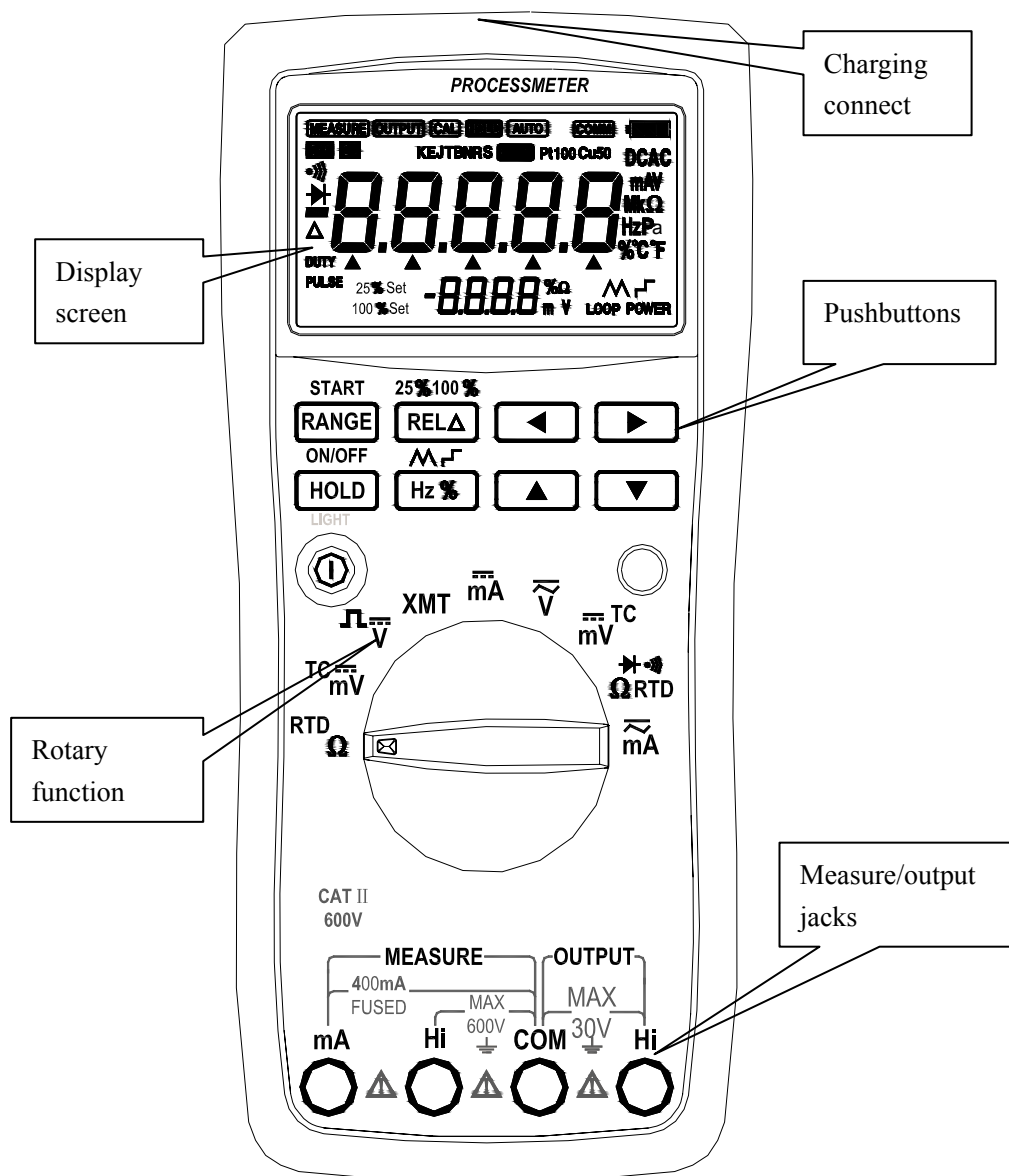


Figure 1.ProcessMeter

Getting Acquainted with the Meter

To become familiar with the features and functions of the meter, study the following figures and tables.

- Figure 2 and Table 2 describe the measure/output jacks.
- Figure 3 and Table 3 describe the measuring functions of the last four rotary function switch positions.
- Figure 4 and Table 4 describe the output functions of the first five rotary function switch positions.
- Figure 5 and Table 5 describe the functions of the pushbuttons.
- Figure 6 and Table 6 explain what all the elements of the display indicate.

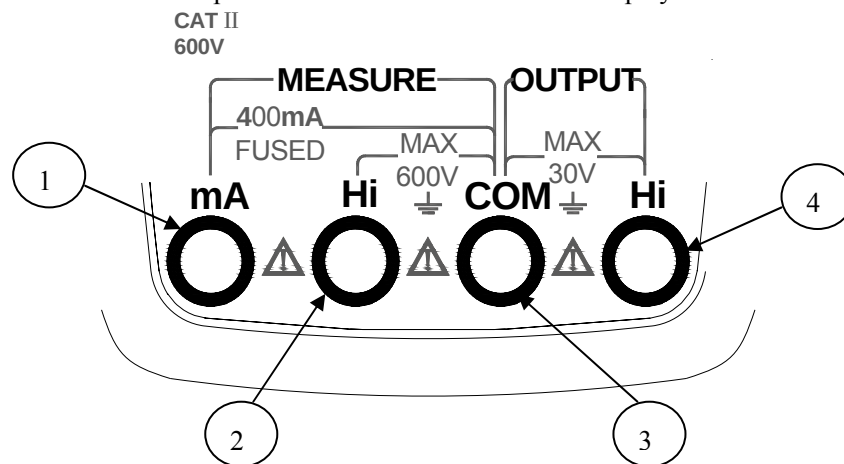


Figure 2.Measure/output Jacks

Table 2.Measure/output Jacks

Item	Function
①	Measuring Signal (+): direct current, alternating current, frequency.
②	Measuring Signal (+): direct voltage, direct mV voltage, alternating voltage, resistance, diodes, continuity, frequency, TC, RTD.
③	COM: Common for all the measurement and output
④	Output Signal(+):resistance, RTD, direct mV voltage, TC, frequency, XMT, direct mA current

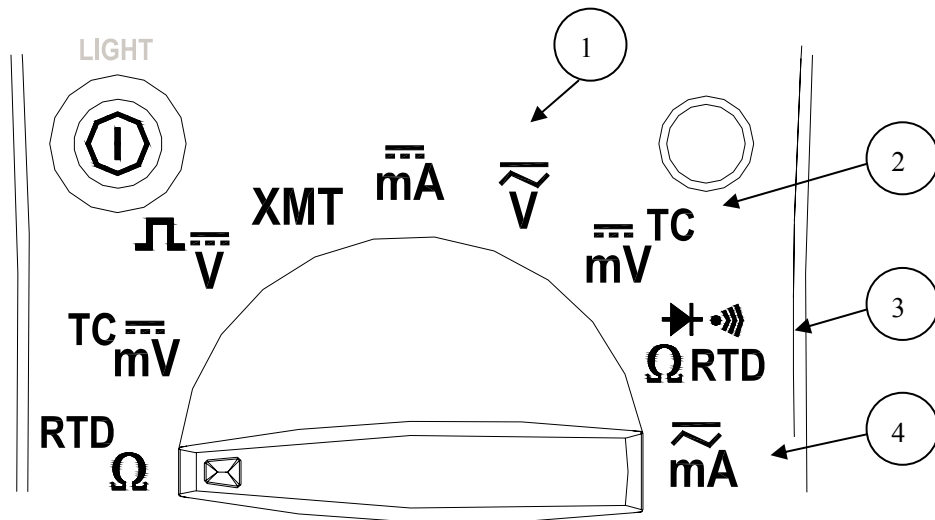


Figure 3 .Rotary Function Switch Positions for Measurement

Table 3 .Rotary Function Switch Positions for Measurement

No.	Position	Function	Pushbutton Actions
①		Default: Measure DC V	START RANGE : Select a fixed range ON/OFF HOLD :Select display-held function REL :Toggles relative reading(set a relative zero point) ○ (blue pushbutton): Select AC or DC Hz :Frequency, Duty cycle ratio
②		Default: Measure DC mV	START RANGE : Select a fixed range in DC mV function; Select an appropriate type of a thermocouple in TC function ON/OFF HOLD :Select display-held function REL : Toggles relative reading (set a relative zero point)in DC mV function; invalid in TC function ○ (blue pushbutton): Select DC mV (direct mV voltage) function or TC function
③		Default: Measure Ω	START RANGE : Select a fixed range in Ω function; Select a corresponding type of TRD function. ON/OFF HOLD :Select display-held function REL : Toggles relative reading (set a relative zero point) in function; invalid in RTD function ○ (blue pushbutton): Select Ω、、RTD function
④		Default: Measure DC mA	Same as ①

Table 4 Rotary Function Switch Positions for Output

NO.	Position	Function	Pushbutton Actions
①	RTD Ω	Output Resistance /RTD	Press  or  to select the set digits for output. Press  or  to change the numerical value of the set digits. The value can do carry or number decrement automatically. Hold the pressed key in one second and the numerical value will keep varying. Press  to select a corresponding type of TRD function. Press  to turn on or turn off the output, and the display indicates the symbol “ON” or “OFF”. Press  (blue pushbutton) to select Ω、RTD function
②	TC $\overline{\text{mV}}$	Output mA /TC	Press  or  to select the set digits for output. Press  or  to change the numerical value of the set digits. The value can do carry or number decrement automatically. Hold the pressed key in one second and the numerical value will keep varying. Press  to select an appropriate type of a thermocouple in TC function. Press  to turn on or turn off the output, and the display indicates the symbol “ON” or “OFF”. Press  (blue pushbutton) to select $\overline{\text{mV}}$、TC function
③	$\overline{\text{V}}$	Output Voltage /frequency	Press  or  to select the set digits for output. Press  or  to change the numerical value of the set digits. The value can do carry or number decrement automatically. Hold the pressed key in one second and the numerical value will keep varying. Press  to select output frequency range in frequency function. Press  to turn on or turn off the output, and the display indicates the symbol “ON” or “OFF”. Press  (blue pushbutton) to select frequency、$\overline{\text{V}}$ function.

Table 4.Rotary Function Switch Positions for Output(cont.)

④	XMT	Simulating Transmitter output	Same as ⑤
⑤		Output Current	In manual waveform output mode,  cycles through: Digital set output mode-> 25%->100%-> Digital set output mode (1) In digital set output mode, press  or  to select the set digits for output; press  or  to change the numerical value of the set digits. The value can do carry or number decrement automatically. Hold the pressed key in one second and the numerical value will keep varying. (2) In 25% mode, press  or  to increase or decrease in 25% ramping steps. (3) In 100% mode, press ^ or to increase or decrease in 100% ramping steps. Press  to turn on or turn off the output, and the display indicates the symbol “ON” or “OFF”. In automatic waveform output mode,  cycles through: Digital set output mode ->  ->  -> Digital set output mode (1) In digital set output mode, press  or  to select the set digits for output; press  or  to change the numerical value of the set digits. The value can do carry or number decrement automatically. Hold the pressed key in one second and the numerical value will keep varying. (2) In  mode, output in auto-ramping way; in  mode, output in auto-stepping way; Press  to turn on or turn off the output, and the display indicates the symbol “ON” or “OFF”. Press  to start or stop automatic waveform output. In automatic waveform output mode, “” is on display; the present value will be held and switch to digital set output mode when the mode is stopped

Figure 5.Pushbuttons

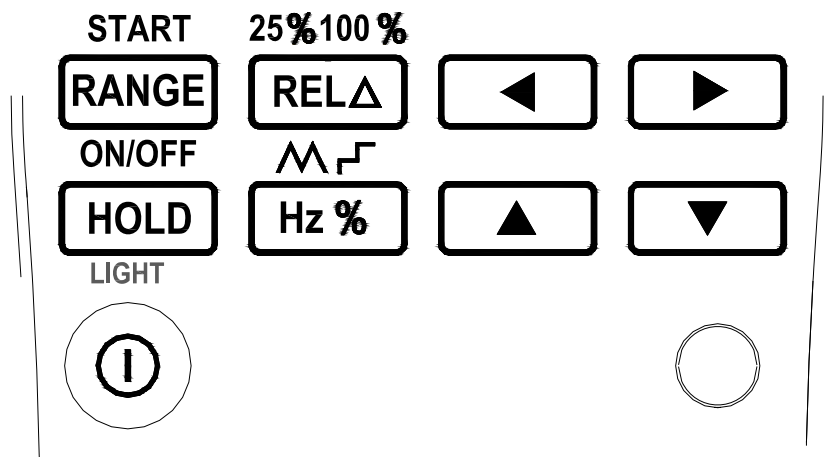


Table 5.Pushbuttons

No.	Pushbutton	Function
①		Measuring: Selects a fixed range(selects a corresponding type in TC and RTD functions) Frequency Output: Selects a fixed range; selects a corresponding type in TC and RTD functions mA automatic waveform output: toggles between start or stop automatic waveform output .
②		Measuring: Select a relative reading (set a relative zero point). mA manual waveform output: Select manual waveform output from 25%mode ,100% mode or digital set output mode.
③		Output: Select the set digits for output which will move left by one step for every press.
④		Output: Select the set digits for output which will move right by one step for every press.
⑤		Measuring: Select display-held function. Output: Turn on or turn off the output, and the display indicates the symbol “” or “”.

Table 5.Pushbottoms(cont.)

No.	Pushbutton	Function
⑥		Measuring: Selects frequency, Duty cycle ratio, alternating or direct current and voltage. mA automatic waveform output: Select in auto-ramping mode () ,auto stepping mode() or set digits for output mode
⑦		mA 25% output: change the numerical value of the set digits, increasing in 25% ramping steps for each press; mA 100% output: change the numerical value of the set digits, increasing in 100% ramping steps for each press; Digital set output mode: increase the numerical value of the set digits. The value can do carry automatically. Hold the pressed key in one second and the value will keep varying.
⑧		mA 25% output: change the numerical value of the set digits, decreasing in 25% ramping steps for each press; mA 100% output: change the numerical value of the set digits, decreasing in 100% ramping steps for each press; Digital set output mode: decrease the numerical value of the set digits. The value can do number decrement automatically. Hold the pressed key in one second and the value will keep varying.
⑨		Measuring: Select Ω、、 and RTD function when rotary function switch  in position; Select DC mV and TC function when rotary function switch in $\overline{mV}^{TC}$ position; Select AC and DC function when rotary function switch in $\overline{V}$ and $\overline{mA}$ position; Output: Select Ω or RTD function when rotary function switch in $\overline{\Omega}^{RTD}$ position; Select DC mV or TC function when rotary function switch in $\overline{mV}^{TC}$ position; Select frequency or $\overline{V}$ function when rotary function switch in $\overline{V}$ position;
⑩		Power or backlight on: backlight is turned on or off when the button is held less than 2 seconds; Power is off when the button is held more than 2 seconds.

Figure 6 Display Unit

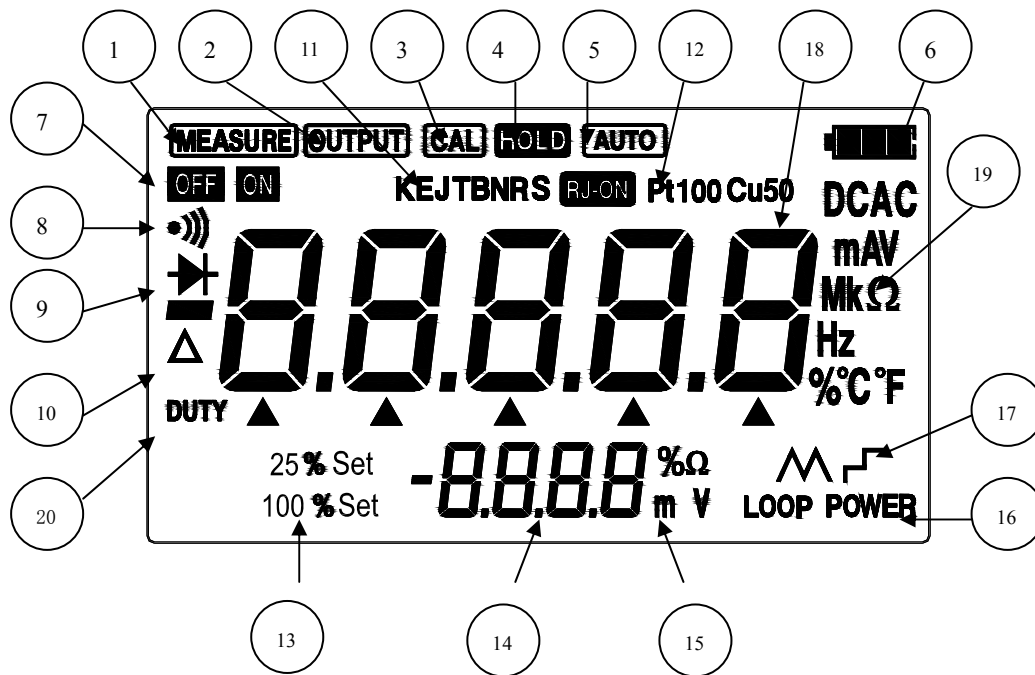


Table 6.Display

No.	Unit	Meaning
①	MEASURE	Lights when measurement is active
②	OUTPUT	Lights when output is active
③	CAL	Lights when calibration is active
④	HOLD	Lights when measured value is held in measuring mode
⑤	AUTO	Lights when auto range is on in measuring mode or mA automatic waveform output starts in output mode
⑥		Shows the capability of battery or charging state
⑦	OFF ON	Indicates turning on/off the output signals in output mode
⑧		Lights in continuity function
⑨		Lights in diode test function
⑩		Lights when relative reading is on

Table 6.Display(cont.)

⑪	KEJTBNRS RJ-ON	Shows the type of TC and reference-junction compensation in measurement and output mode
⑫	Pt100 Cu50	Shows the type of RTD measurement and output
⑬	25%Set 100%Set	Shows 25% or 100% manual-step output of Dc mA in output mode
⑭	-8.8.8.8	Sub-display part of values and information
⑮	%Ω mV	Present unit of values and information of sub-display
⑯	LOOP POWER	Enters into XMT output mode, and external loop power is necessary
⑰	△□	Toggles between Dc mA auto-stepping and auto-ramping output in output mode
⑱	8.8.8.8.8	Main display part of values and information
⑲	mAV MkΩ Hz %℃℉	Present unit of values and information of main-display
⑳	DUTY	Lights in duty cycle ratio

Measuring Electrical Parameters

The proper sequence for taking measurements follows:

1. Plug the test lead into the appropriate jacks
2. Set the rotary function switch to the desired function
3. Touch the probes to the test points
4. View the results on the LCD display

Input Impedance

For the voltage measurement functions, measuring impedance is $10\text{ M}\Omega$. See “Specifications” for more information.

Ranges

A measurement range determines the highest value and resolution at which the meter can measure. Most meter measurement functions have more than one range (see “Specifications”).

Make sure the correct range is selected:

- If the range is too low, the display shows **OL** (overload).
- If the range is too high, the meter will not be displaying its most precise measurement.

The meter normally selects the lowest range that will measure the applied input signal (**ALWAYS**

showing on the display). Press  to lock the range. Each time  is pressed, the meter selects the next higher range for every press. At the highest range, it returns to the lowest range.

Testing Diodes

To test a single diode:

1. Insert the red test lead into the Hi (MEASURE) jack and black test lead into the COM jack.
2. Set the rotary function switch to  RTD
3. Press the blue button so that the  symbol is on the display.
4. Touch the red probe to the anode and the black probe to the cathode (side with band or bands). The meter should indicate the appropriate diode voltage drop.
5. Reverse the probes. The meter displays **OL**, indicating a high impedance.
6. The diode is good if it passes the tests in steps 4 and 5.

Using Display Hold

Warning

To avoid possible electric shock, do not use Hold to determine if dangerous voltage is present.

Activate Hold to freeze the meter’s display on each new stable reading. Press  to activate Hold.

Using Relative Measuring Function

Press , the meter would show the present value in the sub-display district as a reference and the relative value (minus between present value and referenced value) in the main-display district. For next press , the meter would stop displaying the relative value.

Warning

In REL mode, be careful for possible dangerous voltage.

Measuring Frequency, Duty Cycle Ratio

Press  to show Frequency, Duty Cycle Ratio and Voltage (Current) in sequence when measuring voltage (DC mV voltage excluded) and current.

Measuring TC

1. Insert the one end of the test lead into the **Hi** (MEASURE) and **COM** jack and connect the other end to the TC output, as shown in the Figure 7:
2. Set the rotary function switch to .
3. Press the blue button and select TC measure function so that the corresponding unit and type of TC are on the display.
4. Press  to select corresponding type of TC.
5. Automatic compensation for reference-junction temperature

User could start the automatic compensation for reference-junction temperature function in systematic maintenance state (see “Power-Up Option” for information of entering into the systematic maintenance state), the measured value is the temperature yielded by the compensation. Where:

Displayed temperature = THERMAL EMF corresponding to the set temperature + Thermal EMF corresponding to the room temperature

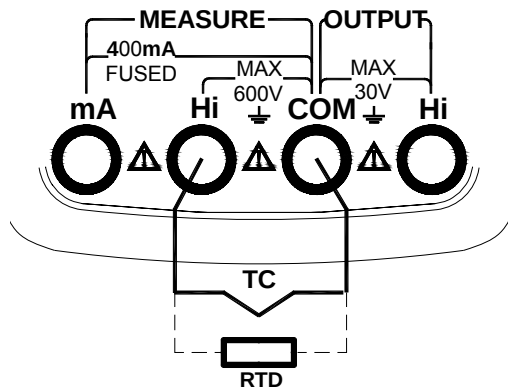


Figure 7.TC, RTD Measurement

Measuring RTD

1. Insert the one end of the test lead into the **Hi** (MEASURE) jack and **COM** jack and connect the other end to the RTD output, as shown in the Figure 7:
2. Set the rotary function switch to .
3. Press the blue button and select RTD measure function so that the corresponding unit and type of RTD are on the display.

4. Press  to select an appropriate type.

Output Function

The output terminal of the meter produces the simulating resistance, the simulating RTD, DC voltage, TC, frequency and simulating transmitter set by the user.

⚠ Caution

Using: Do not append voltage to the output jack; otherwise the internal circuit would be damaged for impropriety.

Simulate Output of Resistance or RTD

⚠ Attention

- Resistance-simulation: The simulator produces the simulation resistance up to 400Ω at its output terminal (Ohms/RTD). The method of simulating resistance output is to send out an appropriate voltage 'VX' according to the exciting current 'IX' produced by the calibrated instrument. Because R (set resistance) = VX (output voltage) / IX (exciting current), the calibrated device must provide an exciting current to the simulator. The exciting current should range from 0.5mA to 2mA.

⚠ Attention

- Resistance-simulation: A 4-wire system is designed for the resistance output during the calibration. If the user adopts a two-wire system, he or she should take into consideration the error (ca. 0.1Ω) arising from the lead resistance of the test leads. If the capacitance between the resistance output terminal of the simulator and the tested instrument is more than $0.1\mu f$, the simulator will produce improper resistance.
1. Insert one end of the test lead into the **Hi** (OUTPUT) jack and **COM** jack of the meter and connect the other end to the input of the user's instrument as shown in the Figure 8:

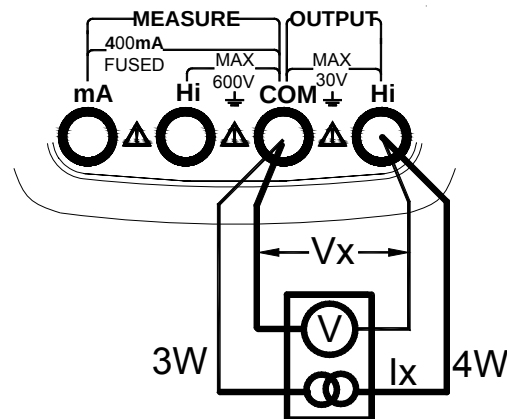


Figure 8. Resistance or RTD Simulate Output

- Set the rotary function switch to RTD , and press the blue button to select resistance or RTD function and displays unit “ Ω ” or “ $^{\circ}\text{C}$ ” and the type of the RTD “Pt100”.
- Press  to select corresponding type in RTD function.
- Press  or  to select the set digits for output.
- Press  or  to change the numerical value of the set digits. The value can do carry or number decrement automatically. Hold the pressed key in one second and the value will keep varying.
- Press  to turn on/off the output followed by displaying the symbol “” or “”.

DC Voltage Output

- Insert one end of the test lead into the **Hi** (OUTPUT) jack and **COM** jack of the meter and connect the other end to the input of the user's instrument as shown in the Figure 9:
- Set the rotary function switch to TC mV (or mV), and press the blue button to select mV (or V) function and displays unit “mV” (or “V”).
- Press  or  to select the set digits for output.
- Press  or  to change the numerical value of the set digits. The value can do carry or number decrement automatically. Hold the pressed key in one second and the value will keep varying.
- Press  to turn on/off the output followed by displaying the symbol “” or “”.

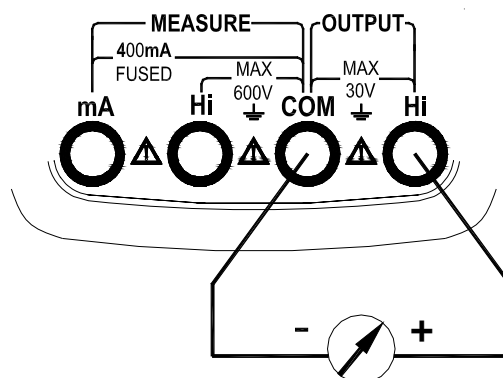


Figure 9.DC Voltage Output

Simulating output from thermocouple (TC)

- Insert one end of the test lead into the **Hi** (OUTPUT) jack and **COM** jack of the meter and connect the other end to the input of the user's instrument as shown in the Figure 9:
- Set the rotary function switch to TC mV , and press the blue button to select TC function and displays unit “ $^{\circ}\text{C}$ ” and the type of “R”.
- Press  to select an appropriate type.
- Press  or  to select the set digits for output.
- Press  or  to change the numerical value of the set digits. The value can do carry or number decrement automatically. Hold the pressed key in one second and the value will keep varying.
- Automatic compensation for reference-junction temperature. During the direct calibration of

an instrument with reference- junction temperature compensation, user could start the automatic compensation for reference-junction temperature function in systematic maintenance state (see “Power-Up Option” for information of entering into the systematic maintenance state), thus providing the required thermo-electromotive force for output followed by displaying the symbol “**REF-ON**”. Where:

$$\text{Output Thermal EMF} = \text{Thermal EMF corresponding to the set temperature} - \text{Thermal EMF corresponding to the room temperature}$$

If there is no need for the Simulator to perform the function of automatic reference-junction compensation, user could turn off the automatic compensation for reference-junction temperature function in systematic maintenance state (see “Power-Up Option” for information of entering into the systematic maintenance state), and “**REF-ON**” will not on display.

7. Press **ON/OFF HOLD** to turn on/off the output followed by displaying the symbol “**ON**” or “**OFF**”.

Frequency Output

1. Insert one end of the test lead into the **Hi** (OUTPUT) jack and **COM** jack of the meter and connect the other end to the input of the user’s instrument as shown in the Figure 9:
2. Set the rotary function switch to **~V**, and press the blue button to select **~** function and displays unit “Hz” indicating frequency set.
3. Press **◀** or **▶** and **▼** or **▲** to select output frequency within 1-100Hz.
4. Press **ON/OFF HOLD** and “ON” is on display, and begin output frequency signal.
5. Press **START RANGE** and displays unit “KHz”, and repeat the 3-4 step to output 0.1-1.1KHz (1.0 - 11.0 KHz) frequency signal.

Simulating Transmitter output (absorption current)

XMT refers to simulate a current loop circuit transmitter with the meter. Do this when you get external dc voltage (5-28 V) or have current loop in series.

⚠ Attention

Set the rotary button in one of the mA output before connecting the testing leads with current loop circuit. Otherwise, low impedance from other parts of rotary will occur in the circuit and caused 35mA current in circuit.

1. Insert one end of the test lead into the **Hi** (OUTPUT) jack and **COM** jack of the meter and connect the other end to the input of the user’s instrument as shown in the Figure 10:

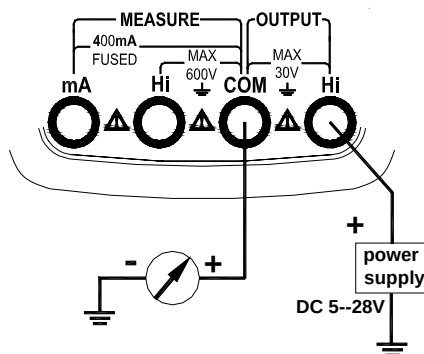


Figure10. Simulating Transmitter output

2. Set the rotary function switch to **XMT**, and external loop power is necessary , select XMT function and displays “LOOP POWER” indicating XMT set.
3. Other button operating is same as that described in direct current output.

⚠ Attention

- Range of power supply:5-28VDC
- Using: During the operation at the current output, try your best to use an external 24VDC power source in a mode of connection with a transmitter, thus being able to prolong the battery life.

DC current output

1. Insert one end of the test lead into the **Hi** (OUTPUT) jack and **COM** jack of the meter and connect the other end to the input of the user’s instrument as shown in the Figure 9:
2. Set the rotary function switch to **mA** and displays unit “mA”.
3. Press **REL** to select set value of manual waveform output, and display unit “mA”, “25%_set” (or “100%_set”). Among them: 0%=4 mA, 100% =20 mA. In digital set output mode: press **◀** or **▶** to select the set digits for output; press **▼** or **▲** to change the numerical value of the set digits. The value can do carry or number decrement automatically. Hold the pressed key in one second and the value will keep varying. In 25% (or 100%) mode: press **▼** or **▲** to change the set value. Press **ON/OFF HOLD** and “ON” is on display, and begin output current signal.
4. Press **MAN** to select set value of auto waveform output, and displays unit “mA”, “M ” (or “F ”). Press **ON/OFF HOLD** to turn on/off the output followed by displaying the symbol “ON” or “OFF”. Press **START RANGE** to start or stop auto waveform output, in which “AUTO” is on display .The present value will be held and enter into digital set output mode when the mode is stopped.

Power-up Options

To select a power-up option, hold down the blue pushbutton while pressing to turn on the meter, then the meter enters into maintenance state.

In maintenance state, the sub-display screen displays option, and the main-display screen displays the default value. Press **○** to alter the option. Press **START RANGE** to store the set value (“SAVE” is displayed, that indicates the option saved).

Turn off the power to exit.

Table 7.Power-on Options

Option		Function	Default
APDF	Auto power-off	Range: 0-60 minutes, ± 10 minutes each time; 0 value indicates canceling the auto power-off function; press  or  to change the value.	10 minutes
bLOF	Lighting time for backlight	Range: 0-9000 seconds; ± 30 seconds each time; 0 value indicates canceling the auto light-off function; press  or  to change the value.	30 seconds
tEPU	Temperature unit display	Press  or  to toggle between $^{\circ}\text{C}$ and $^{\circ}\text{F}$	$^{\circ}\text{C}$
tCTJ	Cold end compensation for TC	Press  or  to toggle between YES and NO	YES
FLtY	Return to default value	Press  and “SAVE” is on main-display, indicating returning to default.	----

Power-On/Off of Meter

Power-key Operation

Press  to turn on the power, and repress it for more than 2 seconds to cut off the power. When the power is turned on, the source 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 source with power on. It is good practice to turn off the power supply pausing 5 seconds, and then restart the calibration.

Automatic power-off

By the shipping time, the source is set in the factory like this: In case there is no operation of the source within a period of 10 minutes after power-on, it will cut off the power supply automatically. However, users can decide whether they want to use the function of the automatic power-off or not. The setting can also be done by themselves. (See “Power-up options”).

Battery Life

Warning

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

Table 8 shows typical alkaline battery life. To preserve battery life:

- Avoid using the backlight
- Do not disable the automatic power-off feature.
- Turn the meter off when not in use.

Table 8 .Typical Alkaline Battery Life

Meter Operation	Hours
Measuring any parameter	100
Simulating Current, Voltage, frequency, TC, RTD	40
Sourcing 20 mA into 500 Ω	4

Maintenance

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 detergent; do not use abrasives or solvents.

Calibration

Calibrate the meter once a year to ensure that it performs according to its specifications. Contact a Service Center for instructions.

Replacing the 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.**

⚠ Note

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

Replace the batteries as follows. Refer to Figure 11. Use four AAA alkaline batteries.

1. Remove the test leads and turn the meter OFF.
2. Specific steps: take off the protector of the meter and then with a standard blade hand screwdriver, turn each battery door screw counterclockwise so that the slot is parallel with the screw picture molded into the case.
3. Lift off the battery door.
4. Remove the meter's batteries.
5. Replace with four new AAA alkaline batteries.
6. Reinstall the battery door and tighten screws.
7. Install the protector.

⚠ Caution

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

Replacing a Fuse

⚠ Warning

To avoid personnel injury or damage to the meter, use only the specified replacement fuse. F1 the specification is 63mA 250V and F2 is 0.5A 250V, which are fast-melt.

0.5A 250V-fuse (F2) protection is in the current input jack, while 63mA 250V-fuse (F1) protection is in the current output jack. To check whether fuses are blown:

1. Turn the rotary function switch to $\overline{mA}$
2. Plug the black test into COM, and the red test lead into the mA input.
3. Using an ohmmeter, check the resistance between the meter test leads. If the resistance is about 1Ω , the fuse is good. An open reading means that fuse F2 is blown.
4. Fuse F1 is blown if the outputs do not alter with the change of the fixed value, and replace it as follows. Refer to Figure 11 as necessary:
 1. Remove the test leads from the meter and turn the meter OFF.
 2. With a standard blade hand screwdriver, turn each battery door screw counterclockwise so that the slot is parallel with the screw picture molded into the case.

3. Replace the blown fuse(s).
4. Reinstall the meter.

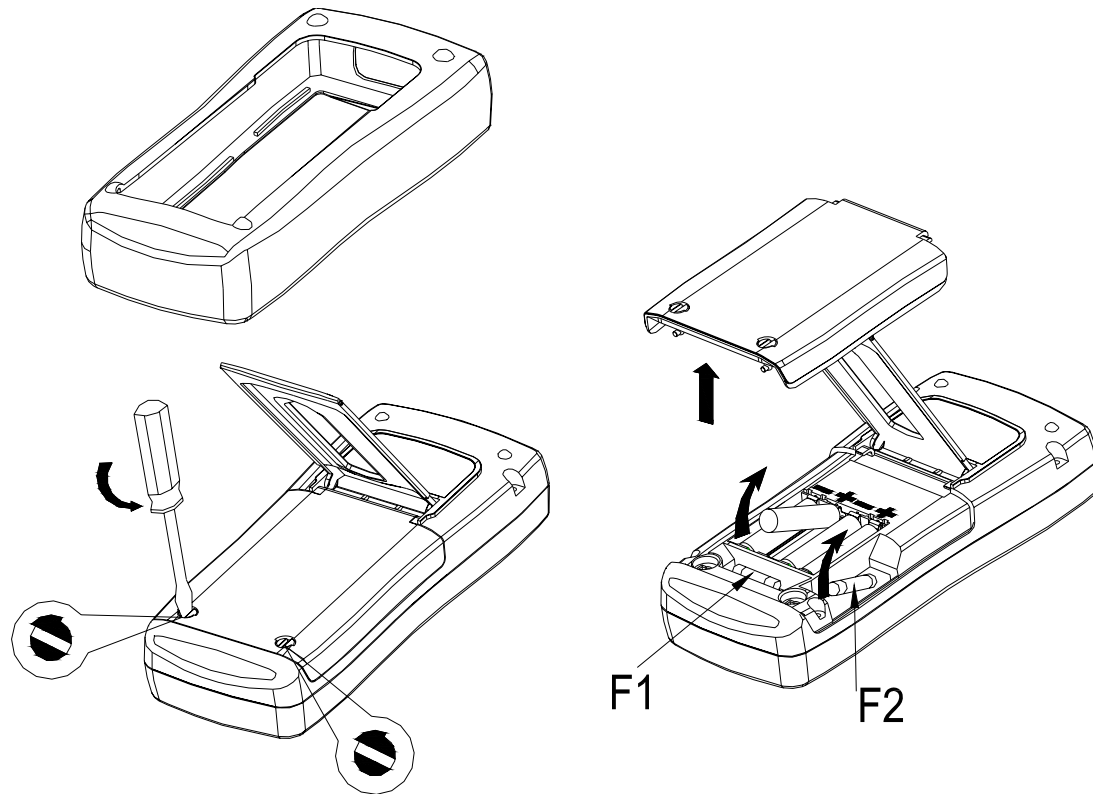


Figure 11. Replacing Batteries and a Fuse

Specifications

All the specifications apply to +18°C to +28°C, 10% to 70%RH unless stated otherwise.

All specifications assume a 5- minute warm- up period.

Standard specification is valid for one year.

Note

“Counts” refers to the number of increments or decrements of the least significant digit.

DC Voltage Measurement

Range(DC V)	Resolution	Accuracy, $\pm$ (% of reading +counts)
4.000V	0.001V	0.2%+4
40.00V	0.01V	0.2%+4
400.0V	0.1V	0.2%+4
Measuring Impedance: 10 M Ω (nominal), <100pF		
Common mode rejection ratio: 50Hz or 60Hz > 100dB		
Normal mode rejection ratio: 50Hz or 60Hz > 45dB		
Overvoltage protection: 600Vp		

DC mV Measurement

Range(DC mV)	Resolution	Accuracy,±(%reading +counts)
40.00mV	0.01 mV	0.5%+6
400.0mV	0.1 mV	0.2%+4
Measuring Impedance: 10 MΩ(nominal)		
Overvoltage protection: 600Vp		

TC Measurement

Range(type)	Set Range	Resolution	Accuracy±(%reading +counts)
R	-40~1760℃	1℃	0.5%+3 (≤100℃) 0.5%+2 (>100℃)
S	-20~1760℃	1℃	0.5%+3 (≤100℃) 0.5%+2 (>100℃)
B	400~1800℃	1℃	0.5%+3 (≤600℃) 0.5%+2 (>600℃)
E	-200~500℃	1℃	0.5%+2 (≤-100℃) 0.5%+1 (>-100℃)
K	-200~950℃	1℃	0.5%+2 (≤-100℃) 0.5%+1 (>-100℃)
J	-200~700℃	1℃	0.5%+2 (≤-100℃) 0.5%+1 (>-100℃)
T	-200~400℃	1℃	0.5%+2 (≤-100℃) 0.5%+1 (>-100℃)
N	-200~1000℃	1℃	0.5%+2 (≤-100℃) 0.5%+1 (>-100℃)
By using ITS-90 temperature scale			
Note: The accuracy does not include the error of internal temperature compensation caused by a sensor. The range of the internal temperature compensation sensor is ± 2℃.			

AC Voltage Measurement

Range(ACV)	Resolution	Accuracy,±(%reading +counts) 40~400Hz
400.0mV	0.1mV	1.0%+4
4.000V	0.001V	0.5%+4
40.00V	0.01V	0.5%+4
400.0V	0.1V	0.5%+4
Specifications are valid from 5% to 100% of amplitude range		
400mV is only confined to manual range		
AC conversion: average value		
Measuring Impedance: 10 MΩ(nominal), <100pF		
Common mode rejection ratio: 50Hz or 60Hz > 100dB		
Overvoltage protection: 600Vp		

DC Current Measurement

Range(DC mA)	Resolution	Accuracy,±(%reading +counts)
40.00mA	0.01 mA	0.2%+4
400.0 mA	0.1 mA	0.2%+4
Overload protection: 0.5A,250V fast-blow fuse Measuring Impedance: 1Ω		

AC Current Measurement

Range(AC mA)	Resolution	Accuracy,±(%reading +counts) 40~400Hz
40.00mA	0.01 mA	0.5%+4
400.0 mA	0.1 mA	0.5%+4
Specifications are valid from 5% to 100% of amplitude range Overload protection: 0.5A,250V fast-blow fuse Measuring Impedance: 1Ω		

Resistance Measurement

Range	Resolution	Accuracy,±(%reading +counts)
400.0Ω	0.1Ω	0.2%+4
4.000kΩ	0.001kΩ	0.2%+4
40.00kΩ	0.01kΩ	0.2%+4
400.0kΩ	0.1kΩ	0.2%+4
4.000MΩ	0.001 MΩ	0.5%+4
40.00 MΩ	0.01 MΩ	1%+4
Open circuit voltage:0.4v Guide lead resistance is excluded in the accuracy Overvoltage protection: 600Vp		

RTD Measurement

Range(type)	Input Range	Resolution	Accuracy,±(%reading +counts)
Pt100	-200~700℃	1℃	0.5%+2
Cu50	-50~150℃	1℃	0.5%+4
By using Pt100-385 temperature scale Measuring current 1 mA Note: attached lead resistance is excluded			

Frequency Count Accuracy

Range	Resolution	Accuracy, $\pm$ (%reading +counts)
50.00Hz	0.01Hz	0.1%+3
500.0Hz	0.1Hz	0.1%+3
5.000KHz	1Hz	0.1%+3
50.00KHz	0.01KHz	0.1%+3
100.0KHz	0.1KHz	0.1%+3
Display updates 3 times/second (at >10Hz)		

Diode Test and Continuity Test

Diode test indication:

Displays voltage drop across device, open circuit voltage: 1.1v-1.6v; short circuit current:<0.2 mA(typical value). Accuracy $\pm$ (2%reading +1count)

Continuity test indication:

Continuous audible tone for test resistance<50

Open circuit voltage: <0.45v

Short circuit current: 130 μ A typical

Overload protection: 600V(peak)

Basic Technical Specification of Output (applicable to temperature range

from 18 to 28 °C, 10% to 70%RH ,within one year after calibration).

Function	Range	Set Range	Resolution	Accuracy	Remark
OHM	400.0Ω	0 to 400.0Ω	0.1Ω	0.5+4	1mA exciting current Without accessory lead resistance
DC mV	100.00mV	-10.00mV to 10.00mV	0.01mV	0.5+4	Max. output current 5mA
DC V	5.0000V	-0.5000V to 5.5000V	0.1mV	0.2+4	Max. output current 5mA
FREQ	100.0Hz	1.0Hz to 110.0Hz	0.1Hz	0.2+2	Square-wave 50% duty cycle ratio 5V p-p
	1.000KHz	0.100KHz to 1.100KHz	10.0KHz	0.2+2	
	10.0KHz	1.0KHz to 11.0KHz	0.1KHz	0.2+2	
XMT	-20.000mA	0 to -22.000mA	0.001mA	0.2+4	External power supply: 28V Max. load:1kΩ at 20mA
DC mA	20.000mA	0 to 22.000mA	0.001mA	0.2+4	Internal power supply: 15V Max. load:500 Ω at 20mA
RTD	Pt100	-200.0 to 850.0	0.1°C	0.5+6	By using Pt100-385 temperature Without accessory lead resistance
	Cu50	-50.0 to 150.0			

Basic Technical Specification of Output(cont.)

Function	Range	Set Range	Resolution	Accuracy	Remark
TC	R	-40 to 1760	1°C	0.5%+3 (≤100°C) 0.5%+2 (>100°C)	By using ITS-90 temperature Note: The accuracy does not include the error of internal temperature compensation caused by a sensor.
	S	-20 to1760	0.1°C	0.5%+20 (≤-100°C) 0.5%+10 (>-100°C)	
	K	-200.0 to 1370.0			
	E	-200.0 to1000.0			
	J	-200.0 to 200.0			
	T	-200.0 to 400.0			
	N	-200.0 to 1300.0			
	B	-40 to 1760	1°C	0.5%+3 (≤600°C) 0.5%+2 (>600°C)	
Maximum voltage applied between any output jack and earth ground :30 V DC Fuse-protection for output jacks: 63mA,250V fast-blow fuse					

General Specifications

- Power supply: 6V batteries(4×1.5 V alkaline AAA batteries or 4×1.5 V Ni-MH AAA batteries)
- Maximum Voltage:600Vp (Maximum Voltage between all input jacks and earth ground)
30V DC (Maximum Voltage between all output jacks and earth ground)
- Operating temperature: 0°C-50°C
- Operating relative humidity: $\leq 80\%$ RH
- Storage temperature: -10 °C-55 °C
- Storage humidity: $\leq 90\%$ RH
- Size : 205 × 95 × 42 mm (plus protector)
- Weight: about 500g (plus protector)
- Accessories: a copy of users manual, a set of CF-733370 industrial test lead (with alligator clips) and two 63mA/250 fast-blow fuses
- Options: battery charger(VCCHG)
- Safety: complied with IEC61010 terms(Safety Standard issued by International Electro-technical Commission)

Appendix

⚠ Warning

To avoid electric shock, do not touch the charging jack when the

testing circuit has been connected to the meter!

⚠ Attention

Make sure that the batteries loaded in are Ni-MH batteries when charging the meter.

- Turn off the power when charging, connect the plug into the charging jack in the top of the meter, and turn on the charger's power ahead of the meter's power.
- Use the charger manufactured by our company only. The Company will not burden any responsibility for the damage of the meter caused by user's self-selected charger.
- Do not use the USB jack in the computer to charge the meter.

Calibration

⚠ Attention

- **Calibration:** To ensure the designed accuracy of the calibrator, it is recommendable to calibrate your calibrator once a year. The following recommended standard equipment is used to perform the calibration which serves as an example.

⚠ Caution

- **Using:** Do not input voltage occurring in short circuit or exceeding the maximum value to the meter and the standard device, otherwise their internal circuits would be possibly damaged.

Press  and  button holding, and at the same time press  to turn on the meter, then the meter toggles calibration function.

Selecting standard device

Calibrating output feature

Calibrating Item	Standard Device	Input Range	Accuracy	Recommendation
DCV/5V	Digital meter	MAX.11 V	$\pm (10\text{ppm} + 50\mu\text{V})$	Keithley2000
DCV/100mV	Digital meter	MAX.1.1V	$\pm(10\text{ppm}+5\mu\text{V})$	
$\Omega/400\Omega$	Digital meter Standard source	MAX. 1.1V $\pm 1\text{mA}$ exciting current	$\pm(10\text{ppm}+5\mu\text{V})$ $\pm (80\text{ppm} + 0.03\mu\text{A})$	
DCA/20mA	Digital meter	MAX.11V	$\pm (10\text{ppm} + 50\mu\text{V})$	
	Standard resistance	100 Ω	$\pm 0.01\%$	BZ10

Calibrating measuring feature

Calibrating Item		Standard Device	Output Range	Accuracy $\pm$ (% output)	Recommendation
DC mV	40.00mV	Standard source	MAX.330mV	0.0002	FLUKE 5500A
	400.0mV		MAX.3.3V	0.0002	
DCV	4.000V		MAX.3.3V	0.0002	
	40.00V		MAX.33V	0.0002	
	400.0V		MAX.330V	0.0002	
	600V		MAX. 1020V	0.0002	
ACV	400.0mV		MAX.330mV	0.025	
	4.000V		MAX.3.3V	0.025	
	40.00V		MAX.3.3V	0.025	
	400.0V		MAX.33V	0.025	
	420V		MAX. 1020V	0.025	
OHM	400.0 Ω		MAX.330 Ω	0.004	
	4.000 K Ω		MAX.3.3K Ω	0.004	
	40.00 K Ω		MAX.33K Ω	0.004	
	400.0K Ω		MAX.330K Ω	0.004	
	4.000M Ω		MAX.3.3M Ω	0.05	
	40.00M Ω		MAX.33M Ω	0.05	
DCmA	40.00mA		MAX.33mA	0.025	
	400.0mA		MAX.330mA	0.025	
ACmA(50Hz)	40.00mA		MAX.33mA	0.09	
	400.0mA		MAX.330mA	0.09	

Ambient Condition for Calibration

Ambient Temperature: $23 \pm 2^{\circ}\text{C}$

Relative Humidity: 45-75% RH

Warming-up:

- The standard equipment must be warmed up to the given time.
- Do not connect the calibrator to the power supply until it has been exposed to the ambient condition for 24 hours. Then set the calibrator to a state of non-automatic shutdown followed by warming up to an hour.

⚠ Attention

**Power supply for calibration: New alkaline AAA batteries (type 7)
are the best choice for calibration.**

Operating Measurement Calibration

Operating the calibration in order of items and calibration points in the following table:

Calibrating Item	Input Range	Calibrating Point
DCV	4.000V	3.000 V
	40.00V	30.00V
	400.0V	300.0V
	600V	400V
ACV(50Hz)	400.0mV	300.0 mV
	4.000V	3.000 V
	40.00V	30.00 V
	400.0V	300.0 V
	420V	400V
DC mV	40.00 mV	30.00 mV
	400.0mV	300.0 mV
OHM	400.0 Ω	300.0 Ω
	4.000K Ω	3.000K Ω
	40.00K Ω	30.00K Ω
	400.0K Ω	300.0K Ω
	4.000M Ω	3.000M Ω
	40.00M Ω	30.00M Ω
DCmA	40.00mA	30.00mA
	400.0mA	300.0mA
AcmA(50Hz)	40.00mA	30.00mA
	400.0mA	300.0mA

Direct Voltage Calibration

1. The calibration wiring diagram is shown in Figure 12:

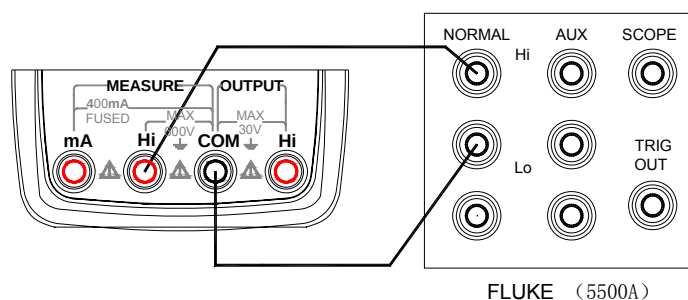


Figure 12 .Direct Voltage Calibration

2. Set the rotary switch in $\tilde{V}$, press START RANGE to select direct voltage range, and then press START RANGE to enter into direct voltage calibration state. The screen displays “MEASURE”, “CAL”, “ON”, “CA-F”, and units of “V”, “DC”.
3. Set the standard source to a corresponding range.
4. Set the standard source output as the displaying value of the meter. Press M-F Hz when output steadily, and “SAVE” is on sub-display part, indicating the calibrated point is stored.

Alternating Voltage Calibration

1. The calibration wiring diagram is shown in Figure 12:
2. Set the rotary switch in $\tilde{V}$, press $\bigcirc$ to select alternating voltage and press START RANGE to select alternating voltage range, and then press REL to enter into alternating voltage calibration state. The screen displays “MEASURE”, “CAL”, “CAL”, “CA-F”, and units of “V” or “mV”, “AC”.
3. Set the standard source to corresponding range (50Hz).
4. Set the standard source output as the displaying value of the meter. Press M-F Hz when output steadily, and “SAVE” is on sub-display part, indicating the calibrated point is stored.

Direct mV Voltage Calibration

1. The calibration wiring diagram is shown in Figure 12:
2. Set the rotary switch in mV^{TC} , press START RANGE to select direct mV voltage range, and then press REL to enter into direct mV voltage calibration state. The screen displays “MEASURE”, “CAL”, “CAL”, “CA-F”, and units of “mV”, “DC”.
3. Set the standard source to corresponding range.
4. Set the standard source output as the displaying value of the meter. Press M-F Hz when output steadily, and “SAVE” is on sub-display part, indicating the calibrated point is stored.

Resistance Calibration

1. The calibration wiring diagram is shown in Figure 12:
2. Set the rotary switch in $\overline{\Omega}$, press $\overline{\text{START RANGE}}$ to select resistance range, and then press $\overline{\text{START RANGE}}$ to enter into resistance calibration state. The screen displays “MEASURE”, “CAL”, “CAL”, “CA-F”, and units of “ Ω ” or “K Ω ”, “M Ω ”.
3. Set the standard source to corresponding range.
4. Set the standard source output as the displaying value of the meter. Press $\overline{\text{Hz}}$ when output steadily, and “SAVE” is on sub-display part, indicating the calibrated point is stored.

Direct Current Calibration

1. The calibration wiring diagram is shown in Figure 13.

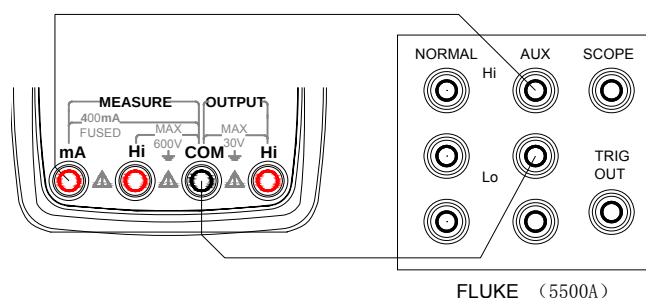


Figure 13. Current Calibration

2. Set the rotary switch in $\overline{\text{mA}}$, press $\overline{\text{START RANGE}}$ to select direct current range, and then press $\overline{\text{REL}}$ to enter into direct current calibration state. The screen displays “MEASURE”, “CAL”, “CAL”, “CA-F”, and units of “mA”, “DC”.
3. Set the standard source to corresponding range (50Hz).
4. Set the standard source output as the displaying value of the meter. Press $\overline{\text{Hz}}$ when output steadily, and “SAVE” is on sub-display part, indicating the calibrated point is stored.

Alternating Current Calibration

1. The calibration wiring diagram is shown in Figure 13.
2. Set the rotary switch in $\overline{\text{mA}}$, press $\bigcirc$ to select alternating current and press $\overline{\text{START RANGE}}$ to select alternating current range, and then press $\overline{\text{REL}}$ to enter into alternating current calibration state. The screen displays “MEASURE”, “CAL”, “CAL”, and units of “mA”, “AC”.
3. Set the standard source to corresponding range (50Hz).
4. Set the standard source output as the displaying value of the meter. Press Hz when output steadily, and “SAVE” is on sub-display part, indicating the calibrated point is stored.

Operation Output Calibration

Operating the calibration in order of items and calibration points in the following table:

Calibrating Item	Output Range	Calibrated Point
DCV	5.0000V	CA_0
		CA_F
		CA_A
DC mV	100.00mV	CA_0
		CA_F
OHM +1mA exciting current	400.0Ω	CA_0
		CA_F
DC mA	20.000mA	CA_0
		CA_F

DCV Calibration

1. The calibration wiring diagram is shown in Figure 14.

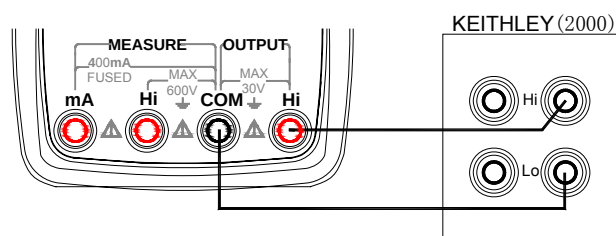


Figure 14. Output Voltage Calibration

2. Set the rotary switch in $\overline{\text{V}}$, press $\overline{\text{ON/OFF HOLD}}$ to turn on output. The screen displays “**OUTPUT**”, “**CAL**”, “**ON**”, “CA-0”, and unit of “V”.
3. Set the digital meter to corresponding range.
4. Press $\leftarrow$ or $\rightarrow$ and ∇ or $\blacktriangle$ when output steadily, and adjust the displayed value of the meter to the reading of the digital meter.
5. Press $\overline{\text{SAVE}}$ and “SAVE” is on sub-display part, indicating the calibrated point is stored.
6. Press $\overline{\text{REL}}$ to change the display to “CA-F”, repeat step 4 and 5 when output steadily.
7. Press $\overline{\text{REL}}$ to change the display to “CA-A”, repeat step 4 and 5 when output steadily.

DC mV Calibration

1. The calibration wiring diagram is shown in Figure 14.
2. Set the rotary switch in $\overline{\text{mV}}$, press $\overline{\text{ON/OFF HOLD}}$ to turn on output. The screen displays “**OUTPUT**”, “**CAL**”, “**ON**”, “CA-0”, and unit of “mV”.
3. Set the digital meter to corresponding range.
4. Press $\leftarrow$ or $\rightarrow$ and ∇ or $\blacktriangle$ when output steadily, and adjust the displayed value of the meter to the reading of the digital meter.
5. Press $\overline{\text{SAVE}}$ and “SAVE” is on sub-display part, indicating the calibrated point is stored.
6. Press $\overline{\text{REL}}$ to change the display to “CA-F”, repeat step 4 and 5 when output steadily.

Ohm Calibration

1. The calibration wiring diagram is shown in Figure 15.

- Set the rotary switch in Ω , press ON/OFF HOLD to turn on output. The screen displays “**OUTPUT**”, “**CAL**”, “**ON**”, “CA-0”, and unit of “ Ω ”.
- Set the digital meter to corresponding range and the standard source as +1mA output.
- Press $\leftarrow$ or $\rightarrow$ and ∇ or $\blacktriangle$ when output steadily, and adjust the displayed value of the meter to the reading of the digital meter.
- Press $\frac{M}{Hz}$ and “SAVE” is on sub-display part, indicating the calibrated point is stored.
- Press $\frac{REL}{A}$ to change the display to “CA-F”, repeat step 4 and 5 when output steadily.

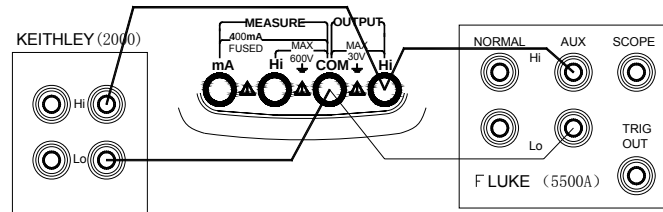


Figure 15.Ohm Calibration

DC mA Calibration

- The calibration wiring diagram is shown in Figure 16.

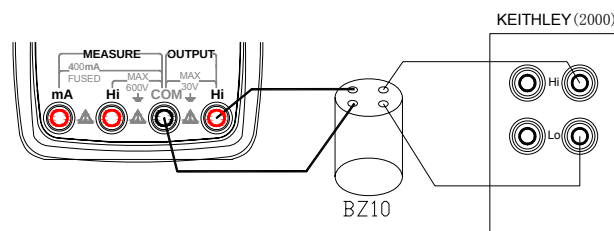


Figure 16.Ouput Dc mA Calibration

- Set the rotary switch in mA , press ON/OFF HOLD to turn on output. The screen displays “**OUTPUT**”, “**CAL**”, “**ON**”, “CA-0”, and unit of “V”.
- Set the digital meter to corresponding range.
- Press $\leftarrow$ or $\rightarrow$ and ∇ or $\blacktriangle$ when output steadily, and adjust the displayed value of the meter to the reading of the digital meter.
- Press $\frac{M}{Hz}$ and “SAVE” is on sub-display part, indicating the calibrated point is stored.
- Press $\frac{REL}{A}$ to change the display to “CA-F”, repeat step 4 and 5 when output steadily.

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.