



KUSAM-MECO

AN ISO 9001:2008 COMPANY

**DIGITAL HIGH PRECISION
MULTIFUNCTION CALIBRATOR**

MODEL - KM-CAL-907

USER MANUAL

Introduction

The voltage/current/pressure calibrator (the calibrator in the following) is a handheld, battery-operated instrument that measures and sources electrical and physical parameters.

Features:

Measure: DC-voltage, DC-current, frequency and continuity

Source: DC-voltage, DC-current, simulation transmitter, frequency and pulse

Pressure: measuring pressure, Calibrating pressure-voltage transmitter, Calibrating 2wire pressure transmitter, Calibrating pressure switch;

Others features:

- Manual step source and auto -step and sweeping –step source
- Measurement/source mA% display
- Measurement wave-filter function
- Measurement manual-holding function
- Pressure source auto-holding function

1 Contact Us

To purchase parts, obtain operation help or address of the vendor or service center nearest to you, please call us or visit our web (see the bottom page of the Manual).

2 Standard Accessories

Make sure that the package contains all the accessories listed below. And if you find they are damaged or any of them is missing, please contact the vendor from which you purchased the product as soon as possible. Refer to the replacing part list in 15.3 in the Manual if you want to order the replacing parts.

- A set of Industrial testing Lead (CL727220)
- A set of Testing Lead (Tp727110)
- A set of Alligator clip (CC807130)
- A quick reference guide
- A User's Manual
- One Fuse 50mA/250V
- One Fuse 63mA/250V



3 Safety Information

For the correct and safe use of the instrument, be sure to follow the cautionary notes stated in this manual whenever handling the instrument. The Company shall not be held liable for any damage resulting from use of the instrument in a manner other than prescribed in the cautionary notes.

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.

Refer to Table 1 for the explanation of the international electric symbols adopted by the calibrator or the user's manual.

Table 1 Explanations of International Electrical Symbols


	EARTH GROUND		WARNING INFORMATION
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⚠Warning

To avoid possible electric shock or personal injury:

- Do not apply more than the rated voltage, as marked on the calibrator, between terminals or between any terminal and earth ground;
- Before use, verify the meter's operation by measuring a known voltage;
- Follow all equipment safety procedures;
- Do not connect the probe of the testing lead with any live power when the other end has been inserted into the current jack;

- 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;
- Select the proper function and range for the measurement;
- 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 lead continuity. Replace damaged test leads before using the meter;
- When using the probes, keep fingers behind the finger guards on the probes;
- Connect the common test lead before connecting the live test lead. When disconnecting test leads, disconnect the live test lead first;
- Do not use the meter if it operates abnormally. Protection may be impaired. When in doubt, have the meter inspect;
- Do not operate this instrument in areas where inflammable or explosive gases or vapor exists. It is extremely hazardous to use the instrument under such environments;
- Do not operate the meter around explosive gas, vapor, or dust;
- When use the pressure module, do make sure the process pressure line is shut off and depressurized before connecting or disconnecting the pressure module;

- Use only type 4 AAA batteries, properly installed in the meter case, to power the meter;
- Do not disconnect the testing lead before shifting to different source or measurement functions;
- When servicing the meter, use only specified replacement parts.
- To avoid false reading, which could lead to possible electric shock or personal injury, replace the batteries as soon as the low battery indicator () appears.



Caution

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

- Disconnect the power and discharge all high-voltage capacitors before testing continuity.
- Use the proper jacks, functions, and ranges for the measurement or source operation.

4 Familiar With the Calibrator

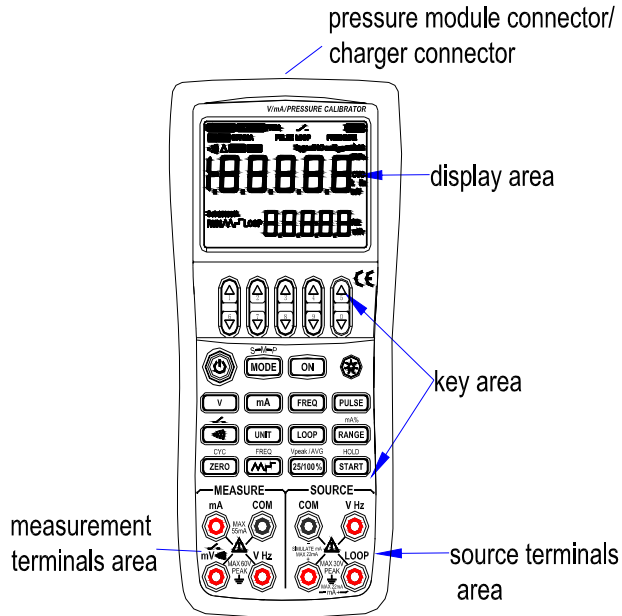


Figure 1 Entire Graph

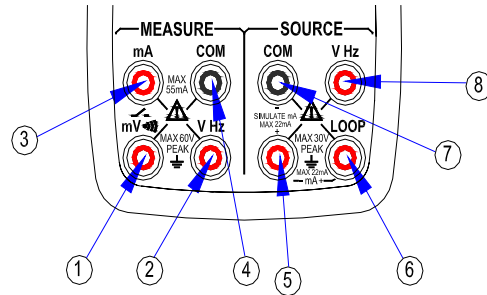



Figure 2 Measurement/ Source Terminals

5.1 Measurement/ Source Terminals

Figure 2 shows the measurement /source terminals of the calibrator. Table 2 explains their use.

Table 2 Measurement/ Source Terminals

Terminal	Function
1.	Measurement Signals (+) : DCmV, 
2.	Measurement Signals (+) : DCV, FREQ
3.	Measurement Signals (+) : DCmA
4.	All the common (return) (-) terminals of measurement function
5.	Source Signals : (-) DCmA Source Signals : (+) Simulate mA
6.	Source Signals : (+) DCmA LOOP Terminal : +24VDC Loop Power Terminal
7.	All the common (return) (-) terminals of source function
8.	Source Signals : (+) DCV, FREQ, PULSE

5.2 Keys

Figure 3 shows keys of the calibrator. Table 3 explains their use.

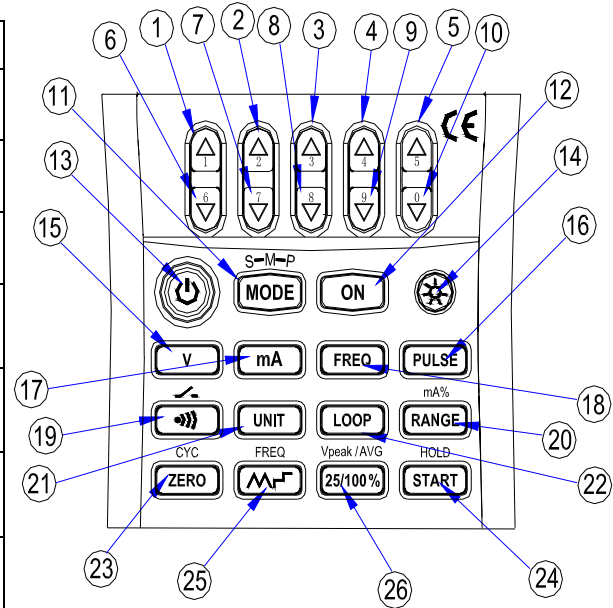




Figure 3 keys

Table 3 Functions of the keys

No.	Name	Function
1~5	Source value set key	Increment of source set point
6~10	Source value set key	Decrement of source set point
11	MODE key	Mode conversion key
12	ON key	Turn on or off measurement/ source function
13	Power key	Turn on or off the power
14	Backlight	Turn on or off the backlight
15	V Key	Select measurement/source DCV function
16	PULSE Key	Select source pulse function
17	mA Key	Select measurement/source mA function
18	FREQ Key	Select measurement/source FREQ function
19	 Key	Select measurement continuity function; Select calibration pressure-switch function
20	RANGE Key	Select measurement/source range; mA and percentage shifting key.

21	UNIT Key	Select pressure unit
22	LOOP key	Turn on or off the 24V Loop power
23	ZERO Key	Set the source value to default value; Set the pressure value to zero-point; In pulse source function, set the pulse number.
24	START Key	Source auto-pulse number; Turn on mA auto-stepping or sweeping function; Measured value holding; Unlock the pressure switch state.
25	 Key	In DCmA source function ,select the auto-wave type; In frequency or pulse source, set the frequency value.
26	25/100% Key	In mA source function, select 25% or 100% manual step output type; In pulse number, frequency source, set the amplitude value; Measuring average value.

Display Screen

Figure 4 shows a typical display screen.

a : Measurement

b : Source

c : Measurement/Source frequency

- d : Calibration pressure-switch
- e : Battery level indicator
- f : Measurement/Source function on
- g : Source /Pressure function off
- h : Measurement/Source voltage
- i : Measurement/Source current
- j : Source pulse
- k : 24V Loop Power Supply on
- l : Measurement pressure
- m : Beeper of measurement continuity
- n : Pressure reading zero off
- o : Measured value holding
- p : Measuring average value
- q : Unit of pressure
- r : Main display date and message
- s : Present Unit of main display date
- t : DCmA 25%or 100% manual step source
- u : Start source number of pulses / DCmA auto-stepping or sweeping source function
- v : 24V Loop Power Supply on

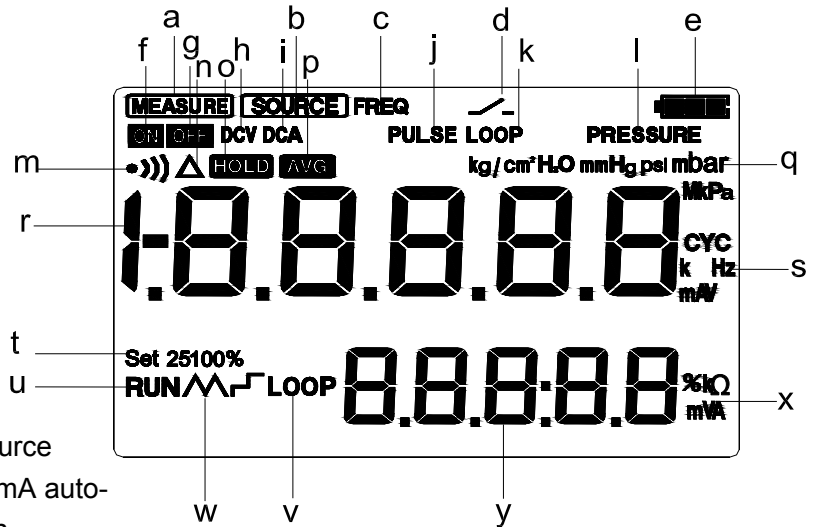


Figure 4 typical LCD display

- w : DCmA auto-stepping or sweeping source
- x : Present unit of assistance district date
- y : Assistance districts date and message

5 Before starting source/measurement

Operating Precautions

Precautions for Safe Use of the Instrument

- When using the instrument for the first time, be sure to read the instructions given in Section Four “Precautions for Safe Use of the Instrument.”
- Do not open the instrument’s case.
Contact the vendor from which you purchased the instrument, for a service of inspecting or adjusting the internal assembly.
- In case of failure
Should the instrument begin to emit smoke, give off an unusual odor, or show any other anomaly, immediately turn off the POWER key. If you are using an Charger, disconnect the plug from the wall outlet. Also cut off power to the object under test that is connected to the input terminals. Then, contact the vendor from which you purchased the instrument.
- Charger
Use an Charger dedicated to the instrument. Avoid placing any load on the Charger, or prevent any heat-emitting object from coming into contact with the adapter.

General Handling Precautions

- Before carrying around the instrument turn off power to the object under test, and then the POWER key of the instrument. If you are using an Charger, disconnect the power cord from the wall outlet. Finally, detach all lead cables from the instrument. Use a dedicated carry case when transporting the instrument.
- Do not bring any electrified object close to the input terminals, since the internal circuit may be destroyed.
- Do not apply any volatile chemical to the instrument's case or operation panel. Do not leave the instrument in contact with any product made of rubber or vinyl for a prolonged period. Be careful not to let a soldering iron or any other heat-emitting object come into contact with the operation panel, as the panel is made of thermoplastic resin.
- Before cleaning the instrument's case or operation panel disconnect the power cord plug from the wall outlet if you are using an Charger. Use a soft, clean cloth soaked in water and tightly squeezed to gently wipe the outer surfaces of the instrument. Ingress of water into the instrument can result in malfunction.
- If you are using an Charger with the instrument and will not use the instrument for a prolonged period, disconnect the power cord plug from the wall outlet.
- For handling precautions regarding the batteries, see "Installing or Replacing the Batteries".
- Never use the instrument with the cover of the battery holder opened.

Environmental Requirements

Use the instrument in locations that meet the following environmental requirements:

- Ambient temperature and humidity

Ambient temperature range: 0 to 50°C

Ambient humidity range: 20 to 80% RH. Use the instrument under non-condensing condition.

- Flat and level locations

Do not use the instrument in locations that are

- Exposed to direct sunlight or close to any heat source.
- Exposed to frequent mechanical vibration.
- Close to any noise source, such as high-voltage equipment or motive power sources.
- Close to any source of intensive electric or electromagnetic fields.
- Exposed to large amounts of greasy fumes, hot steam, dust or corrosive gases.
- Exposed to unstable or a risk of explosion due to the presence of flammable gases.

Note:

- Use the instrument under the following environmental conditions if precise source or measurement is your requirement:

Ambient temperature range: $23 \pm 5^{\circ}$ C;

Ambient humidity range: 20 to 80% RH(non-condensing)

- When using the instrument within a temperature range of 0 to 18° C or 28 to 50° C, add a value based on the temperature coefficient shown in Chapter 18“Specifications” to the given accuracy rating.
- When using the instrument at an ambient humidity of 30% or lower, prevent electrostatic charges from being produced, by using an antistatic mat or any other alternative means.
- Condensation may occur if you relocate the instrument from places with low temperature and humidity to places with high temperature and humidity, or if the instrument experiences any sudden temperature change. In that case, leave the instrument under the given ambient temperature for at least one hour to ensure that the instrument is free from condensation, before using the instrument.

Installing or Replacing the Batteries

Warning

To avoid electrical shock, always remove the source or measurement lead cables from the object under test, as well as from the instrument itself before opening battery door.

Caution

- To avoid the risk of fluid leakage or battery explosion, install batteries with their positive and negative electrodes correctly positioned.
- Do not short-circuit the batteries.
- Do not disassemble or heat the batteries or throw them into fire.
- When replacing batteries, replace all of the four batteries at the same time with new ones from the same manufacturer.
- If the instrument will not be used for a prolonged period, remove the batteries from the instrument.

Step 1: Remove the lead cables and charger and turn off the calibrator before you begin installing batteries.

Step 2: Remove the battery holder cover by sliding it in one-quarter counterclockwise direction and turn off the calibrator.


Step 3: Install four alkaline batteries of same type in the battery holder with their positive and negative electrodes positioned correctly as indicated on the holder.


Step 4: After replacement, reattach the battery holder cover.

Indication of Battery Level

The battery replacement indicator shows the battery level in five steps according to the measured voltage of the batteries.

Full battery: 

The battery level is below 50% full: 

The battery level is below 25% full: 

Low battery: 

The dictation flashes in sequence when getting charged.

Note that the battery replacement indicator is driven by directly measuring the battery voltage when the calibrator is in actual operation. Consequently, the indicator may read differently depending on the battery load condition (e.g., the load condition of the source output is on/ off state) if the batteries are too low.

Connecting the Charger

Warning

- Make sure the voltage of the AC power source matches the rated supply voltage of the Charger, before connecting the Charger to the AC power source.
- Do not use any Charger other than the dedicated Charger from the Company.
- Do not charge non Ni-Cd, Ni-MH batteries or wasted batteries.

Step 1: Make sure the calibrator is turned off.

Step 2: Insert the plug of the optional Charger into the Charger connection jack.

Note:

- Turn off the calibrator before connecting or disconnecting the Charger from AC power, plugging in/out the Charger connection jack.
- Plug out the Charger from the Charger connection jack of the calibrator when discharging.
- Do not charge the calibrator without any battery in.

Turning On the Power

Pressing the Power key once when the power is off turns on the calibrator.

Pressing the Power key for 2 seconds turns off the calibrator.

Automatic Power-off

When the calibrator is running on batteries and no key is operated for approximately ten minutes, the calibrator turns off automatically. The automatic power-off time could be reset in the factory default parts, see Chapter 10 “Factory Default”.

Turning On/Off the Backlight

The LCD can be backlit. Pressing the key turns on the backlight, while pressing the key once again turns it off. This feature makes it easier for you to view the LCD when operating the calibrator in dark places or when carrying out source or measurement. Battery life shortens when the calibrator is operated on batteries.

Note

The backlight automatically turns off after 10 seconds. Press the key once more to relight it. The time could be reset in the factory default parts, see Chapter 10 “Factory Default”.

7 Source

From the calibrator, you can source a DC voltage, DC current, frequency, pulse signal.

⚠Warning

To avoid electrical shock, do not apply more than the rated voltage, as marked on the calibrator, between terminals or between any terminal and earth ground. Always use the calibrator in locations with a voltage to ground below 30 Vpk.

Caution

- Do not apply any voltage to the output terminals for ranges other than 4-20mA simulating transmitter output. Otherwise, the internal circuitry may be damaged.

7.1 Connecting Cables to Terminals

For DC voltage, frequency, pulse (Figure 5)

Step 1: Connect the black lead cable for source to the COM output terminal and the red lead cable to the “VHz” output terminal.

Step 2: Connect the other ends of the cables to the input of equipment under test while making sure the polarities are correct.

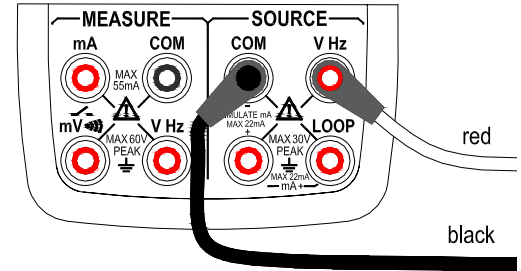


Figure 5 Sourcing DC voltage, frequency, pulse

For DC current (Figure 6)

Step 1: Connect the black lead cable for source to the “mA-” output terminal and the red lead cable to the “mA+/LOOP” output terminal.

Step 2: Connect the other ends of the cables to the input of equipment under test while making sure the polarities are correct.

7.2 Sourcing DC Voltage

Step 1: Using the $\{V\}$ key to select DC voltage source function,

select the desired range from 1000mV, 10V by pressing the $\{RANG\}$ key. The default value and unit of the selected source function and range shall be displayed on the LCD.

Step 2: Set the output value digit by digit using $\{\blacktriangle\}$ / $\{\blacktriangledown\}$ keys.

Each pair of $\{\blacktriangle\}$ / $\{\blacktriangledown\}$ keys corresponds to each digit of the LCD reading. Each press of the $\{\blacktriangle\}$ / $\{\blacktriangledown\}$ key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the $\{\blacktriangle\}$ / $\{\blacktriangledown\}$

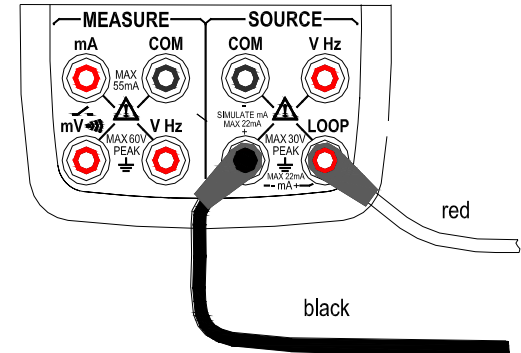


Figure 6 Sourcing DC Current

key continuously changes the digit in question. And the value won't change if it is increased or decreased to the Maxim or Minimum value. Pressing the {ZERO} key initializes the output set point to the default value (0).

Step 3: Pressing the {ON} key causes the indicator on the LCD to change from "OFF" to "ON". The calibrator sources the present DC voltage between the output terminals.

Step 4: To turn off the output, press the {ON} key once again. The "OFF" appears on the LCD and no signals sourced between the terminals.

7.3 Sourcing DC Current

Step 1: Using the {mA} key to select the desired source function 20mA .The default value and unit of the selected source function shall be displayed on the LCD.

Step 2: Set the output value digit by digit using {▲} / {▼} keys.

Each pair of {▲} / {▼} keys corresponds to each digit of the LCD reading. Each press of the {▲} / {▼} key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the {▲} / {▼}

key continuously changes the digit in question. And the value won't change if it is increased or decreased to the Maxim or Minimum value. Pressing the **{ZERO}** key initializes the output set point to the default value (0).

Step 3: Pressing the **{ON}** key causes the indicator on the LCD to change from "OFF" to "ON". The calibrator sources the preset DC current between the output terminals.

Step 4: To turn off the output, press the **{ON}** key once again. The "OFF" appears on the LCD and no signals sourced between the terminals.

7.3.1 Manual Set 25%, 100% 4–20 mA Function

You can set the source value in 4 mA or 16mA increments or decrements within 4–20 mA current.

Step 1: In DC current function, press the **{25%100%}** key to display "25%SET" on the lower part of the screen, and press once again to display "100%SET".The default source value will be showed simultaneously.

Step 2: Using each pair of **{▲}** / **{▼}** output setting keys, set the signal in a step-by-step manner. In 25% set point condition, you can set the signal in 4 mA increments or decrements in the order 4-8-12-16-20 by each press of the key. In 100% set point condition, you can set the signal in 16 mA increments or decrements in the order 4-20 by each press of the key. Pressing the **{ZERO}** key initializes the signal set point to the default value (4mA).

Step 3: Pressing the **(ON)** key causes the indicator on the LCD to change from “OFF” to “ON”. The calibrator sources the preset 4–20 mA current signal between the output terminals.

Step 4: To turn off the output, press the **(ON)** key once again. The “OFF” appears on the LCD and no signals sourced between the terminals.

7.3.2 Auto-stepping and auto-sweeping 4-20mA function

You can set a 4–20 mA range within which to source out current in 4 -20mA increments or decrements in auto-stepping mode or in auto-sweeping mode. It requires 80 seconds to finish a 4-20mA cycle for auto-sweeping mode and 20 seconds for auto-stepping mode.

Step 1: In DC current function, press **(Δ)** key to display auto-stepping mode signal “ Δ ” on the lower part of the screen, and press once again to display auto-sweeping mode signal “ Δ ”. The default source value will be showed simultaneously.

Step 2: Pressing the **(ON)** key causes the indicator on the LCD to change from “OFF” to “ON”. The calibrator sources the default 4 mA current signal between the output terminals.

Step 3: Pressing the **(START)** key starts the auto-stepping and auto-sweeping source. The “RUN “ mark shall be displayed in the lower part of the LCD.

Step 4: Pressing the **{START}** key once more stops the auto-stepping and auto-sweeping source. The “RUN” mark disappears. The terminals source the value displayed on the screen.

Step 5: Pressing the **{ON}** key stops sourcing and “OFF” mark displayed on the screen. No signals sourced between the terminals.

Tips:

- Press the **{START}** key again to continue the auto-stepping and auto-sweeping mode after stopping them, and “RUN” mark displays on the lower part of the screen.
- Using the **{START}** key to start mA auto-stepping and auto-sweeping mode is only available when the source function is in **ON** state.

7.3.3 mA% display

In mA source function, the preset value displayed on main districts of the LCD. And mA% displayed on assistance districts of the LCD.

$$\text{mA \%} = \frac{100(\text{current sourced value mA}-4\text{mA})}{16 \text{ mA}} \%$$

Tips:

You can not undertake increment or decrement set for mA%, can set the mA value only.

7.3.4 4-20 mA simulating transmitter source

Connect the calibrator and the loop power as listed in Figure 7, and operate in steps shown in sourcing DC current.

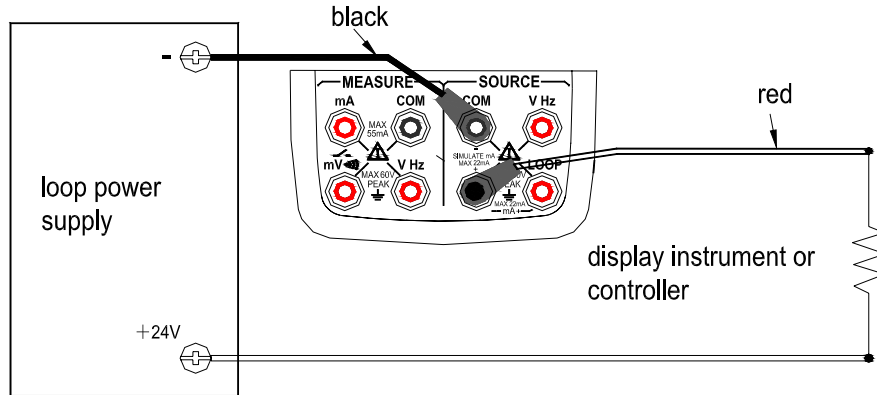


Figure 7 4-20 mA simulating transmitter source

7.4 Sourcing Frequency

The calibrator can source a constant pulse signal responding to the preset frequency and amplitude.

Step 1: Using the **{FREQ}** key, select frequency source function. The LCD shows the default frequency value 10 Hz.

Step 2: Using the **{RANG}** key, select a desired frequency range from 100Hz, 1KHz, 10KHz. The selected function and the default range source value and unit shall be shown on the LCD.

Step 3: Set the output value digit by digit using each pair of **{▲}** / **{▼}** output setting keys.

Each pair of **{▲}** / **{▼}** keys corresponds to each digit of the LCD reading. Each press of the **{▲}** / **{▼}** key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the **{▲}** / **{▼}** key continuously changes the digit. And the value won't change if it is increased or decreased to the Maximum or Minimum value.

Step 4: Pressing the **{Vpeak}** key once switches to amplitude setting mode. The LCD provides a reading of 1V.

Step 5: Set the output value digit by digit using each pair of {▲} / {▼} output setting keys.

Each pair of {▲} / {▼} keys corresponds to each digit of the LCD reading. Each press of the {▲} / {▼} key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the {▲} / {▼} key continuously changes the digit. And the value won't change if it is increased or decreased to the Maximum or Minimum value.

Step 6: To re-enter into the frequency set mode, press the {FREQ} key to set the frequency.

Step 7: Pressing the {ON} key causes the SOURCE indicator on the LCD to change from "OFF" to "ON". The calibrator sources constant pulse signals responding to the preset frequency and amplitude between the output terminals.

Step 8: To turn off the output, press the {ON} key once again. The "OFF" appears on the LCD and no signals sourced between the terminals.

Tips:

- The frequency range could only be changed by pressing **[RANGE]** key in the frequency set mode.
- The frequency value and range could be changed when the frequency source function is both in **[ON]** or **[OFF]** state.

7.5 Sourcing Number of Pulses

The calibrator can source a preset number of pulse signal responding to the preset frequency and amplitude.

Step 1: Using the **[PULSE]** key, select pulse source function. The LCD shows the default value 10 Hz.

Step 2: Using the **[RANGE]** key, select a desired frequency range from 100Hz, 1KHz, 10KHz. The selected function and the default range source value and unit shall be shown on the LCD.

Step 3: Set the output value digit by digit using each pair of **[▲]** / **[▼]** output setting keys.

Each pair of **[▲]** / **[▼]** keys corresponds to each digit of the LCD reading. Each press of the **[▲]** / **[▼]** key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the **[▲]** / **[▼]** key continuously changes the digit . And the value won't change if it is increased or decreased to the Maxim or Minimum value.

Step 4: Pressing the (Vpeak) key once switches to amplitude setting mode. The LCD provides a reading of 1V.

Step 5: Set the output value digit by digit using each pair of (▲) / (▼) output setting keys.

Each pair of (▲) / (▼) keys corresponds to each digit of the LCD reading. Each press of the (▲) / (▼) key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the (▲) / (▼) key continuously changes the digit. And the value won't change if it is increased or decreased to the Maxim or Minimum value.

Step 6: Pressing the (CYC) key ,enter into the pulse number set mode, and the LCD shows the default number of 1 CYC in the part.

Step 7: Set the output value digit by digit using each pair of (▲) / (▼) output setting keys.

Each pair of (▲) / (▼) keys corresponds to each digit of the LCD reading. Each press of the (▲) / (▼) key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the (▲) / (▼) key continuously changes the digit. And the value won't change if it is increased or decreased to the Maxim or Minimum value.

Step 8: To re-enter into the frequency set mode, press the **{FREQ}** key to set the frequency.

Step 9: Pressing the **{ON}** key causes the **SOURCE** indicator on the LCD to change from “**OFF**” to “**ON**”, and the calibrator sources low level between the output terminals.

Step 10: Pressing the **{START}** key the calibrator sources the set number of pulse responding to the preset frequency and amplitude, LCD shows the symbol “**RUN**”.

Step 11: When source is complete, the calibrator automatically turns off the output and ceases operation. The “**RUN**” symbol disappears from the LCD.

Step 12: To turn off the output, press the **{ON}** key once again. The “**OFF**” appears on the LCD and no signals sourced between the terminals.

Tips:

- The frequency range of the pulse could only be changed by pressing **{RANGE}** key in the frequency set mode.
- In the pulse sourcing process, pressing the **{START}** key causes to stop the output, and the “**RUN**” mark vanishes from the LCD. Press the **{START}** key once more to restart the sourcing function.
- Restarting the pulse output requires the source function is in “**ON**” state.

7.6 Zero-off function

In any range of DC voltage, DC current functions, pressing the **{ZERO}** key selects clearing off function, which initializes the preset source value for the convenience of user to reset source value.

In frequency, pulse output functions, the **{ZERO}** key is unavailable.

8 Measurement

From the calibrator, you can measure a DC voltage, DC current, frequency, continuity.

Warning

- In an application where the calibrator is used together with the supplied lead cables for measurement, the allowable voltage to ground of the input terminals is 60 Vpk maximum. To avoid electrical shock, do NOT use the calibrator at any voltage exceeding the maximum voltage to ground.

Tips:

- With the **{HOLD}** key, you can hold the measured value.
- The reading of a measured value is updated differently responding to different measurement function. LCD shows “ - - - - ” on the upper part when shifting the range. If the input is over ranged, the measured value on the LCD reads as “oL”.

8.1 Connecting Cables to Terminals

For DC voltage(mV), continuity measurement (Figure 8)

Step 1: Connect the black lead cable for measurement to the “COM” input terminal and the red lead cable to the ”mV” input terminal.

Step 2: Connect the other end of the cable to the measuring terminals of equipment under test while making sure the polarities are correct.

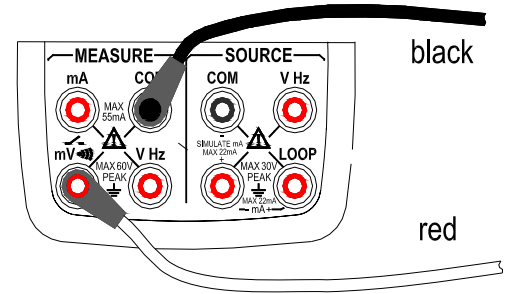


Figure 8 Measuring DC voltage(mV), continuity

For DC voltage(V), Frequency measurement (Figure 9)

Step 1: Connect the black lead cable for measurement to the “COM” input terminal and the red lead cable to the ”VHz” input terminal.

Step 2: Connect the other end of the cable to the measuring terminals of equipment under test while making sure the polarities are correct.

For DC current signal (Figure 10)

Step 1: Connect the black lead cable for measurement to the “COM” input terminal and the red lead cable to the ”mA” input terminal.

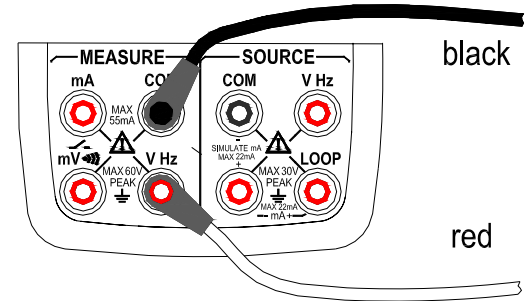


Figure 9 Measuring DC voltage(V), frequency

Step 2: Connect the other end of the cable to the measuring terminals of equipment under test while making sure the polarities are correct.

⚠Warning

- Before connecting the calibrator to the device under test, cut off the power to the device.
- Do not apply any voltage or current exceeding the allowable voltage (60 Vpk) or current (55 mA). Otherwise, there will be a danger of not only damage to the instrument but also personal injury due to electrical shock.
- Mistaking the H voltage input terminal for the mA current input terminal, and vice versa, when wiring, is extremely dangerous.
- The current input terminals are equipped with a built-in current input protection fuse. Over-current input to the terminals will cause the fuse to blow. If the fuse is blown, replace it with one with the specified ratings. For details on fuse replacement, see "replacing the battery and fuse".

⚠Warning

If you make a mistake in wiring or in the operating procedure in this measurement task, there will be a danger of not only damage to the instrument but also personal injury due to electrical shock. Exercise the utmost care when carrying out the measurement task.

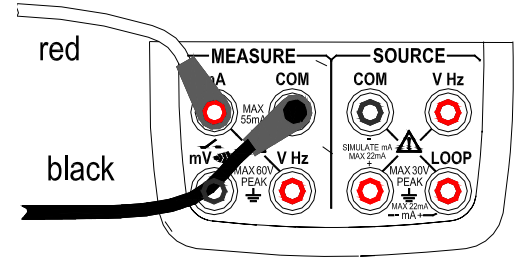


Figure 10 Measuring DC current

NEVER make this mistake.

8.2 Measuring DC Voltage

Step 1: Make sure the lead cables for measurement are not connected to the measuring instrument under test.

Step 2: Using the **[V]** key, select DC Voltage measurement function.

Step 3: Connect the lead cables for measurement to the measuring terminals of the measuring instrument under test.

Step 4: Using the **[RANGE]** key, select a desired range from 200mV, 5V, 50V. The selected function and the measured value and unit shall be shown on the LCD.

8.3 Measuring DC Current

Step 1: Make sure the lead cables for measurement are not connected to the measuring instrument under test.

Step 2: Using the **[mA]** , select DC Current measurement function.

Step 3: Connect the lead cables for measurement to the measuring terminals of the measuring instrument under test.

Step 4: The selected function and the measured value and unit shall be shown in the LCD.

8.3.1 mA % Display

In mA measurement function, the preset value displayed on main districts of the LCD. And mA% value displayed on assistance districts of the LCD.

$$\text{mA \%} = \frac{100(\text{current measured value mA}-4\text{mA})}{16 \text{ mA}} \%$$

8.3.2 Using As 24-V Loop Power Supply

This function helps to turn on a 24V loop power supply connected in line with the measured DC current circuit, in which you can use the calibrator as a loop power supply to calibrate a 2-wire converter by undertaking the following steps:

Step 1: When the calibrator is in current measurement function, pressing the **[LOOP]** key causes the LCD shows **[LOOP]** symbol. And the built-in 24V loop power of the calibrator will be turned on.

Step 2: Connect the calibrator with the loop current terminal of the supply converter as shown in Figure11.

Note:

Since the function discussed above requires a significant amount of DC current (25 mA), operation on batteries will reduce the battery life considerably.

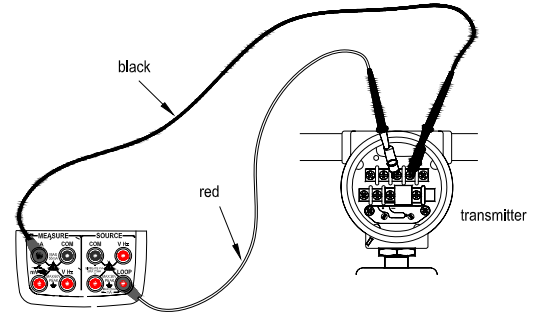


Figure 11 Using 24V loop power circuit

8.4 Measuring Frequency

Step 1: Make sure the lead cables for measurement are not connected to the measuring instrument under test.

Step 2: Using the [FREQ] key, select frequency measurement function.

Step 3: Connect the lead cables for measurement to the measuring terminals of the measuring instrument under test.

Step 4: Using the measurement [RANGE] key, select the suitable range from 500Hz,5KHz,50KHz.The selected function and the measured value and unit shall be shown on the LCD.

8.5 Measuring Continuity

Continuity measurement is used to detect the intactness of the circuit (e.g. a resistance lower than 200). Using the [•>>>] key, select continuity measurement function. LCD displays continuity symbol “•>>>” on the LCD.

Connecting the devices as shown in Figure8, the beeper sounds continuously if the loop circuit resistance under measurement is less than 200Ω , and the LCD shows the “OPEN” or “CLOSE” symbol.

8.6 Measurement-filtering function

Selecting measurement-filtering function stabilizes the measured value displayed on LCD.

In DCV, DCmA function, pressing the **[AVG]** key causes calculation of the average of the samples. LCD shows the **[AVG]** symbol. Repeating the **[AVG]** key cancels the calculation and the **[AVG]** symbol disappears.

8.7 Measured Value holding function

Apart from the continuity measurement functions, the reading-hold function can be used to preserve the current measured value on the upper part of LCD, which consequently doesn't refresh the measured value.

Pressing the **[HOLD]** key selects reading-hold mode, and LCD displays **[HOLD]** symbol. To cancel the selection, press the **[HOLD]** key again and the **[HOLD]** symbol disappears.

9 Pressure

Use calibrator can calibrating pressure, calibrating pressure-transmitter, calibrating pressure switch.

- in an application where the calibrator is used together with the supplied lead cables for measurement, the allowable voltage to ground of the input terminals 60 peak maximum. To avoid electrical shock, do not use the calibrator at any voltage exceeding the maximum voltage to ground.

Tips:

- With the **{HOLD}** key, you can hold the measured value.
- Under calibrating pressure transmitter mode:
 - 1) The reading of a measured value is updated differently responding to different measurement function. LCD shows “-----” on the upper part when shifting the range. If the input is over range, the measured value on the LCD reads as “OL”.
 - 2) “AVG” and “HOLD” keys the same as measuring mode, please reference.

9.1 Measuring Pressure

Ranges and types of the pressure module have various options. See “Accessories” for more information. Due to the difference in medium and accuracy of different pressure modules, user needs to read the Manual before operating it. Real pressure module can work as a surface pressure module by opening the L input terminal exhausting the air. Follow the steps listed below to connect the tested technical pressure pipe with a proper pressure module.

Warning

To avoid a sudden release of the pressure system, do shut off the valve to release the pressure gradually before connecting the pressure module with the pipe.

Caution

- To avoid any mechanical damage to the pressure module, do not apply any force higher than 13.5 Nm(10 ft.1bs) to the pressure pipe mouths(or the module and the pipe mouth).Do apply the specified force when connecting the pipe or the adapter.
- To avoid any damage to the pressure module due to over pressed, do not apply any pressure higher than the maximum value marked or specified.
- To avoid any corrosive damage, use the pressure module only with specified materials. Refer to the printing on the pressure module or the pressure module instruction sheet for the acceptable material compatibility.

Step 1: Connect the pressure module and calibrator as shown in Figure 12. The screw of the pressure module pipe is compatible to the 1/4 inch NPT connector. If you have other requirement, contact the vendor.

Step 2: Using the **{MODE}** key, select the pressure measurement function. The LCD shows “PRESSURE” at right upper part.

Step 3: Pressing the **{ON}** key, the calibrator connects and senses the type of the pressure module and sets the range automatically. If it fails to connect, the LCD shows “NO.OP” in the upper part.

Step 4: Zero off the reading following the pressure module manual. When the reading overtops the 5 percentage of maxim value of the range, the LCD shows

“ERR” in the lower part. Pressing the **{ZERO}** key

initializes the calibrator to 0, and “△” symbol shows on the left upper part of the LCD.

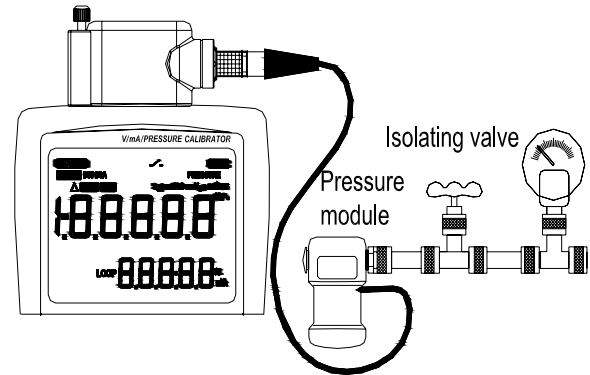


Figure 12 Measuring pressure

Tips:

- For absolute pressure module, the calibrator saves the zero-off value and reuses the value automatically. Therefore, user does not need to zero off the calibration value for each use.
- Pressing the [UNIT] key convert pressure unit (kg/cm², cmH₂O, mmHg, PSI, bar, mbar, MPa, Kpa).

9.2 Calibrate Pressure-Voltage Transmitter

Calibrator can measuring voltage signal from transmitter under pressure mode.

Step 1: Connect the pressure module and calibrator as shown in Figure 13.

Step 2: Pressing the [ON] key, the calibrator connects and senses the type of the pressure module and sets the range automatically. If it fails to connect, the LCD shows “NO.OP” in the upper part.

Step 3: Press the [V] key to select DC voltage measurement function.

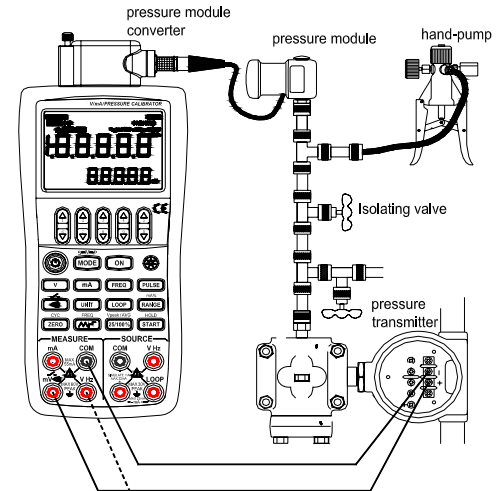


Figure 13 calibrate pressure-voltage transmitter

Step 4: Zero off the reading following the pressure module manual. When the reading overtops the 5 percentage of maxim value of the range, the LCD shows “ERR” in the lower part. Pressing the **{ZERO}** key initializes the calibrator to 0, and “△” symbol shows on the left upper part of the LCD.

Step 5: Apply pressure on the pipe with the pressure source until the desired pressure value displayed on the LCD. The LCD shows the present voltage value from the transmitter in the assistance district part.

Step 6: Pressing the **{RANGE}** key to select the voltage range.

Tips:

- For absolute pressure module, the calibrator saves the zero-off value and reuses the value automatically. Therefore, user does not need to zero off the calibration value for each use.

9.3 Calibrate 2 Wire Pressure Transmitter

Calibrator can measuring current signal from transmitter under pressure mode.

Step 1: Connect the pressure module and calibrator as shown in Figure 14.

Step 2: Pressing the **[ON]** key, the calibrator connects and senses the type of the pressure module and sets the range automatically. If it fails to connect, the LCD shows “NO.OP” in the upper part.

Step 3: Press the **[mA]** key to select measurement current function.

Step 4: Zero off the reading following the pressure module manual. When the reading overtops the 5 percentage of maximum value of the range, the LCD shows “ERR” in the lower part.

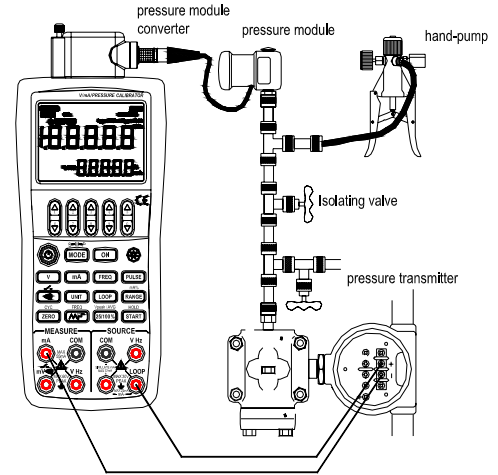
Pressing the **[ZERO]** key initializes the calibrator

to 0, and “ Δ ” symbol shows on the left upper part of the LCD. Figure 14 calibrate 2 wire pressure transmitter

Step 5: Apply pressure on the pipe with the pressure source until the desired pressure value displayed on the LCD. The LCD shows the present current value from the transmitter in the assistance district part.

Tips:

Pressing the **[RANGE]** key to convert mA% mode. The mA% value calculate formula same as measure mode, please reference.





9.4 Calibrate Pressure Switch

Calibrator can measuring switch on and off.

Step 1: Connect the pressure module and calibrator as shown in Figure 15.

Step 2: Pressing the [ON] key, the calibrator connects and senses the type of the pressure module and sets the range automatically. If it fails to connect, the LCD shows “NO.OP” in the upper part.

Step 3: Press the [] key to select switch measuring, LCD displays switch symbol “” on the LCD.

Step 4: Zero off the reading following the pressure module manual. When the reading overtops the 5 percentage of maxim value of the range, the LCD shows “ERR” in the lower part. Pressing the [ZERO] key initializes the calibrator to 0, and “” symbol shows on the left upper part of the LCD.

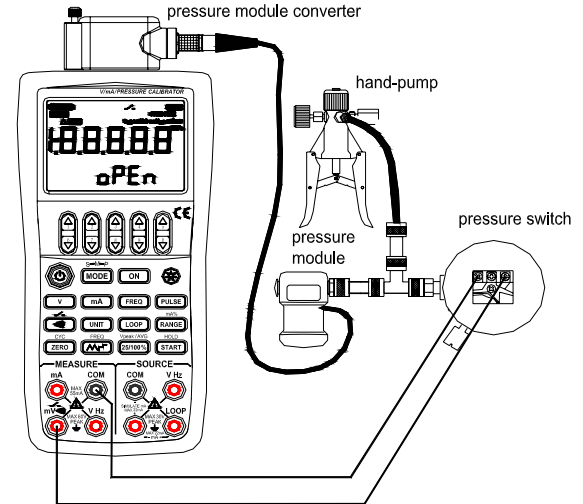


Figure 15 calibrate pressure switch

Step 5: Apply pressure on the pipe with the pressure source until the desired pressure value displayed on the LCD. The LCD shows switch state “CLOSE” or “ OPEN” in the assistance district part.

Tips:

- The beeper sounds for one second if the state of the switch under measurement is changing.
- Pressing the **[HOLD]** key to unlock switch state and pressure measurement.

10 Factory Default

You can reset the factory default of the calibrator.

When turning on the calibrator, pressing the **[ZERO]** key immediately to enter the default set. LCD displays the default function on the main districts part and the default value on the assistance district part.

10.1 Setting Auto-power off time

Step 1: Enter the setting state, LCD displays “AP.OFF” symbol on the upper part, indicating automatic power-off setting mode.

Step 2: Set the time within 0-60 minute range by using the second pair of **[▲]/[▼]** counting from right to left.

Each press of the **[▲] / [▼]** key causes 10 -minute increments or 10- minute decrement with constant setting.

Constant press of the key causes increments or decrement of the value in sequence. The value won't change when reaching the maximum or minimum value. The time unit is minute.

Step 3: Pressing the **[ON]** key, LCD displays “SAVE” symbol on the assistance district part for 1s.

Tips:

Zero default value (0) represents no automatic power-off function.

10.2 Setting Backlight time

Step 1: Pressing the **[MODE]** key, LCD displays “BL.OFF” symbol on the upper part, indicating backlight time setting mode.

Step 2: Set the time by using the pair of **[▲]** / **[▼]** . And the unit is second.

Each pair of **[▲]** / **[▼]** keys corresponds to each digit of the LCD reading. Each press of the **[▲]** / **[▼]** key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the **[▲]** / **[▼]** key continuously changes the digit . And the value won't change if it is increased or decreased to the Maxim or Minimum value. The setting range is confined within 0-3600 seconds.

Step 3: Pressing the **[ON]** key, LCD displays “SAVE” symbol on the assistance district part for 1sec.

Tips:

When the default value is 0, the backlight won't be off automatically if turned on, except that you turn it off manually.

10.3 Setting frequency

Step 1: Pressing the **{MODE}** key ,LCD displays “FRSET” symbol on the upper part, indicating frequency setting mode.

Step 2: Shifting between the 50Hz and 60Hz by using the right pair of **{▲}** / **{▼}** .

Step 3: Pressing the **{ON}** key, LCD displays “SAVE” symbol on the assistance district part for 1s.

10.4 Factory default

Step 1: Pressing the **{MODE}** key, LCD displays “FACRY” symbol on the upper part, indicating factory default.

Step 2: Pressing the **{ON}** key, LCD displays “SAVE” symbol on the upper part for 1s. All settings are defaulted

as below:

AP.OFF: 10min.

BL.OFF: 10sec.

FRSET: 50 Hz.

Tips:

Any change of setting to the above-mentioned function, press the **[ON]** key to save the value. Any press of the **[ON]** key saves the nearest setting value.

11 Adjusting Measurement Functions

Environmental Requirements

Ambient temperature: $23 \pm 5^{\circ}\text{C}$

Relative humidity: 35% to 75% RH

Warm-up:

- Before using, warm up the calibrator for the period of time specified.
- Put the meter into the standard environment for 24 hours, and then turn on the power. Change the set into non-automatic power-off state and warm it up for one hour.

Caution:

Power Supply: new alkaline size (AAA) battery type 7 is the best choice for adjustment.

Measurement Adjustment Operation

Please undertake the adjustment following the sequence and points listed in Table 4.

Table 4 Adjustment Points of Measurement Functions

Range	Adjustment Point		Remarks
	0	F	
DCV_200mV	200mV	-	Notice: replace input terminal
DCV_5V	5V	-	
DCV_50V	50V	-	
DCmA_50mA	50mA	-	
FREQ_500Hz	500Hz	-	Plus 3V square wave

* Applying reference input signals from the calibration standard as listed in the above table.

Tips:

- You can also select only the range in need of readjustment to adjust it separately.

Turn on the meter; press the **(MODE)** key while simultaneously holding down the **(ON)** key into the source

adjusting state, and then press the **(MODE)** key into the measurement adjusting state, LCD shows “CAL”

symbol on the assistance districts part of the LCD and the reference value and unit on the main districts part of the LCD.

Tips:

- If the battery level is below 25% full, the adjustment operation can't be operated. And the LCD shows "ERR" in the lower part.

11.1 Adjusting all ranges of the DC Voltage

Step 1: Make sure the lead cables for measurement are not connected to the measuring instrument under test.

Step 2: Using the **{V}** key, select DC voltage function.

Step 3: Connect the lead cables to the output terminals of the standard source as shown in Figure16.

Step 4: Pressing the **{RANGE}** key selects the range. The measured value and unit shall be shown in the upper part part of the LCD.

Step 5: Pressing the **{ZERO}** key enters the measurement CAL mode. The LCD shows the present adjusting point "CAL:0" in the lower part and the reference voltage and unit needed for the point in the upper part.

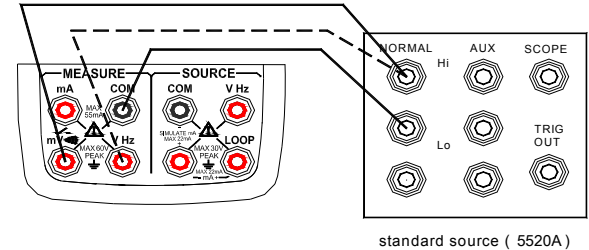



Figure 16 Calibrating DC voltage and frequency

Step 6: Pressing the [] key saves the adjusted value and the LCD shows “SAVE” symbol in the upper part for 2 seconds.

Step 7: Pressing the [**ZERO**] key exits the CAL mode and back to step 4 for next range, until other range adjustment is finished.

11.2 Adjusting Frequency


Step 1: Make sure the lead cables for measurement are not connected to the measuring instrument under test.

Step 2: Using the [**FREQ**] key, select frequency function.

Step 3: Connect the lead cables to the output terminals of the standard source as shown in Figure 16.

Step 4: The measured value and unit shall be shown in the upper part of the LCD.

Step 5: Pressing the [**ZERO**] key enters the measurement CAL mode. The LCD shows the present adjusting point “CAL:0” in the lower part and the reference frequency and unit needed for the point in the upper part.

Step 6: Pressing the [] key saves the adjusted value and the LCD shows “SAVE” symbol in the upper part for 2 seconds.

Step 7: Pressing the [**ZERO**] key exits the CAL mode. The adjustment is finished.

11.3 Adjusting 50mA DC Current

Step 1: Make sure the lead cables are not connected to the standard source.

Step 2: Using the [mA] key, select DC current function.

Step 3: Connect the lead cables to the output terminals of the standard source as shown in Figure 17.

Step 4: The measured value and unit shall be shown in the upper part of the LCD.

Step 5: Pressing the [ZERO] key enters the 50mA of DCmA

CAL mode. The LCD shows the present adjusting point “CAL:0” in the lower part and the reference current and unit needed for the point in the upper part.

Step 6: Pressing the [M_{off}] key saves the adjusted value and the LCD shows “SAVE” symbol in the upper part for 2 seconds.

Step 7: Pressing the [ZERO] key exits the CAL mode. The adjustment is finished.

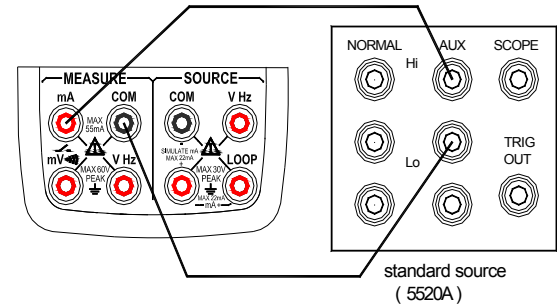


Figure 17 Calibrating DC current 50mA

12 Adjusting Source Functions

Environmental Requirements

Ambient temperature: 23±5°C

Relative humidity: 35% to 75% RH

Warm-up:

- Before using, warm up the calibrator for the period of time specified.
- Set the meter into the standard environment for 24 hours, and then turn on the power. Change the set into non-automatic power-off state and warm it up for one hour.

Power Supply: new alkaline size (AAA) battery type 7 is the best choice for adjustment.

Source Adjustment Operation:

Table 5 Adjustment Points of Source Functions

Range	Adjustment Point *			Remarks
	0	A	F	
DCV_1000mV	0	0	1000mV	
DCV_10V	0	-	10V	
DCmA_20mA	0	-	20mA	

* Adjusting the displayed value same with the reading of the digit meter when the present calibrator is stabilized.

- You can calibrate a desired function and range separately.

- You must calibrate all the calibrating points of the selected range together.

Turn on the meter, press the **(MODE)** key while simultaneously holding down the **(ON)** key into the source adjusting state.

Tips:

If the battery level is below 25% full, the adjustment operation can't be operated. And the LCD shows "ERR" in the lower part.

12.1 Adjusting Voltage Source

Step 1: Using the **(V)** key, select DC voltage function.

Connect the lead cables for measurement to the standard digital meter as shown in Figure 18..

Step 2: Pressing the **(RANGE)** key selects the right range.

Step 3: The LCD shows "CA-0" or "CA-F" symbol on the associate districts part and the calibrator is ready for the zero-point or F-point adjustment of source functions. The LCD shows the highest five digits and its unit in the main districts part and the lowest digit of the calibrated sourced value in the right of the assistance districts part respectively.

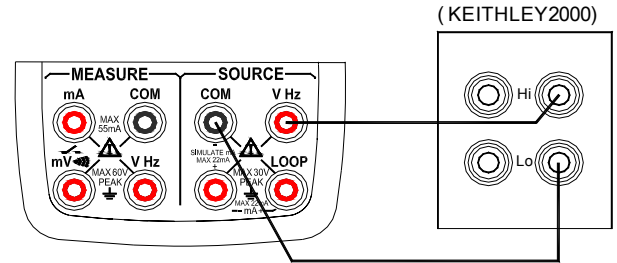


Figure 18 Adjusting voltage source

Step 4: Read the calibrator output on the calibration standard. Then, using the pair of **[▲] / [▼]** keys, adjust the reading so that it matches the measured CAL adjustment setpoint. In the CAL mode, the right pair of **[▲] / [▼]** keys are used to increase or decrease the least-significant digit, (the digit in the right of the assistance districts LCD part).

Step 5: Press the **[25/100%]** key to save the CAL adjustment reading.

Step 6: Pressing the **[START]** key shifts to the next setpoint.

Step 7: By repeating steps 3 to 6, you can adjust all the adjustment point assigned to that range.

Step 8: By repeating steps 2 to 7, you can adjust all ranges of the DC voltage source function.

Note:

- Make sure the previous adjusting point has been saved before shifting to another one.

12.2 Adjusting Current Source

Step 1: Using [mA] key, select DC current function.

Connect the lead cables for measurement to the standard digital meter as shown in Figure 19.

Step 3: The LCD shows “CA-0” or “CA-F” symbol on the associate districts part and the calibrator is ready for the zero-point or F-point adjustment of source functions. The LCD shows the highest five digits and its unit in the main districts part and the lowest digit of the calibrated sourced value in the right of the assistance districts part respectively.

Step 3: Read the calibrator output on the calibration standard. Then, using the pair of [▲] / [▼] keys, adjust the reading so that it matches the measured CAL adjustment setpoint. In the CAL mode, the right pair of [▲] / [▼] keys are used to increase or decrease the least-significant digit, (the digit in the right of LCD part).

Step 4: Press the [25/100%] key to save the CAL adjustment reading.

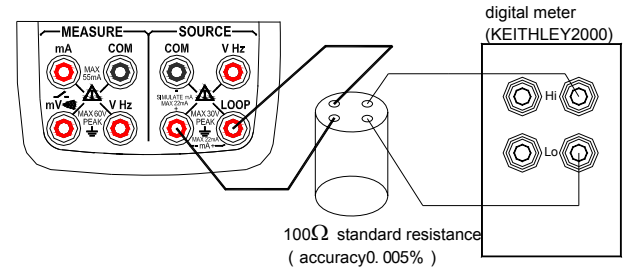


Figure 19 Adjusting current source

Step 5: Pressing the **(START)** key shifts to the next setpoint.

Step 7: By repeating steps 2 to 5, you can adjust all the adjustment point assigned to that range.

Note:

Make sure the previous adjusting point has been saved before shifting to another one.

13 Replacing Batteries or fuse:

Warning

To avoid possible electric shock, remove the test leads from the calibrator before open the battery door. And make sure the battery door is tightly closed before turning on the calibrator.

Caution

- To avoid possible linkage of the liquid and explosion of the battery, make sure to place the battery with right polarity.
- Do not operate the battery in short-circuit.
- Do not disassemble or heating the battery or throw them into the fire

- When replacing, use only four same specified ones.

Take out the battery if you don't operate the meter for a long time.

Step 1: Remove the test leads and Charger before replacing batteries or fuse, and turn off the meter.

Step 2: Remove the protector as shown in Figure 20. With a standard blade hand screwdriver, turn each battery door screw a quarter counterclockwise to remove the battery door.

- **Step 3:** Replace with four new AAA alkaline batteries under the instructions shown on the battery door. Or replace the blown fuses with same type F1 (50mA/250V), F2 (50mA/250V) or F3 (63mA/250V).

Step 4: Reinstall and tighten the battery door, put on the protector before using the meter.

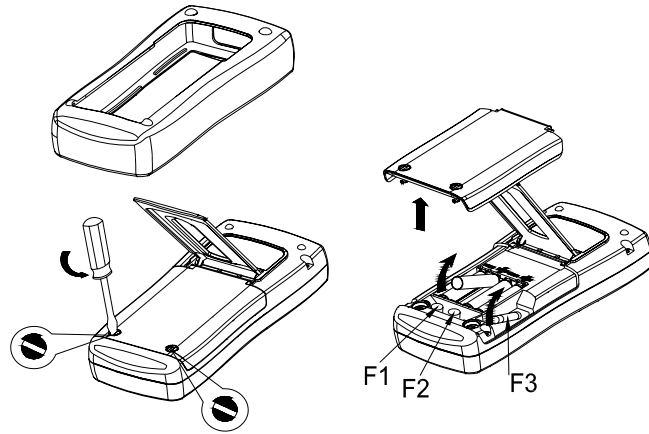


Figure 20 Replacing batteries and fuses

14 How to use the charger

Warning

- The charger could be used only to specified product.
- Make sure the voltage of the AC power is same with the given voltage of the charger before connecting them.
- Do not shut circuit the output plug of the charger.
- Do not charge non-Ni-Cd, non-Ni-MH battery or wasted battery.

Step 1: Turn off the calibrator.

Step 2: Connect the plug into the charging jack of the terminal.

Step 3: Plug the charger into the AC power.

Note:

In normal charging function, the indicating light of the charger lights on.

When finished, the charging function stops automatically, and the indicating light becomes dark.

Blinking of the indicating light means the charger is not connected or no battery is inside.

Note:

Do not use the calibrator when it undergoes charging, otherwise, the charging will be prolonged.

15 Maintenance

15.1 cleaning the calibrator

Warning

To avoid electrical shock or damaging the meter, serve the meter only by the replacement parts specified and never get water inside the case.

Caution

To avoid damaging the plastic lens and case, do not use solvents or abrasive cleansers.

Clean the Calibrator with a soft cloth dampened with water or water and mild soap.

15.2 Calibration or Sending to the Service Center

Calibration, maintenance or repair work unmentioned in this manual should be undertaken by the experienced worker. If the meter operates abnormally, inspect the batteries first and replace them if necessary.

If you suspect that the meter has failed, review this manual to make sure you are operating it correctly. If the meter still fails to operate properly, pack it securely (in its original container if available) and forward it, postage paid, to the nearest Service Center. The company assumes NO responsibility for damage in transit.

The Company guarantees a rapid repair and maintenance and delivers the meter back as soon as possible. Please refer to the Warranty. If the warranty is due, you will be billed for the maintenance and repair work. If the calibrator or the pressure module is not within the Warranty range, you can contact the warranted service center for enquiring about the expenditure. Please refer to the Chapter “Contact Us” to find a warranted service center.

15.3 Replacement of Parts

All the types of parts are listed in Table 6, see Figure 21 as reference.

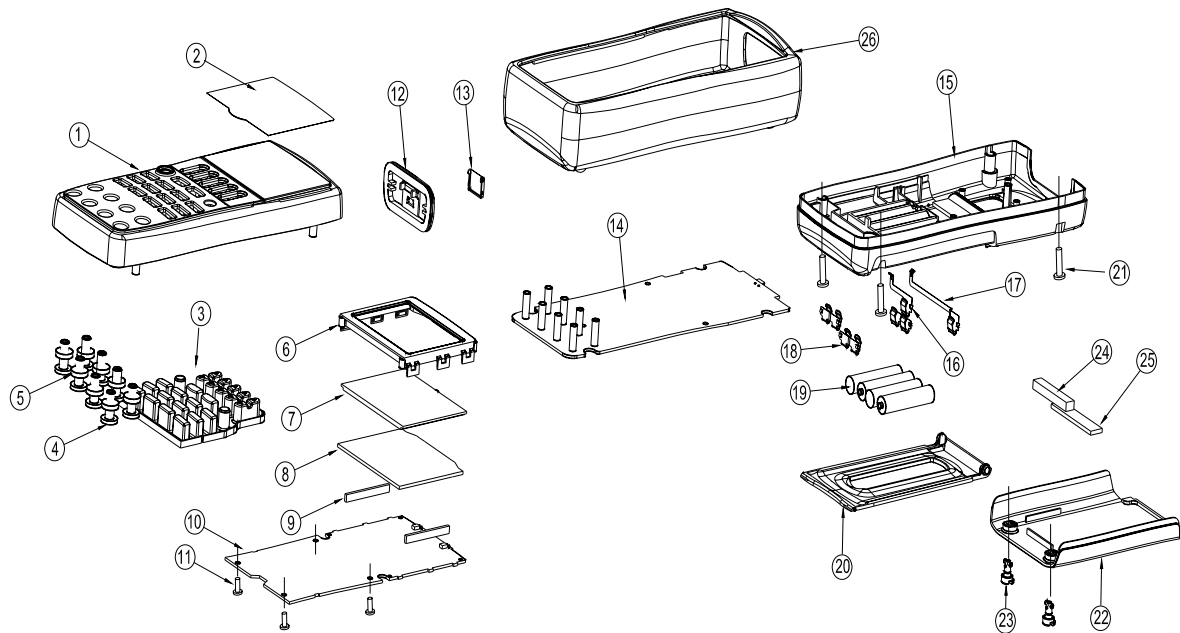


Figure 21. Replacing part

Table 6. Replacing parts

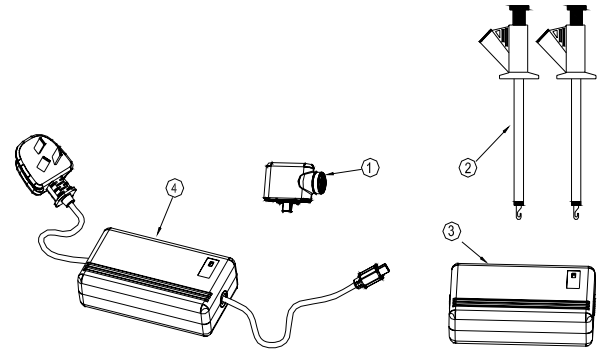
Item	Instruction	Quantity	Item	Instruction	Quantity
1	Top panel	1	15	Bottom Panel	1
2	plastic lens	1	16	Spring A	1
3	Rubber Key	1	17	Spring B	1
4	Terminal Wrapper	8	18	Spring C	3
5	Terminal Gasket	8	19	AAA Alkaline battery	4
6	LCD Frame	1	20	Tilt-stand	1
7	LCD	1	21	Screw M3*16	4
8	Backlight Panel	1	22	Battery Door	1
9	Conductive Rubber wire	2	23	Plastic Screw	2
10	LCD Circuit Panel	1	24	Sponge : length×width×height = 40×6×6	1
11	Screw M3*8	4	25	Sponge : length×width×height = 48×10×2.5	1
12	Terminal Cover	1	26	Outer Protector	1
13	Cover Door	1			
14	Main Circuit Panel	1			

16 Options

For more information about the options (see Figure 22) and its price, please contact the representative of the company. For information about relevant pressure module and its type (see Table 8 and Table 9). For information about the new pressure module, which isn't listed in Table 8 and table 9, please contact the representative of the company.

Table 7 Options

No.	Name of the Options	Mode
1	CALCP Pressure module convertor	A000018
2	Test Hoop	TP907110
3	CA Battery Parcel	A000021
4	CA Charger	A000020



F
Figure 22 Options

17 Specifications and Capacitance of External Pressure Module

The pressure module output can possibly cause overflow the five digits of LCD. Or when choosing an unsuitable unit, the value cannot be read due to smallness. LCD displays OL (overload) if the reading exceeds those range listed in the following table.

Table 8.APM-S Pressure Module Specification

Part number	Range	Pressure Type	1 Reference Accuracy	2 Entire Accuracy
3APM010WGSG	0to2.49kPa(0to 10 inH ₂ O)	gauge	0.20%	0.30%
APM007KGSG	0to7kPa	gauge	0.10%	0.20%
APM035KGSG	0to35kPa	gauge	0.035%	0.07%
APM070KGSG	0to70kPa	gauge	0.035%	0.07%
APM001BGSG	0to100kPa	gauge	0.035%	0.07%
APM160KGSG	0to160kPa	gauge	0.035%	0.07%

APM200KGSG	0to200kPa	gauge	0.025%	0.05%
APM250KGSG	0to250kPa	gauge	0.025%	0.05%
APM004BGSG	0to400kPa	gauge	0.025%	0.05%
APM006BGSG	0to600kPa	gauge	0.025%	0.05%
APM010BGSG	0to1MPa	gauge	0.025%	0.05%
APM016BGSG	0to1.6MPa	gauge	0.025%	0.05%
APM021BGSG	0to2.1MPa	gauge	0.025%	0.05%
APM025BGSG	0to2.5MPa	gauge	0.025%	0.05%
APM040BGSG	0to4MPa	gauge	0.025%	0.05%
APM060BGSG	0to6MPa	gauge	0.025%	0.05%

APM100BGSG	0to10MPa	gauge	0.025%	0.05%
APM160BGSG	0to16MPa	gauge	0.025%	0.05%
APM200BGSG	0to20MPa	gauge	0.025%	0.05%
APM250BGSG	0to25MPa	gauge	0.025%	0.05%
APM400BGSG	0to40MPa	gauge	0.025%	0.05%
APM600BGSG	0to60MPa	gauge	0.025%	0.05%
APM700BGSG	0to70MPa	gauge	0.025%	0.05%
APM005PDSG	0to34kPa(0to 5psi)	Differential	0.035%	0.07%
APM100PDSG	0to689kPa(0to 100psi)	Differential	0.025%	0.05%
APM005PASG	0to34kPa(0to 5psi)	absolute	0.035%	0.07%

APM015PASG	0to103kPa(0to15psi)	absolute	0.025%	0.05%
APM030PASG	0to207kPa(0to 30psi)	absolute	0.025%	0.05%
APM007BASG	0to700kPa	absolute	0.025%	0.05%
APM200PCSG	-103kPa to 1.379MPa (-15 to 200psi)	combination	0.025%	0.05%
APM001BCSG	-100kPa to 100kPa / -1bar to 1bar	combination	0.035%	0.07%
APM001BVSG	-100kPa to 0kPa	Vacuum	0.035%	0.07%

1. Reference Accuracy is defined as the full scale range accuracy gained in the lab environment.
2. Entire Accuracy is defined as the full scale range accuracy in one year including 0°C-50°C temperature compensation.
3. APM010WGSG pressure module terminal is non-isolated, which is compatible only with dry or non-corrosive air. Other pressure module terminal is 316LSS isolation, which can be combined with all mediums compatible with 316-type stainless steel, all pressure module reference terminal are non-isolated.

Table 9. APM-H Pressure Module Specification

APM-H Pressure Module 1 Accuracy 0.010%F.S.		
APM005PGHG	103kPa(15psi)	gauge
APM020PGHG	345kPa(50psi)	gauge
APM100PGHG	689kPa(100psi)	gauge
APM500PGHG	3450kPa(500psi)	gauge
APM01KPGHG	6890kPa(1000psi)	gauge
APM015PAHG	103kPa(15psi)	absolute
APM050PAHG	345kPa(50psi)	absolute
APM100PAHG	689kPa(100psi)	absolute
APM500PAHG	3450kPa(500psi)	absolute
APM01KPAHG	6890kPa(1000psi)	absolute
APM03KPAHG	20670kPa(3000psi)	absolute

1. Six-month full scale range accuracy includes 15°C-45°C temperature compensation.
2. All pressure terminals are non-isolated, which are compatible only with dry or non-corrosive air.

18 Specifications

General Specifications for measure

These specifications assume:

- A 1-year calibration cycle
- An operating temperature of 18□ to 28□
- Relative humidity of 35% to 70% (non_condensing)

Accuracy is expressed as ± (percentage of reading + percentage of range).

Function	Reference	Range	Resolution	Accuracy	Remark
DCV	200mV	-20.00mV ~ 220.00mV	10μV	0.02+0.02	Input Resistance : 100MΩ
	5V	-0.5000V ~ 5.5000V	0.1mV	0.02+0.01	Input Resistance : 1MΩ
	50V	-5.000V ~ 55.000V	1mV	0.03+0.01	
DCmA	50mA	-4.000mA ~ 55.000mA	1μA	0.02+0.01	Input Resistance : 5Ω
FREQ	500Hz	3Hz ~ 500.00Hz	0.01Hz	±2digit	Input Impedance : 100 kΩ at least; Sensitivity : 3Vp-p minimum; Duty Cycle: 50%.
	5KHz	3Hz ~ 5.0000KHz	0.1Hz		
	50KHz	3Hz ~ 50.000KHz	1Hz		
*CONT.	≤250Ω sound	OPEN/CLOSE			Open voltage: 2.5V

* In pressure switch module, shows specification of switch.

Other feature:

- Rate: 2 Readings per Second about
- DCV
Normal Mode Rejection Ratio (NMRR) $\geq 120\text{dB}$ (at 50Hz or 60Hz)
Common Mode Rejection Ratio (CMRR) $\geq 60\text{dB}$ (at 50Hz or 60Hz)
- Temperature Coefficient: 0.1 times the applicable accuracy specification per degree °C for 5 °C to 18°C and 28°C to 50°C.
- Maximum voltage between V Ω Hz terminal and COM terminal: 60 Vpk
- Maximum Input current: 55mA
- Protected with a 63mA/250V fast blow fuse

General Specifications for Source

These specifications assume :

A 1-year calibration cycle

An operating temperature of 18°C to 28°C (64.4°C ~82.4°C)

Relative humidity of 35% to 70% (non_condensing)

Accuracy is expressed as \pm (percentage of set value + percentage of range)

Function	Reference	Range	Resolution	Accuracy	Remark
DCV	1000mV	-100.000mV~ 1100.000mV	10 μ V	0.02+0.01	Maximum output current: 2mA
	10V	-1.0000V~ 11.0000V	0.1mV	0.02+0.01	Maximum output current: 5mA
DCA	20mA	0.000mA~ 22.000mA	1 μ A	0.02+0.02	External supply for simulate mA: 5V–28V Maximum load 1K Ω at 20mA
FREQ	100Hz	1.00Hz~ 110.00Hz	0.01Hz	± 2 count	Output voltage: 1~11 V_{p-p} (zero base waveform); Amplitude accuracy: $\pm(10\% + 0.5V)$; Maximum load: >100 K Ω ; Duty Cycle: 50%.
	1KHz	0.100kHz~ 1.100KHz	1Hz		
	10KHz	1.0KHz~ 11.0KHz	0.1KHz		
PULSE	100Hz	1~100000 cycles	1cyc	_____	Output voltage: 1~11 V_{p-p} (zero base waveform);
	1KHz				

	10KHz				Amplitude accuracy: $\pm(10\% + 0.5V)$; Maximum load: $>100\text{ K}\Omega$; Duty Cycle: 50%.
LOOP	24V			$\pm 10\%$	Maximum current: 25 mA Short circuit protected

Other feature:

- Temperature Coefficient: 0.1 times the applicable accuracy specification per degree °C for 5°C to 18°C and 28°C to 50°C .
- Maximum voltage between any output terminal and earth: 30Vpk
Maximum output current: Approximately 25mA.

General Specifications for Pressure

Function	Reference	Range	Resolution	Accuracy	Remark
PRESSURE	Determined by pressure module	_____	Determined by pressure module	Determined by pressure module	For more detail, refer the pressure module about APM.

Other feature:

- Temperature Coefficient: 0.1 times the applicable accuracy specification per degree °C for 5°C to 18°C and 28°C to 50°C.
- Maximum voltage between any output terminal and earth: 60Vpk
Maximum output current: Approximately 55mA.
- Protected with a 63mA/250V fast blow fuse

19 Points for Attention to Use of Operation Instruction

- 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.

MUMBAI

TEST CERTIFICATE

DIGITAL HIGH PRECISION MULTIFUNCTION CALIBRATOR

This Test Certificate warrants that the product has been inspected and tested in accordance with the published specifications.

The instrument has been calibrated by using equipment which has already been calibrated to standards traceable to national standards.

MODEL NO. KM-CAL-907

SERIAL NO. _____

DATE: _____

ISO 9001
REGISTERED



WARRANTY

Each "KUSAM-MECO" product is warranted to be free from defects in material and workmanship under normal use & service. The warranty period is one year (12 months) and begins from the date of despatch of goods. In case any defect occurs in functioning of the instrument, under proper use, within the warranty period, the same will be rectified by us free of charges, provided the to and fro freight charges are borne by you. This warranty extends only to the original buyer or end-user customer of a "KUSAM-MECO" authorized dealer.

This warranty does not apply for damaged IC's, fuses, burnt PCB's, disposable batteries, carrying case, test leads, or to any product which in "KUSAM-

MECO's" opinion, has been misused, altered, neglected, contaminated or damaged by accident or abnormal conditions of operation or handling. "KUSAM-MECO" authorized dealer shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of "KUSAM-MECO".

"KUSAM-MECO's" warranty obligation is limited, at option, free of charge repair, or replacement of a defective product which is returned to a "KUSAM-MECO" authorized service center within the warranty period.

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