

Thank you for purchasing the CA11E HANDY CAL. Prior to using, read this User's Manual carefully to fully and properly utilize all of the features of this instrument. Also, refer as needed to IM CA11E-02-E, an additional User's Manual for this instrument.

### 1. Safety Precautions

When operating the instrument, strictly observe the precautions below to ensure its correct and safe operation. If used other than as instructed in this manual, Yokogawa Meters & Instruments Corporation is not liable for any damage that may result.

#### ■ The following safety symbols are used on the instrument and in the manual:

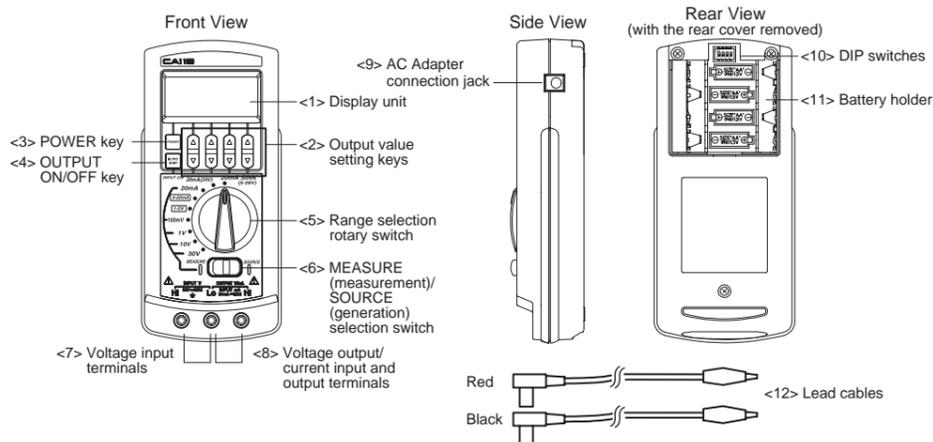
-  Danger! Handle with care. This symbol indicates that the operator must refer to an explanation in the User's Manual in order to avoid risk of injury or death of personnel or damage to the instrument.
-  **WARNING** Indicates a hazard that may result in the loss of life or serious injury of the user unless the described instruction is abided by.
-  **CAUTION** Indicates a hazard that may result in an injury to the user and/or physical damage to the product or other equipment unless the described instruction is abided by.
-  **NOTE** Indicates information that is essential for handling the instrument or, should be noted in order to familiarize yourself with the instrument's operating procedures and/or functions.

#### ■ Damage to the instrument, personal injury or even death may result from electrical shock or other factors. To avoid this, follow the precautions below:

#### **WARNING**

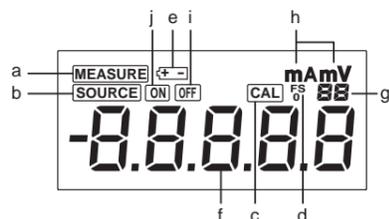
- **Use where gases may be present**  
Do not operate the instrument in a location where flammable or explosive gas/vapor present. It is extremely hazardous to operate the instrument in such an atmosphere.
- **External connection**  
If necessary to touch a circuit to make an external connection, turn off the power to that circuit, ensure there is no voltage, then perform the connection. When replacing the batteries, disconnect the lead cables in advance.
- **Disassembly**  
Do not disassemble or remodel the instrument yourself. This needs to be done by our service personnel.

### 2. Names and Functions of Parts



#### <1> Display unit

- a. MEASURE  
Lights up when MEASURE (measurement) is selected using the selection switch <6>.
- b. SOURCE  
Lights up when SOURCE (generation) is selected using the selection switch <6>.
- c. CAL  
Lights up in the calibration mode.
- d. 0/FS  
Lights up or blinks when offset or full-scale adjustment is performed in the calibration mode.
- e.   
This mark indicates the battery's status. When lit, it indicates the batteries will soon need replacing. When blinking, it indicates that they must be replaced (see Section 3, "Replacing the Batteries").
- f. Main Seven Segment  
Displays a measured value or an output value.
- g. Sub Seven Segment  
"SP" appears here when the sweep function (see Section 7, "Other Features") is selected in SOURCE mode (signal generation). It also displays the lower two digits of a measured or an output value in the calibration mode.
- h. Displays the unit of the range selected.
- i. OFF  
In SOURCE mode (signal generation), it lights up when the output is turned off or when the protective circuit is activated.  
In MEASURE mode (measurement), it lights up only when the protective circuit is activated.
- j. ON  
It lights up when the output is turned on in SOURCE mode (signal generation).



#### <2> Output value setting keys

Sets an output value SOURCE mode (signal generation). The [▲]/[▼] keys are provided under the lower four digits, whose values are increased or decreased in increments of 1. Carry of the digit is applied to increasing the value (pressing the [▲] key) when it is 9. Borrow of the digit is applied to decreasing the value (pressing the [▼] key) when it is 0.  
For the 4-20 mA and 1-5 V ranges, see Subsection 5.2, "Generating DC current or DC voltage."

#### <3> POWER key

Turns on/off the power supply. For more information, see Section 4, "Turning the Power On/Off."

#### <4> OUTPUT ON/OFF key

Turns the output on/off in SOURCE mode (signal generation). In MEASURE mode (measurement), it returns measurement operation to normal status after the protective circuit is activated.

#### <5> Range selection rotary switch

Selects a range for SOURCE mode (signal generation) or MEASURE mode (measurement). Note that the 4-20 mA and 1-5 V ranges are step output ranges in signal generation and are the same as the 20 mA and 10 V ranges in measurement, respectively. For invalid ranges, terminal-to-terminal connection becomes open, causing "nC-" and "OFF" to appear on the display unit.

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#### ■ Notice regarding the Manual

- <1> The information contained in this User's Manual is subject to change without notice.
- <2> Every effort has been made to ensure that the information contained herein is accurate. However, should any concerns, errors, or omissions come to your attention, or if you have any comments, please contact us.

#### <6> MEASURE (measurement) / SOURCE (generation) selection switch

Selects MEASURE (measurement) or SOURCE (generation).

#### <7> Voltage input terminals

Used to measure a voltage range.

#### <8> Voltage output/current input and output terminals

Used for SOURCE mode (signal generation) in the voltage range, and for MEASURE mode (measurement) and SOURCE mode (signal generation) in the current range.

#### <9> AC Adapter connection jack

Used to connect an AC adapter (optional).

#### <10> DIP switches

See Section 7, "Other Features."

#### <11> Battery holder

Contains four AA-size batteries. See Section 3, "Replacing the Batteries."

#### <12> Lead cables for measurement or generation

Used to connect the instrument to the device under measurement/generation.

### 3. Replacing Batteries

When the  mark is blinking on the display unit, the batteries are exhausted. Replace them according to the following procedure:

- <1> Check that the power is turned off (disconnect the lead cables).
- <2> Slide off the cover at the back of the instrument.
- <3> Replace all four batteries with new ones. Insert them according to the polarity directions shown inside the holder.
- <4> After replacing the batteries, return the cover to the original position.

#### ■ Connecting the AC Power (optional)

##### Before connecting the AC power

Strictly observe the following warnings to avoid electrical shock or damage to the instrument.

#### **WARNING**

- Do not use any AC adapter other than the dedicated AC adapter (A1020UP, A1022UP, B9108WB) from Yokogawa.
- Before connecting the power cord, check that the supply voltage matches the rated voltage of the instrument.
- Before connecting the power cord, check that the instrument's power key is OFF.

##### Connection procedure:

- <1> Check that the [POWER] key of the instrument is off.
- <2> Connect the AC adapter (optional) to the instrument's AC adapter connection jack. (Note that unless the AC adapter is connected to the power outlet, the power cannot be turned on).

### 4. Turning the Power On/Off

#### ■ Operating the POWER Key

When the instrument's power is off, pressing and holding the [POWER] key for more than 1 second causes the power to be turned on. Pressing the key again causes it to be turned off.

When the power is turned on, the instrument starts a self-test and displays "CA11E." Then the features selected using the range selection rotary switch and the MEASURE/SOURCE selection switch start functioning.

- For battery-driven operations, disconnect the AC adapter from the instrument.

#### ■ Automatic Power Off

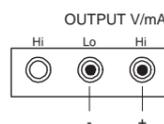
In the factory setting, all indications start blinking if the instrument has not been operated for about 9.5 minutes. Then, if the instrument is not operated for another 30 seconds, it automatically turns off. To disable this automatic power off feature, see Section 7, "Other Features."

If you wish to keep the instrument turned on after the indications start blinking, press the [POWER] key (or any other key). This causes the blinking to return to normal lighting, without changing the previous settings.

### 5. SOURCE (generation)

#### 5.1 Connecting the Output Terminals

- <1> Insert the plugs of the supplied lead cables into the output terminals of the instrument.
- <2> Connect the clips on the other ends of the cables to the input terminals of the device under generation.



#### **CAUTION**

- Do not apply any voltages to the output terminals except for the 20 mA SINK range. If voltage is applied mistakenly, the internal circuit may be damaged.
- As the instrument is calibrated without the voltage drop of the lead cables, error due to the resistance of the lead cables (approx. 0.1 Ω for go and return) must be considered for load current measurement.

#### 5.2 Generating DC Current or DC Voltage

The instrument generates voltage or current at a specified value through the output terminals. In valid ranges, terminal-to-terminal connection opens, and the display unit indicates "nC-" and "OFF."

**Normal setting:**

- <1> Switch the MEASURE/SOURCE selection switch to "SOURCE" (generation). This causes the display unit to show "SOURCE" and "OFF."
- <2> Select the range to be generated using the range selection rotary switch. The display unit shows an initial value and unit for each range.
- <3> Press the [▲]/[▼] keys under the lower four digits to set an output value (5th digit: changes by carry and borrow of the value from the 4th digit).
- <4> Press the [OUTPUT ON/OFF] key to output a signal. The display unit shows "ON."  
To stop the output, press the [OUTPUT ON/OFF] key again. This causes "OFF" to appear on the display unit and the terminals to open.

**Allowable load**

The instrument should be used according to the maximum output and the maximum load range (See Section 9, "Specifications").  
Current SINK (absorb) is only possible in the 20 mA SINK range.

**1-5 V step output range**

In the 1-5 V range, the [▲]/[▼] keys for the most significant digit can be used to step up or down by 1 V. For the lower three digits, these keys are used to increase or decrease the value of each digit in increments of 1.

**4-20 mA step output range**

Use the range selection rotary switch to select 4-20 mA.  
5-digit resolution

Set Dip Switch 3 to "OFF."  
Use the [▲]/[▼] keys under the upper one digit to change the value in increments of 4 mA: 4↔8↔12↔16↔20 mA.  
For the lower three digits, these keys are used to increase or decrease the value of each digit in increments of 1.

4-digit resolution

Set Dip Switch 3 to "ON."  
Use the [▲]/[▼] keys under the upper two digit to change the value in increments of 4 mA: 4↔8↔12↔16↔20 mA.  
For the lower two digits, these keys are used to increase or decrease the value of each digit in increments of 1.

For more information, see Subsection 7.2, "Switching Display Resolution."

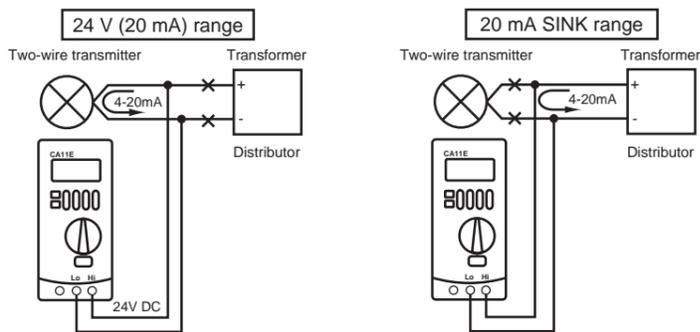
**24 V (20 mA) range**

In the 24 V output (20 mA measurement) range, the instrument can be used as a source of constant voltage (24 V) to conduct a loop test of a transmitter. Select "24 V (20 mA)" and SOURCE using the respective switches. Press the [OUTPUT ON/OFF] key to set the output to "ON" (for 24 V DC output). The display unit shows the current measurement and "SOURCE" (for 20 mA measurement).

**20 mA SINK range**

The instrument can absorb (SINK) a current with a specified value sent from an external voltage generator (distributor) to the "Hi" terminal of the instrument. As the instrument serves as a two-wire transmitter, it can be used for a loop test. Select "20 mA SINK" and SOURCE using the respective switches. Press the [OUTPUT ON/OFF] key to set the output to "ON."  
The display unit shows the set value (SINK) and "SOURCE."

Uses an external power supply for 20 mA SINK in the range of 5-28 V. The polarity of applied voltage should be as shown in the figures below. Be careful not to apply voltage in the opposite direction.



**Output limiter**

If a load current in the voltage range or a load voltage in the current range exceeds the maximum value specified in the specifications, the protective limiter is activated, turning off the output signal. To recover from this condition, correct the load to normal status and press the [OUTPUT ON/OFF] key to turn on output.

**Sweep function**

This function increases or decreases the output level to the preset level as a constant rate by setting DIP switch 1 to ON. For more information, see Subsection 7.1, "Sweep Function."

**6. Measurement**

**WARNING**

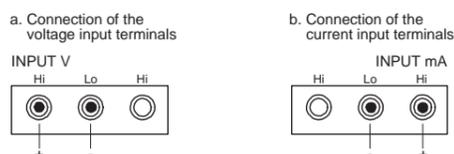
- When connecting the device under measurement, turn off the power of the device. Connecting/disconnecting the lead cables for measurement without turning off the power of the device under measurement may be extremely dangerous.
- Special care should be taken to avoid connecting a current circuit to the voltage input terminals or a voltage circuit to the current input terminals. Inadvertent connection may not only cause damage to the circuit or device under measurement and the instrument, but may also be dangerous to personnel.
- Always use the lead cables supplied with the instrument.
- Maximum allowable voltage between all input/output terminals and ground is 30 V DC. Any voltage exceeding this level may not only damage the instrument, but also cause injury to personnel. Never attempt to apply such voltage.

**CAUTION**

- Do not apply voltage exceeding the maximum allowable input voltage to the voltage input terminals. This may damage the instrument. Maximum input voltage: 30 V DC
- Do not apply current exceeding the maximum allowable input current to the current input terminals. If current exceeding this level is applied, built-in fuses for protecting the current input circuit will burn out. If a fuse burns out, contact us for repair. Maximum input current: 24 mA

**6.1 Connecting Procedure**

- <1> Insert the plugs of the supplied lead cables into the terminals of the CA11E as shown in figure "a" below for voltage or in figure "b" below for current.
- <2> Connect the clips on the other ends to the input terminals of the device under measurement.



**6.2 Measuring DC Voltage and DC Current**

- <1> Switch the MEASURE/SOURCE selection switch to MEASURE (measurement). MEASURE lights up on the display unit.
- <2> Select the range to be measured using the range selection rotary switch.

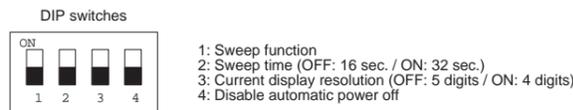
- The display unit shows the measurement results and unit. Indication of the measurement results will be updated approximately every second.
- If an input signal is over range or not measurable, the display unit shows "----."
- For invalid ranges, terminal-to-terminal connection becomes open, causing the display unit to show "-nC-" and "OFF."

**Input limiter**

If voltage is applied to the current input terminals or excessive current is applied to them, the internal protective circuit is activated, opening the terminal-to-terminal connection and causing the display unit to show "OFF."  
In this case, check that the connection is correct and press the [INPUT ON] key (= [OUTPUT ON/OFF] key). This causes the OFF indication to disappear and measurement to resume.

**7. Other Features**

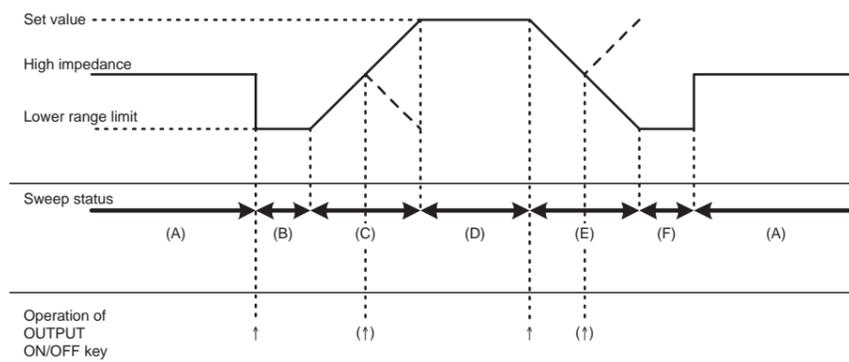
The following features are available depending on the settings of the DIP switches, which can be accessed by removing the cover from the back of the instrument.



**7.1 Sweep Function**

By setting DIP switch 1 to ON, the output level can be increased or decreased to the preset level at a constant rate. This function cannot be used in the 24 V (20 mA) range.

**Output status transition diagram**



**Operation procedure**

- <1> Turn on DIP switch 1.
- <2> Use DIP switch 2 to select sweeping time (16 or 32 seconds)
- <3> Set the MEASURE/SOURCE selection switch to SOURCE. The display unit shows "SOURCE," "OFF," "SP," and lower limit (initial value).
- <4> Use the [▲]/[▼] keys to preset the upper limit for output in the same way as for normal signal generation (Status A above).
- <5> Press the [OUTPUT ON/OFF] key.
  - (B) The display unit shows "ON" and a lower limit (initial value) for 2 seconds, and the instrument outputs that value.
  - (C) Then the reading on the display unit and the output level automatically increase to the upper limit set in Step <4> at the constant sweep time rate set in Step <2>. The display unit shows the "ON" light blinking. In this case, if you press the [OUTPUT ON/OFF] key again, the reading and the output level will start decreasing from that value at a constant rate. The output status changes to Status E (shown by dotted-lines in the figure).
  - (D) When the reading and the output level reach the set values, they remain at these levels until the [OUTPUT ON/OFF] key is pressed. The display unit's "ON" light comes on. In this case, if you press the [OUTPUT ON/OFF] key, the reading and the output level start decreasing from that value at a constant rate. The output status changes to Status E.
  - (E) Then the reading and the output level automatically decrease to the set lower limits at the constant sweep time rate set in Step <1>. The display unit shows the "OFF" light blinking. In this case, if you press the [OUTPUT ON/OFF] key again, the reading and the output level start increasing from that value at a constant rate. The output status changes to Status C (shown by dotted-lines in the figure).
  - (F) Then the reading and the output level reach the lower limits and remain at these levels for 3 seconds. The display unit's "ON" light comes on.

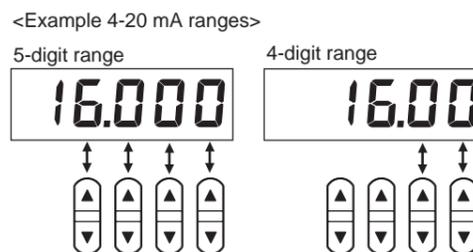
<6> Return to Step <4>.

**Canceling the sweep function**

- <7> Open the cover at the back of the instrument and set DIP switch 1 to off.

**7.2 Switching Display Resolution**

By changing the setting of DIP switch 3, the display resolution (5 digit/4 digit) can be selected. The available ranges are as follows:  
SOURCE: 20 mA, 4-20 mA, 24 V (20 mA), 20 mA SINK  
MEASURE: 20 mA, (4-20 mA)



**7.3 Disabling Automatic Power Off**

According to the factory setting of the instrument, it automatically turns itself off if not operated for about 10 minutes. By setting DIP switch 4 to "ON," this function can be disabled. However, when the instrument is battery-driven, it is generally recommended that this switch be set to "OFF" in order to prevent the batteries from being exhausted.