

In addition to this User's Manual, there is another manual for the instrument, IM CA11E-01-E, which provides instructions for its safe use and explains its functions. Refer to it as needed.

YOKOGAWA
Yokogawa Meters & Instruments Corporation

IM CA11E-02E
1st Edition Apr. 2006 (KP)

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8. Calibration Procedure

■ Calibration Procedure

To maintain a high level of accuracy, it is recommended that the CA11E HANDY CAL be calibrated annually. The "Selecting the Standards" section below presents calibration methods using the recommended standards.

■ Selecting the Standards

Source feature

Items to be calibrated	Names of standards	Range	Measuring range	Accuracy	Remarks
DCV	Digital multimeter	100 mV 1000 mV 10 V 30 V	Max.110 mV Max.1.1 V Max.11 V Max.33 V	$\pm(0.005\%+5 \mu\text{V})$ $\pm(0.005\%+20 \mu\text{V})$ $\pm(0.005\%+200 \mu\text{V})$ $\pm(0.005\%+2 \text{ mV})$	Model 7561 (Yokogawa) or equivalent
20 mA	Digital multimeter	20 mA(4-20 mA)	Max.24 mA		
20 mASINK	Digital multimeter, standard DC voltage generator	20 mASINK	0.01 to 24 mA 5 to 28 V	$\pm(0.001\%+0.8 \mu\text{V})$	

Measurement feature

Items to be calibrated	Names of standards	Range	Generated value	Accuracy	Remarks
DCV	Standard DC voltage generator	100 mV 1000 mV 10 V(1-5 V) 30 V	100 mV 1 V 10 V 30 V	$\pm(0.01\%/100 \text{ mV})$ $\pm(0.01\%/1 \text{ V})$ $\pm(0.01\%/10 \text{ V})$ $\pm(0.02\%/30 \text{ V})$	Model 2552 (Yokogawa) or equivalent
20 mA	Standard DC current generator	20 mA(4-20 mA)	20 mA	$\pm 0.02\%/20 \text{ mA}$	

■ Environmental Conditions for Calibration

Ambient temperature: $23 \pm 1^\circ\text{C}$
Relative humidity: 45 to 75% R.H.
Warm-up: Warm-up time as specified for the standard

■ Calibration Points

- The calibration points are as specified in the following tables.
- It is possible to independently select the necessary range to be recalibrated.
- Always calibrate the zero (0) point and full scale (FS) as a pair for generation.

Source:

Calibration points	Standard Value*1
100 mV	0 FS
1 V	0 FS
10 V	0 FS
30 V	0 FS
20 mA	0 FS
20 mA SINK	0.1 FS

*1: Make adjustments to CA11E according to the reading of the standard (CA11E output Value) as specified in the table.

Measurement:

Calibration points	Standard Value*2
100 mV	FS
1 V	FS
10 V	FS
30 V	FS
20 mA	FS

*2: Set the Value to the standard as specified in the table.

■ Calibrating the Generation Feature

Operation procedure:

- Warm up the standard.
- Before turning on the power of the CA11E calibrator, connect it to the standard.
- Turn on the power of the instrument.
- Simultaneously press and hold the [▲1] and [▼4] keys (shown in the figure in the "Assignment of Keys for Calibration" section below) for about 2 seconds to enter the calibration mode.
- Select the generation range to calibrate using the MEASURE/SOURCE selection switch and range selection rotary switch. The display unit shows "CAL," "SOURCE," "ON," "0," and the lower limit.
- Read the output value of the CA11E using the standard (digital multimeter), and using the [▲] and [▼] adjustment keys adjust the CA11E so that the output value is set to the offset value. Then press the [▼1] input determination (ENTER) key to fix the setting. After fixing the setting, the display unit reading changes to "CAL," "SOURCE," "ON," "FS," and a full scale of the range.
- Read the output value of the CA11E using the standard (digital multimeter), and using the [▲] and [▼] adjustment keys adjust the CA11E so that the output value is set to the full scale value. Then press and hold the [▼1] input determination (ENTER) key for about 1 second to fix the setting. After fixing the setting, the display unit shows "0 FS" blinking. Re-press and hold the [▼1] input determination (ENTER) key for about 1 second to write the calibration coefficients to the EEPROM of the instrument. (This overwrites the previous calibration coefficients.) When this is complete, the instrument returns to the status in Step 5.
- Repeat Steps 5 to 7 for each range to be calibrated.

To return to the previous step:

- To return to the previous step without fixing the setting, press the [▲1] input cancellation key. Note that this is possible only before writing to the EEPROM.

To return to the normal operation mode:

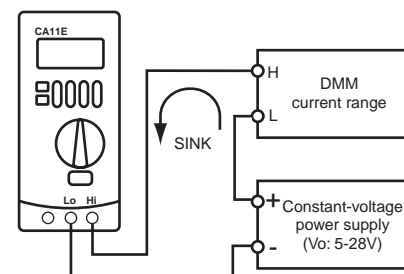
- Simultaneously press and hold the [▲1] and [▼4] keys (shown in the figure in the "Assignment of Keys for Calibration" section below) for about 2 seconds, or press the [POWER] key to turn off the power once and then press it again to turn it back on.

■ Notice regarding the Manual

- The information contained in this User's Manual is subject to change without notice.
- 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.

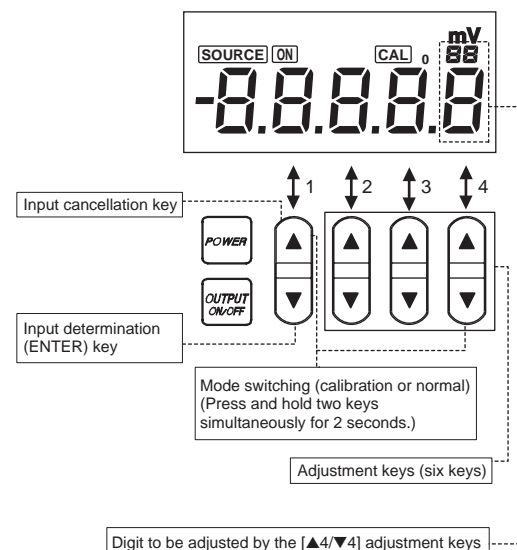
■ Calibration Precautions

- Connection for 20 mA SINK calibration
Connect the CA11E calibrator to the standard as shown below:



■ Assignment of Keys for Calibration

When the CA11E calibrator is in the calibration mode, keys are assigned as specified here.



■ Calibrating the Measurement Feature

Operation procedure:

- Warm up the standard.
- Before turning on the power of the CA11E calibrator, connect it to the standard.
- Turn on the power of the instrument.
- Simultaneously press and hold the [▲1] and [▼4] keys (shown in the figure in the "Assignment of Keys for Calibration" section below) for about 2 seconds to enter the calibration mode.
- Select the measurement range to calibrate using the MEASURE/SOURCE selection switch and range selection rotary switch. "CAL" and "MEASURE" appear and "FS" blinks on the display unit. (If a value nearly equivalent to full scale has been input, a measured value and "FS" appear.)
- Set up the standard in order to input the full scale value to the instrument. Wait until the reading stabilizes, then press and hold the [▼1] input determination (ENTER) key for about 1 second to fix the setting.
- After fixing the setting, "0" and "FS" indications on the display unit start blinking. Re-press and hold the [▼1] input determination (ENTER) key for about 1 second to write the calibration coefficients to the EEPROM of the instrument. (This overwrites the previous calibration coefficients.)
- Repeat Steps 5 to 7 for each range to be calibrated.

To return to the previous step:

- To return to the previous step without fixing the setting, press the [▲1] input cancellation key. Note that this is possible only before writing to the EEPROM.

To return to the normal operation mode:

- Simultaneously press and hold the [▲1] and [▼4] keys (shown in the figure in the "Assignment of Keys for Calibration" section below) for about 2 seconds, or press the [POWER] key to turn off the power once and then press it again to turn it back on.

9. Specifications

■ Source Functions

Accuracy: \pm (% of set value + μ V, mV or μ A), at $23 \pm 5^\circ\text{C}$

Range Selection	Range of Generated Signal	Accuracy	Setting Resolution	Remarks
30 V	0 to 30.00 V	0.05% + 20 mV	10 mV	Maximum output current: 1 mA
10 V	0 to 11.000 V	0.05% + 2 mV	1 mV	Maximum output current: 10 mA (When the load is 1k Ω or greater, and the error of the lead cables is also excluded.)
1-5 V	1/2/3/4/5 V		1 Vstep	
1 V	0 to 1100.0 mV	0.05% + 0.2 mV	0.1 mV	
100 mV	0 to 110.00 mV	0.05% + 50 μ V	10 μ V	
20 mA*	0 to 24.000 mA	0.05% + 4 μ A	0.1 μ A	Maximum load: 12 V
4-20 mA*	4/8/12/16/20 mA		4 mAstep	
24 V(20 mA)*	24 V	\pm 10%	—	Maximum current: 22 mA
20 mA SINK*	0.1 to 24.000 mA	0.1% + 4 μ A	1 μ A	External power supply: 5 to 28 V

Temperature coefficient: 1/10 of accuracy/ $^\circ\text{C}$, but (0.005% + 10 μ V)/ $^\circ\text{C}$ in the 100 mV range.

* The resolution can be changed between 5 digits and 4 digits using a DIP switch.

■ Measurement Functions

Accuracy: \pm (% of reading + least significant digits), at $23 \pm 5^\circ\text{C}$

Range Selection	Indication	Accuracy	Resolution	Remarks
30 V	0 to \pm 30.00 V	0.05% + 2 dgt	10 mV	Input impedance: Approximately 1 M Ω
10 V	0 to \pm 11.000 V	0.05% + 2 dgt	1 mV	
1 V	0 to \pm 1100.0 mV	0.05% + 2 dgt	0.1 mV	
100 mV	0 to \pm 110.00 mV	0.05% + 7 dgt	10 μ V	Input impedance: 45 Ω
20 mA*	0 to \pm 24.000 mA	0.05% + 4 dgt	1 μ A	

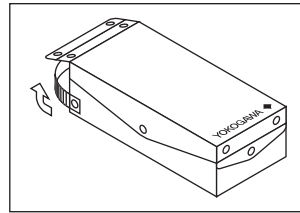
Temperature coefficient: 1/10 of accuracy/ $^\circ\text{C}$, but (0.005% + 10 μ V)/ $^\circ\text{C}$ in the 100 mV range.

* The resolution can be changed between 5 digits and 4 digits using a DIP switch.

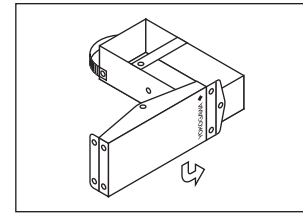
- Power supply: Four 1.5-V alkaline batteries (LR6, AA-size) or dedicated AC adapter (sold separately)
- Battery life: Approximately 50 hours for 5 V DC output with a load of 10 k Ω or greater (when running on alkaline batteries)
Approximately 25 hours for 20 mA output with a load of 5 V (when running on alkaline batteries)
- Automatic Power Off: After a period of approximately 10 minutes with no operations
- Generation Signal Level Setting: By four sets of up and down keys
- Response of generator: Approximately 1 second (between the time for an output signal to start changing and the time when it enters the accuracy range)
- Loading conditions: Less than 0.1 μ F (DC V)
- Measured-value indication updating intervals: Approximately 1 second
- Display: 7 segments LCD
- Maximum allowable applied voltage: 30 V DC between each terminal and ground
- Operating temperature and humidity range: 0 to 50 $^\circ\text{C}$, 20 to 80% R.H. (no condensation)
- Storage temperature and humidity range: -20 to 50 $^\circ\text{C}$, 90% R.H. or less (no condensation)
- Dimension: Approximately 192 (H) \times 92 (W) \times 42 (D) mm (excluding protrusions)
- Weight: Approximately 440 g
- Accessories: Lead cables (B9108MS) for measurement and generation (one pair, consisting of one black cable and one red cable)
4 alkaline batteries
2 User's manuals
- Optional accessories: Dedicated AC adapter (A1020UP: AC100V, A1022UP: AC120V, B9108WB: AC 220-240V)
Carrying case (B9108NK)
Rubber boot (93038)
Strap (97040)
Accessory case (B9108XA)
- Safety standards: EN61010-1 (only AC adapter B9108WB) (A1020UP and A1022UP are excluded.)
- EMC standards: EN61326 ClassB
EN55011 ClassB Group1
EN61000-3-2
EN61000-3-3
- Immunity: EN61326
Performance criterion under immunity test environments: B (self-returnable performance deterioration)
- Test conditions of EMC and Immunity standards: AC adapter (B9108WB) and Lead cables (B9108MS) are used.

10. How to Use the Carrying Case and Rubber Boot

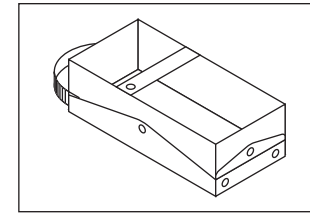
■ The carrying case (B9108NK) may be used as follows:



(1) Undo the fasteners on the top and sides of the case cover to open it.



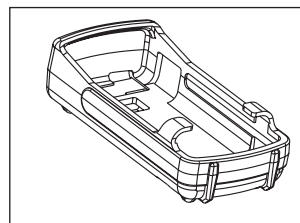
(2) With the fastener on the logo-side of the case centered, lift the cover and pivot it to the side and under the case itself.



(3) Re-do the fasteners at the top and sides of the cover.

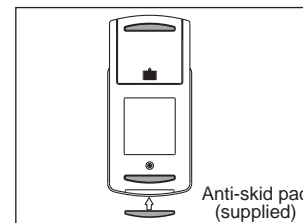
Note: The fastener on the logo-side cannot be undone.

■ Rubber Boot (93038)



The optional rubber boot provides shock protection and can be used with a strap.

■ Anti-skid pad



Anti-skid pad (supplied)

Note: When using the instrument with a rubber boot, the anti-skid pad at the bottom is not needed. When used without a rubber boot in a leaning position, the supplied anti-skid pad should be used.