User's Manual

CA11E
HANDY CAL
(Voltage/Current Calibrator) **- 2 -**

Keep this manual in a safe place so that you can refer to it when necessary.

Printed in Korea

YOKOGAWA
Yokogawa Meters & Instruments Corporation

IM CA11E-02E
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Safety Precautions

⚠ WARNING

The following manual, including this manual, are provided as manuals for the CA11E.
Please be sure to read all manuals.
IM CA11E-03EN (Getting Started Guide: For Safety)
IM CA11E-01E (User's Manual - 1 - : Generation, Measurement, and Other features)
IM CA11E-02E (User's Manual - 2 - : Calibration procedure and Specification): This manual

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 (DMM)	100 mV 1000 mV 10 V 30 V	Max. 110 mV Max. 1.1 V Max. 11 V Max. 33 V	±(0.005%+5 µV) ±(0.005%+20 µV) ±(0.005%+200 µV) ±(0.005%+2 mV)	Model 7561 (YOKOGAWA) or equivalent
20 mA	Digital multimeter	20 mA (4-20 mA)	Max. 24 mA	±(0.01%+0.8 µA)	
20 mA SINK	Digital multimeter, standard DC voltage generator	20 mA SINK	0.01 to 24 mA 5 to 28 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	±(0.01%/100 mV) ±(0.01%/1 V) ±(0.0%/10 V) ±(0.02%/30 V)	Model 2552 (YOKOGAWA) or equivalent
20 mA	Standard DC current generator	20 mA (4-20 mA)	20 mA	±(0.02%/20 mA)	---

■ Environmental Conditions for Calibration

Ambient temperature: 23 ± 1°C
Relative humidity: 45 to 75% RH
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	0 mV
	FS	100 mV
1 V	0	0 mV
	FS	1000 mV
10 V	0	0 V
	FS	10 V
30 V	0	0 V
	FS	30 V
20 mA	0	0 mA
	FS	20 mA
20 mA SINK	0.1	0.1 mA
	FS	20 mA

*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	100 mV
1 V	FS	1 V
10 V	FS	10 V
30 V	FS	30 V
20 mA	FS	20 mA

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

■ Calibration the Generation Feature

Operation procedure:

<1> Warm up the standard.
<2> Before turning on the power of the CA11E calibrator, connect it to the standard.
<3> Turn on the power of the instrument.
<4> Simultaneously press and hold the ▲1/▼4 keys (shown in the figure in the "Assignment of Keys for Calibration" section below) for about 2 seconds to enter the calibration mode.
<5> 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.
<6> Read the output value of the CA11E using the standard (digital multimeter), and using the ▲/▼ adjustment keys adjust the CA11E so that the output value is set to the offset 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 reading changes to "CAL," "SOURCE," "ON," "FS," and a full scale of the range.
<7> Read the output value of the CA11E using the standard (digital multimeter), and using the ▲/▼ 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.
<8> Repeat Steps 5 to 7 for each range to be calibrated.

To return to the previous step:

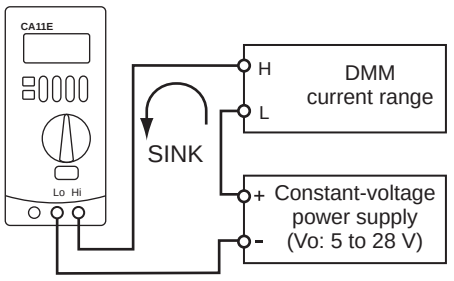
<9> To return to the previous step without fixing the setting, press and hold the ▲1 input cancellation key for about 1 second.
Note that this is possible only before writing to the EEPROM.

To return to the nomal operation mode:

<10> Simultaneously press and hold the ▲1/▼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.

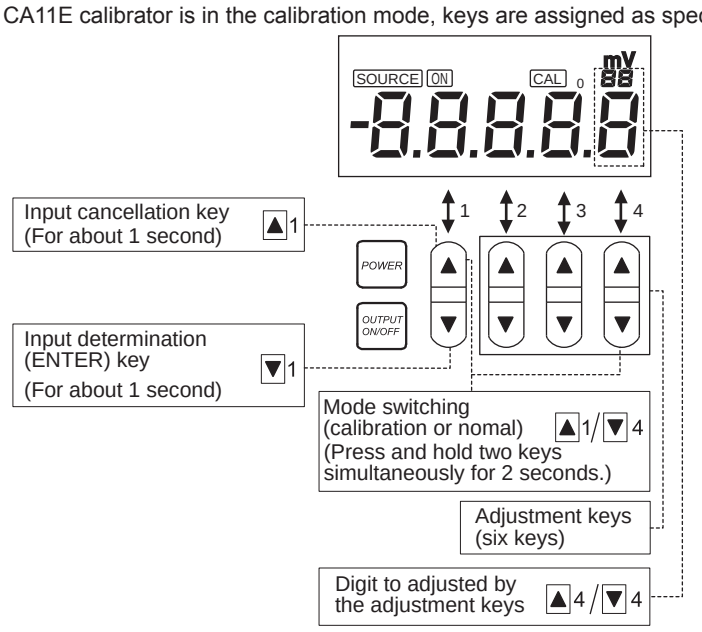
■ Calibration Precautions

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



■ Assignment of Keys for Calibration

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



■ Calibration the Measurement Feature

Operation procedure:

<1> Warm up the standard.
<2> Before turning on the power of the CA11E calibrator, connect it to the standard.
<3> Turn on the power of the instrument.
<4> Simultaneously press and hold the ▲1/▼4 keys (shown in the figure in the "Assignment of Keys for Calibration" section below) for about 2 seconds to enter the calibration mode.
<5> 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.)
<6> 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.
<7> 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.)
When this is complete, the instrument returns to the status in Step 5.
<8> Repeat Steps 5 to 7 for each range to be calibrated.

To return to the previous step:

<9> To return to the previous step without fixing the setting, press and hold the ▲1 input cancellation key for about 1 second.
Note that this is possible only before writing to the EEPROM.

To return to the nomal operation mode:

<10> Simultaneously press and hold the ▲1/▼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: ±(% of set value+μV, mV or μA), at 23±5°C

Range Selection	Renge of Generated Signal	Accuracy	Setting Resolution	Rmarks
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 *2: When the load is 1 kΩ or greater, and the error of the lead cables is also exculuded.
1-5 V	1/2/3/4/5 V		1 V step	
1 V	0 to 1100.0 mV	0.05%+0.2 mV *2	0.1 mV	
100 mV	0 to 110.00 mV	0.05%+50 μV	10 μV	---
20 mA *1	0 to 24.000 mA	0.05%+4 μA	1 μA	Maximum load: 12 V
4-20 mA *1	4/8/12/16/20 mA		4 mA step	
24 V (20 mA) *1	24 V	±10%	---	Maximum current: 22 mA
20 mA SINK *1	0.1 to 24.000 mA	0.1%+4 μA	1 μA	External power supply: 5 to 28 V

Temperature coefficient: 1/10 of accuracy/°C, but (0.005% + 10 μV)/°C in the 100 mV range.
*1: The resolution can be changed between 5 digits and 4 digits using a DIP switch.

■ Measurement Functions

Accuracy: ±(% of reading+least significant digits), at 23±5°C

Range Selection	Indication	Accuracy	Resolution	Rmarks
30 V	0 to ±30.00 V	0.05%+2 dgt	10 mV	Input impedance: Approx. 1 MΩ
10 V	0 to ±11.000 V	0.05%+2 dgt	1 mV	
1 V	0 to ±1100.0 mV	0.05%+2 dgt	0.1 mV	
100 mV	0 to ±110.00 mV	0.05%+7 dgt	10 μV	
20 mA *1	0 to ±24.000 mA	0.05%+4 dgt	1 μV	Input impedance: 45Ω

Temperature coefficient: 1/10 of accuracy/°C, but (0.005% + 10 μV)/°C in the 100 mV range.
*1: The resolution can be changed between 5 digits and 4 digits using a DIP switch.

■ General Specifications

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 kΩ 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 μF (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°C, 20 to 80% RH (no condensation)
Storage temperature and humidity range: -20 to 50°C, 90% RH or less (no condensation)
Dimension: Approximately 192 (H) × 92 (W) × 42 (D) mm (excluding protrusions)
Weight: Approximately 440 g (including batteries)
Accessories: Lead cables (B9108MS) for measurement and generation (one pair, consisting of one black cable and one red cable)
Alkaline batteries - - - 4 pieces
User's manuals - - - 3 copies
Optional accessories: Dedicated AC adapter
94012: AC100 V, 94013: AC120 V,
94016: AC 220-240 V (94016-F: VDE standard, 94016-S: BS standard)
Lead cables (B9108MS) for measurement and generation (one set, consisting of one black cable and one red cable)
Carrying case (B9108NK)
Rubber boot (93038)
Strap (97040)
Accessory case (B9108XA)

Safety standards: EN61010-1, EN61010-2-030
(only AC adapter 94016, 94012 and 94013 are excluded.)
Measurement category O (other)
Indoor use, Altitude 2000 m or less, Pollution degree 2

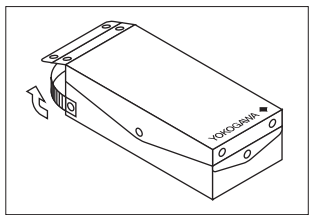
EMC standards: EN61326-1 ClassB,
EN61000-3-2, EN61000-3-3
EMC Regulatory Arrangement in Australia and New Zealand
EN55011 Class B, Group 1
Korea Electromagnetic Conformity Standard
(한국 전자파적합성기준)

Measurement error may temporarily occur under immunity environments.
Test conditions of EMC and Immunity standards:
AC adapter (94016) and Lead cables (B9108MS) are used.

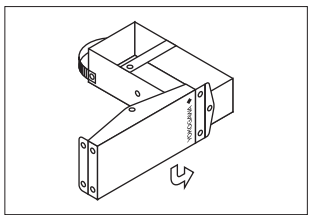
10. How to Use the Carrying Case and Rubber Boot

■ Carrying case (B9108NK)

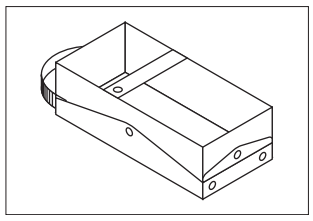
The carrying case (B9108NK) may be used as follows:



(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.

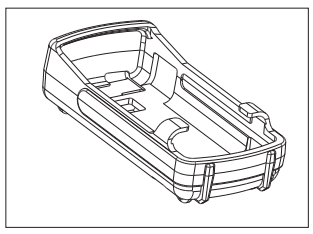


(3) Re-do the fasteners at the top and sides of the cover

NOTE

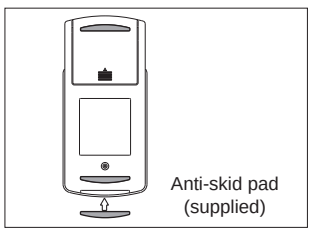
The fastener on the logo-side cannot be undone.

■ Rubber Boot (93038)



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

■ Anti-skid pad



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.

11.Sales in Each Country or Region

11.1 Disposing the Product

Waste Electrical and Electronic Equipment (WEEE), DIRECTIVE 2012/19/EU
(This directive is valid only in the EU.)

This Product complies with the WEEE Directive (2012/19/EU) marking requirement.
This marking indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category
With reference to the equipment types in the WEEE directive Annex I, this product is classified as a "Monitoring and Control instrumentation" product.
When disposing products in the EU, contact your local Yokogawa Europe B. V. office.
Do not dispose in domestic household waste.

11.2 How to Replace and Dispose the Batteries

New EU battery Directive, DIRECTIVE 2006/66/EC
(This directive is valid only in the EU.)
Batteries are included in this product.
When you remove batteries from this product and dispose them, discard them in accordance with domestic law concerning disposal.
Take a right action on waste batteries, because the collection system in the EU on waste batteries are regulated.

Battery type: Alkaline dry cell

Notice:
The marking indicates they shall be sorted out and collected as ordained in ANNEX II in DIRECTIVE 2006/66/EC.

How to remove batteries safely:
For more information, see Section 3. "Replacing Batteries" in User's Manual - 1 - (IM CA11E-01E).

11.3 Authorized Representative in the EEA

Yokogawa Europe BV. shall act as Authorized Representative of Yokogawa Meters & Instruments Corporation in the EEA for this Product.
To contact Yokogawa Europe BV., see the separate list of worldwide contacts, PIM 113-01Z2. (EEA: European Economic Area)

11.4 For the Pollution Control of Electronic and Electrical Products of the People's Republic of China

They are applicable only in the People's Republic of China.

产品中有毒有害物质或元素的名称及含量

部件名称	有毒有害物质或元素					
	铅（Pb）	汞（Hg）	镉（Cd）	六价铬（Cr(VI)）	多溴联苯（PBB）	多溴二苯醚（PBDE）
框架（塑料）	×	×	×	×	○	○
线路板 ASSY	×	×	×	×	○	○
导线	×	×	×	×	○	○
电池	×	×	×	×	○	○

○：表示该部件的所有均质材料中的有毒有害物质的含量均在 GB/T 26572 标准中所规定的限量以下。
×：表示该部件中至少有一种均质材料中的有毒有害物质或元素的含量超过 GB/T 26572 标准所规定的限量要求。

环保使用期限：

该标识适用于 SJ/T11364 中所述，在中华人民共和国销售的电子电气产品的环保使用期限。
只要您遵守该产品相关的安全及使用注意事项，在自制造日起算的年限内，则不会因产品中有害物质泄漏或突发变异，而造成对环境的污染或对人体及财产产生恶劣影响。
注）
该年数为"环保使用期限"，并非产品的质量保证期。零件更换的推荐周期，请参照使用说明书。