

In addition to this User's Manual, there is another manual for the instrument, IM CA12E-01E, which provides instructions for its safe use and explains its functions. Refer to it as needed.



IM CA12E-02E  
3rd Edition Sep. 2009 (KP)

### 8. Calibration Procedure

#### ■ Calibration Procedure

To maintain a high level of accuracy, it is recommended that the CA12E 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	Max. 110 mV	±(0.005%+5 μV)	Model 7561 (Yokogawa) or equivalent
Ω	Digital multimeter	400 Ω	Max. 440 Ω Measuring current: 1 mA	±(0.005%+0.02 Ω)	Model 7561 (Yokogawa) or equivalent

#### Measurement feature

Items to be calibrated	Names of standards	Range	Generated value	Accuracy	Remarks
DCV	Standard DC voltage generator	100 mV	100 mV	± 0.01%	Model 2552 (Yokogawa) or equivalent
Ω	Decade resistance box	400 Ω	400 Ω	± 0.01%	Model 279301 (Yokogawa) or equivalent

#### ■ Environmental Conditions for Calibration

Ambient temperature: 23 ± 1°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 mV
	FS
400 Ω	0 mV
	FS

\*1: Make adjustments to CA12E according to the reading of the standard (CA12E output value) as specified in the table.

#### Measurement:

Calibration points	Standard Value*2
100 mV	100 mV
400 Ω	400 Ω

\*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 CA12E calibrator, connect it to the standard. Be sure to remove the external RJ sensor.
- 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 CA12E using the standard (digital multimeter), and using the [▲] and [▼] adjustment keys adjust the CA12E 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 shows a full scale of the range.
- Read the output value of the CA12E using the standard (digital multimeter), and using the [▲] and [▼] adjustment keys adjust the CA12E 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.

#### ■ Calibration Precautions

- Calibration for 400-Ω generation
  - Set resistance-measuring current to 1 mA (\*)
    - (\*) Check the specifications of the digital multimeter (DMM) to be used as the standard. Example: Resistance-measuring current is 1 mA for the 2000 Ω range of Model 7561 (Yokogawa).
  - Connection method
    - Connect the CA12E calibrator to the standard in a four-wire connection configuration for calibration as shown below:

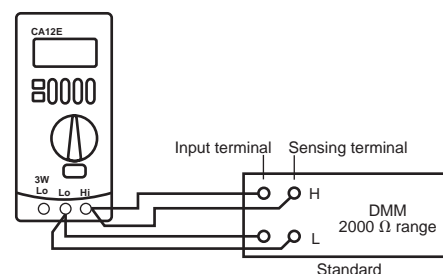
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Tachibana Bld. No. 2, 6-1-3, Sakaecho, Tachikawa-shi, Tokyo 190-8586 Japan  
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Phone: 31-88-4641000 Facsimile: 31-88-4641111  
YOKOGAWA AMERICA DO SUL LTDA. (BRAZIL)  
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YOKOGAWA ENGINEERING ASIA PTE. LTD. (SINGAPORE)  
Phone: 65-6241-9933 Facsimile: 65-6241-2606  
YOKOGAWA MEASURING INSTRUMENTS KOREA CORPORATION (KOREA)  
Phone: 82-2-551-0660 to -0664 Facsimile: 82-2-551-0665  
YOKOGAWA AUSTRALIA PTY. LTD. (AUSTRALIA)  
Phone: 61-2-8870-1100 Facsimile: 61-2-8870-1111  
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Phone: 973-17-358100 Facsimile: 973-17-336100  
YOKOGAWA ELECTRIC CIS LTD. (RUSSIAN FEDERATION)  
Phone: 7-495-737-7868 Facsimile: 7-495-737-7869

IM3E-2009.2

#### ■ Notice regarding the Manual

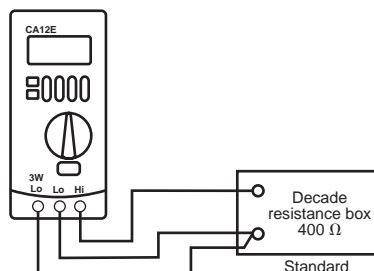
- The information contained in this Instruction Manual is subject to change without notice.
- Every effort has been made to ensure that the information contained herein is accurate. However, should any concerns, errors, or omissions come to your attention, or if you have any comments, please contact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



#### <2> Calibration for 400-Ω measurement

##### • Connection method

Connect the CA12E calibrator to the standard in a three-wire connection configuration for calibration as shown below:

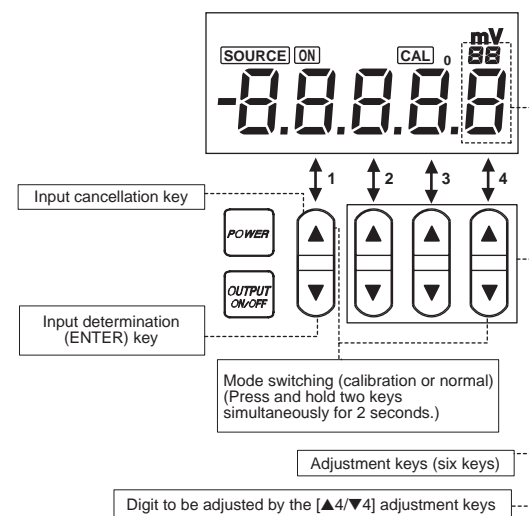


#### <3> Calibration for internal RJ compensation

Because this calibration requires special equipment (a K-type thermocouple and 0°C reference temperature chamber), contact the sales agent or office where the instrument was purchased, or our office.

#### ■ Assignment of Keys for Calibration

When the CA12E 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 CA12E calibrator, connect it to the standard. Be sure to remove the external RJ sensor.
- 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/Measurement Functions

Accuracy:  $\pm$ (% of set value or reading + °C,  $\mu$ V, or  $\Omega$ ), at 23  $\pm$ 5°C

Range Selection	Range of Source/Measure	Accuracy			Resolution
		Source *3	Measurement *4	Remarks	
TC *1	K -200.0 to +1372.0°C	0.05%+1°C	0.07%+1.5°C	-100°C or above Below -100°C	0.1°C
	E -200.0 to +1000.0°C				
	J -200.0 to +1200.0°C				
	T -200.0 to +400.0°C				
	N -200.0 to +1300.0°C				
	R 0 to 1768°C	0.05%+3°C	0.07%+3°C	Below 100°C	1°C
	S 0 to 1768°C	0.05%+2°C	0.07%+2°C	100°C or above	
	B +600 to +1800°C	0.05%+4°C	0.07%+4°C	Below 1000°C	0.1°C
	L -200.0 to +900.0°C	0.05%+0.5°C	0.07%+1.5°C	0°C or above	
U -200.0 to +400.0°C	0.05%+1°C	0.07%+2°C	Below 0°C		
100 mV	-10.00 to +110.00 mV	0.05%+30 $\mu$ V	0.05%+30 $\mu$ V	Measurement range: 0 to $\pm$ 110.00 mV	0.1 $\mu$ V
400 $\Omega$	0 to 400 $\Omega$	0.05%+0.2 $\Omega$	0.05%+0.2 $\Omega$ *5	Excitation current	0.1 $\Omega$
PT100 *2	-200.0 to +850.0°C	0.05%+0.6°C	0.05%+0.6°C*5	*6	0.1°C
JPT100	-200.0 to +500.0°C				

Temperature coefficient: 1/10 of accuracy/°C

- \*1: According to JIS C 1602-1995 (Reference Thermo-electromotive Force Table). L and U are determined according to the DIN standard.  
 \*2: According to JIS C 1604-1997 (Reference Resistance Table)  
 International Practical Temperature Scale of 1968 (IPTS68) for PT100 reference resistance  
 IPTS68 for PT100 is -200 to +650°C.  
 \*3: The TC generation accuracy does not include the RJ accuracy.  
 The sensor output accuracy must be taken into consideration when output compensation is determined based on the RJ temperature (output compensation performed every 4 seconds).  
 \*4: When it is calculated according to the Reference Thermo-electromotive Force Table, the TC measuring accuracy includes the RJ accuracy (TC accuracy added).  
 The terminal temperature must be stable.  
 \*5: Three-wire measurement  
 \*6: Excitation current for generation: 0.5-2 mA; Excitation current for measurement: approximately 2 mA  
 When the excitation current is 0.1 mA, 0.05% + 1°C (0.4  $\Omega$ ) is added, and the maximum input capacitance of the device under calibration is 0.1  $\mu$ F.

- Power supply: Four 1.5-V alkaline batteries (LR6, AA-size) or dedicated AC adapter (sold separately)  
 Battery life: Approximately 55 hours (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 20 ms (between the time when the specified current is supplied and the time when the output value enters the accuracy range)  
 Loading conditions: Less than 0.1  $\mu$ F (DCV)  
 Measured-value indication updating intervals: Approximately 1 second  
 Display: 7 segments LCD  
 Maximum allowable applied voltage: 42 V between each terminal and ground  
 Operating temperature and humidity range: 0 to 50°C, 20 to 80% R.H. (no condensation)  
 Storage temperature and humidity range: -20 to 50°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 (B9108MT) for measurement and generation (one set, consisting of two black cables and one red cable)  
 4 alkaline batteries  
 Terminal adapter (B9108KF)  
 2 User's manuals  
 Optional accessories: Dedicated AC adapter (94012: AC100 V, 94013: AC120 V, B9108WB: AC 220-240 V)  
 Lead cables (B9108MT) for measurement and generation  
 Carrying case (B9108NK)  
 Rubber boot (93038)  
 Strap (97040)  
 Accessory case (B9108XA)  
 RJ sensor: reference junction compensation (B9108WA)  
 Safety standards: EN61010-1 (only AC adapter B9108WB) (94012 and 94013 are excluded.)  
 EMC standards: EN61326-1 ClassB  
 EN55011 ClassB Group1  
 EN61000-3-2  
 EN61000-3-3

Measurement error may temporarily occur under immunity environments.  
 Test conditions of EMC and Immunity standards: AC adapter (B9108WB), Lead cables (B9108MT) and RJ sensor (B9108WA) are used.

## Disposing the Product

### Waste Electrical and Electronic Equipment (WEEE), Directive 2002/96/EC

This Product complies with the WEEE Directive (2002/96/EC) marking requirement. The affixed product label (see below) 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 1, this product is classified as a "Monitoring and Control instrumentation" product.

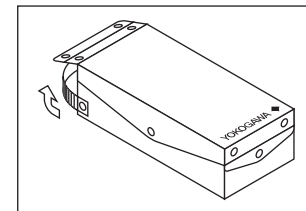
To return unwanted products within the EU area, contact your local Yokogawa Europe B. V. office. Do not dispose in domestic household waste.



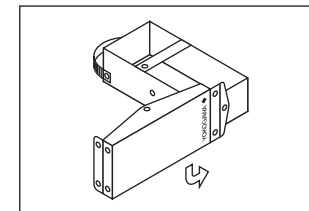
## 10. How to Use the Carrying Case and Rubber Boot

### ■ Carrying case (B9108NK)

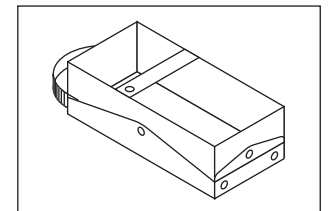
The carrying case (B9108NK) may be used as follows:



(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.

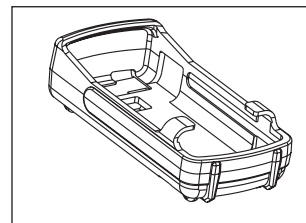


(3) Re-do the fasteners at the top and sides of the cover.

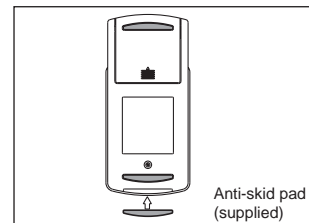
**Note: The fastener on the logo-side cannot be undone.**

### ■ Rubber boot (93038)

### ■ Anti-skid pad



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



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.**

### ■ Specifications of the External RJ Sensor \*3

(Model: B9108WA)

Measuring range	Accuracy (when combined with the instrument)
-10 to +50°C	18 to 28°C: $\pm$ 0.5°C Other ranges: $\pm$ 1°C

Cord length: Approximately 1.5 m

Compensation using the built-in sensor is also possible by adjusting the setting of the internal DIP switch on the instrument.

## "Measures for Administration of the Pollution Control of Electronic Information Products" of the People's Republic of China

The following are the provisions of "Measures for Administration of the Pollution Control of Electronic Information 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					
	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)	x	x	x	x	○	○
线路板 ASSY	x	x	x	x	○	○
导线	x	x	x	x	○	○
电池	x	x	x	x	○	○
选购						
RJC CABLE B9108 WA	x	x	x	x	○	○

○: 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 SJ/T11363-2006 标准中所规定的限量以下。  
 x: 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 SJ/T11363-2006 标准所规定的限量要求。

环保使用期限:



该标识适用于 2006 年 2 月 28 日颁布的《电子信息产品污染控制管理办法》以及 SJ/T11364 - 2006《电子信息产品污染控制标识要求》中所述,在中华人民共和国销售的电子信息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,则不会因产品中有有害物质泄漏或突变,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”,并非产品的质量保质期。零件更换的推荐周期,请参照使用说明书。