

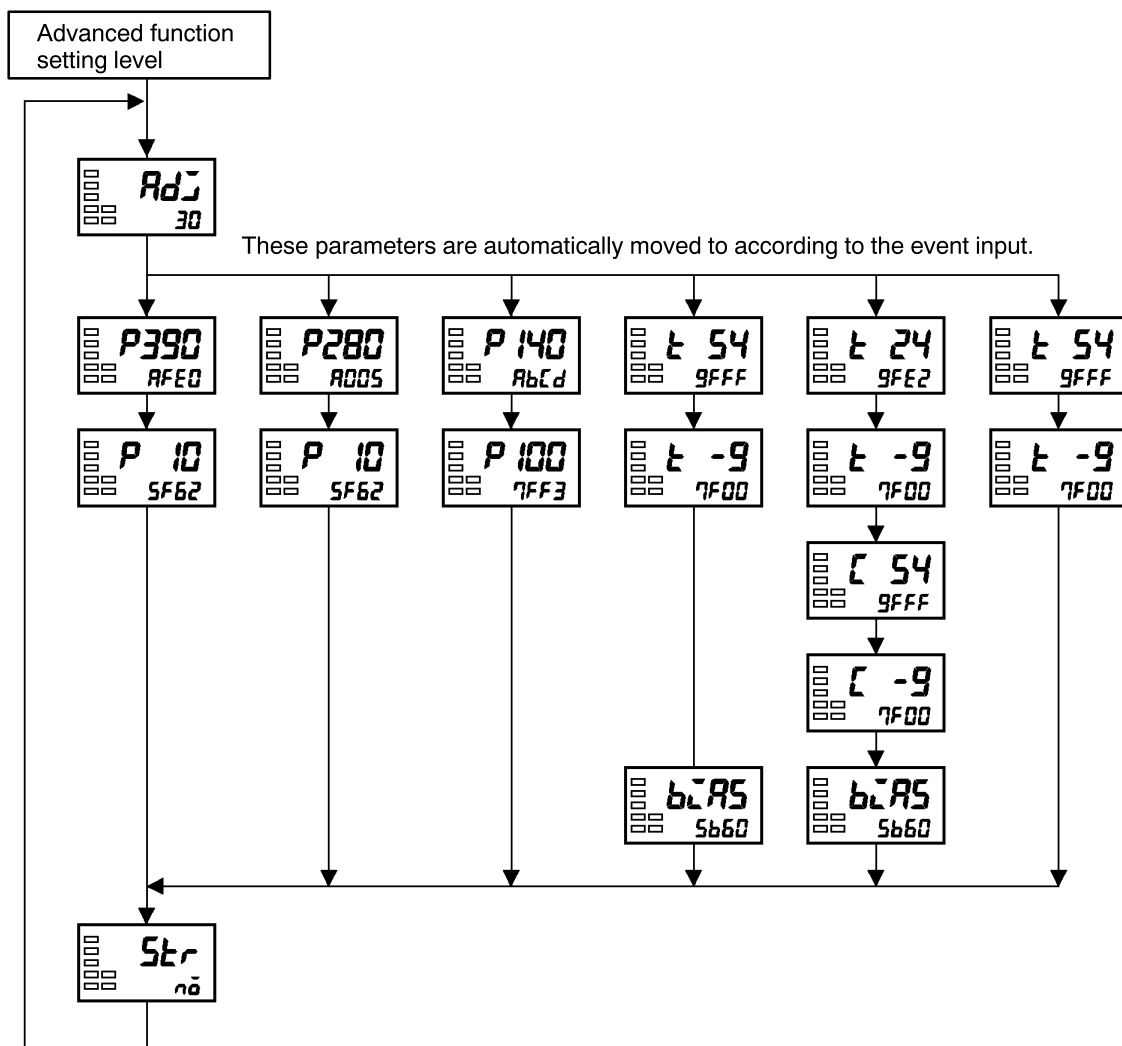
CHAPTER 6

CALIBRATION

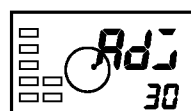
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6.1 Parameter Structure

- To calibrate the E5CN, enter the password “1201” at the “move to calibration level” parameter in the “advanced function setting level”. “Adj” is displayed.
- However, note that the “move to calibration level” parameter might not be displayed when, for example, the user is calibrating the E5CN for the first time. If this happens, set the “initial/communications protection” parameter in the protect level to “0” before moving to the “advanced function setting level”.
- The parameters in the calibration level are structured as follows:



Once the user has calibrated the E5CN, a dot will be displayed when the calibration level is moved to, to indicate that the E5CN has already been calibrated by the user.



Dot is displayed.

6.2 User Calibration

The E5CN is correctly calibrated before it is shipped from the factory, and normally need not be calibrated by the user.

If, however, it must be calibrated by the user, use the parameters for calibrating temperature input and analog input.

However, note that OMRON cannot ensure the results of calibration by the user.

Also, calibration data is overwritten with the latest settings. The default calibration settings cannot be returned to after user calibration.

● Calibrating input

When the user calibrates the E5CN, the input type currently selected in parameters is calibrated. The following 22 input types can be calibrated.

- Thermocouple : 12 types
- Non-contact temperature sensor : 4 type
- Analog input : 1 type
- Platinum resistance thermometer : 5 types

● Registering calibration data

The new calibration data for each item is temporarily registered. It can be officially registered as calibration data only when all items have been calibrated to new values. So, be sure to temporarily register all items when you calibrate the E5CN.

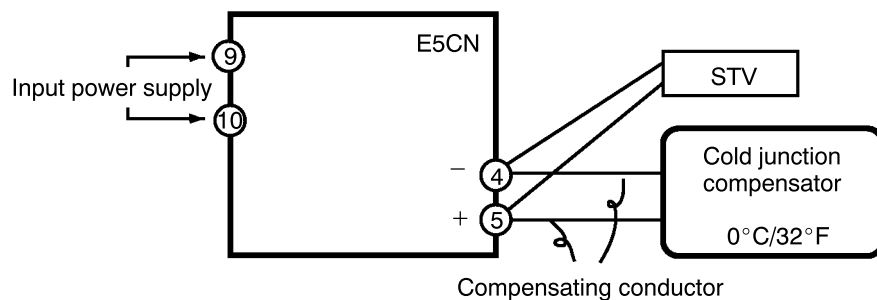
When calibration data is registered, it is registered regardless of whether or not the E5CN has been calibrated by the user.

Prepare separate measuring devices and equipment for calibration. For details on how to handle measuring devices and equipment, refer to the respective instruction manuals.

6.3 Calibrating Thermocouples

- Calibrate according to the type of thermocouple, thermocouple 1 group (input types 0, 2, 5, 6, 8) and thermocouple 2 group (input types 1, 3, 4, 7, 9, 10, 11, 12, 13, 14, 15).
- When calibrating, do not cover the bottom of the E5CN. Also, do not touch the input terminals (Nos. 4 and 5) or compensating conductor on the E5CN.

● Preparations

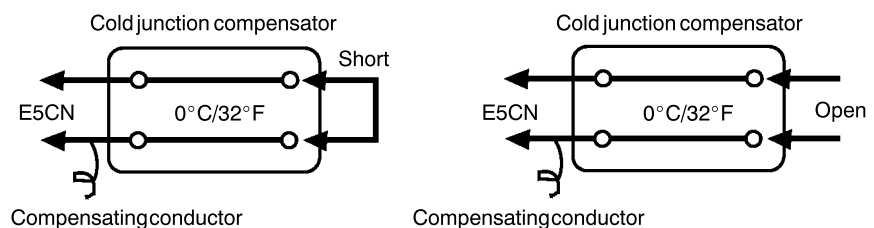


- Set the cold junction compensator designed for compensation of internal thermocouples to 0°C. However, make sure that internal thermocouples are disabled (tips are open).
- In the above figure, STV refers to a standard DC current/voltage source.
- Use the compensating conductor designed for the selected thermocouple. However, note that when thermocouples R, S, E, B or a non-contact temperature sensor is used, the cold junction compensator and the compensating conductor can be substituted with the cold junction compensator and the compensating conductor for thermocouple K.



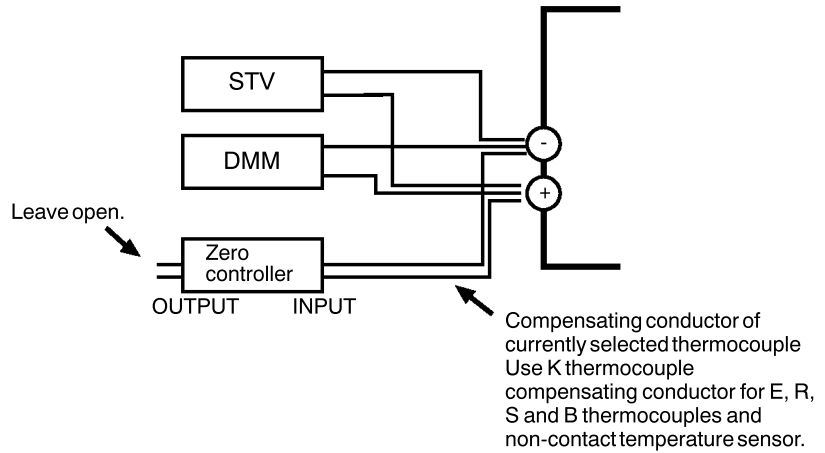
Connecting the Cold Junction Compensator

Correct process values cannot be obtained if you touch the contact ends of the compensating conductor during calibration of a thermocouple. Accordingly, short-circuit (enable) or open (disable) the tip of the thermocouple inside the cold junction compensator as shown in the figure below to create a contact or non-contact state for the cold junction compensator.



This example describes how to calibrate the E5CN when thermocouple input is currently selected on an E5CN supporting thermocouple input.

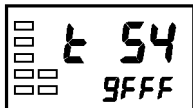
- (1) Connect the power supply.
- (2) Connect a standard DC current/voltage source (STV), precision digital multimeter (DMM) and contact junction compensator (e.g. zero controller as in figure) to the thermocouple input terminals, as shown in the figure below.



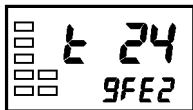
- (3) Turn the power ON.
- (4) Move to the calibration level.
This starts the 30-minute aging timer. This timer provides an approximate timer for aging. After 30 minutes, the No.2 display changes to “0”. You can advance to the next step in this procedure even if “0” is not displayed.





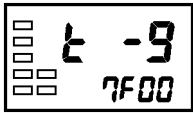
Input type 0, 2, 5, 6, 8



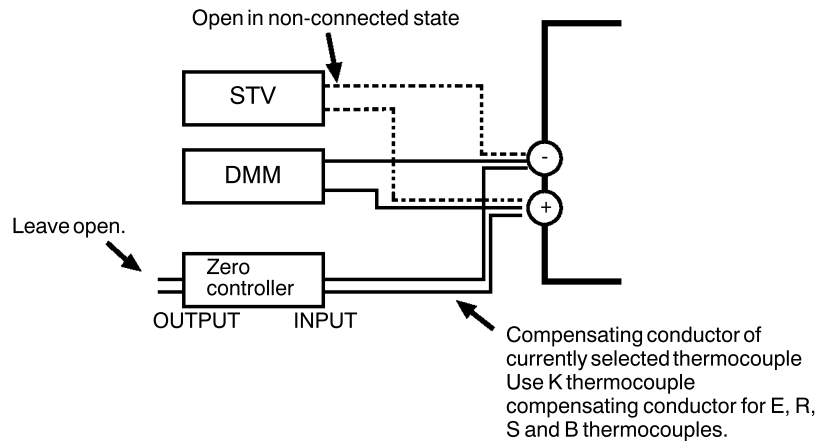
Input type, 1, 3, 4, 7, 9, 10, 11, 12, 13, 14, 15



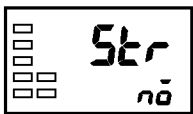
- (5) Press the  key to set the E5CN to the state on the left.
The No.2 display at this time displays the currently entered count value entered in Hexadecimal. Set the STV as follows:
 - Input types 0, 2, 5, 6, 8 : Set to “54 mV”.
 - Input types 1, 3, 4, 7, 9, 10, 11, 12, 13, 14, 15: Set to “24 mV”.
 Allow the count value on the No.2 display to fully stabilize, then press the  key to temporarily register the calibration setup.



- (6) Press the key to set the E5CN to the state on the left. Set STV to “-9mV”. Allow the count value on the No.2 display to fully stabilize, then press the key to temporarily register the calibration setup.
- (7) Press the key. The No.2 display changes to the state on the left when the input type is 1, 3, 4, 7, 9, 10, 11, 12, 13, 14 or 15.
- (8) Set STV to “54mV”. Allow the count value on the No.2 display to fully stabilize, then press the key to temporarily register the calibration setup.
- (9) Press the key. The No.2 display changes to the state on the left when the input type is 1, 3, 4, 7, 9, 10, 11, 12, 13, 14 or 15. Set STV to “-9mV”.
- (10) Allow the count value on the No.2 display to fully stabilize, then press the key to temporarily register the calibration setup.
- (11) Press the key to set the E5CN to the state on the left.
- (12) Change the wiring as follows:



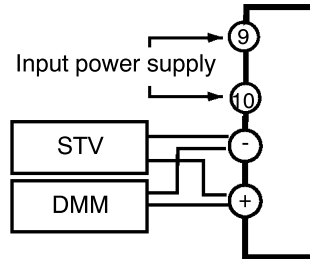
Disconnect the STV to enable the thermocouple of the cold junction compensator. When doing this, be sure to disconnect the wiring on the STV side.



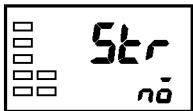
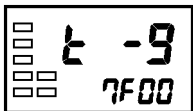
- (13) Allow the count value on the No.2 display to fully stabilize, then press the key to temporarily register the calibration setup.
- (14) Press the key. The No.2 display changes to the state on the left. Note that the data to be temporarily registered is not displayed when it is not entirely prepared. Press the key. The No.2 display changes to “5E5”. Release the key and wait two seconds or press the key. This stores the temporarily registered calibration data to EEPROM. Data will not be stored to memory if you press the key with “no” displayed on the No.2 display.
- (15) The calibration mode is quit by turning the power OFF.










6.4 Calibrating Analog Input

This example describes how to calibrate when 0 to 50 mV input (input type 16) is currently selected on an E5CN supporting thermocouple input.

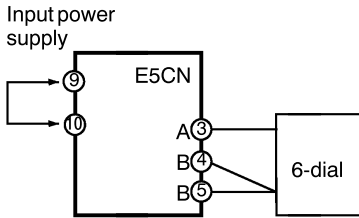


- (1) Connect the power supply.
- (2) Connect an STV and DMM to the analog input terminals, as shown in the figure above.
- (3) Turn the power ON.
- (4) Move to the calibration level.
This starts the 30-minute aging timer. This timer provides an approximate timer for aging. After 30 minutes, the No.2 display changes to "0". You can advance to the next step in this procedure even if "0" is not displayed.



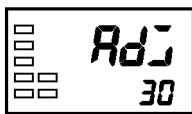
- (5) Press the  key to set the E5CN to the state on the left. The No.2 display at this time displays the currently entered count value entered in Hexadecimal. Set the STV to "54mV".
- (6) Allow the count value on the No.2 display to fully stabilize, then press the  key to temporarily register the calibration setup.
- (7) Press the  key to set the E5CN to the state on the left. Set STV to "-9mV".
- (8) Allow the count value on the No.2 display to fully stabilize, then press the  key to temporarily register the calibration setup.
- (9) Press the  key. The No.2 display changes to the state on the left. Note that the data to be temporarily registered is not displayed when it is not entirely prepared. Press the  key. The No.2 display changes to "5E5". Release the key and wait two seconds or press the  key. This stores the temporarily registered calibration data to EEPROM. To cancel storage of temporarily registered calibration data to memory, press the  key without pressing the  key.
- (10) The calibration mode is quit by turning the power OFF.

6.5 Calibrating Platinum Resistance Thermometers



This example describes how to calibrate the E5CN when it is connected to a platinum resistance thermometer.

When calibrating a platinum resistance thermometer use wires of the same thickness as those used to connect the E5CN.



Input type 0



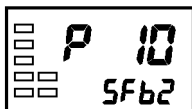
Input types 1, 3



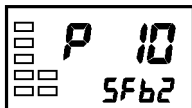
Input types 2, 4



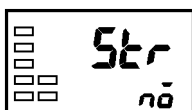
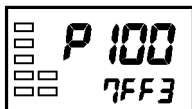
Input type 0



Input types 1, 3



Input types 2, 4



- (1) Connect the power supply.
- (2) Connect a precision resistance box (called “6-dial” in this manual) to the platinum resistance thermometer input terminals.
- (3) Turn the power ON.
- (4) Move to the calibration level. This starts the 30-minute aging timer. This timer provides an approximate timer for aging. After 30 minutes, the No.2 display changes to “0”. You can advance to the next step in this procedure even if “0” is not displayed.
- (5) Press the key to display the count value for each input type. The No.2 display at this time displays the currently entered count value entered in Hexadecimal. Set the 6-dial as follows:
 - Input type 0: 390 Ω
 - Input type 1 or 3: 280 Ω
 - Input type 2 or 4: 140 Ω
- (6) Allow the count value on the No.2 display to fully stabilize, then press the key to temporarily register the calibration setup.
- (7) Press the key to set the E5CN to the state on the left. Set the 6-dial as follows:
 - Input type 0: 10 Ω
 - Input type 1 or 3: 10 Ω
 - Input type 2 or 4: 100 Ω
- (8) Allow the count value on the No.2 display to fully stabilize, then press the key to temporarily register the calibration setup.
- (9) Press the key. The No.2 display changes to the state on the left. Note that the data to be temporarily registered is not displayed when it is not entirely prepared. Press the key. The No.2 display changes to “ $5E5$ ”. Release the key and wait two seconds or press the key. This stores the temporarily registered calibration data to EEPROM. Data will not be stored to memory if you press the key with “no” displayed on the No.2 display.
- (10) The calibration mode is quit by turning the power OFF.

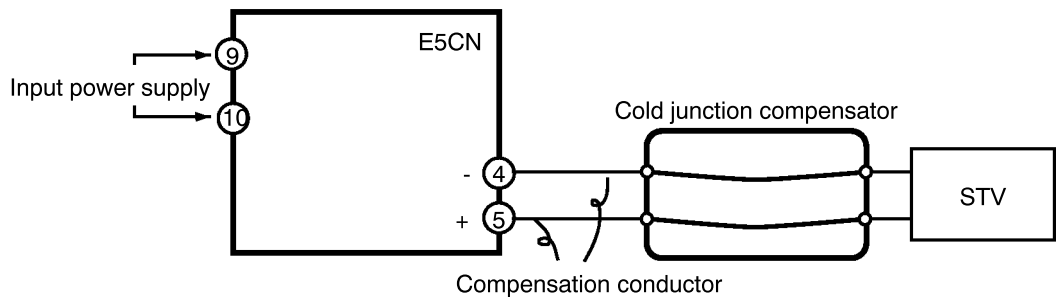
6.6 Checking Indication Accuracy

● Thermocouple or non-contact temperature sensor

- After calibrating input, be sure to check indication accuracy to make sure that the E5CN has been correctly calibrated.
- Operate the E5CN in the PV/SP monitor mode.
- Check the indication accuracy at the upper and lower limits and mid-point.

• Preparation

The following figure shows the required device connection. Make sure that the E5CN and cold junction compensator are connected by a compensating conductor for the thermocouple that is to be used during actual operation. For the non-contact temperature sensor, connect a K thermocouple, and set the input type to the K thermocouple.



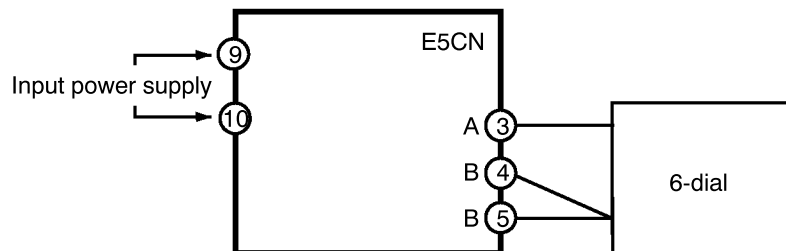
• Operation

Make sure that the cold junction compensator is at 0°C, and set STV output to the voltage equivalent to the starting power of the check value. The cold junction compensator and compensation conductor are not required when an external cold junction compensation method is used.

● Platinum resistance thermometer

• Preparation

The following figure shows the required device connection:



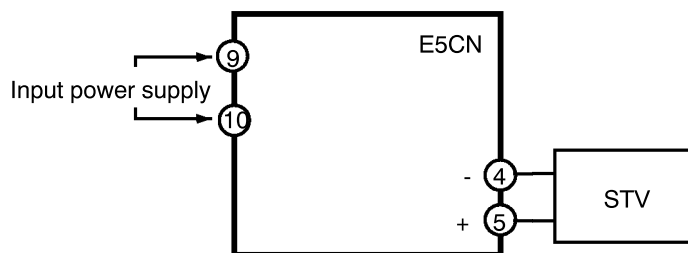
• Operation

Set the 6-dial to the resistance equivalent to the check value.

● Analog input

• Preparation

The following figure shows the required device connection:



• Operation

Set the STV output to the voltage of the check value.